EMODnet

European Marine Observation and Data Network

EMODnet Thematic Lot n° 1 - Geology

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

Start date of the project: 12/04/2017 - (24 months)

EMODnet Phase III – Final Report

Reporting Period: 12/04/2017 – 11/04/2019

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

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Disclaimer

Executive summary

[Max 750 words]

The EMODnet-Geology Project started in April 2017, was executed for 2 years and ended in April 2019. The group consisted of 34 partners and 5 subcontractors who were able to provide geological information from all European seas. By including organisations from Iceland, Norway and Russia, it was possible to expand the information coverage into the North Atlantic Ocean and to the margins of the Arctic (Barents Sea and White Sea).

During the first three months efforts were put on partner data inventory on data which comply with the new requirements of 1:100 000 scale or finer where underlying data permit, as well as on launch of the new EMODnet Geology portal by partner and WP 9 lead GEUS in Copenhagen. Albeit very short dead-line for this action the portal was up and running in the third project month.

All guidelines of the different work packages were updated during the first 9 months, except for the new work package WP8 Submerged Landscapes, which started with a first workshop in late June in Copenhagen. The second WP8 workshop was held in Crete on January 31 – February 1 2018. Those two focussed workshops were essential in the formulation of the guidelines, with the one held in Copenhagen resulting in the methodology to be followed and the timetable and the workshop in Crete defining the feature classes. Defining submerged landscape features had never been attempted before. The case study pilot areas agreed upon in Copenhagen were important in identifying the large variation of submerged landscape features that are present beneath European Seas. The chosen pilot areas were UK Shelf, Baltic, Aegean, and Tyrrhenian seas, as well as offshore Ireland and in the Sea of Marmara. One of the major realisations was just how large the subaerially exposed land area of Europe became when sea level was reduced by 120 metres. In this context, it was another challenge to identify those features which were formed when subaerially exposed from those that were formed latterly when sea level rose.

Except for WP8 which had just started in this phase of EMODnet Geology the other work packages updated their map products according to the new resolution specifications set by the Service Contract. Finally all map products were updated and several new ones were released in the end of the 24 month period of the service contract. New products available on the EMODnet Geology portal as of 29. April 2019 were: Coastal Behavior; Release of new satellite derived coastal migration maps (8. April 2019); Marine Minerals - Update of available maps and release of one new mineral, sapropel (16. April 2019); Submerged Landscapes; Release of the completely new, never before seen, maps on submerged landscapes of the European coasts (19. April 2019); Multi-scale seabed substrate, update of the substrate map to 1:100.000 scale with the multi-scale approach enabling even finer resolutions. Harmonized up to scale 1:50.000 (23. April 2019); Events and Probabilities; update of the events and probabilities products (26. April 2019); and Sea-Floor Geology; update of available maps and release of the new maps on geomorphology and Quaternary geology (29. April 2019).

Throughout the project period EMODnet was marketed at a multitude of various events, from lay-mans' level to highly scientific meetings, such as the worlds' largest geo-scientific meeting the American Geosciences Union (AGU) Annual meeting 2017 and 2018, the IUGS/UNESCO Resources for Future Generations 2018 Conference, with a final boost having an EMODnet Geology booth at the European Geosciences Union (EGU) Annual meeting in Vienna in April 2019, not to mention all the many other national and international events where EMODnet in general and EMODnet Geology was presented for thousands of stakeholders.

1 Introduction

The EMODnet-Geology Project is one of eight that brings together information on the Geology, Chemistry, Biology, Physics, Bathymetry, Seabed Habitats, Coastal Mapping, and Human Activities in the European marine environment. During the second phase of EMODnet (2013-2016), 36 organisations from 30 countries demonstrated that geological information could be compiled and harmonised to map products at 1:250 000 scale from all of the European seas. In 2017, the group of mainly geological survey organisations from 30 countries was being awarded the contract to deliver similar information for the entire European seas, but in a much finer scale, 1:100 000 or finer where the underlying data permit.

The current EMODnet-Geology Project started in April 2017, was running for 2 years, and ended in April 2019. The group consists of 39 partners or subcontractors who were able to provide geological information from all European seas shown in Figure 1 and, by including organisations from Iceland, Norway and Russia, to expand the information coverage into the North Atlantic Ocean and to the margins of the Arctic (Barents Sea and White Sea). The data that were included in the project were principally that held by the project partners, although other organisations contribute to the geological mapping objectives in some of the participating countries. The geology data that were compiled in the earlier phases and in the current project included:

- Sea-bed substrate (sediment layer at the seafloor),
- Sediment accumulation rate ;
- Sea-floor geology - lithology (bedrock geology beneath the surficial sediment and Quaternary deposits);
- Sea-floor geology - stratigraphy ;
- Quaternary geology
- Geomorphology
- Coastal behaviour;
- Mineral occurrences (e.g. oil and gas, aggregates, metallic minerals) ;
- Geological events and probabilities (e.g earthquakes, submarine landslides, volcanic centres).
- Submerged landscapes (LGM landscape, palaeolandscapes across various postglacial timeframes).

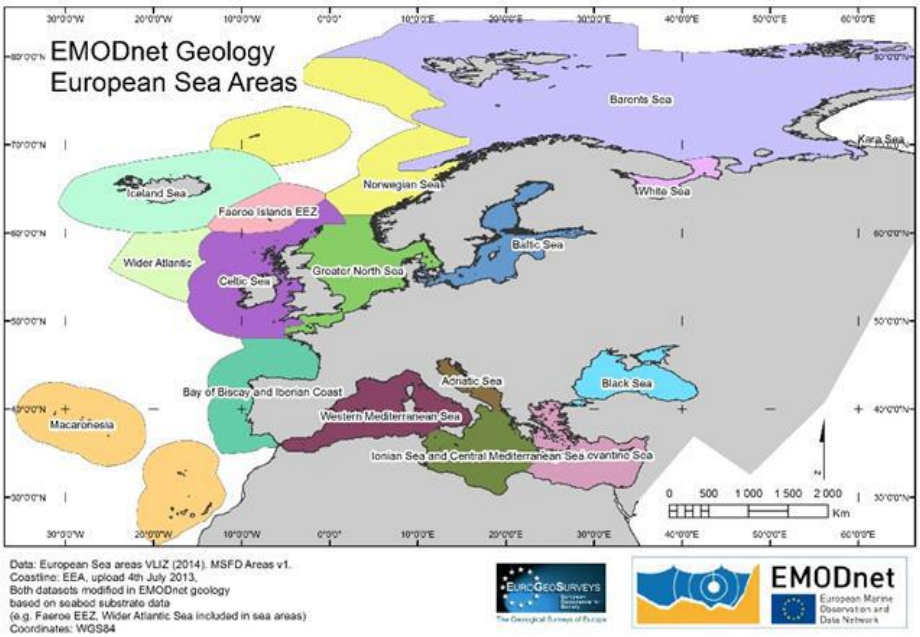


Figure 1. The European regional seas included in the EMODnet Programme. The EMODnet-Geology consortium network includes partner organisations who hold information from all regional seas.

The consortium included the following organisations 1. Geological Survey of Finland (GTK); 2. UK Research and Innovation (UKRI, United Kingdom) 3. Geological Survey of Sweden (SGU); 4. Geological Survey of Norway (NGU); 5. Geological Survey of Denmark and Greenland (GEUS); 6. Jardfeingi (Faroe Islands); 7. Iceland GeoSurvey (ISOR); 8 Geological Survey of Estonia (EGT); 9. Latvijas Vidas Geologijas un Meteorologijas Centr – Latvian Environment, Geology and Meteorology Centre (LEGMC; Latvia); 10. Lithuanian Geological Survey (LGT); 11. Polish Geological Institute (PGI-NRI); 12. Geological Survey of the Netherlands (TNO); 13. Royal Belgian Institute of Natural Sciences (RBINS); 14. Bureau de Recherches Géologiques et Minieres (BRGM, France); 15. IFREMER (France); 16. Geological Survey of Ireland (GSI); 17. Geological Survey of Spain (IGME); 18. Instituto Português do Mar e da Atmosfera (IPMA, Portugal); 19. Istituto Superiore per la Protezione e la Ricerca Ambientale. Servizio Geologico d'Italia (ISPRA); 20. Geological Survey of Slovenia (GeoZs); 21. Croatian Geological Survey (HGI); 22. Geological Survey of Montenegro (GEOZAVOD); 23. Geological Survey of Albania (GSA); 24. Hellenic Survey of Geology and Mineral Exploration (HSGME, Greece); 25. Hellenic Center for Marine Research, Greece (HCMR); 26. Institute of Oceanology – Bulgarian Academy of Science (IO-BAS); 27. National Research and Development Institute for Marine Geology and Geoecology (GeoEcoMar, Romania); 28. Geological Survey of Cyprus (GSC); 29. Continental Shelf Department of the Office of the Prime Minister (Malta); 30. Centre for Environment, Fisheries and Aquaculture Science (CEFAS, United Kingdom); 31. Edge Hill University (United Kingdom); 32. Dipartimento Scienze della Terra Università La Sapienza, Roma (UNIROMA, Italy); 33. Department of Geology, University of Tartu (Estonia); 34 Foundation for Research and Technology Hellas – Institute of Computer Science (FORTH- ICS); 35. Prichornomorske State Regional Geological Enterprise (Ukraine); 36. Dokuz Eylul University (Turkey); 37. A.P Karpinsky Russian Geological Research Institute (VSEGEI); 38. Federal Institute for Geosciences and Natural Resources (BGR, Germany); 39. EMCOL Research Centre, Istanbul Technical University (ITU, EMCOL, Turkey).

The partnership consisted of the geological survey organisations of the maritime countries of the European Union, added with expertise from five universities, mainly to fulfill the requirements of the new work package WP8 Submerged Landscapes. Twenty-five of the project partners are also members of the Geological Surveys of Europe (EuroGeoSurveys), which exists to promote the work of the geological surveys and therefore provides a long-term association under which the project partners collaborate.

As the principal holders of marine geological information, the partnership also ensured that data from all of the European regional seas were provided to the project. The project built on information primarily held by the project partners, but also connected to other owners of information by offering data delivery to EMODnet either through the EMODnet Data Ingestion portal or straight to the EMODnet Geology portal. By doing so, the project would not recreate information that is held elsewhere. This was especially essential in case of the seismic surveys and borings which were partly archived in external databases. The EMODnet Geology portal (http://www.emodnet-geology.eu/) was from the beginning of this phase of EMODnet hosted by the Geological Survey of Denmark and Greenland (GEUS) in Copenhagen. In order to ensure sustainability of the EMODnet Geology project, the EuroGeoSurveys' European Geological Data Infrastructure (EGDI) provides an appropriate platform for developing a long-term infrastructure for delivering the best available and up-to-date marine geological information held by the project partners.

2 Highlights in this reporting period

- Amongst the first actions of the project was transfer of the old EMODnet Geology portal of the second phase of EMODnet from UKRI, United Kingdom, to facilities at GEUS, Denmark. The new portal at GEUS was up and running in mid-June 2017. The portal layout, styling and colors were aligned with new guidelines from the EMODnet Secretariat by end of 2017. Datasets from previous phases of EMODnet Geology (in scales 1:1 000 000 & 1:250 000) were made available through the new and updated EMODnet 3 Geology portal during 2017.
- Update of the inventory of all available data, especially at the required 1:100,000 scale all over but finer where the underlying data permit was carried out by all work packages during the whole reporting period. Guidelines of the work of the different work packages were updated to the criteria of the Service Contract and they were distributed to all partners by November 2017, except for the new work package 8 (Submerged landscapes), which had their guidelines finalized and distributed during the first quarter of 2018.
- Partners harmonized and treated their high resolution seafloor data and submitted them to the different work packages. The new WP8 worked with the new resolution criteria from the beginning and published their data products accordingly.
- The first version of the harmonized seabed substrate data on scale 1:100 000 with confidence estimates was made available on the EMODnet 3 Geology portal 23.03.2018.
- WP5 (Coastal behavior) generated a full-coverage pan-European satellite-based analysis of coastline migration, providing 10 years of coastline-position data for every 500 meters along the European coastline. This new data product was published on the portal in April 2019 together with a packet of several new EMODnet Geology products (listed below, see details in chapter 6: work package updates):

  New products available on the EMODnet Geology portal as of 29. April 2019, with dates of main releases. The schedule was agreed upon with the EMODnet Secretariat:

  - 2019.04.08 Coastal Behavior; Release of new stallite derived coastal migration maps.
  - 2019.04.16 Marine Minerals; Update of available maps and release of one new mineral (Sapropel).
  - 2019.04.19 Submerged Landscapes; Release of the completely new maps on submerged landscapes of the European coasts.
  - 2019.04.23 Seabed Substrate multiscale; Update of the substrate map to 1:100.000 scale with the multiscale approach enabling even finer resolutions. Harmonized up to scale 1:50.000.
  - 2019.04.26 Events and Probabilities; update of the events and probabilites products
  - 2019.04.29 Sea-Floor Geology; update of available maps and release of the new maps on geomorphology and Quaternary geology.
- Obtained data and metadata on multibeam and seismic surveys and borings has been according to tender specifications (1.7.1.) made available on the web portal as "Boreholes" and "Geophysics" under "Indexes" on the map viewer.
- Throughout the project period EMODnet was marketed at a multitude of various events, from lay-mans' level to highly scientific meetings, such as the worlds' largest geo-scientific meeting the American Geosciences Union (AGU) Annual meeting 2017 and 2018, the IUGS Resources for Future Generations 2018 Conference, with a final boost having an EMODnet Geology booth at the European Geosciences Union (EGU) Annual meeting in Vienna in April 2019, not to mention all the many other national and international events where EMODnet in general and EMODnet Geology was presented for thousands of potential stakeholders.

3 Summary of the work done

The first year of this third phase of the EMODnet-Geology Project was focused on identifying the geological information that exist in each country and reconstructing the EMODnet-Geology portal. The portal was moved from UKRI (UK) to GEUS (Denmark) and was by month 3 up and running. Initially the priority was to assess information in the higher resolution requested in this phase of the project (1:100 000 scale or finer where the underlying data permit) held by each participating organisation, although as the year progressed also external information, that was publicly available was included. All workpackages (listed below) updated their guidelines and distributed them to the project partners. After collection of all available geological data the different work packages worked on the construction of the products and portal services as outlined in the service contract and the GANNT chart presented in the project tender. The service contract described the project to last from month 1 (April 2017) to month 24 (April 2019). The main areas of progress was in collating information for work packages 3 (sea-bed substrate), 4 (sea-floor geology), 5 (coastal behavior), 6 (geological events and probabilities), 7 (minerals), 8 (submerged landscapes), and 9 (data management, web portal and services). Since work package 8 (submerged landscapes) is a new work package and in practice started at the kick-off meeting in end of May 2017 it took almost the first project year to clarify the amount and extent of all possible data to be included. The work continued into the early months of the second year of the project. Guidelines for this work package were agreed upon, finalized and distributed to partners in early 2018.

The second half of the project (April 2018 to April 2019) concentrate on update of all web products produced by work packages 3 (sea-bed substrate), 4 (sea-floor geology), 5 (coastal behavior), 6 (geological events and probabilities), 7 (minerals), while work package 8 (submerged landscapes) developed completely new information through offered web services. By the end of second project year all work packages offered on the web portal new or updated data products in scale 1:100.000 or finer where the underlying data permit. The updates were all released with press releases distributed widely by the secretariat, the EMODnet Geology portal and the project partners.

The consortium has been aware of the earlier problems with the Geology portal and has put efforts on the recent implementation of the portal and its services. Access to data is improved by centralizing data products on the portal and adding Styled-layer-descriptions (opposed to ArcGIS, this is a non-proprietary styling format). Data products are available through all commonly used methods. To further improve accessibility of data, PostgreSQL is promoted as the preferred method of storing and accessing data products. By principal, all data products, vocabularies, harmonization, and contributions to the data entity indexes are stored in the database.

Progress in each of the tasks specified in Section 1.4.1 of the Tender Specifications is listed in appendix 1 (page 40).

4 Challenges encountered during the reporting period

Provide an overview of the main challenges encountered during the reporting period and the measures taken to address them, including those related to technical and data provision issues.

Main challenge	Measures taken
WP3. Seabed substrate: The EEA coastline used in previous EMODnet projects was considered too general for the high resolution seabed substrate data by the project group.	Therefore it was agreed that the partners should use the national/original coastline of their data.
WP3. The EMODnet seabed substrate data product represent information using the Folk sediment classification scheme. However, the European sea-bed substrate information has been interpreted using more than 30 different national sediment classification schemes that are not necessarily directly compatible with the Folk scheme.	WP3 has provided guidelines to harmonise national data into the Folk scheme. The harmonisation includes evaluation of the different classification schemes used in each country, and classification or translation of the national data into the shared EMODnet classification system. To make the harmonisation process transparent the substrate attribute table includes columns for the Folk sediment classes as well as a column for the original seabed substrate class.
WP3. Some partners have provided data at more general scales than 1:100 000.	The previous WP3 outputs 1:250 000 and 1:1 000 000 data products was not updated (during the first two years) due to the time constraints.
WP3. Generally it can be metioned that the delayed delivery and heterogenic quality of the received data challenged the harmonization process and dataset/data product combination.	During the project further instructions were given if needed and emerged issues were discussed and resolved together with the partner/data provider in question.
WP3 has co-operated with other WP's and other EMODnet lots to ensure the data usability between WP's and to avoid double work among partners.	WP3 representatives have participated in workshops held by other WP's (e.g. WP8 and WP4 workshops). WP3 Leader (GTK) participated in the Emodnet Seabed Habitats – EMODnet Geology Lots workshop organized on 2 October 2017 at SHOM, Athens, Greece. EMODnet Geology and WP3 Leader have been active in EMODnet Technical Working group and EMODnet Data Ingestion projects and participated in their meetings.
WP5. Coastal behaviour: Current set of entryterms describing coastal type is incomplete and definitions are commonly imprecise.	For the time being, we are building and optimizing an updated set for internal use, with some new terms. In time, these will be communicated with INSPIRE and other vocabulary groups working on uniform definitions available through dedicated servers.
WP5. Coastal behaviour: Visualizing results at a pan-European scale (ca. 1:20,000,000 in a single image) requires data aggregation because many measurements are overlapping at this scale.	We finalized a method for smoothing the short-distance variability when zooming out to larger scales. It is used for all WP5 WMSs.

WP6 Geological events and probabilities: In the current 1:100,000 scale of representation, WP6 data density is higher even though in limited areas. **For this reason, the first visualization on the portal might induce to overlook the presence of relevant data.**	Collaboration with WP9 leader (web-portal administrator) has been essential in order to identify the best way to highlight the presence of these data on the portal.
WP6: Data collected in EMODNET do not allow to determine quantitative probability of Geological Events.	Qualitative probability (or susceptibility) has been chosen as the most suitable proxy.
WP6: Many models for susceptibility of geological events have been applied on land but very few in submerged areas.	Many mathematical models have been considered to select the most appropriate susceptibility analysis in submerged areas.
WP7 Minerals: Data not provided in Phase III which was submitted in Phase II due to circumstances outside of the project (permissions for inclusion of the data).	In an instance where data could no longer be submitted in the new format required for WP7 correspondence was made to the project partner to ensure that this data could be submitted at any stage throughout the project if circumstances changed.
WP7 Data not submitted by final submission deadline - There were two instances of data which was not submitted by project partners.	Efforts were made to ensure this data was delivered but unfortunately did not make the final data merge. It is hoped that this data will be incorporated into the Phase III data merge under the project extension.
WP7 Polymetallic sulphides associated with geothermal sites are recorded. Our Icelandic partners ISOR have records of low temperature geothermal sites that may host sulphides at depth, but on the surface exhibit sulphate or white smoker type chimneys.	Discussions relating to how these important sites can be mapped are ongoing. We suggest a new classification of seabed mineralisation be created.
WP8 Submerged landscapes. For the first time to formulate a GIS including shapefiles and their definitions for the features of submerged landscapes	Group meetings and discussions between experts in submerged landscape mapping
WP8. The varied nature of the features which formed the classes provided challenges which included their various scales which ranged upward from point source to polylines and polygons.	A carefully designed set of feature classes which addressed the different data sets and scales
Identification of Europe wide time frames	To be addressed in next phase.
Producing performance indicators required us to centralise the data products on one server running This setup requires more work than anticipated.	All phase II data products re-validated and re-mastered in terms of contents, metadata, and legends (SLD). All contents and metadata moved to a relational database. Legends stored on disk, since GeoServer does not support database storage.

Building a full WP9 geophysical entity index challenged by limited access to GeoSeas/SeaDataNet services.	We raised the issue to partners and contacts involved in SeaDataNet with no luck. Access is still limited to point requests, which are not usable for creating a data product in WP9 (area download).
Data owners had difficulties setting up the necessary tools to share borehole and geophysics entities	Measures were taken to allow data owners to share data using alternative methods – especially static file upload to a common file drive turned out to suit the needs for most data owners.
More than anticipated work had to be done to support technical cross-lot initiatives.	Estimates and decisions had to be adjusted to allow time and budget for cross-lot meetings and initiatives.
The complexity of orchestrating a full-fledged interactive data portal with metadata search, OGC services, and web maps was a challenge.	We partnered with other portals to lower maintenance cost and risk. The main portal takes care of social media and user logging. EGDI takes care of interactive web maps and metadata searching.
Data owners were using different technology for creating their new data products. Most of them use ArcGIS with proprietary formats for styling and dissemination.	A comprehensive guideline was developed in corporation with the main portal stipulating the work involved in publishing new data products – including requirements of using open standards for both styling and dissemination.
Performance issues were encountered for some of the bigger data sets when displayed in full on the interactive web map.	This is still an issue and hard to address. The amount and complexity of the shapes are of a scale hard to make perform. At the moment we make a note on the layers encouraging users to zoom to local area.

5 Allocation of project resources

In this section, please provide information about the efforts spent during the reporting period on the achieving the main objectives and tasks of the project. Provide an overview of resource usage (percentage of project resources) divided into the following categories (if no precise information is available, provide estimate indication instead).

Categories	Resource usage (%)
Making data and metadata interoperable and available	35
Preparing data products	15
Preparing web-pages, viewing or search facilities	10
Managing user feedback	5
Project management	20
Outreach and communication activities	10
Others	5

6 Work package updates

WP1 – Project Management (led by the Geological Survey of Finland - GTK)

Objectives: To manage the overall project, ensure delivery of the outputs and outcomes as agreed with the European Commission. To assess and evaluate the project and its results.

The EMODnet-Geology Project contract was signed on April 12th 2017. Work on the project commenced immediately with partners starting the exercise of compiling inventories of available data for each work package (Workpackage 2). The project kick-off meeting was held in Espoo, Finland on 30-31 May 2017 hosted by the Geological Survey of Finland (GTK) at which all but 3 partner organisations were able to participate. The objectives of the project were described by the Project Co-ordinator and the timescale for achieving the objectives according to the project workplan were presented along with financial information and other project management procedures. A second project meeting was held in Rome, Italy on 26-28 September 2017, hosted by the University of Sapienza. 37 of the 39 partner organisations were represented (including subcontractors). The third project meeting was held in Budva, Montenegro on 26-28 March, hosted by the Geological Survey of Montenegro. The final meeting was held in Shengjin, Albania on 25-27 September 2018. 36 consortium member organizations with 75 participants and two associated partners (BSH Germany, Eurogeosurveys Belgium) were able to participate in this meeting. The Project coordination has provided trimonthly progress reports to the EASME, the EMODnet Secretariat and the European Commission according to schedule and has attended all of the EMODnet Steering Committee meetings throughout the project.

During the project period four cases have appeared where the status of a partner has changed such that new documentation and amendment of contract has been requested by the EASME. The case of the Maltese partner (Continental Shelf Department – CSD) was approved by EASME in late December 2017 and the second case (Estonia) was approved on 29. November 2018. The third case concerning the move of one senior expert from the University of Sussex to Edge Hill University was by EASME requested to be connected to the change of status of the British Geological Survey (NERC-BGS to UKRI) as well as the change of status of the Greece survey IGME to HSGME. The requests for changes of the contract/member status regarding consortium members 3, 32, and 25 were sent to EASME on 22. March and 8. April 2019 and were accepted on 28 May 2019. According to the decision of EASME all references to partner "Natural Environment Research Council – British Geological Survey" (NERC-BGS) are deemed to refer to "UK Research and Innovation" (UKRI), all references to partner "University of Sussex" are deemed to refer to "Edge Hill University" and all references to partner "Institute of Geology and Mineral Exploration" (IGME) are deemed to refer to "Hellenic Survey of Geology and Mineral Exploration" (HSGME).

WP2 - Geological data specification and sourcing (led by GTK)

Objectives: To prepare and provide access to the information required to deliver in 1:100,000 scale or finer, if such data exists, maps of the sea-bed substrate (improving where possible the current resolution of the classes and data), the rate of accumulation and/or sedimentation on the sea-floor; sea-floor (bedrock) lithology and sea-floor (bedrock) stratigraphy; geological events and event probabilities and minerals occurrences. For the coast, information will be provided on its behaviour (migration direction, rate and volume) as well as resilience. Information and expertise will also be provided for reconstructions of the submerged landscapes of the European continental shelf at various time-frames, such as information on shorelines and coastal environments and deposits; valleys and riverbeds, terraces and associated deposits; river-deltas and delta-clinoforms; submerged water points, e.g. submarine groundwater discharges, and freshwater lakes; thickness of Holocene deposits above the Last Glacial Maximum (LGM) landscape; flora and fauna on the submerged landscapes. The data products (maps) will use the standards developed in the EMODnet-Geology Project.

During the initial months of the project each partner was asked to compile inventories of the information that would be used to construct the outputs for work packages 3 to 8. These assessments were presented according to schedule at the 2nd project meeting held in Rome on the 26-28 September. Information was subsequently delivered to the work package leaders according to the guidelines that they distributed to the project group during the 'Construction of the products/maps' phase of the project, which started in month 4 (July 2017). The sourcing of further information is an ongoing objective throughout the project, especially regarding the new work package 8 Submerged Landscapes. Progress during the entire project is reported in the following sections describing work packages 3-8.

The main purpose of the WP was to coordinate the effort of data inventory such that the coordination (GTK) during the kick-off meeting and the weeks after that had a possibility to emphasize the importance of all available partner and third party data and to assist partners in data submission to the different work packages. This was done in order to assure as good data coverage as possible for all work packages.

WP3 - Sea-bed substrate (led by GTK)

WP3 – Seabed substrate

Objectives: *To compile all available seabed substrate information at a scale of 1:100,000 or finer, to support the delivery of the seabed substrate component of Section 1.7.2. of the tender specifications, and all available information on the rate of accumulation and sedimentation on the sea floor. Additional seabed information not included in the seabed substrate datasets will be further discussed and described for the future work towards more detailed/informative geological products designed for different purposes, such as maritime spatial planning. To optimise co-operation with WP4, especially on issues requiring the integration of information, such as geomorphology and Quaternary geology. WP3 will also continue and deepen the communication and co-operation with other relevant Lots such as Seabed Habitats, to ensure that geological information in used in these Lots to its fullest extent and capabilities.*

WP3 identified the available high resolution seabed substrate data as well as created sea-bed substrate data attribute table, adjusted available data into the scheme, and combined the first version of the sea-bed substrate map (data) at 1:100 000 (1:100k) scale for the study area. WP3 produced seabed substrate data also at more detailed scales (multiscale product) and updated sedimentation rate data collected in the previous phases. WP3 included two case studies, which were led and reported by CEFAS.

WP3 leader, Geological Survey of Finland (GTK), provided guidelines for national seabed substrate harmonisation and confidence evaluation, which partners implemented individually. Harmonisation included the evaluation of the different classification schemes used in each country, classification or translation of the national seabed substrate data into a shared EMODnet classification scheme, fitting the data into a WP3 geodatabase and compilation of maps into a seabed substrate map of the European sea areas. During this phase, the index information and confidence estimates were included in the actual seabed substrate attribute table and not done separately as previously. The partners provided their seabed substrate data/map in an ArcGIS/Esri format for WP3 leader. GTK did not do any interpolation on the basis of samples or other raw data as national partners are the best experts to interpret data from their marine areas.

The aim was to deliver GIS layers of information compiled on a scale of 1:100k or more detailed wherever possible. WP3 follows the guidelines for the smallest cartographic unit (SCU) (Foster-Smith, R. & al., 2007). Based on this the SCU in the printed map should be about 4 - 9 mm2, meaning that within e.g., 1:100k data product SCU should be about 0.05 km2 (5 hectares). Nevertheless, the 1:100k data product includes all seabed

substrate data that was received from the partners at this scale. If the partners have different principles for SCU's they have not been changed. Thus, the 0.05 km2 rule does not necessarily apply to all data.

During this phase the data was not adjusted into a shared coastline as previously, because the EEA coastline used in previous EMODnet projects was considered too rough for the high resolution seabed susbstrate data. It was agreed by all partners to use their original national coastline (of the data).

Altogether 25 countries distributed high-resolution data to WP leader, from which 16 partners delivered 1:100k data, 20 partners data at scales 1:1 500-70 000 and 4 countries informed that they do not have high-resolution data (high resolution = 1:100k or more detailed). The high-resolution data is available from very limited areas. After receiving the data, WP leader, GTK, checked that it meets the criteria and combined it with other datasets.

Harmonisation into EMODnet Geology sediment classification scheme

The EMODnet Geology follows the modified Folk sediment classification system set up during the previous phases of the project. Rock & boulders (> 50%) class is included in the schema as this information has geological and biological significance. The EMODnet seabed substrate schema includes a hierarchy of Folk classifications with 16, 7 and 5 classes, where one is able to unite all 16 classes into five classes (Kaskela et al. 2019). The hierarchy was developed in an agreement with EMODnet Seabed Habitat mapping group to serve their needs as well.

Harmonisation of data includes the evaluation of the national classification schemes and adjusting the national data to fit with the EMODnet seabed substrate classification scheme. The harmonisation of data has included evaluation of the different classification schemes used in each country, classification or translation of the national data into the shared EMODnet classification system (taking into account integration with hydrographic, chemical and biological lots) and compilation of maps into a sea-bed substrate map of European sea areas.

The EMODnet substrate reclassification approach is generated on the grounds of the surface substrate. The vertical limit of 30 cm was agreed in urEMODnet because it correlates with the sample resolution in the majority of cases (~ box corer and Van veen). The reclassification approach has not changed from the previous EMODnet projects and it is supported by its simplicity and transparency. The project partners were advised to use the most detailed Folk classification (16-7-5 Folk classes) possible. Due to fundamental differences in data (e.g. grain-size limits) it is not always possible to make one-to-one translation of the national substrate category into the Folk category. Thus the resulting class might be more of "compromise" that includes the majority of the substrate variation in that class. To support the transparency of the reclassification process the seabed substrate attribute table includes column for the original seabed substrate category.

Combining individual maps including a new multiscale data product

GTK combined all available spatial datasets that were distributed at a scale of 1:100k into a seabed substrate map of the seafloor. This seabed substrate map was made available for use through the project portal on 23rd March 2018. However, some partners provided new data into the data product later and the map was updated during the second year. The latest version was released April 23rd 2019.

More detailed sea-bed substrate datasets were processed and a new multiscale data product was introduced during the second year of the project. The product consists of data layers at multiple scales compiled in three subsequent EMODnet Geology projects running since 2009: A new 1:50 000, updated 1:100k and previously released 1:250 000 (1:250k) and 1:1 000 000 (1:1M) (Fig. 2).

In order to achieve one uniform data product, attribute tables of 1:250k and 1:1M scale maps, produced in the previous EMODnet Geology projects, had to be modified to follow the schema implemented in the EMODnet 3 Geology. However, not all the information included the EMODnet 3 Geology schema have not been gathered in the previous EMODnet phases and therefore are missing from the datasets at 1:1M and 1:250k scales. In that case, the fields are left empty and it has also been addressed in updated metadata.

With this technical modification, all the EMODnet Geology seabed substrate maps have only one existing schema. This means that all the attribute tables are identical and same layout files of different folk classes could be used with all the datasets making them more user friendly. In addition, updated metadata packages are more coherent

and informative.

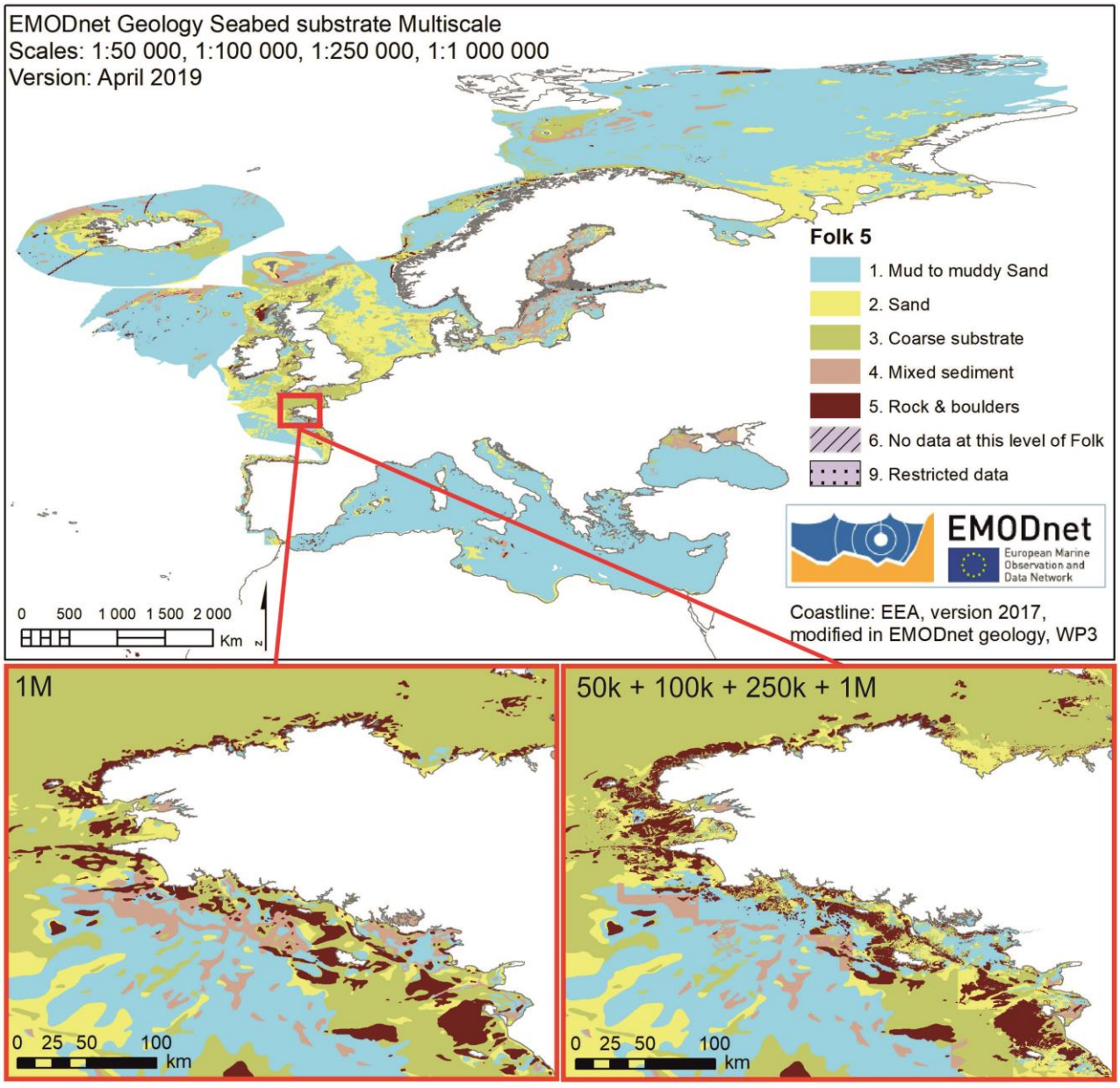


Figure 2. The EMODnet Geology sea-bed substrate multiscale product including 1: 50 000, 1:100 000, 1:250 000 and 1:1 000 000 scales for the European Seas; hierarchy of 5 classes.

Additional features

The Folk sediment classification is based on grain sizes and the ratios between sand, mud and gravel. However, there are some geologically and biologically important seabed surface features, which cannot be explained by grain size only e.g. biogenic material, siliclastic material, hard clay, till, Fe-Mn concretion bottoms. To advance the collection of the additional information, WP3 added a column to the substrate attribute table on features not represented in the Folk classification. The field allows free text, but the guidelines suggested some features to

include, e.g. bioclastic sediment, till, moving mud. The current 1:100k scale dataset includes spatial information of about additional features (like glacial clay, till, bedrock & boulders, and pockmark areas).

Confidence estimates

The EMODnet seabed substrate dataset is a compilation of individual datasets/maps submitted by the partner organisations. The confidence of the resulting EMODnet seabed substrate data product varies between seabed areas depending on the confidence of the original datasets. Therefore, WP3 output includes a confidence estimate. The confidence analysis follows the methodology set up by Rhys Cooper (UKRI), where the confidence of the seabed substrate data is estimated by assigning a confidence score (0-4) using the "3-step confidence method" developed by the Joint Nature Conservation Council (Three-step confidence assessment framework for classified seabed maps, H. Elwood, JNCC). The confidence estimate was included directly in seabed substrate dataset and not done separately as previously. The total confidence of the 1:100k seabed substrate data varies between 0-4.

Sediment accumulation

Workpackage 3 collected and presented data on accumulation/sedimentation rates for recent fine grained/soft sediments. The data were compiled as point-source information. The maps were completed during the second year of the EMODnet 3 Geology Project.

Case study

WP3 includes two case studies, which are led and reported by CEFAS: Quantitative seabed sediment composition of the north-western European continental shelf (Case study 1) and Spatial prediction of sedimentation rates in the Baltic Sea (Case study 2). Both case studies are available on the EMODnet Geology Portal.

Short summary of WP3 main actions:

- WP3 Seabed substrate datasets (1 M & 250 k) from previous phases of EMODnet Geology were made available trough new/updated EMODnet 3 Geology portal in 2017.
- WP3 Guidelines for data harmonisation were distributed to the partners in September 2017.
- The first version of the harmonised seabed substrate data on scale 1:100 000 with confidence estimates was made available at the EMODnet 3 Geology portal 23.03.2018.
- New guidelines for EMODnet 3 Geology sedimentation rate delivery were provided July 3rd 2018.
- In this reporting period, partners have provided their sedimentation rates data. Together with the data collected in previous phases, the sedimentations rates dataset consists of deliveries from 14 partners (1350 points).
- Seabed substrate data (scales of 1:100 000, and 1:50 000) were delivered to EMODnet Seabed Habitats Lot in January 2019.
- Seabed substrate data at a scale of 1:100 000, seabed substrate multiscale dataset and sedimentation rates data together with associated metadata, were delivered to EMODnet Geology Portal by the end of March 2019, and were published April 23rd 2019.

WP 4 Seafloor geology

During the reporting period a new edition of the WP 4 Data specifications and Technical Guidelines has been developed and distributed to all project participants. This includes the description of a procedure to collect, compile and harmonize in parts data according to INSPIRE standards (data model and geology classifications). The WP 4 guidelines were distributed in the summer 2017.

The workpackage guidelines include additional vocabularies for the Quaternary geology which was developed further and new vocabularies specifically for geomorphology, the new theme for WP 4. This was developed together with the CGMW/INQUA/BGR project of the Quaternary map of Europe IQUAME2500 and contains ca. 90 terms including mud volcanos, cold seeps (an area of the ocean floor where hydrogen sulfide, methane and other hydrocarbon-rich fluid seepage occurs, pockmarks (concave crater-like depression of the type that occurs in profusion on muddy seafloors), glacial scour marks, submarine landslides etc..

While this new vocabulary has been used by the WP 4 participants on the geomorphology layer, in the WP 4 Harmonisation workshops in Roma September 2017, Montenegro spring 2018 and Albania September 2018 several suggestions for modifications have been made by and new terms and definitions were added iteratively.

In summary the following map layers have been delivered during the reporting period, using the INSPIRE Geology vocabulary for all themes but not the Geomorphology. In order to present the geomorphology adequately, a vocabulary was developed:

Pre-Quaternary map layers:
- age/stratigraphy (Figure 3)
- lithology
- faults

Quaternary map layers:
- age/stratigraphy
- lithology (Figure 4)

Geomorphology map layer:
- geomorphology (land forms, physiographic features, biogenic features) (Figure 5)

All of these layers are harmonized semantically.

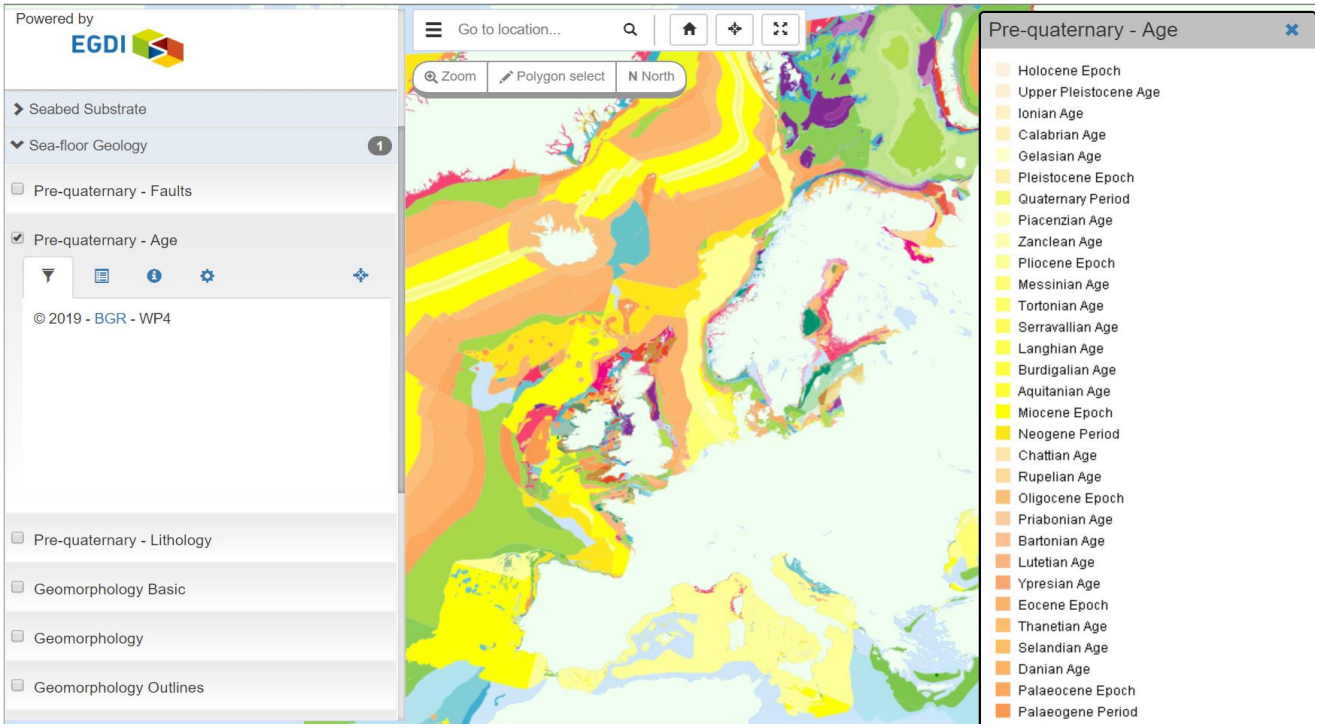


Figure 3. Pre-Quaternary geology (age) including the data of the IGME 5000 Overview map of Europe as shown on the EMODnet Geology portal.

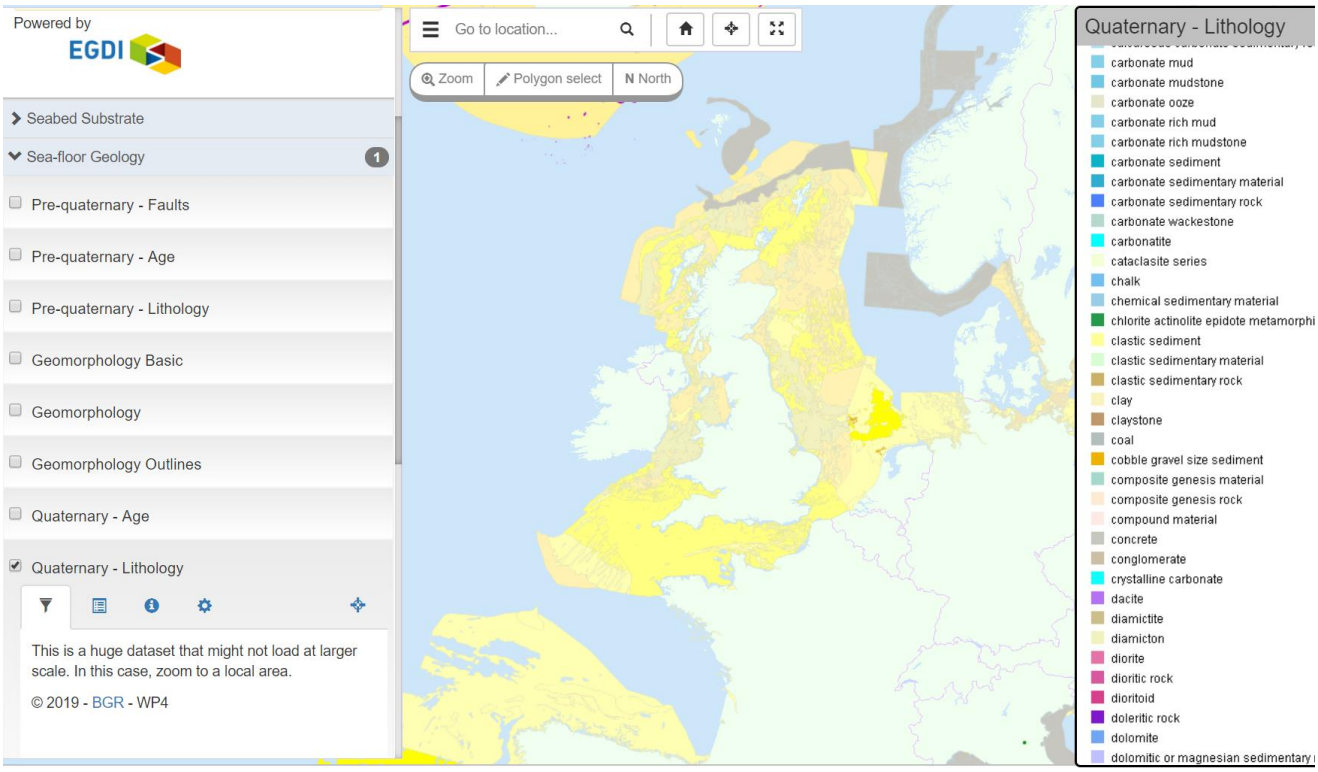


Figure 4. Quaternary geology (lithology) map layer onEMODnet Geology portal

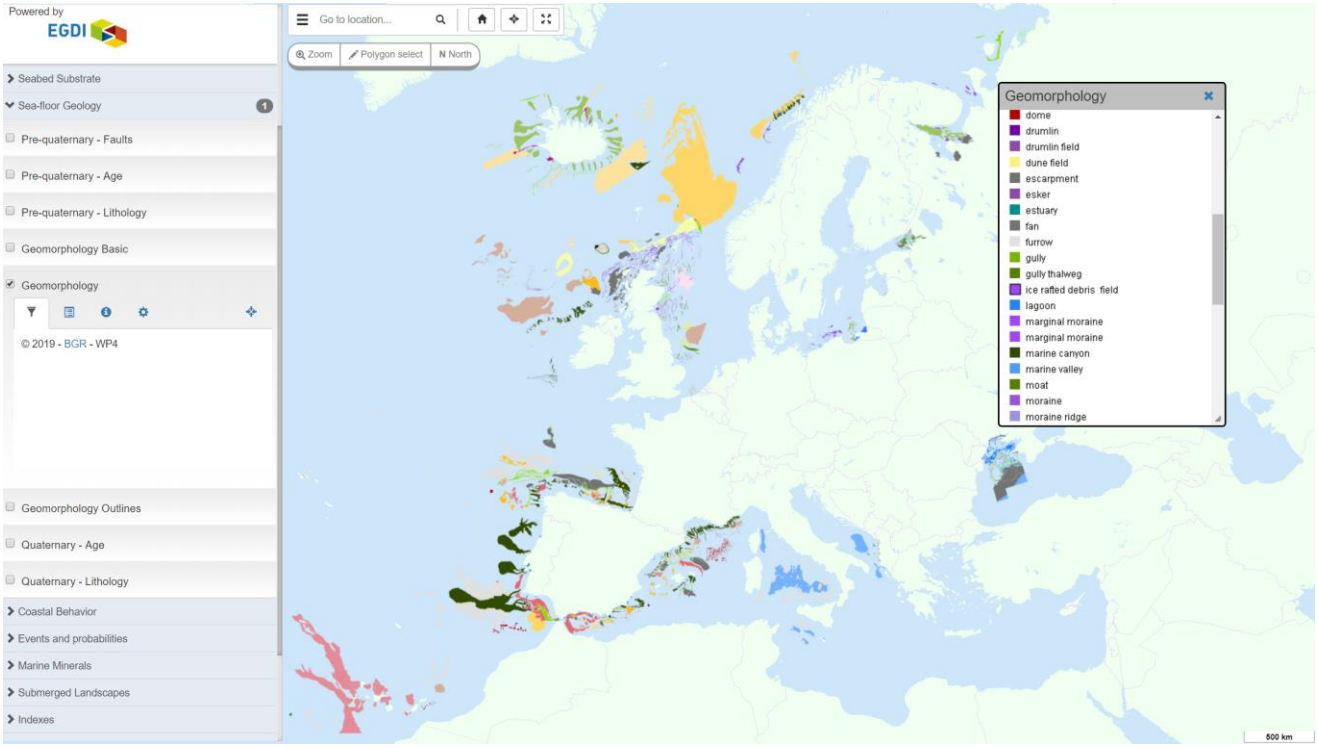


Figure 5. Geomorphology map layer on EMODnet Geology portal.

In these layers users can find in particular Information on scientifically valuable geological and geomorphological structures, on geological material (lithology), its age (stratigraphy) and its forms (geomorphology) on the European seafloor. The layers contain information on structures on the seafloor important for geoscience research and investigations of future exploration of mineral and energy resources, but also of biologic resources. It is also a source of knowledge to show features of the seafloor geomorphology valuable for habitats of numerous species (Fishery, tourism). In addition, the layers provides information on the sea floor conditions to plan building infrastructures (such as windparks, or a pipeline or a protection area for endangered species). Target groups thus include, amongst others: science and research, governments, fishery, industry, environmental agencies, tourism.

As geomorphology is a new theme and a European coverage did exist before, this map layer is not yet as well completed as the Quaternary and pre-Quaternary geology layers. It shows the landforms at the seafloor and often their genetic context.

Harmonisation work in particular took place in a few pilot areas in South-west Europe in the Eastern Mediterranean Sea and in the Adriatic Sea and goof progress could be made.

In addition numerous outreach activities have been performed, including session organisation at an international conference (RFG), presentation at various meetings and conferences (CGMW General Assembly, RFG, EGU). A GSL issue including several papers about EMODnet WP 4 activities is in preparation (see chapter 9, Outreach and communication activities)

Short summary of WP4 main actions:

- Within EMODnet Geology, the workpackage 4 "Seafloor Geology" (lead by BGR) compiled and harmonized the European marine geology map data as detailed as possible for the themes
    - pre-Quaternary and
    - Quaternary geology;
    - geomorphology.

These three data layers on Seafloor Geology show the underlying geology from Earths ancient past (more than 2500 Million years ago) to modern Quaternary deposits and geomorphological features. From it we can read the story about Earths Evolution in the European, marine part of our planet Earth, i.e. from the oldest rocks and how they form, to the youngest rocks and geomorphological features representing the most recent geological and environmental changes.

- A particular highlight is the geomorphology compilation, as it represents a first geomorphological map collection of European Seas ever. This in combination with the Quaternary geology of the Sea Bottom will be a valuable source for economic, scientific and aquacultural (fishery, farming) users. For this an international working term dictionary (vocabulary) has been developed in order to be able to present the European geomorphology adequately.
- Another highlight was the Resources for Future Generations (RFG) conference in Vancouver, June 2018: The Geological Society of London elected the EMODnet-IUGS cross-disciplinary and international Session "From Continental Shelf to Slope - Mapping the Oceanic Realm" as worthwhile to set up a Special Issue of the Geological Society of London (GSL). This volume is now in preparation and is edited by scientists related to the IUGS and EMODnet Geology: K. Asch, WP4 leader and IUGS Vicepresident, Hiroshi Kitazato, marine geobiologist, IUGS Treasurer and Henry Vallius, EMODnet Geology project leader, all renowned scientists who co-organized the IUGS/EMODnet Session of the RFG conference.

- Furthermore the WP 4 leader gave several presentations at conferences about the EMODnet geology project and its successes with particular focus on WP 5 topics, e.g. the EGU General Assembly 2019 in Vienna on "Interoperability, Standards and EMODnet Geology: Building the Mosaic of European Sea Floor Data"

WP 5 Coastal behaviour

Up-to-date information (from maps, studies and new analyses) was used on the type and behaviour of coastal landforms along the entire coastal zone of the regional seas included in the proposal, at the maximum available resolution, using field as well as satellite data. It was not possible to attain a resolution of 1:100,000, as it would require a monitoring point each 50 m along the coastline. Field-based data with more than local coverage are at best spaced 250 m apart, and generally more than 1 km provided they are available at all. Satellite-based data can be generated at finer resolution, but for practical (performance and relevance) purposes a spacing of 500 meters has been judged to be the best.

Using this approach, WP5 updated the traditional field-based map, which was originally published by project EUROSION, extending its geographical coverage and using the recent-most data available to EMODnet partners (Figure 6). Only a few small areas in Eastern Europe are now missing, but some larger areas without field data needed to be filled in using expert knowledge. A good example is Norway, which was judged to be 100% stable on the basis of its rocky nature and isostatic uplift (falling sea level). To address the main downsides of this WMS (monitoring series from different time periods and at varying spatial scales, data gaps as many remote regions have never been surveyed, the use of different coastline indicators), we created a satellite-based, full-coverage pan-European WMS with derived coastline-migration values for the 10-year period 2007-2017. It must be validated in the coming years, especially for cliff and bluff coasts. Satellite data suffer from coarse (5+ m) pixel resolution and from difficulties in the automated shoreline detection where the land-water boundary is not linear. Finally, the EUROSION coastal type map was updated to be added to the portal (Figure 7).

At the same time, the WP has been collating information (published and unpublished studies) on European coastal resilience. The WMS for this knowledge (index map with available studies) has not yet been finalized. As coastal resilience is a loosely defined term, we made an inventory of different definitions in different countries. One relevant indicator of resilience, the coastal hotspot has been a focal point, and several partners contributed to a map with national hotspot distribution. A map on coastal resilience will be added to the portal in a later stage as a follow-up action.

So far, the satellite-based WMS has been incorporated into the European Atlas of the Sea, and jointly with the EMODnet Secretariat, a school exercise was prepared as part of outreach activities.

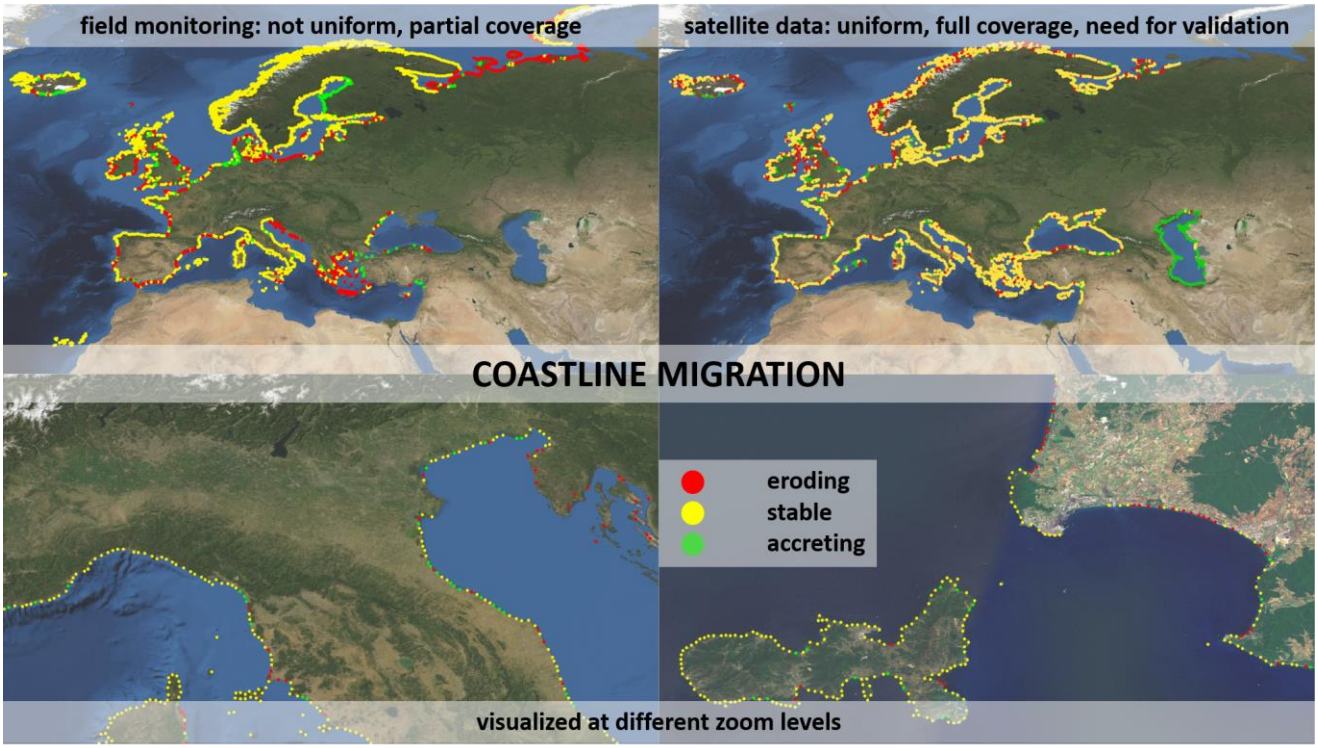


Figure 6. Coastline-migration maps at different zoom levels.

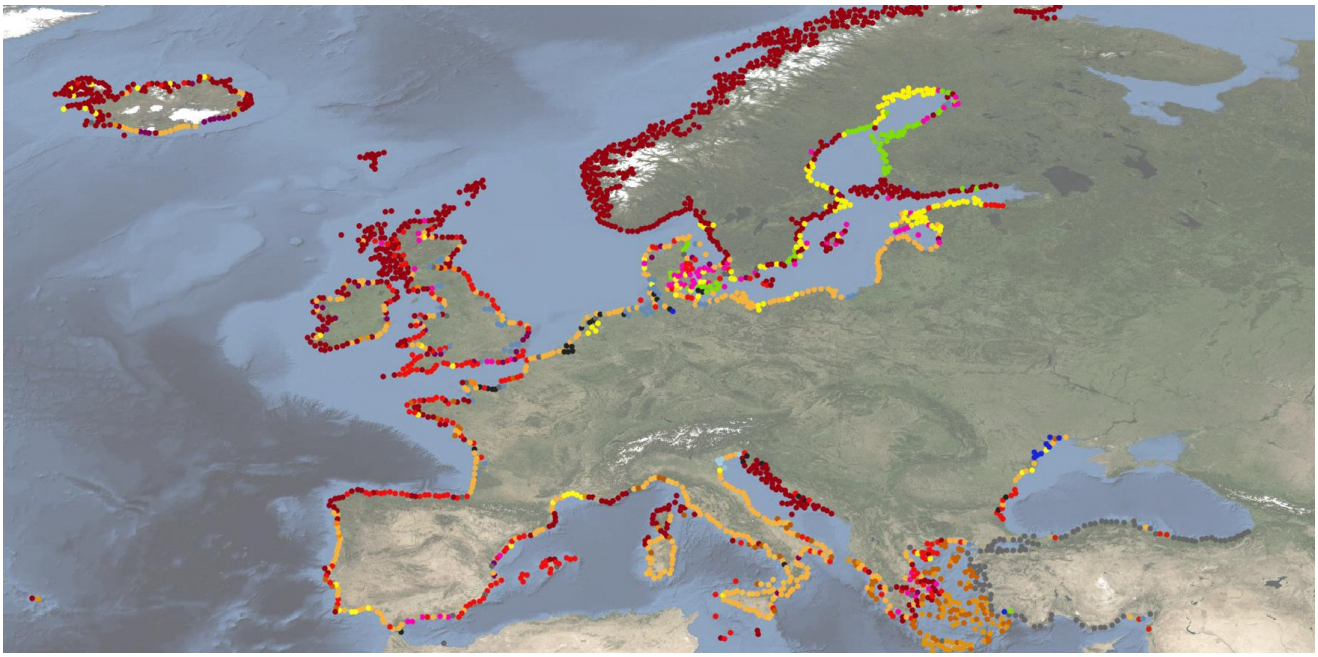


Figure 7. Coastal type map.

WP6 – Geological Events and Probabilities

Starting from the results of the previous phase and considering the content of the current tender, it was verified that the guidelines framework suits the needs of the higher resolution required in this phase. Occurrences have been updated and detailed, attribute tables filled in with additional data available from the references.

The new WP6 Guidelines were distributed at the end of November 2017. Partners have been asked to deliver new shapefiles. The higher resolution of the products foreseen by the current phase of the project requires to provide more details (where available) concerning each occurrence.

Earthquakes have been included among the products to be delivered, in addition to the webservice provided by the EMSC (European Mediterranean Seismological Centre) website. Following contacts with the EMSC, it was decided to create an additional earthquakes layer within WP6. A shapefile format regarding earthquakes has been included in WP6 guidelines, in order to allow Partners to provide harmonized information as well as additional data, which are not reported on the EMSC website.

Partners started to deliver new shapefiles in 2018. Harmonization of deliveries evidenced that continuous update of the list of attributes complementing the shapefiles is necessary.

Twelve layers, each complemented by its appropriate Attribute table, have been delivered to WP9 Leader, to be displayed on the Portal, and were published as final maps regarding landslides, volcanic centers, earthquakes, tsunamis, mud-volcanoes and fluid emissions, tectonics (Figure 8).

The possibility to represent "geological events probabilities" has been explored. Discussion regarding the definition of probabilities was necessary, taking into account the description provided by the INSPIRE data specification and the data available within the Project. 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, which are not always available in submerged areas. The qualitative likelihood (also known as susceptibility) is defined as a descriptive assessment of the likelihood of occurrence of a hazard event.

A literature review of the models used to elaborate susceptibility maps has been conducted, evidencing that assessment of probabilities relies on many different parameters including geomorphological elements.

Different models have been tested, aiming to identify which geo-morphological characteristics contribute to a higher probability of occurrence. As a first step in this process morphometric maps (such as a slope gradient map) of the European seas were elaborated.

The Maxent model was selected among the different models considered. The first tests have been performed on landslides, which are the most suitable events considered. More reliable tests should be possible based on the comprehensive collection of higher resolution data achieved at the end of this phase.

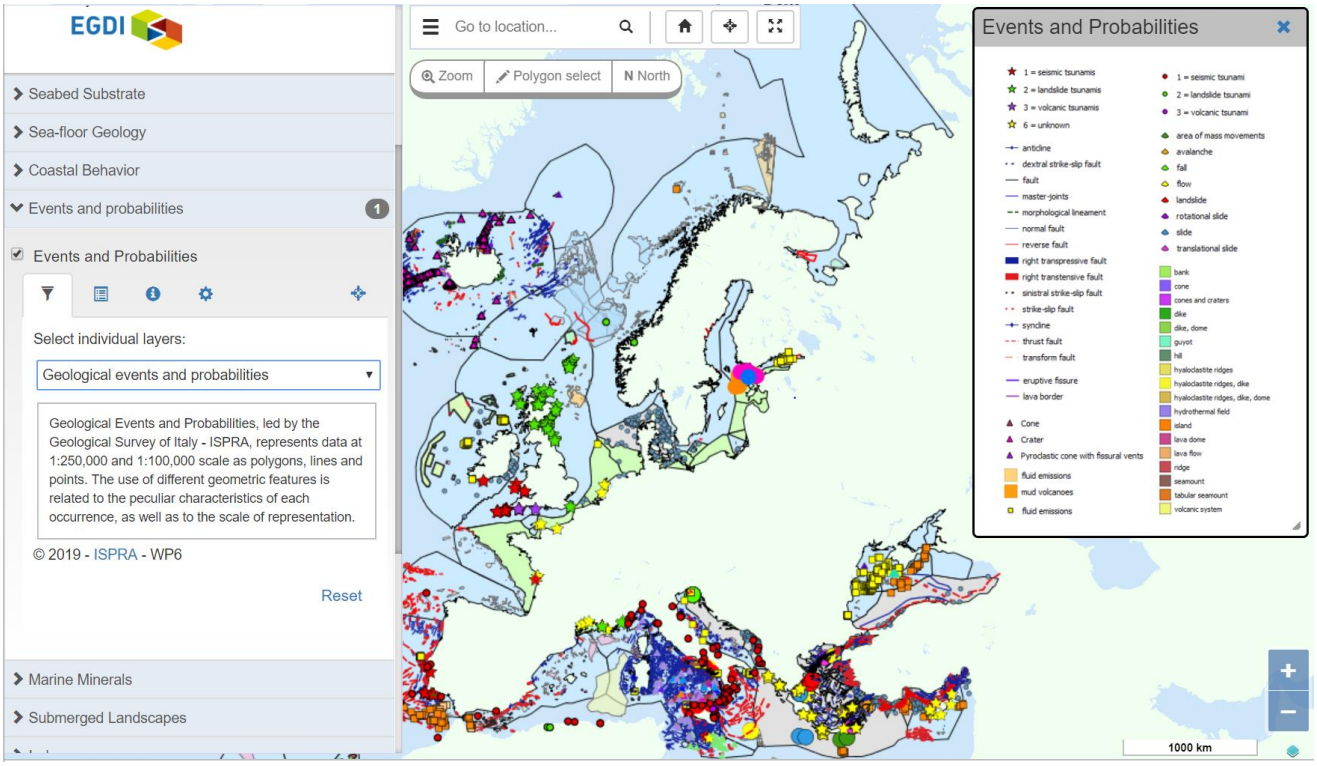


Figure 8. Geological events and probabilities summary map on the EMODnet Geology portal.

WP7 – Minerals

(Months 1-12) Following presentation of WP7, including the comprehensive framework and timeline, at the second EMODnet Geology meeting at the Sapienza University, Rome 26-28th Sept, the GSI team was available to guide partners through submission of their data. Some partners were in touch to query information or alert us of the usefulness of these data to third parties.

It was our understanding that the framework was been well received by all partners, questions and concerns were minor.

The deadline for submitting partners' first iteration surpassed and data was submitted for 10 of the 11 mineral types so far. These data were under QC and merge; they were to be published as a service with new text and metadata to describe the WP, once the WP lead had received an update from all partners. This service was created by GEUS who are the Data Management WP leader and responsible for data administration. GEUS was to add a DOI and CC license to the service.

A poster presentation of the project and the WP was created and has been available for use by all partners. It currently resides on the FTP site, with all WP7 meeting presentations, the guidance document and template shape files.

(Months 13-24) WP7 progress was presented at the third project meeting in Montenegro in March 2018. Project partners who were yet to submit their data were reminded of the next deadline and also the importance of submitting their national datasets in the new format required for Phase III. In the following months GSI received most European marine minerals data and began the data collation and merging process. GSI were again available throughout this time to provide assistance with any queries relating to data submissions. At the final project meeting in Albania in September 2018 a final call was made to partners who had not submitted data or to clarify with GSI that no data submission was possible in this phase. It was decided between the team in GSI in January

2019 to allow a small extension to a project partner in order to have the data included in the final merge. Unfortunately this data was not delivered by the extended deadline.

In February 2019 final checks were performed on all WP7 data submitted in Phase III. This data was then merged into 12 marine mineral layers in both polygon and point format and released on the EMODnet Geology portal on 16. April 2019 (Figure 9).

WP 7 continues to communicate EMODnet, Marine Geology, and WP7 Minerals nationally and internationally at relevant geology and marine events, meetings and conferences.
The ongoing plan for *disseminating* information includes: online and published news articles; a poster and peer-reviewed publication; sessions, exhibitions and presentation at national and international Earth and Ocean science fora.

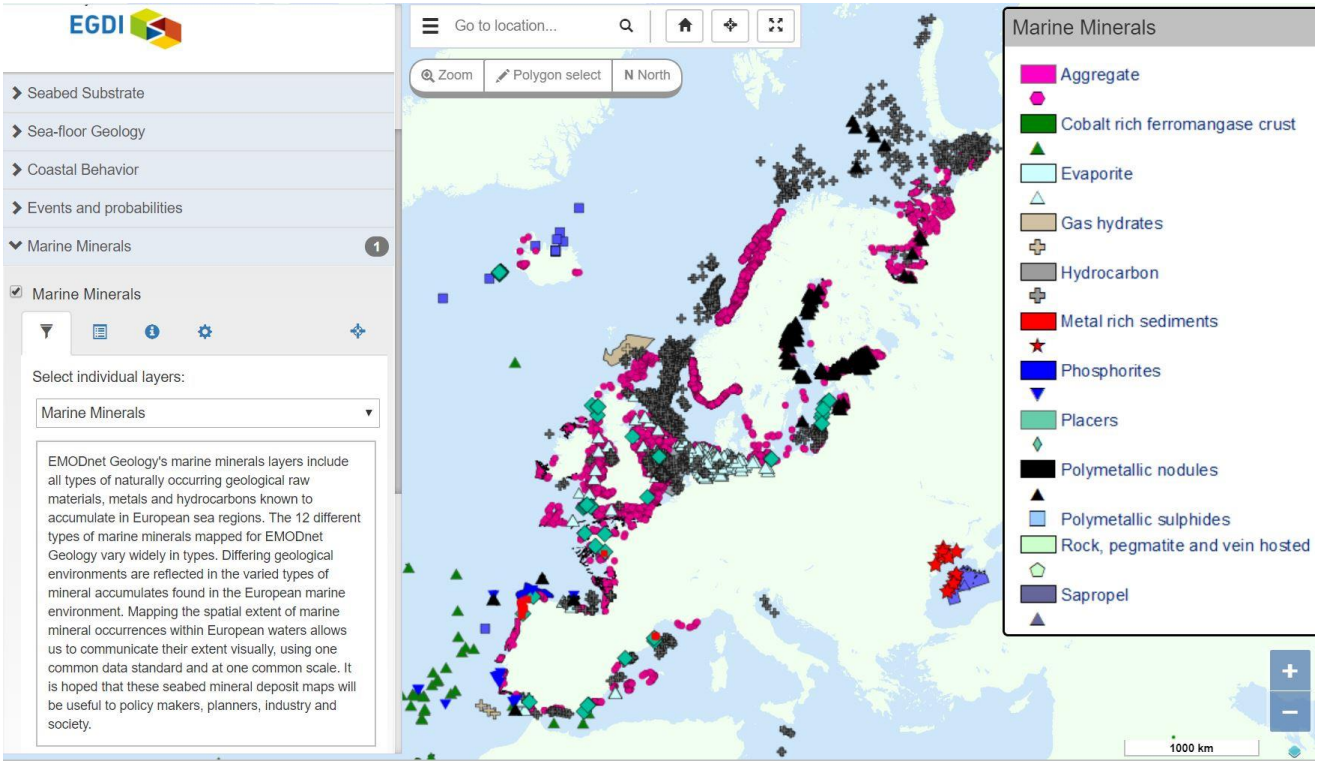


Figure 9. Summary map of Marine minerals on the EMODnet Geology portal.

WP8 – Submerged Landscapes

In 2017, submerged landscapes were added to the EMODnet geology theme as a separate work package, with the objective of integrating existing data on palaeoenvironmental indicators with interpretations of geomorphology, stratigraphy and type of sediment. This information would be used to reconstruct a pan-European marine palaeogeography at various scales and time-frames. As identified in the original EMODnet Phase 3 tender, there were relatively few relevant Submerged Landscape data products available for European seas. The data distribution was also uneven, site specific and not necessarily representative. A problem was that data was documented in many formats, at many different scales. To address this problem the EMODnet outputs would be generated through data integration and interpretation. This identifies WP8 as different to the

other work packages in that it involves compiling and 'interpretation' of the data, as opposed to just compilation of existing data sets.Based on three specific submerged landscape workshops and two plenary EMODnet meetings, an initial pan-European submerged landscape GIS has been constructed in EMODnet Phase 3. This is the first time that a Europe wide submerged landscape GIS has been compiled.

At the first workshop held in June 2017 in Copenhagen it was noted that the first EMODnet compilation of submerged landscape features in European seas would be based on four pilot areas; the Baltic Sea, the North Sea and English Channel, the Tyrrhenian Sea and the Aegean Sea. These four regions were chosen because; 1) they were generally representative of the varied palaeogeomorphologies of European Seas, 2) the databases for these areas were comprehensive and well-studied and 3) the WP8 working group were experts in these regions. Because of major control and impact on data preservation from the most recent major Holocene sea level rise after the Last Glacial Maximum (LGM), at 18,000 to 20,000 years, it was also agreed that the focus would be on the last 20,000 years. Appropriate feature classes were discussed and how they would be represented in GIS. At a second workshop held in January 2018 in Heraklion, 27 submerged feature classes were agreed upon, grouped into four main classes: 1. Channels, 2. Coasts and Shoreline, 3. Coastal Landscape, 4. Archaeology and 5. Others. The features were defined in 27 shape files of points, polygons and lines. The templates for these feature classes and the guidelines on their use were distributed to the EMODnet partners in June 2018. By the final deadline for submissions in December 2018, 21 EMODnet members had contributed data (Figure 10).

The features so far contributed have been quality assured and were uploaded onto the EMODnet portal in April 2019 (see figure). In addition to this data, existing data bases such as SPLASHCOS were added by linking these through Web Map Services (WMS).

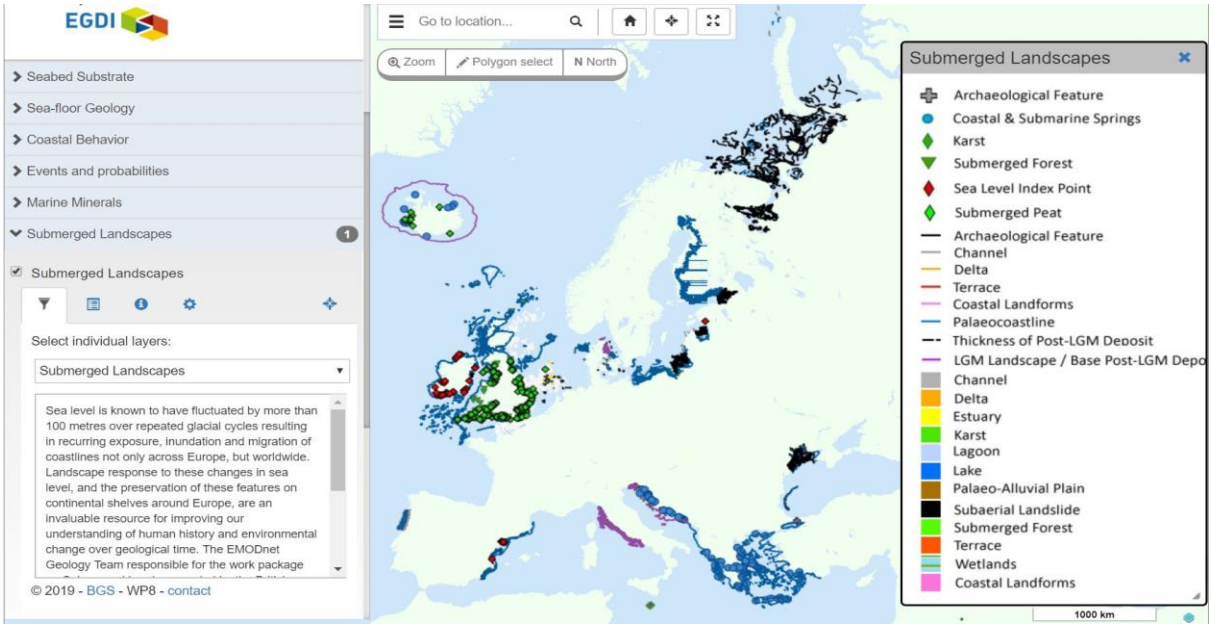


Figure 10. Submerged landscapes map on the EMODnet Geology portal

Short summary of WP8 main actions:

- During the first year between 2017 to 2018, the first draft guidelines for defining the feature classes used in compiling the submerged landscape GIS were produced from an appraisal of existing records such as maps, geophysical data, databases, reports, and literature.
- At the first workshop held in June four pilot areas were chosen for the submerged landscape features in the GIS; the European Seas; the Baltic, the North Sea and English Channel, the Tyrrhenian Sea and the Aegean.
- During a second workshop held in Crete in January 2018, the feature classes were specifically defined in 27 shapefiles of points, polygons and lines. These 27 shapefiles were grouped into four main

classes: 1. Channels, 2. Coasts and Shoreline, 3. Coastal Landscape, 4. Archaeology as well as a class and 5. Others.

- During the second year, 2018 to 2019, templates for the WP8 shapefiles were completed and delivered to all partners. On the basis of feedback from partners, the draft WP8 task guide was updated.
- At the EMODnet project meeting in Albania between the 24th and 27th September 2018 there were two meetings to discuss WP8 project progress, implementation of the Task Guide, and synergies between WP8 and other WPs. From these meetings the feedback was positive and EMODnet members approved the validity of the guidelines.
- 21 EMODnet members contributed with submerged landscape feature class data to the WP co-ordinators - UKRI.
- After checking and validation all data was first uploaded on the test portal and finally released on the EMODnet Geology portal on 19th April 2019.

Next phase 2019-2021 - a forward plan

At a third workshop in Istanbul in February 2019 the compiled submerged landscape GIS resulting from the early part of Phase 3-1, was considered and reviewed as a basis for forward planning of the next EMODnet phase (2019-2021). It was agreed that the submerged landscape GIS produced so far, with the identification, definition and compilation of the 27 feature classes, over such a short two year timescale, was a major step forward, in the development of the EMODnet Geology portal database, but more broadly in the contribution to understanding of the pan-European palaeolandscape science. The discussion confirmed that the data was indeed unevenly distributed as identified in the original tender document, and that the four main pilot regions were mainly representative of European Seas. It was agreed that in the Phase 3-2 it will be necessary to extend the data to fill the gaps between the pilot areas, but also to continue working on the pilot areas. In Phase 3-2 the requirement is to move forward from the pilot to a broader implementation to map the feature classes across the European sea areas. To achieve these objectives there needs to be a continuing population of the database at all scales and to use the data from the pilot areas as a basis for interpretation of other regions where data is absent or not as comprehensive.

Major data gaps identified (see Figure 10) include: The Black Sea, eastern Mediterranean (Turkey coast), French Mediterranean coast, Iberian coast, Biscay region, Norwegian coast and north east Baltic. Project partners in these regions were identified and will be encouraged to submit data to fill the gaps in the next phase. To address objectives discussed, two approaches were agreed:

A. Fast track pilot areas with: Four time slices: 1. End of Holocene sea level rise – maximum flooding (6,000-7,000 years BP), 2. 8,000-9,000 (Baltic transgression), 3. Younger Dryas (12,900-11,700 years), 4. Last Glacial Maximum (18,000 to 20,000 years).
B. Pan European data from partners to construct regional maps, including: The LGM from bathymetry, Modelling of Ice Cap margin derived from GIA, River channels, A backdrop of the shallow water zone between 0 and 130 metres,

WP9 – Data management, web portal and services (lead by GEUS)

WP9 had four main tasks that were all fulfilled:

1. Data consolidation, data management and dissemination

WP 9 took charge of consolidating data and functionality from both current and previous phases into a more modern infrastructure collaborating with EMODnet Data Ingestion, EMODnet Bathymetry, EMODnet Human Activities and EGDI to offer one entry-point for European marine geology data products. At the first full

network meeting, we were able to present a new portal with new interactive maps and with all existing data products migrated to the new platform.

Since then, the functionality has increased in terms of available options on the portal and offering OGC services on all data products. All data products now reside on one central infrastructure running PostgreSQL, GeoServer and GeoNetwork. The portal runs Wordpress.

All software is open source and free of charge. New data products were added during the last month of the project. All data products reside in an online relational database. This enables us to do data mashup and cross-domain trials. The work package held talks with other EMODnet lots to share data across lots. Users benefit by having access to more geological relevant data products in the interactive map. The portal was aligned with the other lots in terms of logos, colors and general structure.

2. Create a collaboration workspace for partners.

WP 9 developed new features to allow for better collaboration in the project. Work package leaders and partners have access to password protected pages for sharing information and raw data files. WP9 further developed and supported the tools during the project. A test facility for new data products was made where work package leaders could test the interactive functionality before rolling out the data products to the production portal.

3. Create entity indexes and methods for boreholes, grab samples, and geophysical data.

The work package developed schemas for geological point data and geophysical line data. Existing schemas were considered. For boreholes, inspiration from EPOS borehole index was gathered. For geophysical data, SeaDataNet schema was used. These schemas help data owners share their live geological data via web services and flat files. For those partners not able to setup a fully functional web service, alternative methods were designed offering automatic translation of attributes into the common schema format. WP9 developed a cookbook for setting up the web services. WP9 also developed an automated metadata harvester for harvesting the entity indexes. Users can search the index, download metadata and request further details via the interactive web map.

4. Support

The work package created download functionality for all data products including questionnaires to better understand the users' needs. The work package continuously monitor health and usage, quarterly support the EMODnet Secretariat in creating statistical reports, daily offer support and feedback to end-users, and periodically do maintenance on the systems.

WP – 10. Dissemination (led by GTK)

Objective: To ensure effective and widespread dissemination and two-way communication of the activities and outcomes achieved within the project, during and also after the EMODnet-Geology Phase 3. Dissemination will especially highlight the benefits that the project will bring to target groups cross the European Union and beyond. As EMODnet-Geology will now also cover submerged landscapes, as well as geomorphology, it will be an important new aspect in dissemination. The project and especially this work package will co-operate with the EMODnet Secretariat in its efforts to disseminate the results to stakeholders.

The outreach activities are listed in table in chapter 9.

In order to give more visibility for EMODnet in general and in particular EMODnet geology we ordered EMODnet Geology shirts with EMODnet logos and the general payoff in front of the shirt as well as on the short sleeve and

with our own payoff "Discover Europe's Seafloor Geology" and the web address on the back of the shirt (Figure 11). As our outreach activities are often connected with large conference, fairs, and scientific meetings we see that the shirt is good for marketing – EMODnet, both in general and EMODnet Geology specifically.

Figure 11. EMODnet geology shirt

A press-release of the outcomes of the first project year was drafted at the GTK and distributed to partners in May 2018. The partners translated the text and in cases necessary edited it according to local needs.

A major outreach activity was the European Geosciences Union's (EGU) Annual meeting in Vienna on 8-12. April where EMODnet Geology shared a booth with the Eurogeosurveys. The event is very good for promotion of any European geoscientific activities as the meeting is attended by ca. 17.000 delegates from around the world. Our booth was very popular and we had a chance to introduce EMODnet in general and EMODnet Geology in particular to more than a thousand delegates. We also had the chance to release one of the new products during the EGU week as the new satellite derived coastal behaviour map was introduced with a press-release on the first day of the conference week on 8. April. Also the other new products which were not released during the week were introduced with a poster where the beta-versions of the maps were printed. The dissemination action at EGU was very successful as can be seen in the below screenshot of the Matomo statistics of visits on our webpage during the last half year of the project (Figure 12). EGU week was the last week of the project contract, as the contract ended on Thursday that week, 11th April.

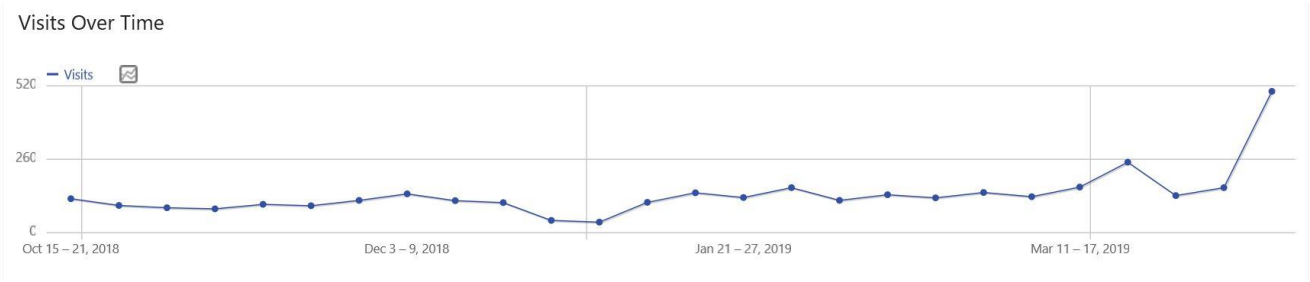


Figure 12. Matomo weekly web page statistics during the last half year of the project.

WP – 11. EMODnet Collaboration (led by GTK)

Objective: To ensure that the EMODnet-Geology Project is fully aware and complementary to the objectives of other marine science initiatives within European waters. To prepare for better and linked marine data that will have an immediate impact on the planning of environmental policy and mitigation measures within the European Union and to facilitate impact assessments and scientific work.

The EMODnet Geology lot has actively communicated with other EMODnet lots, especially the Seabed Habitats lot, the Human Activities lot as well as the High Resolution Seabed mapping Project.

- WP 3 seabed substrate had a meeting with the Seabed Habitats lot in Athens 2 October 2018, which was attended also by the project coordinator.

The regional sea conventions (RSC's) have been officially invited to our project meetings. The RSC's had not responded to any of the invitations by end of September 2017.

A visit to HELCOM was suggested in a promotional letter "Introduction to the EMODnet geology project" - Unfortunately, this offer did not succeed.

Finally the Barcelona Convention responded positively to the invitation to attend our project meeting "*Even though we are very interested to participate to this event, our tight schedule does not allow it.*"

For the moment we are co-operating with Geoscience Australia. The cooperation was discussed and further co-operation planned during the IUGS Resources for Further Generations conference (Vancouver, June 2018), where EMODnet Geology was together with Geoscience Australia sharing a session called "From Continental Shelf to Slope - Mapping the Oceanic Realm ".

The main driver for this action is international collaboration between various sea-floor mapping programmes and brainstorming on a road map for future global seafloor mapping initiatives.

We see that the European approach is best tested and well running, a single standard for one continent. Thus, co-operation with similar global initiatives is important at this moment, such that global standards and protocols in acquisition and processing of seafloor data into user-friendly products can be assured.

We will also approach the ambitious Seabed 2030 project by GEBCO and Nippon Foundation in order try to add a geological component to their agenda. The Emodnet Geology consortium is working on the cooperation with this initiative and next meeting of the network is planned for September 2019 in Havaii as a session during the *OceanObs'19* meeting. EMODnet Geology 3 coordinator will attend the meeting.

EMODnet geology has created contact with an initiative of seafloor mapping of the Caspian Sea, where we have succesfully promoted the usage of EMODnet standard methodology, as the Caspian Sea is now included in the next phase of EMODnet Geology.

WP – 12. Project analysis and sustainability (led by GTK and GEUS)

Objective: To analyse each phase of the project and to provide a report on the lessons learned.

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 following issues were recorded and the measures taken can be used as advice in further EMODnet Geology implementation:

- The EEA coastline used in previous EMODnet projects was considered too general for the high resolution seabed substrate data by the project group. As a measure it was agreed that the partners should use the national/original coastline of their data.
- The EMODnet seabed substrate data product represent information using the Folk sediment classification scheme. However, the European sea-bed substrate information has been interpreted using more than 30 different national sediment classification schemes that are not necessarily directly compatible with the Folk scheme. Thus WP3 provided guidelines to harmonise national data into the Folk scheme. The harmonisation includes evaluation of the different classification schemes used in each country, and classification or translation of the national data into the shared EMODnet classification system. To make the harmonisation process transparent the substrate attribute table includes columns for the Folk sediment classes as well as a column for the original seabed substrate class.

- The Folk sediment classification is based on grain sizes and the ratios between sand, mud and gravel. However, there are some geologically & biologically important seabed surface features, which cannot be explained by grain size only e.g. biogenic material, siliclastic material, hard clay, till, Fe-Mn concretions fields. To advance the collection of the additional information, WP3 added a column to the substrate attribute table on features not represented in the Folk classification. The field allows free text, but the guidelines suggest some features to include, e.g. bioclastic sediment, till, moving mud. The current 1:100 000 scale dataset includes spatial information about additional features (like glacial clay, till, bedrock & boulders, and pockmark areas).
- In order to avoid duplicate work and to promote smooth data collation and product assemblage the work package lead partners participated in workshops held by other work packages as well as other EMODnet lots (Seabed Habitats, EMODnet Data Ingestion).
- For smooth coordination between lots and EMODnet portals representatives of EMODnet Geology coordinator (GTK) also participated in meetings of the EMODnet Steering Committee and the EMODnet Technical Working group.
- Current set of entry terms describing coastal type is incomplete and definitions are commonly imprecise. For the time being, we are building and optimizing an updated set for internal use, with some new terms. In time, these will be communicated with INSPIRE and other vocabulary groups working on uniform definitions available through dedicated servers.
- Regarding the coastal maps (WP5) visualizing results at a pan-European scale (ca. 1:20,000,000 in a single image) requires data aggregation because many measurements are overlapping at this scale. In order to avoid the problem we finalized a method for smoothing the short-distance variability when zooming out to larger scales. It is used for all WP5 WMSs.
- In the current 1:100,000 scale of representation of geological events and probabilities (WP6), data density is higher even though in limited areas. For this reason, the first visualization on the portal might induce to overlook the presence of relevant data. Collaboration with the web-portal administrator (EMODnet Geology Technology coordinator) has been essential in order to identify the best way to highlight the presence of these data on the portal.
- Early in beginning of the project it was observed that data collected in EMODNET Geology do not allow to determine quantitative probability of Geological Events. Instead qualitative probability (or susceptibility) has been chosen as the most suitable proxy.
- Many models for susceptibility of geological events have been applied on land but very few in submerged areas. Many mathematical models have been considered to select the most appropriate susceptibility analysis in submerged areas, this work continues.
- Regarding marine minerals (WP7) polymetallic sulphides associated with geothermal sites are recorded. The Icelandic partner ISOR has records of low temperature geothermal sites that may host sulphides at depth, but on the surface exhibit sulphate or white smoker type chimneys. Discussions relating to how these important sites can be mapped are ongoing. WP7 suggests a new classification of seabed mineralisation to be created.
- Our new work package Submerged landscapes (WP8) faced the challenges of defining and collecting Europe-wide information on the submerged landscapes as well as finding solutions on GIS delivery of these results. Since this is the first time ever that GIS layers of requested features were to be delivered the 24 months' time for delivery was very short. Now when the map layers exist it's much easier for the next phase of EMODnet Geology to build on the existing product and visualize the environments of the post-glacial time slices.
- Building a full WP9 geophysical entity index was challenged by limited access to GeoSeas/SeaDataNet services. We raised the issue to partners and contacts involved in SeaDataNet with no luck. Access is still limited to point requests, which are not usable for creating a data product in WP9 (area download).
- Data owners that volunteered to submit borehole and geophysics entities had difficulties setting up the necessary tools to share. In order to avoid this problem measures were taken to allow data owners to share data using alternative methods – especially static file upload to a common file drive turned out to suit the needs for most data owners.

- More than anticipated work had to be done to support technical cross-lot initiatives. Thus estimates and decisions had to be adjusted to allow time and budget for cross-lot meetings and initiatives.
- The complexity of orchestrating a full-fledged interactive data portal with metadata search, OGC services, and web maps was a challenge. Consequently we partnered with other portals to lower maintenance cost and risk. The main portal takes care of social media and user logging. EGDI takes care of interactive web maps and metadata searching.
- Data owners were using different technology for creating their new data products. Most of them use ArcGIS with proprietary formats for styling and dissemination. A comprehensive guideline was developed in corporation with the main portal stipulating the work involved in publishing new data products – including requirements of using open standards for both styling and dissemination.
- Performance issues were encountered for some of the bigger data sets when displayed in full on the interactive web map. This is still an issue and hard to address. The amount and complexity of the shapes are of a scale hard to make perform. At the moment we make a note on the layers encouraging users to zoom to local area.

Sustainability:

Given the significant investment in EMODnet over the last 10 years, the sustainability of the EMODnet-Geology Project outputs has been a significant consideration for the project partners. The long-term maintenance of the system has required a commitment from the partner organisations to establish a system for the regular updating and dissemination of the marine geology information that EMODnet has assembled. At the centre of the sustainability are the EuroGeoSurveys' network and the European Geological Data Infrastructure (EGDI), which the EMODnet-Geology group has integrated into its activities during this phase of the project. As the EuroGeoSurveys' members have committed to maintaining EGDI as their infrastructure for providing access to Pan-European and national geological datasets and services from the Geological Survey Organizations of Europe, the future of the collaboration between large numbers of marine geoscience groups is assured. To ensure the sustainability of the EMODnet Geology project, EGDI provides an appropriate platform for developing a long-term infrastructure to assist the EC in developing its maritime strategy.

The host of the EMODnet Geology portal GEUS has with this final report provided the contracting authority a separate handover document describing the architecture of the portal and its services and how, in practice, these could be taken over by the contracting authority or a third party.

7 User Feedback

Date	Organization	Type of user feedback (e.g. technical, case study etc.)	Response time
11.07.2017	Hamburg University	Support: "Problems with access to seabed substrate data"	Resolved by GTK immediately
23.08.2017	Hamburg University	Question: "Acknowledgement/citation of EMODnet geology project"	GTK answered immediately
31.08.2017		Question: "EUNIS sensitivity"	Forwarded to EMODnet Biology
31.08.2017	xxxxx@outlook.es	Question: "EUNIS sensitivity"	Forwarded to EMODnet Biology.
29.9.2017	ISPRA	WP 4 EMODnet Habitat lot : Interest in WP 4 Geology Lot, geomorphology – Offer to provide list of attributes of interest	A week-end
31.10.2017	St. Andrews UK	Support: Problems with access to seabed substrate data	Corrected within 24 hrs
14.11.2017	Deltares NL	Typo error on the portal	Corrected within 7 min
12.12.2017	NetKit FR	Support: Problem accessing seabed substrate data via WMS in QGIS	Corrected within 25 hrs
26.01.2018	Private	Problem opening Substrate map in ArcGIS (version info missing in the zip)	Solved within 72h/GTK
31.01.2018	MAKE	Requesting Substrate Classifi-cation info	Solved within 24h/GTK
01.02.2018	NetKit	Found problems with legends and metadata descriptions, regarding WP6 Geological events and probabilities.	Solved within 48h GTK+GEUS+ISPRA
05.02.2018	IZVRS	Looking for download link to sediment acc. rates	GEUS missed this in the mailbox. Solved on 10.04.2018
13.02.2018	MAKE	Requesting Substrate Classifi-cation info	Solved within 24h/GTK
15.02.2018	4C Offshore Ltd.	Problems with access to seabed substrate data	A weekend
01.03.2018	UGent	How to open Substrate map in non-ArcGIS software	Answered within 48h. /GTK
02.03.2018	Private	Question about the raw data of the the sediment grain size	Answered within 24 hrs
2.5. 2018	EMODnet Secretariat	Dear, I want to download the "Coastal behaviour" map, but the link provided to me through email does not work. Could you help me out? Many thanks in advance! N	24 hrs
14.5. 2018	Joint Monitoring Programme for Ambient Noise North Sea (JOMOPANS)	This Interreg North Sea Region project wants to use WP3 seabed-sediment data to quantify the contribution of shipping to submarine noise in light of its impact on marine life	Directly (conference call), with plan for follow-up actions
May 2018	Ventotene Island Municipality	Request of information on marine geology to be displayed on Geotouristic itineraries	

25.5. 2018	EMODnet Secretariat	Metadatabase not working	24 hrs
June 2018	IRWIN CARR Consulting	Email: "As a small consultancy business we rely on the availability of high quality environmental data to offer noise impact assessments to the marine construction industry. To generate realistic noise modelling we need to account for both depth (bathymetry), sediment properties (geology) and water properties. If these were not available to us, we'd either have to be over-cautious (limiting to development) or generate the data ourselves (prohibitively costly – limiting competition in the sector). Thus the public access to databases like EMODnet enable a market for SMEs to competitively offer high quality services that were previously unthinkable for small projects. This benefits both the environment and the industry".	
6.6. 2018	JandeNul	WMS not working	24 hrs
25.6.2018	TalkWithLead	Help offered	24 hrs
6-25. 6 2018	Joint Monitoring Programme for Ambient Noise North Sea (JOMOPANS)	This Interreg North Sea Region project wants to use WP3 seabed-sediment data to quantify the contribution of shipping to submarine noise in light of its impact on marine life	As part of follow-up actions of a conference call, it was concluded that JOMOPANS requires median sand size in addition to Folk class as mapped in EMODnet Geology WP3. It is obvious that during future phases of EMODnet Geology median sand size should be included in addition to the Folk classes, in such cases where data is available, such as in sand-dominated areas like the North Sea.
31.8.2018	Private	Feedback	n/a (general opinion)
18.12.2018	Uni of Ulster	Data request	2 days
28.1.2019	Ifremer	Data questions	2 days
11.2. 2019	EMODnet Secretariat	Request for contribution for Teacher's Corner European Atlas of the Sea	1 day
19.2.2019	TNO	Download problem	1 day
4.4.2019	IGME/MINDeSEA	Marine mineral types used by MINDeSEA as start point to produce, in 2018, a first compilation map on energy-critical elements in pan-European seas.	1 day

8 Meetings held/attended since last report

Meetings held/attended during the first year of the project as reported in the Interim Report

Date	Location	Title	Internal/External + Short Description
10.-12. April 2017	Limassol, Cyprus	EMODnet Data Ingestion –project kick-off meeting	60 participants, projects plans and schedule discussed and agreed. EMODnet Geology WP3 Leaders participated in the meeting. Attended.
20-21 April 2017	Florence, Italy	GEO (Group on Earth Observations) data providers Workshop	Opportunity for EMODnet Geology to contribute marine geology data to GEO (120 participants). Attended by WP6.
2.-5. May 2017	Nova Scotia, Canada	GeoHab 2017. Marine Geological & Biological Habitat Mapping Conference, Nova Scotia, Canada	160 participants. Presentation about EMODnet programme and EMODnet 3 Geology Seabed substrate dataset was given in the conference. Several consortium members attended the conference.
29. May 2017	EMODnet geology Steering Group meeting in Espoo, Finland	Project kick-off	All WP leaders were present at the kick-off meeting in planning the project kick-off
30-31. May 2017	EMODnet geology project kick-off meeting in Espoo, Finland	Project kick-off	Project coordination and all WP leaders introduced all consortium partners to the Service contract and project actions
12–16. June 2017	Rostock, Germany	The 11th Baltic Sea Science Congress, Rostock, Germany	250 participants. Presentation about EMODnet programme and EMODnet 3 Geology Seabed substrate dataset was given in the conference. Several consortium members attended the conference.
26-28. June 2017	EMODnet Geology III WP8 Submerged landscapes meeting in Copenhagen, Denmark	Discussion of the features to be included in the new WP and interactions with other WPs. This is a new topic which needs proper planning.	Participation by WP8 partners and WP3,4,6, and 8 leads. EMODnet geology coordination was represented by WP3 member A Ka (GTK)
4-7. July 2017	EMODnet Techincal Working group meeting in Genoa, Italy	Technical issues	The EMODnet geology coordination was represented by U.A. (GTK) and EMODnet geology lot by technical coordinator B Pj
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

29. September 2017	Rome, Italy	The EuroGeoSurveys (EGS) Marine Geology Expert Group (EGS MGEG) Annual Meeting	20 participants. EMODnet 3 Geology was advertised in the presentation (by WP3 leader, AK) during the meeting.
2. October 2017	SHOM, Athens	EMODnet Seabed Habitats – EMODnet Geology, co-operation between lots	EMODnet Geology coordinator and WP3 Leaders (GTK) participated in this co-operation workshop
9.10. 2017	Tallinn, Estonia	The Gulf of Finland Trilateral Forum	80 participants. EMODnet programme and EMODnet 3 Geology Seabed substrate dataset were presented in the
27. October 2017	Rome	Meeting of the Italian Research Group contributing to EMODnet Geology (ISPRA, ENEA, ISMAR, OGS, Universities of Palermo, RomaTRE and Trieste)	Discussion on the next steps to be undertaken in order to provide data at the resolution required by the new phase of the Project, particularly regarding WP6.
6. November 2017	Skype	WP9 strategy and coordination, between partners GEUS and GeoZS.	Strategy and coordination of WP9 activities.
8-9. December 2017	Lafayette, LA - USA USGS facilities	Meeting of the Earth Science Working Group of the USA-Italy bilateral programme	Coastal change and events probabilities. Potential cooperation between USGS and ISPRA concerning activities carried out by ISPRA within WP5 and WP6 (20 participants). Attended by WP6.
30. November 2017	Helsinki, Finland	The Gulf of Finland Expert Group Meeting	20 participants. Experiences of data harmonization and seabed substrate data harmonization process in the EMODnet Geology project was presented at the Meeting.
23. November 2017	SYKE, Helsinki	EMODnet Broad scale habitats.	Finnish/National meeting discussing EMODnet Broad scale habitats and HELCOM Hub classification
11-15. December 2017	AGU 2017 Fall Meeting, New Orleans, LA, USA	Geological events in submerged areas: attributes and standards in the EMODnet Geology Project Marine minerals	Presentation of the criteria and methods applied in the compilation of WP6 Information on EMODnet Geology & WP7 marine minerals
31. January - 1st February 2018	Iraklion, Crete	Meeting of WP8	Successful completion and agreement of the draft guidelines for WP8
12-16. February 2018	Ocean Science Meeting, Portland, Oregon, USA.	Seabed Mapping Data Translated into Standardised Marine Minerals Maps for Europe.	GSI presented a poster on the WP7 Marine Minerals Maps of Europe. Available via the EMODnet Geology web FTP
22-23. February 2018	External meeting attended: CGMW General	Cross-boundary Geological Mapping	The General Assembly of the Commision of the Geological Map of the world takes place bi-annually. Crossboundary mapping projects worldwide are being introduced and discussed.

	Assembly, Paris (UNESCO)		WP 4 leader gave a presentation and displayed a poster of the cross-boundrary marine mapping of EMODnet.
20.-21. March 2018	Majorca, Spain	EMODnet Technical Working group meeting	20 participants. EMODnet Geology WP3 Leaders participated in the meeting.
26. March 2018	Budva, Montenegro	Meeting of the Adriatic Group of EMODnet	Discussion on the data available for the Adriatic solid geology pre-Pliocene geological map
26. March 2018	Budva, Montenegro	EMODnet 3 Geology WP4 workshop	20 participants, all members of the consortium, participated in the meeting.
27-29. March 2018	Budva, Montenegro	EMODnet 3 Geology –3rd project meeting	70 participants, project results and near future plans discussed

Meetings held/attended during the second year of the project

Date	Location	Type event (meeting, training (workshop), etc.)	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
16-17. April 2018	Barcelona, Spain	EMODnet Data Ingestion meeting Barcelona, Spain	A	EMODnet 3 Geology WP3 representatives (GTK) participated in the EMODnet Data Ingestion meeting in Barcelona, Spain, April 2018.
4. May 2018	Rome, Italy	Workshop	A	Italian Department of Civil Protection (with contributions by INGV, CNR and Universities). Summary of the knowledge on submerged volcanoes and potential hazard scenarios – Public Institutions – 50 attendees. WP6.
8. May 2018		Workshop on construction aggregates	A	Main intention with the workshop was to demonstrate how Material Flow Analysis (MFA) information on construction aggregate stocks, production, use and recycling is a necessity for developing resource supply models. The ca. 20 participants from Norway, Denmark and the NL discussed how quantitative but not-for-purpose information presently available (e.g. through EMODnet WP7) could serve MFA and help prove the feasibility of new H2020 applications. WP5.
17. May 2018	Espoo, Finland	EMODnet 3 Geology; GTK internal meeting Espoo, Finland	O	EMODnet 3 Geology, GTK internal meeting at GTK, Espoo.
22. May 2018		Workshop	A	Facing complexity: marine ecosystems Integrated, holistic and ecosystem approaches to marine environments – Research Institution – 50 attendees. WP6.
1. June 2018	Brussels, Belgium	Symposium on Transnational and Integrated Long-term Marine Exploitation Strategies	O	The symposium, attended by ca. 125 people from government, industry and academia, highlighted the results of a four-year project on marine sand and gravel in the Belgian and Dutch North Sea. EMODnet project partners RBINS and TNO introduced the first transnational voxel (3D-pixel) model of the North Sea subsurface, showing presence as well as likelihood of resources. WP5.

1. June 2018	Brussels, Belgium	Marine sands as a precious resource - conference	A	Project partners presented work completed by WP7
18-21. June 2018	Vancouver, BC, Canada	conference	A	Resources for Future Generations (RFG) Conference. Attendance by WP1, WP3, WP4, WP6, WP7.
18-21. June 2018	Vancouver, BC, Canada	Session at conference	0/A	Session From Continental Shelf to Slope- Mapping the Oceanic Realm at RFG Conference. Presentations by WP1, WP4 and WP7.
29. June 2018	Galway, Ireland	Irelands Marine Economic Forum, Our Ocean Wealth	A	WP leader discussed project and WP outputs with delegates. WP7.
3. July 2018	Brussels	GeoERA Kick-off meeting	A	Presentation of EMODnet Geology (coordinator). Almost 100 participants.
13. July 2018	Rotterdam, Netherlands	Theme Day	A (keynote lecture)	The theme day, attended by ca. 40 people from government, industry and academia, addressed mud dynamics in the Southern North Sea and its interaction with ecological processes. The need for transnational seabed data such as those in EMODnet was acknowledged, especially when coupled with future permanent monitoring stations in the North Sea.
21. August 2018	GTK, Espoo, Finland	EMODnet 3 Geology; GTK internal meeting Espoo, Finland	O	EMODnet Geology was presented to the entire GeoERA community by Henry Vallius, project Coordinator. The Minerals WP and framework was presented to the MINDeSEA project by WP leader Maria Judge.
2-7. September 2018	Napoli, Italy	conference	A	Cities on Volcanoes 10 - Development of volcanology, volcanic hazard, risk and resilience (850 participants)
7. September 2018	Skype	Communication meeting	A	
10. September 2018	Rome, Italy	meeting at ISPRA headquarters	O	Earth Science Working Group of the USA-Italy bilateral programme - Marine geology is one of the issues tackled by the group in view of future cooperation, focusing on potential assessment of geological events probabilities
12-14. September 2018	Catania, Italy	conference	A	Geosciences for the environment, natural hazard and cultural heritage (ca. 1000 participants)
13. September 2018	Copenhagen	Portal quality review	A	List of recommended improvements
25. September 2018	Shengjin, Albania	EMODnet 3 Geology Steering Group meeting	A	EMODnet 3 Geology work package leaders. All issues regarding the last 6 months of the project. 10 participants.

26. September 2018	Shengjin, Albania	WP 4 Harmonization workshop	O/A	Organization, realization and lead. Issues regarding the last 6 months of the project. 15 participants.
26. September 2018	Shengjin, Albania	EMODnet geology, WP 8 workshop	O/A	WP8 Submerged Landscapes workshop. All issues regarding the last 6 months of the project. 20 participants.
25-27. September 2018	Shengjin, Albania	EMODnet 3 Geology project meeting	O/A	EMODnet 3 Geology project meeting. All issues regarding the last 6 months of the project. 75 participants.
1-2. October 2018	Brussels	Technical Working Group workshop	A	The EMODnet Technical Working Group consists of the data portal managers and developers involved in EMODnet projects. The group meets at least twice per year to discuss common challenges and solutions to provide better services to the EMODnet users.
8-10. October 2018	Bari, Italy	IEEE Metrology for the sea workshop 2018	A	Key note lecture. Vallius H., et. al. The EMODNET-Geology project – harmonizing geological maps of the European seas.
17-18. October 2018	St. Petersburg, Russia	International Scientific Forum «Gulf Of Finland – Natural dynamics and anthropogenic Impact»	A	Vallius, H., et al., 2018. The EMODnet-Geology project – delivering harmonized geological maps of the European seas. Oral presentation.
30-31. October 2018	Dublin, Ireland	Atlantic Ireland 2018, Irelands annual petroleum conference	A	GSI attended the annual meeting and distributed EMODnet Geology information from the GSI booth.
7. November 2018	Dublin, Ireland	GeoScience 2018, Irelands annual geoscience conference	A	Ireland's national Geoscience conference was attended by GSI and an update on EMODnet Geology was presented.
8-9. November 2018	Kinsale, Ireland	INFOMAR Seminar 2018, Irelands seabed mapping conference	A	GSI attended the annual meeting and presented EMODnet Geology.
19–20. November 2018	Bryssels, Belgium	10th EMODnet Steering Committee Meeting	A	31 participants. EMODnet Geology was represented in the meeting by the WP3 Leader (Kotilainen).
26-27. November 2018	York	Preparatory workshop Marie Skłodowska-Curie ITN	A	Preparatory workshop Marie Skłodowska-Curie ITN proposal 'TIPs4COAST', University of York

		proposal 'TIPs4COAST', University of York		
27. November 2018	Copenhagen	Meeting	O	Coordination between UKRI and GEUS.
3-4. December 2018	Copenhagen	Workshop	A	The main objective of the meeting was to present the planned products for the MSFD 2018 reporting information in relation to Article 19(3), as well as to discuss the way forward and roadmap of the group for 2019-2020. EMODnet Geology presented how they use INSPIRE in their data products – issues and solutions. Circa 30 participants.
6. December 2018	Italian Embassy in Washington, DC - USA	Meeting	A	Earth Science Working Group of the USA-Italy bilateral programme - Marine geology is one of the issues tackled by the group in view of future cooperation, focusing on potential assessment of geological events probabilities (30 participants)
8-15. December 2018	Washington, DC - USA	AGU Fall meeting 2018 The world's largest annual geoscience meeting	A	Session and discussion panel on "Global Developments in Seafloor Mapping: Gaining a Greater Insight into Earth Systems" (27,000 participants) An international session was hosted at the meeting, with a focus on seabed mapping programmes, collaborations, challenges, methods, standards and geological discoveries. EMODnet Geology was presented, discussed numerous times as an international example of best practice in networking, data sharing, data harmonising as well as data standard and product development. It is an excellent example of cross-border cooperation in the geosciences and has been highlighted to international initiatives such as Seabed 2030 and American projects such as ASPIRE as a valuable source of open source data and European marine geoscience contacts.
12. February 2019	Brussels	EGS Expert Group Chairs Meeting and 42nd EGS National Delegates Forum	A	Ca. 50 participants. Emphasized the importance of EMODnet for the Marine Geology Expert Group, and approached other WG Chairs on collaboration in fields of geochemistry and coastal landslide sensitivity.
18. February 2019	Rome	meeting	A/O	Presentation of the web Portal of the Geological Survey of Italy, which includes a link to EMODnet Geology. (200 participants)
19-21. February 2019	Istanbul	EMODnet Geology workshop on submerged landscapes (WP8)	A	Ca. 15 participants. Agreed on actions to finalize WP8 output in current phase, and planned strategy for next phase.
21-22. February 2019	Rome	meeting (organized by Italian	A	Periodical meeting of the Italian marine geologists. Short presentations of recent relevant results. (100 participants)

		Geological Society)		
13. March 2019	Brussels	DG MARE , European Atlas of the Seas meeting	A	Eight participants. EMODnet-Geology data on coastal behaviour will be used in the European Atlas of the Sea, and an educational exercise will be made. Ostend meeting on April 24 will be attended.
14. March 2019	Amersfoort	Dutch Cultural Heritage Agency	O	Three participants. Agreement on alignment on activities concerning submerged landscapes.
20. March 2019	Enkhuizen	NCK Days (annual Meeting of the Netherlands Centre for Coastal Research)	A	Pitched EMODnet during meeting of Program Committee, suggested NCK Theme Day highlighting Dutch output of all EMODnet Lots.
2-3. March 2019	Rome, Italy	EMODnet Data Ingestion – project meeting	A	47 participants, project results were discussed. EMODnet Geology WP3 Leaders (Alanen) participated in the meeting.
08-12. April 2019	Vienna	European Geosciences Union (EGU) Annual meeting	A	EMODnet Booth at the conference which was attended by ca. 17,000 delegates from around the world.
08-12. April 2019	Vienna	European Geosciences Union (EGU) Annual meeting	O	Presentation on EMODnet Geology: Seafloor geology (Interoperability, Standards and EMODnet Geology: Building the Mosaic of European Sea Floor Data).
10. April 2019	Rome, Italy ISPRA	Geological Day Workshop	O	Presentation of the ISPRA-Marine Geology Section activities and the achievements of the EMODnet Geology Project (100 participants).
11. April 2019	Vienna	European Geosciences Union (EGU) Annual meeting	O	Event for launch of EMODnet geology new data on 11.04.2019
SUM	Counted 2nd year only		**O**	**Total # of meetings organised = 14 during 2nd year**
SUM	Counted 2nd year only		**A**	**Total # of meetings attended = 37 during 2nd year**

9 Outreach and communication activities

Please list all the relevant communications activities or products you have developed/executed during this period (including presentations, lectures, trainings, demonstrations and development of communication materials such as brochures, videos, etc.).

Relevant scientific and/or popular articles you know have been published using/referring to EMODnet must also be reported here.

Date	Media	Title	Short description and/or link to the activity
2017	*EMODnet Annual Report 2016*	*EMODnet Annual Report 2016*	*Report published by the EMODnet Secretariat includes a full section on practical use cases showcasing how EMODnet is supporting concrete real-life use cases. One example is use of EMODnet 2 Geology WP3 products in the Gulf of Finland assessment. The development of EMODnet standard classifications for the seabed substrate allowed a digital map layer covering Russian, Finnish and Estonian waters to contribute towards the Gulf of Finland assessment published in 2016. The assessment was one of the most important outcomes of the Gulf of Finland Year arranged by the three countries in 2014. The map which shows that erosion, transportation, and accumulation bottoms have combined to give a patchy seabed substrate distribution also formed the basis of the regional spatial plan for the sea area created by the Regional Council of Kymenlaakso (in Finland).*
20-21. April 2017	*GEO meeting*	*GEO (Group on Earth Observations) data providers*	*GEO, Workshop, Florence, Italy. Opportunity for EMODnet Geology to contribute marine geology data to GEO*
2-5. May 2017	*Presentation*	*EMODnet programme and EMODnet 3 Geology Seabed substrate dataset have been presented in connection with the following presentation in GeoHab 2017 Conference, Halifax, Canada: Kaskela, A.M. and Kotilainen, A.T. Seabed geodiversity of the Baltic Sea.*	*160 participants*
04. May 2017	*Presentation*	*Henry Vallius and EMODnet Geology partners: Multi-scale harmonized geological maps of the European seas–3rd phase of the EMODNET-geology project*	*GeoHab 2017, Halifax, Canada. Presentation of the new phase of the EMODnet geology project to the GeoHab community*

03. May 2017	*Presentation*	*Anu Kaskela and Aarno Kotilainen: Seabed geodiversity of the Baltic Sea*	*GeoHab 2017, Halifax, Canada. Case study from a regional sea (the Baltic Sea) on seabed geodiversity*
10-12. May 2017	*Presentation*	*Italian Geological Mapping of submerged areas and its contribution to EMODnet - European Marine Observation and Data Network*	*Congress of the Italian Association of Cartography (AIC), Genoa, Italy. Presentation of the Italian Geological Mapping Project (CARG) and the products obtained from its elaboration and delivered within EMODnet Geology*
22-23. May 2017	*Meeting*	*WP7 at ADSMS*	*6th Annual Deep Sea Mining Summit, London, UK. EMODnet, marine geology and minerals specifically.*
14. June 2017	*Plenary lecture*	*EMODnet programme and EMODnet 3 Geology Seabed substrate dataset were presented by Anu Kaskela and Aarno Kotilainen: Quantifying seabed geodiversity of the Baltic Sea*	*Baltic Sea Science Congress 2017, Rostock, Germany Case study from a regional sea (the Baltic Sea) on quantification of seabed geodiversity. 250 participants.*
12.–16. June 2017	*Presentation*	*Quantifying seabed geodiversity of the Baltic Sea.*	*EMODnet programme and EMODnet 3 Geology Seabed substrate dataset have been presented in connection with the following presentation in the 11th Baltic Sea Science Congress, Rostock, Germany: Kaskela, A.M., Kotilainen, A. T. Quantifying seabed geodiversity of the Baltic Sea. 250 participants*
29-30. June 2017	*Publicising EMODnet*	*Harnessing Our Ocean Wealth, Galway, Ireland*	*Digital Ocean, Galway, Ireland. Publicising EMODnet, EMODnet Geology and the Minerals WP through brochures, pull-up banners and discussion.*
3-6. September 2017	*Abstract*	*Miocene to present deformation in the Aegean: extension vs. transtension and strike slip tectonics*	*Book of Abstracts, 15th Congress of the RCMNS, Athens, Greece 2017. Authors: Sakellariou D., Tsampouraki-Kraounaki K*
4-6. September 2017	*Map presentation*	*Geosciences: a tool in a changing world. Map of submerged volcanic structures in Italy*	*Italian Volcanology Association Congress Pisa, Italy. Presentation of EMODnet Geology products at the Italian Volcanology Association Congress*
8-17. September 2017	*Presentation*	*"IGME: The Hellenic state's advisor on geoscientific issues"*	*82nd Thessaloniki International Fair Presentation of EMODnet as a part of a slideshow in Greek at the International exhibition*
12-15. September 2017	*Round table*	*"Role of EMODnet"*	*RAO/CIS Offshore 2017, St. Petersburg. 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*

24-28. September 2017	*Poster*	*"The contribution of foraminifera on applied geological research"*	*16th International ΝΑΝΝΟΠΛΑΓΚΤΟΝ Association Meeting, Athens, Greece. Authorr: Zananiri, I.*
26. September 2017	*Introduction*	*Introduction of the Central Portal, the services provided by the thematic portal of EMODnet3-geology*	*Partner PSRGE (Ukraine) was visited by colleagues from Geological Survey of Canada, and they were introduced to the EMODnet concept and the contribution of Ukraine*
24-29. September 2017	*Map*	*First map and catalogue of submarine mineral deposits from Spain: EMODnet-Geology project*	*46th Underwater Mining Conference, Berlin, Germany. UMC 2017 · Economical, Technological and Environmental Aspects: Cooperative Solutions for Future Deep-sea Mining. Authors: Gonzales, J., Medialdea, T., Gomez-Ramoz, G., Blasco, I., Blanco, L., Somoza, L., Marino, E., and Leon, R.*
29. September 2017	*Presentation*	*EMODnet 3 Geology*	*EMODnet 3 Geology was advertised in the presentation (by WP3 leader, Kotilainen) during the EuroGeoSurveys (EGS) Marine Geology Expert Group (EGS MGEG) Annual Meeting in Rome, Italy, 29.9.2017. 20 participants*
29. September 2017	*A short article in the BGR Newsletter (4/2017)*	*Geoinformationen:* *Teilnehmer Arbeitspaket* *EU-Projekt zu Meeresdaten*	*Announcing that BGR is participating in the EMODnet project https://www.bgr.bund.de/SharedDocs/Newsletter/DE/2017/newsletter-2017-04.html?view=renderNewsletterHtml&nn=1544598*
29. September 2017	*Public dissemination*	*Relief model of submerged volcanic structures in Italy*	*European Researchers Night. European dissemination project: research meets society*
29. September 2017	*Presentation*	*"IGME – Greece: 2017 Activity Report"*	*EuroGeoSurveys, Marine Geology Expert Group Annual Meeting. Presentation of EMODnet geology to the network. Author: I. Zananiri.*
09. October 2017	*Presentation*	*EMODnet Geology - geological data from the European marine areas.*	*EMODnet programme and EMODnet 3 Geology Seabed substrate dataset have been presented in Gulf of Finland Trilateral Forum in Tallinn 9.10.2017: Kaskela, A., Kotilainen, A., Alanen, U., Ryabchuk, D., Suuroja, S., Vallius H., 2017. EMODnet Geology - geological data from the European marine areas. 80 participants*
19-23. October 2017	*Presentation*	*Submerged Prehistoric Landscapes in the Aegean Sea*	*Honor Frost Foundation Conference, 19-23 Oct. 2017, Nicosia, Cyprus. Authors: A. Zavitsanou, D. Sakellariou*
07. November 2017	*Information*	*'What geoscience is worth to you'*	*Geoscience 2017, Dublin, Ireland Information on the EMODnet Geology project & WP7 minerals*
12-16. November 2017	*Presentation*	*Strike-slip deformation behind the Hellenic subduction: The Amorgos Shear Zone, South Aegean Sea*	*8th INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology (PATA). Blenheim, New Zealand. Authors: Tsampouraki-Kraounaki and D. Sakellariou*

15-16. November 2017	*Information*	*The Irish National Seabed Mapping Programme*	*INFOMAR Seminar, Cork, Ireland. Information on the EMODnet Geology project & WP7 minerals*
16. November 2017	*Presentation*	*European Marine Sand and Gravel Group (EMSAGG) Work Shop*	*EMSAGG Workshop, Cork, Ireland. Presentation of the EMODnet Geology project & WP7 minerals*
30. November 2017	*Presentation*	*Experiences of data harmonization and seabed substrate data harmonization process in the EMODnet Geology project*	*Gulf of Finland Trilateral (Russia – Estonia – Finland) Expert Group Meeting, Helsinki, Finland. Presentation by Kotilainen, A. et. al.*
30 November 2017	*Presentation*	*Need for data harmonization in multinational marine areas. Experiences from the harmonization within geology (EMODnet, TOPCONS, Balance)*	*Gulf of Finland Trilateral (Russia – Estonia – Finland) Expert Group Meeting, Helsinki, Finland. Authors: Kotilainen, A., Kaskela, A., and Alanen, U. 20 participants.*
8-9. December 2017	*Bilateral meeting*	*Coastal change and events probabilities*	*USGS-ISPRA bilateral meeting, Lafayette, LA – USA. Activities carried out by ISPRA concerning coastal changes within WP5 and WP6*
13. December 2017	*Press releases and post on Facebook and LVGMC webpage*	*"Lvģmc Geologists is participating in the emodnet-geology project"*	*Dissemination by Latvian Partner LVGMC (LEGMC) as press releases as well as post on Facebook and on partners own webpage https://www.meteo.lv/lapas/*
11-15. December 2017	*Presentation*	*Geological events in submerged areas: attributes and standards in the EMODnet Geology Project* *Marine minerals*	*AGU 2017 Fall Meeting, New Orleans, LA, USA* *Presentation of the criteria and methods applied in the compilation of WP6* *Information on EMODnet Geology & WP7 marine minerals*
11-16. February 2018	*Poster*	*Seabed Mapping Data Translated into Standardised Marine Minerals Maps for Europe.*	*Ocean Science Meeting, Portland, Oregon, USA. Poster on the WP7 Marine Minerals Maps of Europe. Available via the EMODnet Geology web FTP. 150 in attendance.*
22-23. February 2018	*External meeting attended:*	*Cross-boundary Geological Mapping*	*CGMW General Assembly, Paris (UNESCO). The General Assembly of the Commision of the Geological Map of the world takes place bi-annually. Cross-boundary mapping projects worldwide are being introduced and discussed. WP 4 leader gave a presentation and displayed a poster of the cross-boundrary marine mapping of EMODnet.*
8. March 2018	*Lecture*	*"EMODnet Geology"*	*ISOR annual meeting, Reykjavik*
10. March 2018	*Interview*	*"EMODnet Geology"*	*Interview in the The Icelandic National Broadcasting Service (RÚV news), (average rating view on RUV news is about 40.000)*
21. March 2018	*Session*	*DINOloket, EMODnet and OpenEarth*	*NCK Days 2018, Haarlem, Netherlands Sprint session led by D. Maljers and J. Stam (TNO) and G. de Boer (Van Oord Dredging and Marine Contractors)*
21. March 2018	*Poster*	*A new generation of marine geological maps in the Netherlands*	*NCK Days 2018, Haarlem, Netherlands, by S. van Heteren et al.*

19. April 2018	*Presentation*	*"Challenges and pitfalls in building a marine voxel model. 3D-models and voxel-models in geology"*	*BLUG workshop. Brussels. Authors: Kint, L., Terseleer, N., Van den Eynde, D., Van Lancker, V., Hademenos, V., Missiaen, T., De Mol, R., De Tré, G., Stafleu, J., van Heteren, S.*
22. May 2018		*USA-Italy bilateral research proposal*	*Communication of scientific research results towards improved natural disasters resilience induced by geohazards.*
17-11. May 2018	*Poster*	*Transnational Belgian-Dutch geological knowledge base on marine aggregates. From 3D voxel modelling to 4D cross-border environmental assessments*	*GeoHab 2018, Marine Geological and Biological Habitat Mapping, Santa Barbara, U.S. Authors: Van Lancker, V., Kint, L., Terseleer, N., Hademenos, V., Missiaen, T., De Mol, R., De Tré, G., van Heteren, S., Stafleu, J., Degrendele, K., & Roche, M.*
23. May 2018	*email to network*	*Stakeholder questionnaire*	*A questionnaire on usage and/or willingness to submit data to EMODnet Geology and/or EMODnet in general to stakeholders throughout Europe was distributed to all partners in 30 European countries.*
30. May – 3. June 2018	*Presentation*	*EMODNET Geology III: European harmonized marine geological maps.*	*12th Panhellenic Symposium Of Oceanography & Fisheries, Corfu, Greece. Authors: Sakellariou D, Drakopoulou P, Zananiri I, Loukaidi V, Kyriakidou H, Zavitsanou A, Rousakis G.*
1. June 2018	*Poster presentation*	*Mapping marine minerals in Europe*	*TILES Final Conference on 'Marine Sands as a Precious Resource'. Brussels*
1. June 2018	*Proceedings*	*Code of Sand: 17 messages guiding a more sustainable use of marine sands.*	*TILES Final Conference on 'Marine Sands as a Precious Resource'. Brussels. Authors: Van Lancker V, Francken F, Kapel M, Kint L, Terseleer N, Van den Eynde D, Hademenos V, Missiaen T, De Mol R, De Tré G, van Heteren S, Stafleu J, Stam J, Degrendele K, Roche M., Baetens K, De Clercq M, Scory S, Stolk A, van der Voet E.*
8. June 2018	*Press release*	*EMODnet Geology project (in Finnish).*	*Geological Survey of Finland (GTK) released press release about EMODnet Geology project (in Finnish). Mediatiedote: Geologian tutkimuskeskus tuottaa merialueiden käytön suunnitteluun uusia, tarkkoja ja ilmaisia karttoja.*
12. June 2018	*Geological Survey of Italy Publication - Annual report 2017*	*Summary of the EMODnet Geology Project*	*Summary of the EMODnet Geology Project since its start to the present phase, within the activities of the Marine Geology Section of the Geological Survey of Italy*
16-21. June 2018	*Presentation*	*Transnational Belgian-Dutch geological knowledge base on marine aggregates. From 3D voxel*	*RFG2018 Resources for Future Generations. Premier conference on Energy, Minerals, Water, The Earth. Vancouver (CAN). Session: Marine Geoscience and Geospatial Data Crossing*

		modelling to 4D cross-border environmental assessments.	*Borders. Authors: Van Lancker, V., Kint, L., Terseleer, N., Hademenos, V., Missiaen, T., De Mol, R., De Tré, G., van Heteren, S., Stafleu, J., Degrendele, K., & Roche, M.*
20. June 2018	*Presentation*	*The Precious Mosaic of Seafloor Data: Challenges, Chances and the EMODnet-Project" Resources for Future Generations conference, Vancouver, Canada.*	*Presentation about EMODnet Geology, the usage of international standards, e.g. INSPIRE data model and and IUGS/CGI Vocabularies, setting up new standards, data compilation and challenges of data harmonisation across EEZ boundaries (Kristine Asch, BGR)*
20. June 2018	*Presentation*	*Integrated seabed mapping for management and industry: from 2d maps to 3d voxels to 4d evolution over time.*	*Workshop Hydrographic Society Benelux "Bathymetry - the foundation for sustainable seas, oceans and waterways". Antwerp (BE). Authors: Van Lancker, V. & TILES consortium*
21. June 2018	*Presentation*	*EMODNET Sea Floor Geology: Integrating Europe's Marine Geology Across EEZ-Boundaries*"	*Resources for Future Generations conference,, Vancouver, Canada. Presentation of the methods, status and mapping challenges for EMODnet geology, in particular WP4 seafloor geology (Kristine Asch, BGR)*
21. June 2018	Presentation	*Discover Europe's seabed geology - The EMODnet concept of uniform collection and harmonization of marine data*	*Resources for Future Generations conference,, Vancouver, Canada. Presentation of EMODnet and EMODnet geology (Henry Vallius, GTK)*
21. June 2018	*Session organized by EMODnet Geology and IUGS*	*IUGS/EMODnet Session "From Continental Shelf to Slope - Mapping the Oceanic Realm"*	*(Kristine Asch, Hiroshi Kitazato, Henry Vallius) Resources for Future Generations Conference, Vancouver; Canada. The Geological Society of London elected this session as worthwhile to set up a Special issue of the session contribution. Contributions from North-America, Europe, Australia and Asia. Discussion of a IUGS/EMODnet geology initiative/activity on cross-disciplinary marine geoscience mapping*
21. June 2018	*Presentation*	*Revealing the secrets of Norway's seafloor*	*International Conference Resourcing Future Generation, Vancouver, Canada. Presentation of EMODnet, The Norwegian approach and challenges (Reidulv Bøe , LiljaRun Bjarnadóttir - Sigrid Elvenes, NGU)*
21. June 2018	*presentation*	*EMODnet Geology translating seabed data into informative marine mineral maps*	*International Conference Resourcing Future Generation, Vancouver, Canada. Presentation of EMODnet Geology WP Mineral Resources (Maria Judge, Koen Verbruggen, Charise McKeon)*
20-22. June 2018	*Presentation*	*"El proyecto EMODnet- Geology: Una initiative para extender el accesso a los datos geologicos de los oceanos y mares Europeos"*	*VI International Symposium on Marine Sciences, Vigo, Spain. Authors: Medialdea, T., Somosa, L., Gonzales, F.J., Lobato, A., Rodriquez-Santalla, I., Blasco, I., Leon, R., Blanco, L., and Gimenez, J.*
21. June 2018	*Oral presentation*	*Translating seabed data into informative marine mineral maps*	*Resources for Future Generations 2018 conference, Vancouver, BC, Canada*

22. June 2018	*Workshop presentation*	*Standardisation of sediment data across transnational boundaries*	*CEFAS workshop on 'Particle size Sediment data standards meeting'. Peterborough (UK). Authors: Van Lancker, V., Kint, L., van Heteren, S. & the TILES Consortium*
28-29. June 2019	*Presentation*	*Transnational resource mapping in the North Sea: tools and challenges.*	*European Marine Sand and Gravel Group (EMSAGG) 6th triennial conference Marine Sand and Gravel - Beyond the Horizon. Southampton (UK). Authors: Van Lancker, V. & TILES consortium*
2. July 2018	*Press-release*	*First years' progress of EMODnet Geology*	*Starting in Finland on 8.6. a press-release on first years progress of EMODnet Geology. The press-release was distributed on 2. July to all partners in 30 countries where it's been translated into national languages and published.*
July 2018	*IUGS Newsletter (E-Bulletin*	*RFG2018: From Continent to Slope: Mapping the Oceanic Realm (IUGS and EMODNET)*	*Short summary of the IUGS/EMODnet session Mapping the Ocean realm, July 2018 issue (No. 144)* http://iugs.org/uploads/E-Bulletin/IUGS-E-bulletin-July-144.pdf
4-7 July 2018	*Map release*	*"A nova cartografia geológica digital da Margem Ibérico-Atlântica: O proyeto EMODnet-Geology"*	*The new digital geological maps of the Iberian Atlantic Margin: The EMODnet-Geology Project. Symposium presentation. Resumos do IX Simpósio MIA2018, Coimbra*
4-7 September 2018	*Presentation*	*"The new digital geological maps of the Iberian Margin: The EMODnet-Geology project"*	*IX MIA 2018 Symposium, Coimbra, Spain. Authors: Medialdea, T., Terrinha, P., Somosa, L., Batista, L., Gonzales, F.J., Lobato, A., Silva, S.*
19. September 2018	*Presentation*	*"EMODnet Geology"*	*Presentation for offshore geoscience community in Iceland (Conference), Reykjavik.*
24. September 2018	*News flash on Albanian TV News*	*"EMODnet Geology"*	*An Albanian TV channel interviewed EMODnet Geology coordinator Henry Vallius, the Secretary General of the Eurogeosurveys, and our host from the Albanian Geological Survey for evening news. The same news flash was distributed to other channels as well and sent out on the other channels the next day. Great visibility in Albania.*
24. September 2018	*Video clip on EMODnet Geology portal*	*"EMODnet Geology"*	*The Albanian TV News video clip was uploaded to the home page of the EMODnet Geology portal.*
24. September 2018	*Presentation*	*EMODnet 3 Geology*	*EMODnet 3 Geology was advertised in the presentation (by WP3 leader, Kotilainen) during the EuroGeoSurveys (EGS) Marine Geology Expert Group (EGS MGEG) Annual Meeting in Shengjin, Albania. 20 participants*

28. September 2018	*Presentation*	*"EMODnet Geology"*	*European Researchers' Night in Iceland, Reykjavik.*
8-10 October 2018	*Presentation*	*Vallius H., et. al. "The EMODNET-Geology project – harmonizing geological maps of the European seas".*	*IEEE Metrology for the sea workshop 2018. Key note lecture.*
17. October 2018	*Presentation*	*Vallius, H., Kotilainen, A., Ryabchuk, D., and the EMODnet Geology Partners, 2018. "The EMODnet-Geology project – delivering harmonized geological maps of the European seas. Oral presentation".*	*Presentation at "Gulf of Finland – Natural Dynamics and anthropogenic impact" Conference, St. Petersburg, Russia. Vallius, H., Kotilainen, A., Ryabchuk, D., the EMODnet Geology Partners, 2018. The EMODnet-Geology project – delivering harmonized geological maps of the European seas. Conference Abstract Volume: The International Scientific Forum "Gulf of Finland – Natural Dynamics and anthropogenic impact", St. Petersburg, Russia*
14-20. October 2018	*Presentation*	*Somoza et. al. "Catalogue of gas seeps around the Iberian continental margin: Atlantic Vs. Mediterranean".*	*14th Gas in Marine Sediments GIMS 14, Haifa, Israel.*
5-7. November 2018	*Poster*	*Vallius, H., Zananiri, I. and the EMODnet Geology team. "The EMODnet Geology project: Discover Europe's seabed geology".*	*IMDIS 2018, Barcelona, Spain.*
5-7. November 2018	*Presentation*	*Oset Garcia et. al. "EMODnet Central Portal data services".*	*IMDIS 2018, Barcelona, Spain.*
9. November 2018	*News item on portal*	*Coming soon: Pan-European coastline-migration map based on satellite data 2007-2016.*	*https://www.emodnet-geology.eu/*
9. November 2018	*News item on portal*	*Why may a mapped coastline differ from the 'official' coastline?*	*https://www.emodnet-geology.eu/*
4. December 2018.	*Presentation*	*Overview on EMODnet Geology and INSPIRE compliance*	*TG-DATA meeting Copenhagen*
8-9. December 2018	*Presentation*	*Ireland's contribution to EMODnet Geology WP7, Marine Minerals*	*INFOMAR Seminar 2018, Ireland's seabed mapping conference. 120 in attendance.*
8-9. December 2018	*Poster*	*Ireland's contribution to EMODnet Geology WP8, Submerged landscapes.*	*INFOMAR Seminar 2018, Ireland's seabed mapping conference. 120 in attendance.*

08-15. December 2018	*Conference proceedings, session. Poster and presentation*	*EMODnet network, Geology and hydrography presented and discussed at length during international marine geologists and seabed mappers meeting*	*AGU (American Geosciences Union) Annual Meeting 2018 session. C. 150 international research professionals and industry representatives reached.*
1. January 2019	*Call for abstracts*	*"Mapping the Geology and Geomorphology of the European Seas"*	*Thematic EMODnet Geology Issue, Quarterly Journal of Engineering Geology and Hydrogeology.* ***10*** *abstracts received by dead-line. Will be listed in later report.*
3. January 2019	*Call for abstracts*	*"From Continental Shelf to Slope - Mapping the Oceanic Realm"*	*Books Editorial Committee of the Geological Society of London approved proposal on a Special Publication based on the talks held at Resources for Future Generations 2018 in Vancouver, added with significant input from the EMODnet Geology community.* ***23*** *abstracts received by dead-line. Will be listed in later report.*
10. January 2019	*Presentation*	*"EMODnet Geology"*	*Presentation for Iceland Diving Club*
January 2019	*Newsletter*	*MINDeSEA Newsletter, Issues 1 and 2.*	*Project: GeoERA, MINDeSEA; GARAH*
30. January 2019	*Abstract*	*New approaches to sand resource management – in a constrained*	*Conference Sand and the Sandbank: is sand extraction a sustainable business? Abstract Book. The Geological Society and Royal Geographical Society. London (UK). Author: Van Lancker, V.*
February 2019	*Text for the website*	*Description of WP7 - Minerals*	*Text describing the WP7 aims, the information, maps and a range of potential uses for data in lay-mans terms have been written out and submit to WP Data Management*
14. February 2019	*Proposal for Breakout Session at OceanObs'19*	*'Seabed Mapping – the Missing Link in OceanObs' at OceanObs19;*	*Proposal, with participation of EMODnet and EurogeoSurveys Marine Geology Expert Group, accepted*
1. March 2019	*Abstract submitted for OceanObs'19*	*'EMODnet Geology, multinational collaboration for systematic mapping of Europe's marine geology'*	*Poster abstract submitted by Henry Vallius and EMODnet Geology partners, accepted.*
March 2019	*Poster accepted*	*Title: EMODnet Geology marine minerals data for European seas as an indication of associated endemic species dispersal*	*GeoHab 2019 (May 2019), not yet presented*
March 2019	*Conference proceedings*	*Title: Analysing the distribution of marine mineral deposits across European*	*Goldschmidt '19, not yet presented*

	submitted to Goldschmidt '19	*Seas: A new perspective from the EMODnet-Geology project*	
22. March 2019	*Poster*	*Pan-European coastline-migration map based on satellite data 2007-2016*	*NCK Days*
March 2019	*Conference proceedings submitted*	*"Analysing the distribution of marine mineral deposits across European Seas: A new perspective from the EMODnet-Geology project"*	*Goldschmidt '19 conference. Authors:* T. Medialdea, M. Judge, F.J. Gónzalez, L. Somoza, P. Terrinha, E. Marino.
31. March 2019	*Atlas*	*Atlas of Italian Submarine Volcanic Structures*	*In: Memorie Descrittive della Carta Geologica d'Italia. Authors: Silvana D'angelo, Andrea Fiorentino, Guido Giordano, Alessandra Pensa, Annamaria Pinton, Letizia Vita*
2018	*Course*	*Course "In-situ and remote sensing Tools in Aquatic Sciences"*	*Ocean and Lakes (Universiteit Gent, Vrije Universiteit Brussel, Universiteit Antwerpen). By Dr. Vera van Lancker.*
3-6. March 2019	*Map*	"Distribution of critical raw materials mapped in European seas"	*PDAC (Prospectors and Developers Association of Canada) Annual Convention. EGS booth displayed a map of critical raw materials created by the MINDeSEA project using EMODnet Geology data*
1-3. April 2019	*Extended abstract*	*Multi-scale analysis of sandbank features optimising geomorphological mapping of sandy shelf environments: Belgian part of the North Sea.*	*Marine and River Dune Dynamics – MARID VI, 1-3 April 2019, Bremen, Germany, 6 pp. Authors: Kint, L., N. Terseleer and V. Van Lancker*
4-5. April 2019	*Poster*	*""Discover Europe's seabed Geology"*	*Seminar and Workshop for PhD and MSc students: `Holocene sea-level reconstructions and palaeolandscapes` Authors: Vallius, H., Ryabchuk, D., and Zananiri, I.*
8-12. April 2019	*Booth*	*"Discover Europe's seabed Geology"*	*EMODnet Geology booth at EGU' 19 (European Geosciences Union) Annual conference with about 17.000 attendees. The booth attracted thousands of of geoscientists from around the globe.*
8. April 2019	*Press release*	*"EMODnet Geology- satellite derived Coastal Migration map of whole Europe released"*	*Press release of the new satellite derived Coastal Migration map, which was launched as the first completely new of our products, which was later in April followed by nre products from all work packages (As they were not released within the reporting period, please see descriptions of the different work packages.)*
09 April 2019	*EGU General Assembly, Vienna*	*Interoperability, Standards and EMODnet Geology: Building the*	*Presentation of EMODnet, EMODnet Geology, Emodnet geology Workpackage Seafloor geology: Use of INSPIRE and other international*

		Mosaic of European Sea Floor Data. Kristine Asch, BGR	*standards,e.g. from IUGS, setting up new standards, data compilation and challenges of data harmonisation across EEZ boundaries*
In review/ preparation			
In review	*Section in Publication*		*Include a section on the EMODnet Geology lot to the Geology Chapter in the Springer Handbook of Geographic Information, 2nd ed. (Asch, K., NN). Eds: W. Kresse, D. Danko with focus on the compilation of Seaflor geology (WP 4)*
in preparation	*Geological Society of London Special issue*	*From Continental Shelf to Slope - Mapping the Oceanic Realm*	*proposal accepted for the Geological Society of London Special issue; From Continental Shelf to Slope - Mapping the Oceanic Realm) – with ca 10 paper proposals on EMODnet geology subjects. Editors: Asch, Kristine, Kitazato, Hiroshi, and Vallius, Henry*
in preparation	*Geological Society of London Special issue*	*Discover Europe's seabed geology - The EMODnet concept of uniform collection and harmonization of marine data* *Henry Vallius - Geological Survey of Finland*	
in preparation	*Geological Society of London Special issue*	*EMODNET Sea Floor Geology: Integrating Europe's Marine Geology Across EEZ-Boundaries* *Kristine Eva Charlotte Asch - Federal Institute for Geosciences and Natural Resources*	
in preparation	*Geological Society of London Special issue*	*(Mapping) Dacian sediments on the Black Sea shelf east of the Danube Delta. P.F. Gozhik, V.Ye. Rokitsky, Ukraine*	
in preparation	*Geological Society of London Special issue*	*Integrated Thematic Geologic Mapping of the Atlantic Façade of Iberia (a response to societal needs).* *Pedro Terrinha, IPMA, Portugal, and Teresa Medialdea, IGME, Spain*	
in preparation	*Geological Society of London Special issue*	*Classification and Map Compilation of Geomorphological Information of the German Sea floor in the frame of the EMODnet project* *Sonja Breuer & Kristine Asch - Federal Institute for Geosciences and Natural Resources*	

in preparation	*Geological Society of London Special issue*	*Geomorphology of the Bulgarian Black Sea Shelf* *Lyubomir Dimitrov, Bogdan Prodanov, Todor Lambev, Elena Borisova (all from Institute of Oceanology – BAS, Varna).*	

Table: List of known publications using EMODnet data or data products, including scientific dissemination.

Date	Name of journal, conference, …	Publication title	Authors	Organisation(s)
2.-5. May 2017	Conference Paper: The GeoHab 2017 Conference: marine geological and biological habitat mapping, 1-5 May, 2017, Dartmouth, Nova Scotia, Canada: Program and Abstracts, 63.	Seabed geodiversity of the Baltic Sea.	Kaskela, A.M., Kotilainen, A.T	Geological Survey of Finland (GTK)
10-12 May 2017	Congress Mapping and Blue Growth: knowledge, decision making, management, representation of a sensitive issue. Genoa, Italy	La Cartografia Geologica Italiana delle aree sommerse e il suo contributo a EMODnet - European Marine Observation and Data Network	Loredana Battaglini, Silvana D'Angelo, Andrea Fiorentino	Italian Association of Cartography (AIC)
12.–16. June 2017	Conference paper: 11th Baltic Sea Science Congress, 12-16, June 2017, Rostock, Germany: Abstract Book. 37.	Quantifying seabed geodiversity of the Baltic Sea.	Kaskela, A.M., Kotilainen, A.T.	Geological Survey of Finland (GTK)
8. August 2017	Scientific Paper: Geomorphology 295, 419–435.	Seabed geodiversity in a glaciated shelf area, the Baltic Sea.	Kaskela, A.M., Kotilainen, A.T.	Geological Survey of Finland (GTK)
4 - 6 September 2017	Map release	Map of submerged volcanic structures in Italy Geosciences: a tool in a changing world, Congress Pisa, Italy	Pinton A., Pensa A., Giordano G., Battaglini L., D'Angelo S., Fiorentino A. and Vita L.	Italian Volcanology Association
27. September 2017	Book Chapter: In: Viitasalo, M., Kostamo, K., Hallanaro, E.-L., Viljanmaa, W., Kiviluoto, S., Ekebom, J., Blankett, P. (Eds.). Meren aarteet. Löytöretki Suomen	Vedenalaiset maisemat (in Finnish).	Hämäläinen, J., Kaskela, A., Kotilainen, A., Viitasalo, M.	Geological Survey of Finland (GTK); Finnish Environment Institute (SYKE)

	vedenalaiseen meriluontoon (in Finnish). Gaudeamus. 48-63.			
3. November 2017	Academic dissertation (Ph.D. Thesis): Department of Geosciences and Geography, University of Helsinki. Geological Survey of Finland. 42 p.	Seabed Landscapes of the Baltic Sea: Geological characterization of the seabed environment with spatial analysis techniques. Academic dissertation, Department of Geosciences and Geography, University of Helsinki. Geological Survey of Finland. 42 p.	Kaskela, A.M.	Geological Survey of Finland (GTK)
11-15 December 2017	Presentation	Geological events in submerged areas: attributes and standards in the EMODnet Geology Project AGU 2017 Fall Meeting New Orleans, LA - USA	Andrea Fiorentino, Loredana Battaglini, Silvana D'Angelo	American Geophysical Union
2018	Report Koninklijk Belgisch Instituut voor Natuurwetenschappen, 41 p.	Kaderrichtlijn Mariene Strategie. Beschrijvend element 6: Zeebodemintegriteit. Ruimtelijke analyse fysisch verlies en fysische verstoring.	Kint, L., Montereale Gavazzi, G. & Van Lancker, V.	Royal Belgian Institute of Natural Sciences (RBINS)
2018	Report In: Belgische Staat. Evaluatie van de goede milieutoestand van de Belgische mariene wateren. Kaderrichtlijn Mariene Strategie. BMM, Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, Brussel, België, 24 pp.	Fysische verstoring en verlies van de zeebodem (D6).	Van Lancker, V., Kint, L. & Montereale Gavazzi, G.	Royal Belgian Institute of Natural Sciences (RBINS)
9. March 2018	Research Report: Geologian tutkimuskeskus, Tutkimustyöraportti 6/2018. GTK Research Report (electronic publication).	Vedenalaisten Natura-luontotyyppien mallinnus Suomen merialueella (In Finnish). Geologian tutkimuskeskus, Tutkimustyöraportti 6/2018. GTK Research Report (electronic publication)	Kaskela, A., Rinne, H.	Geological Survey of Finland (GTK); Åbo Akademi, Finland
2 -7 September 2018	Atlas	Atlas of Volcanic Seamounts in Italy Congress Cities on Volcanoes; Naples, Italy	Giordano G., Battaglini L., D'Angelo S., Fiorentino A., Pinton A.,	International Association of Volcanology and Chemistry of Earth Interior

			Pensa A. & Vita L.	
12 -14 September 2018	Presentation	Structural mapping of Italian Seas: an integrated view of different geological events "Geosciences for the environment, natural hazard and cultural heritage" congress. Italian Geological Society Catania , Italy	*M. Agate, L. Battaglini, S. D'Angelo, A. Fiorentino, G. Giordano, F. Loreto, D. Morelli, C. Palmiotto, M. Pantaloni, A. Pensa, A.M. Pinton, L. Vita*	ISPRA
12 -14 September 2018	Presentation	Regional scale morphotectonic pattern of the Tyrrhenian Sea. "Geosciences for the environment, natural hazard and cultural heritage" Congress. Italian Geological Society Catania , Italy	Palmiotto C., Loreto M.F., D'Angelo S. & Fiorentino A.	ISPRA.
12 -14 September 2018	Presentation	The pre-Pliocene geological map of the Adriatic Sea. "Geosciences for the environment, natural hazard and cultural heritage" Congress. Italian Geological Society Catania , Italy	Marco Pantaloni, Sokol Marku, Bogomir Celarc, Slobodan Miko, Slobodan Radusinovic, Ljiljana Vućić & the Working Group on the Adriatic Sea Geology	Italian Geological Society
12 -14 September 2018	Presentation	Digital mapping of submerged areas: from the planning to the development of the final products "Geosciences for the environment, natural hazard and cultural heritage" Congress. Italian Geological Society Catania , Italy	L. Battaglini, S. D'Angelo, A. Fiorentino	ISPRA
17. October 2018	Conference paper: Conference Abstract Volume: The International Scientific Forum "Gulf of Finland – Natural Dynamics and	The EMODnet-Geology project – delivering harmonized geological maps of the European seas. Conference Abstract Volume: The International	Vallius, H., Kotilainen, A., Ryabchuk, D., the EMODnet Geology Partners.	Geological Survey of Finland (GTK); A. P. Karpinsky Russian Geological Research

	anthropogenic impact", St. Petersburg, Russia	Scientific Forum "Gulf of Finland – Natural Dynamics and anthropogenic impact", St. Petersburg, Russia		Institute (VSEGEI),
10-14 December 2018	Presentation	The Italian Geological Mapping Project (CARG) and its Contribution to EMODnet Geology 3 AGU Fall meeting 2018 Washington, DC – USA American Geophysical Union	Andrea Fiorentino, Loredana Battaglini, Silvana D'Angelo	ISPRA
2018	Bollettino della Associazione Italiana di Cartografia 2018 (163), 102-112.	La Cartografia Geologica Italiana delle aree sommerse e il suo contributo a EMODnet - European Marine Observation and Data Network	Andrea Fiorentino, Loredana Battaglini, Silvana D'Angelo	ISPRA.
2019	Final Report Belgian Science Policy 2018 – 82 p.	Transnational and Integrated Long-term Marine Exploitation Strategies (TILES). Final Report. (BRAIN-be - Belgian Research Action through Interdisciplinary Networks)	Van Lancker V, Francken F, Kapel M, Kint L, Terseleer N, Van den Eynde D, Hademenos V, Missiaen T, De Mol R, De Tré G, Appleton R, van Heteren S, van Maanen PP, Stafleu J, Stam J, Degrendele K, Roche M.	Royal Belgian Institute of Natural Sciences (RBINS). Ghent University. TNO Geological Survey of the Netherlands. FPS Economy, Continental Shelf Service
2019	Book chapter In: J. Duarte (Ed.): Transform Plate Boundaries and Fracture Zones, ELSEVIER , 2019, ISBN: 978-0-12-812064-4	Plio-Quaternary extension and strike-slip tectonics in the Aegean. Chapter 14, p. 339-374. https://doi.org/10.1016/B978-0-12-812064-4.00014-1	Sakellariou, D., Tsampouraki-Kraounaki, K.	Hellenic Centre for Marine Research
13. February 2019	Scientific Paper: Geosciences 2019, 9, 84.	Picking Up the Pieces—Harmonising and Collating Seabed Substrate Data for European Maritime Areas. Geosciences 2019, 9, 84.	Kaskela, A.M., Kotilainen, A.T., Alanen, U., Cooper, R., Green, S., Guinan, J.,	GTK and all EMODnet Geology partners

			van Heteren, S., Kihlman, S., Van Lancker, V., Stevenson, A., the EMODnet Geology Partners	
27 March 2019	Netherlands Journal of Geosciences 98, E1. https://doi:10.1017/njg.2018.18	3D subsurface characterisation of the Belgian Continental Shelf: a new voxel modelling approach.	Hademenos V, Stafleu J, Missiaen T, Kint L, and Van Lancker VRM	Ghent University, Geological Survey of the Netherlands (TNO), Flanders Marine Institute, Royal Belgian Institute of Natural Sciences (RBINS)
8-12 April 2019	Presentation	The contribution of detailed bathymetry to the identification of volcanic seamounts in Italian Seas. EGU General Assembly European Geosciences Union	Andrea Fiorentino, Silvana D'Angelo, Guido Giordano, Alessandra Pensa, Annamaria Pinton and Letizia Vita	ISPRA
8-12 April 2019	Poster presentation of map	A map of the geomorphological characteristics of the Italian seas EGU General Assembly European Geosciences Union	M.Conti, L. Battaglini, S.D'Angelo, A. Fiorentino	ISPRA
April 2019	Memorie Descrittive della Carta Geologica d'Italia, vol.104.	Atlas of Italian Submarine Volcanic Structures	Silvana D'Angelo, Andrea Fiorentino, Guido Giordano, Alessandra Pensa, Annamaria Pinton, Letizia Vita	Geological Survey of Italy - ISPRA

10 Updates on Progress Indicators

Using the indicator as a header list the metrics collated and the time interval. If there was no activity to report leave the section under the indicator header blank. Please note that this list can be subject to revision.

Indicator 1 - Volume of data made available through the portal

- Seabed Substrates 1:1M (35,594 features)
- Seabed Substrates 1:250k (69,724 features)
- Seabed Substrates 1:100k (19,217 features) – new this phase
- Seabed Substrates 1:50k (32,446 features) – new this phase
- Seabed Substrates Multiscale product (sum of above) – new this phase
- Sediment Accumulation Rate (1,350 features) – updated this phase
- Sea-floor Pre-Quaternary Bedrock Geology (7,809 features) – new this phase
- Sea-floor Pre-Quaternary Faults (11,011 features) – new this phase
- Sea-floor Geomorphology (58,216 features) – new this phase
- Sea-floor Quaternary Geology (205,719 features) – new this phase
- Coastal Behavior Multiscale (1,535,997 features) – new this phase
- Coastal Migration (117,072 features)
- Geological Events & Probabilities
    - Geological Event Distribution (250k) (52 features)
    - Submarine Earthquakes Points (100k) (1,487 features) – new this phase
    - Submarine Landslides Points (100k) (61 features) – new this phase
    - Submarine Landslides Points (250k) (58 features)
    - Submarine Landslides Lines (100k) (468 features) – new this phase
    - Submarine Landslides Lines (250k) (953 features)
    - Submarine Landslides Polygons (100k) (848 features) – new this phase
    - Submarine Landslides Polygons (250k) (1,862 features)
    - Submarine Fluid Emissions Points (100k) (444 features) – new this phase
    - Submarine Fluid Emissions Points (250k) (461 features)
    - Submarine Fluid Emissions Polygons (100k) (2,452 features) – new this phase
    - Submarine Fluid Emissions Polygons (250k) (147 features)
    - Quaternary Tectonics Lines (100k) (9,061 features) – new this phase
    - Quaternary Tectonics Lines (250k) (6,126 features)
    - Tsunamis Affected Coast Points (100k) (121 features) – new this phase
    - Tsunamis Affected Coast Points (250k) (122 features)
    - Tsunamis Origin Points (100k) (80 features) – new this phase
    - Tsunamis Origin Points (250k) (92 features)
    - Submarine Volcanoes Points (100k) (405 features) – new this phase
    - Submarine Volcanoes Points (250k) (361 features)

  - Submarine Volcanoes Lines (100k) (216 features) – new this phase
  - Submarine Volcanoes Lines (250k) (129 features)
  - Submarine Volcanoes Polygons (100k) (723 features) – new this phase
  - Submarine Volcanoes Polygons (250k) (247 features)
- Marine Minerals
  - Aggregates (8,605 features) – new this phase
  - Aggregates (points) (8,605 features) – new this phase
  - Cobalt rich ferromanganese crusts (33 features) – new this phase
  - Cobalt rich ferromanganese crusts (points) (73 features)
  - Evaporites (257 features) – new this phase
  - Evaporites (points) (265 features) – new this phase
  - Gas Hydrates (1 feature) – new this phase
  - Gas Hydrates (points) (4 features) – new this phase
  - Marine Hydrocarbons (1,359 features) – new this phase
  - Marine Hydrocarbons (points) (1,359 features) – new this phase
  - Marine Placers (18 features) – new this phase
  - Marine Placers (points) (52 features) – new this phase
  - Phosphorites (6 features) – new this phase
  - Phosphorites (points) (25 features) – new this phase
  - Polymetallic Nodules (190 features) – new this phase
  - Polymetallic Nodules (points) (1,359 features) – new this phase
  - Polymetallic Sulphides (62 features) – new this phase
  - Marine Sapropel (1 feature) – new this phase
  - Marine Sapropel (points) (1 feature) – new this phase
  - Metal Rich Sediments (12 features) – new this phase
  - Metal Rich Sediments (points) (12 features) – new this phase
  - Rock Peg Vein (21 features) – new this phase
  - Rock Peg Vein (points) (22 features) – new this phase
- Submerged Landscapes
  - Archaeological Feature - polygon (3 features) – new this phase
  - Archaeological Feature - point (27 features) – new this phase
  - Channel - polygons (986 features) – new this phase
  - Channel - lines (436 features) – new this phase
  - Coastal and Submarine Springs (118 features) – new this phase
  - Delta - polygons (73 features) – new this phase
  - Delta - lines (1 feature) – new this phase
  - Estuary - polygons (53 features) – new this phase
  - Estuary - lines (0 features) – new this phase

- Karst - polygons (6 features) – new this phase
- Karst - points (6 features) – new this phase
- Lagoon (8 features) – new this phase
- Lake (13 features) – new this phase
- Palaeo-Alluvial Plain (1 feature) – new this phase
- Coastal Landforms - polygons (547 features) – new this phase
- Coastal Landforms - lines (51 features) – new this phase
- Subaerial Landslide - polygons (12 features) – new this phase
- Subaerial Landslide - lines (0 features) – new this phase
- Subaerial Landslide - points (0 features) – new this phase
- Submerged Forest - polygons (6 features) – new this phase
- Submerged Forest - points (136 features) – new this phase
- Terrace - polygons (134 features) – new this phase
- Terrace - lines (36 features) – new this phase
- Wetlands (22 features) – new this phase
- Palaeocoastline (1,844 features) – new this phase
- LGM Landscape - Base Post-LGM Deposit (6,872 features) – new this phase
- Thickness of Post-LGM Deposit (4,802 features) – new this phase
- Sea Level Index Point (65 features) – new this phase
- Submerged Peat (288 features) – new this phase

- Entity Indexes
  - Boreholes and Grab Samples (439,136 features) – new this phase
  - Geophysics (5,710 features) – new this phase

Indicator 2 - Organisations supplying each type of data 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 according to the signed contract. 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 was working on interpretations of coastal and marine data, mainly the submerged landscapes topic, made available marine data for EMODnet Geology. In practice the European geological survey organisations (project partners) are in most cases administrators of the national geo-datacentres, so very few data are to be found outside the consortium. Those external sources, which might have additional data, are encouraged to submit their data through the EMODnet Data Ingestion portal or straight to EMODnet geology lot.

The EMODnet Geology consortium drafted a stakeholder questionnaire on possible data delivery to EMODnet geology as well as possible usage of EMODnet geology data products on web. This questionnaire was distributed by consortium partners to all participating countries. Stakeholders were asked to respond to the coordinator (GTK, Finland) who collected and analysed the obtained information. The analysis of the obtained replies from 20 stakeholders from 6 countries revealed that EMODnet is in general rather well known and the products have been used to some degree. There is also interest in providing information to EMODnet from European seas but

also Kenya and the Indian Ocean either through national EMODnet Geology partners or through the EMODnet Data Ingestion portal. The offered data were partly coastal geological data, geological data in general, geophysical data and bathymetry.

Some data for Workpackage 3 were provided by the Bundesamt für Seeschiffahrt und Hydrography (BSH), Hamburg, a German federal governmental institution similar to BGR, in co-operation with the Institute of Baltic Sea Research (IOW) in Warnemünde.

A part of the data for Workpackage 4, pre-Quaternary geology (Age, lithology, faults) were taken from "The 1: 5 Million International Geological Map of Europe and Adjacent Areas (IGME 5000), Copyright (Bundesanstalt für Geowissenschaften und Rohstoffe, Asch.K (2005).

Indicator 3 - Organisations that have been approached to supply data with no result

WP7 (Minerals):

Institute of Geology and Mineral Exploration (HSGME), Greece

Italian National Institute for Environmental Protection and Research (ISPRA), Italy

Geological Survey of Slovenia, Slovenia

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 2018 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

Download since early September 2017, when the portal started download registration, until end April 2019.

- Seabed Substrates: 51,625 MB
- Sea-floor Geology: 5,534 MB
- Coastal behaviour: 27,000 MB
- Events & Probabilities: 3,139 MB
- Mineral occurrences: 823 MB

REMARK! Data products are here defined as equal to Zip file downloads. Most Zip files contain several, up to more than 40 GIS layers, this is especially true with the Submerged landscapes map. Since those GIS layers are part of the same map category (=product) there's no sense in treating each layer as one product.

Number of download requests per month

- Oct17: 11
- Nov17: 34
- Dec17: 19
- Jan18: 31
- Feb18: 35
- Mar18: 66
- Apr18: 46
- May18: 50
- Jun18: 35

- Jul18: 33
- Aug18: 34
- Sep18: 20
- Okt18: 49
- Nov18: 51
- Dec18: 34
- Jan19: 29
- Feb19: 31
- Mar19: 50
- Apr19 not yet calculated.

New products released from mid-April 2019. Statistics pending.

Indicator 5 - Organisations that have downloaded each data type

We have had altogether 679 downloads from different users (listed below). We started distinguishing between Academia/Research-Government/Public-Business and Private Company-Others after the 9th EMODnet Steering Committee meeting.

Number of downloads per product:

- Coastal Behavior: 60
- Events & Probabilities: 41
- Minerals: 39
- Sea-Floor: 116
- Seabed Substrate 100k: 109
- Seabed Substrate 250k: 193
- Seabed Substrate 1M: 111

Individual downloads:

Date	product	email	Organization
23.9.2017	Events & Prob.	email not revealed (GDPR)	Sinay
25.9.2017	Minerals	email not revealed (GDPR)	126
30.9.2017	Coastal Behav.	email not revealed (GDPR)	Cranfield
10.10.2017	Coastal Behav.	email not revealed (GDPR)	Private
10.10.2017	Events & Prob.	email not revealed (GDPR)	Private
20.10.2017	Events & Prob.	email not revealed (GDPR)	Scottish power
20.10.2017	Minerals	email not revealed (GDPR)	Scottish power
24.10.2017	Minerals	email not revealed (GDPR)	EC
29.10.2017	Minerals	email not revealed (GDPR)	UNI Ulster
29.10.2017	Substrate 1M	email not revealed (GDPR)	Private
30.10.2017	Substrate 1M	email not revealed (GDPR)	UNI St-Andrews
30.10.2017	Substrate 1M	email not revealed (GDPR)	UNI St-Andrews
30.10.2017	Substrate 1M	email not revealed (GDPR)	Aberystwyth University
2.11.2017	Sea-floor	email not revealed (GDPR)	LVGMC
2.11.2017	Coastal Behav.	email not revealed (GDPR)	Private
3.11.2017	Substrate 250k	email not revealed (GDPR)	SGU
4.11.2017	Substrate 250k	email not revealed (GDPR)	UNI St-Andrews
4.11.2017	Substrate 250k	email not revealed (GDPR)	UNI St-Andrews
7.11.2017	Sea-floor	email not revealed (GDPR)	Private
7.11.2017	Sea-floor	email not revealed (GDPR)	DP Energy
7.11.2017	Substrate 250k	email not revealed (GDPR)	Private
7.11.2017	Substrate 250k	email not revealed (GDPR)	DP Energy
8.11.2017	Coastal Behav.	email not revealed (GDPR)	Private
8.11.2017	Substrate 1M	email not revealed (GDPR)	Private
8.11.2017	Substrate 250k	email not revealed (GDPR)	Private
9.11.2017	Events & Prob.	email not revealed (GDPR)	Private
10.11.2017	Coastal Behav.	email not revealed (GDPR)	HPM,museo

10.11.2017	Substrate 250k	email not revealed (GDPR)	UNI DK
13.11.2017	Sea-floor	email not revealed (GDPR)	Private
13.11.2017	Substrate 1M	email not revealed (GDPR)	Private
13.11.2017	Substrate 250k	email not revealed (GDPR)	Private
14.11.2017	Coastal Behav.	email not revealed (GDPR)	Private
14.11.2017	Events & Prob.	email not revealed (GDPR)	Private
14.11.2017	Minerals	email not revealed (GDPR)	Private
15.11.2017	Substrate 250k	email not revealed (GDPR)	IEO, El Instituto Español de Oceanografía
16.11.2017	Substrate 1M	email not revealed (GDPR)	THUENEN Institute
16.11.2017	Substrate 250k	email not revealed (GDPR)	THUENEN Institute
17.11.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
20.11.2017	Substrate 250k	email not revealed (GDPR)	Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos
20.11.2017	Substrate 1M	email not revealed (GDPR)	Private
21.11.2017	Sea-floor	email not revealed (GDPR)	UNI Plymoth
21.11.2017	Substrate 250k	email not revealed (GDPR)	UNI Plymoth
22.11.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
22.11.2017	Substrate 1M	email not revealed (GDPR)	CNR, Marine Costal Environment Institute
24.11.2017	Substrate 250k	email not revealed (GDPR)	Private
29.11.2017	Sea-floor	email not revealed (GDPR)	UNI
29.11.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
2.12.2017	Substrate 250k	email not revealed (GDPR)	UNI St-Andrews
5.12.2017	Sea-floor	email not revealed (GDPR)	UNI Bangor
5.12.2017	Substrate 250k	email not revealed (GDPR)	AC
5.12.2017	Sea-floor	email not revealed (GDPR)	GSI
5.12.2017	Substrate 250k	email not revealed (GDPR)	GSI
5.12.2017	Sea-floor	email not revealed (GDPR)	Private
5.12.2017	Substrate 250k	email not revealed (GDPR)	Private
8.12.2017	Sea-floor	email not revealed (GDPR)	IEO, El Instituto Español de Oceanografía
8.12.2017	Coastal Behav.	email not revealed (GDPR)	Private
11.12.2017	Events & Prob.	email not revealed (GDPR)	EMODNET
14.12.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
15.12.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
15.12.2017	Substrate 250k	email not revealed (GDPR)	UALG, Algarven yliopisto
15.12.2017	Substrate 250k	email not revealed (GDPR)	UALG, Algarven yliopisto
15.12.2017	Substrate 250k	email not revealed (GDPR)	UNI Ulster
15.12.2017	Substrate 250k	email not revealed (GDPR)	Ulster University
19.12.2017	Substrate 1M	email not revealed (GDPR)	ARTELIA
22.12.2017	Substrate 250k	email not revealed (GDPR)	Bangor University
24.12.2017	Substrate 250k	email not revealed (GDPR)	UGent
2.1.2018	Substrate 1M	email not revealed (GDPR)	University of Gothenburg
9.1.2018	Substrate 250k	email not revealed (GDPR)	University of Sheffield
11.1.2018	Sea-floor	email not revealed (GDPR)	Acoustical Consultancy
11.1.2018	Substrate 1M	email not revealed (GDPR)	Acoustical Consultancy
11.1.2018	Substrate 250k	email not revealed (GDPR)	Private
12.1.2018	Substrate 250k	email not revealed (GDPR)	DTU Aqua, Danmarks Tekniske Uni
16.1.2018	Sea-floor	email not revealed (GDPR)	ARUP
16.1.2018	Substrate 250k	email not revealed (GDPR)	ARUP
17.1.2018	Substrate 1M	email not revealed (GDPR)	shom
17.1.2018	Coastal Behav.	email not revealed (GDPR)	ARUP
19.1.2018	Coastal Behav.	email not revealed (GDPR)	personal use
19.1.2018	Events & Prob.	email not revealed (GDPR)	personal use
19.1.2018	Sea-floor	email not revealed (GDPR)	personal use
19.1.2018	Substrate 250k	email not revealed (GDPR)	personal use
22.1.2018	Substrate 250k	email not revealed (GDPR)	Maritime University of Szczecin
23.1.2018	Sea-floor	email not revealed (GDPR)	PGI_NRI
24.1.2018	Substrate 1M	email not revealed (GDPR)	COISPA
24.1.2018	Substrate 250k	email not revealed (GDPR)	COISPA
24.1.2018	Coastal Behav.	email not revealed (GDPR)	Independent
24.1.2018	Minerals	email not revealed (GDPR)	Independent
26.1.2018	Coastal Behav.	email not revealed (GDPR)	Swansea University
26.1.2018	Substrate 250k	email not revealed (GDPR)	Swansea University
26.1.2018	Substrate 250k	email not revealed (GDPR)	Personal Use
27.1.2018	Coastal Behav.	email not revealed (GDPR)	ESRI
27.1.2018	Events & Prob.	email not revealed (GDPR)	ESRI
27.1.2018	Sea-floor	email not revealed (GDPR)	ESRI
28.1.2018	Substrate 250k	email not revealed (GDPR)	Queens University
30.1.2018	Substrate 250k	email not revealed (GDPR)	KU Lueven

30.1.2018	Substrate 1M	email not revealed (GDPR)	MAKE
31.1.2018	Substrate 250k	email not revealed (GDPR)	University of Aberdeen
31.1.2018	Substrate 250k	email not revealed (GDPR)	Cathie Associates Ltd.
1.2.2018	Substrate 1M	email not revealed (GDPR)	ifremer
2.2.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
2.2.2018	Substrate 1M	email not revealed (GDPR)	Hellenic Centre for Marine Research
5.2.2018	Events & Prob.	email not revealed (GDPR)	Universidade do Algarve - CCMAR
5.2.2018	Minerals	email not revealed (GDPR)	Universidade do Algarve - CCMAR
5.2.2018	Substrate 1M	email not revealed (GDPR)	Plymouth University
5.2.2018	Substrate 1M	email not revealed (GDPR)	Universidade do Algarve - CCMAR
6.2.2018	Substrate 250k	email not revealed (GDPR)	Sealife Dolphinwatching
6.2.2018	Substrate 250k	email not revealed (GDPR)	RAI
7.2.2018	Substrate 250k	email not revealed (GDPR)	Marine Institute
7.2.2018	Coastal Behav.	email not revealed (GDPR)	Independent research
9.2.2018	Substrate 250k	email not revealed (GDPR)	Maritime and Coastguard Agency
9.2.2018	Substrate 250k	email not revealed (GDPR)	COISPA
15.2.2018	Coastal Behav.	email not revealed (GDPR)	University of Salento
15.2.2018	Events & Prob.	email not revealed (GDPR)	UNISALENTO
15.2.2018	Substrate 1M	email not revealed (GDPR)	University of Salento
15.2.2018	Substrate 250k	email not revealed (GDPR)	DTU Aqua
15.2.2018	Coastal Behav.	email not revealed (GDPR)	TNO
15.2.2018	Substrate 250k	email not revealed (GDPR)	Instituto Español de Oceanografía
16.2.2018	Substrate 250k	email not revealed (GDPR)	EMODnet Secretariat
17.2.2018	Substrate 1M	email not revealed (GDPR)	Ulster University
17.2.2018	Substrate 250k	email not revealed (GDPR)	Ulster University
17.2.2018	Substrate 250k	email not revealed (GDPR)	DP Energy
19.2.2018	Substrate 1M	email not revealed (GDPR)	EDF EN
20.2.2018	Substrate 250k	email not revealed (GDPR)	Utrecht University
20.2.2018	Substrate 250k	email not revealed (GDPR)	Observatoire Pelagis
20.2.2018	Events & Prob.	email not revealed (GDPR)	Private
20.2.2018	Minerals	email not revealed (GDPR)	
22.2.2018	Sea-floor	email not revealed (GDPR)	Universidad de La Laguna
22.2.2018	Substrate 1M	email not revealed (GDPR)	Utrecht University
22.2.2018	Substrate 250k	email not revealed (GDPR)	Universidade Vigo
22.2.2018	Coastal Behav.	email not revealed (GDPR)	Deltares
22.2.2018	Sea-floor	email not revealed (GDPR)	COISPA
22.2.2018	Substrate 1M	email not revealed (GDPR)	Deltares
23.2.2018	Substrate 250k	email not revealed (GDPR)	Universidad Politécnica de Cartagena
23.2.2018	Substrate 250k	email not revealed (GDPR)	MAKE
25.2.2018	Substrate 250k	email not revealed (GDPR)	HYDRA
1.3.2018	Substrate 250k	email not revealed (GDPR)	Federal Maritime and Hydrographic Agency
1.3.2018	Events & Prob.	email not revealed (GDPR)	Private
1.3.2018	Substrate 250k	email not revealed (GDPR)	DP Energy
2.3.2018	Substrate 250k	email not revealed (GDPR)	sinay
3.3.2018	Events & Prob.	email not revealed (GDPR)	Democritus University of THrace
3.3.2018	Minerals	email not revealed (GDPR)	Democritus University of THrace
3.3.2018	Sea-floor	email not revealed (GDPR)	Democritus University of THrace
5.3.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
5.3.2018	Substrate 250k	email not revealed (GDPR)	SailorsMate AS
5.3.2018	Substrate 250k	email not revealed (GDPR)	UTSA
6.3.2018	Substrate 250k	email not revealed (GDPR)	BGS
6.3.2018	Substrate 250k	email not revealed (GDPR)	dick schaap
6.3.2018	Substrate 250k	email not revealed (GDPR)	dick schaap
6.3.2018	Substrate 250k	email not revealed (GDPR)	Private
7.3.2018	Substrate 1M	email not revealed (GDPR)	DTU Aqua
7.3.2018	Substrate 250k	email not revealed (GDPR)	University of waikato
7.3.2018	Coastal Behav.	email not revealed (GDPR)	dick schaap
9.3.2018	Coastal Behav.	email not revealed (GDPR)	tno
12.3.2018	Substrate 250k	email not revealed (GDPR)	gtk
13.3.2018	Coastal Behav.	email not revealed (GDPR)	Vattenfall Wind Power Limited
13.3.2018	Events & Prob.	email not revealed (GDPR)	Vattenfall Wind Power Limited
13.3.2018	Minerals	email not revealed (GDPR)	Vattenfall Wind Power Limited
13.3.2018	Sea-floor	email not revealed (GDPR)	Vattenfall Wind Power Limited
13.3.2018	Substrate 1M	email not revealed (GDPR)	Vattenfall Wind Power Limited
13.3.2018	Substrate 250k	email not revealed (GDPR)	Vattenfall Wind Power Limited
14.3.2018	Coastal Behav.	email not revealed (GDPR)	Tallinn University of Technology
14.3.2018	Sea-floor	email not revealed (GDPR)	Leibniz Institute for baltic Sea Research
14.3.2018	Coastal Behav.	email not revealed (GDPR)	RBINS

14.3.2018	Coastal Behav.	email not revealed (GDPR)	Leibniz Institute for baltic Sea Research
14.3.2018	Minerals	email not revealed (GDPR)	RBINS
14.3.2018	Minerals	email not revealed (GDPR)	Leibniz Institute for baltic Sea Research
14.3.2018	Sea-floor	email not revealed (GDPR)	RBINS
14.3.2018	Substrate 1M	email not revealed (GDPR)	Ulster University
14.3.2018	Substrate 1M	email not revealed (GDPR)	Leibniz Institute for baltic Sea Research
14.3.2018	Substrate 250k	email not revealed (GDPR)	RBINS
14.3.2018	Sea-floor	email not revealed (GDPR)	Private citizen
14.3.2018	Substrate 250k	email not revealed (GDPR)	Leibniz Institute for baltic Sea Research
14.3.2018	Substrate 250k	email not revealed (GDPR)	Private citizen
16.3.2018	Substrate 250k	email not revealed (GDPR)	Swansea University
16.3.2018	Substrate 250k	email not revealed (GDPR)	Vattenfall Wind Power Limited
16.3.2018	Substrate 250k	email not revealed (GDPR)	Cefas UK
19.3.2018	Substrate 1M	email not revealed (GDPR)	MCS
19.3.2018	Substrate 250k	email not revealed (GDPR)	MCS
20.3.2018	Substrate 250k	email not revealed (GDPR)	NIOZ
20.3.2018	Substrate 250k	email not revealed (GDPR)	MIO, l'Institut Méditerranéen d'Océanologie
20.3.2018	Events & Prob.	email not revealed (GDPR)	Vattenfall Wind Power Limited
20.3.2018	Minerals	email not revealed (GDPR)	Vattenfall Wind Power Limited
20.3.2018	Sea-floor	email not revealed (GDPR)	ENSTA Bretagne
20.3.2018	Sea-floor	email not revealed (GDPR)	Vattenfall Wind Power Limited
20.3.2018	Substrate 1M	email not revealed (GDPR)	ENSTA Bretagne
20.3.2018	Substrate 1M	email not revealed (GDPR)	Vattenfall Wind Power Limited
20.3.2018	Substrate 250k	email not revealed (GDPR)	Vattenfall Wind Power Limited
21.3.2018	Substrate 1M	email not revealed (GDPR)	Universitat Autònoma de Barcelona
21.3.2018	Substrate 100k	email not revealed (GDPR)	GTK
22.3.2018	Substrate 100k	email not revealed (GDPR)	GTK
22.3.2018	Coastal Behav.	email not revealed (GDPR)	Vattenfall Wind Power Limited
22.3.2018	Sea-floor	email not revealed (GDPR)	Vattenfall Wind Power Limited
22.3.2018	Substrate 100k	email not revealed (GDPR)	Vattenfall Wind Power Limited
23.3.2018	Substrate 100k	email not revealed (GDPR)	GTK
25.3.2018	Substrate 1M	email not revealed (GDPR)	Bundesamt für Seeschifffahrt und Hydrographie
25.3.2018	Substrate 1M	email not revealed (GDPR)	Bundesamt für Seeschifffahrt und Hydrographie
27.3.2018	Substrate 1M	email not revealed (GDPR)	Institute of Marine Research
28.3.2018	Sea-floor	email not revealed (GDPR)	The Renewables Consulting Group
29.3.2018	Coastal Behav.	email not revealed (GDPR)	Université de Toulouse - GET
29.3.2018	Sea-floor	email not revealed (GDPR)	RPS Energy
29.3.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
3.4.2018	Substrate 1M	email not revealed (GDPR)	EDF EN
4.4.2018	Coastal Behav.	email not revealed (GDPR)	swansea university
4.4.2018	Sea-floor	email not revealed (GDPR)	swansea university
5.4.2018	Substrate 100k	email not revealed (GDPR)	ifremer
6.4.2018	Coastal Behav.	email not revealed (GDPR)	FCUL, Lissabonin yliopisto
6.4.2018	Substrate 1M	email not revealed (GDPR)	ifremer
6.4.2018	Substrate 250k	email not revealed (GDPR)	ifremer
6.4.2018	Coastal Behav.	email not revealed (GDPR)	Cglobe
6.4.2018	Events & Prob.	email not revealed (GDPR)	Cglobe
6.4.2018	Sea-floor	email not revealed (GDPR)	Cglobe
6.4.2018	Substrate 100k	email not revealed (GDPR)	Cglobe
6.4.2018	Substrate 1M	email not revealed (GDPR)	Cglobe
6.4.2018	Substrate 250k	email not revealed (GDPR)	Cglobe
7.4.2018	Substrate 250k	email not revealed (GDPR)	DW-ShipConsult
10.4.2018	Coastal Behav.	email not revealed (GDPR)	University
10.4.2018	Substrate 1M	email not revealed (GDPR)	University
10.4.2018	Substrate 250k	email not revealed (GDPR)	Instituto Español de Oceanografía
11.4.2018	Substrate 1M	email not revealed (GDPR)	TNO
11.4.2018	Substrate 250k	email not revealed (GDPR)	TNO
12.4.2018	Coastal Behav.	email not revealed (GDPR)	University of Torvergata
12.4.2018	Substrate 1M	email not revealed (GDPR)	Newcastle University
12.4.2018	Substrate 1M	email not revealed (GDPR)	Newcastle University
12.4.2018	Substrate 250k	email not revealed (GDPR)	Royal Belgian Institute of Natural Sciences
13.4.2018	Coastal Behav.	email not revealed (GDPR)	UN-IHE Delft
13.4.2018	Substrate 100k	email not revealed (GDPR)	CCMAR
13.4.2018	Coastal Behav.	email not revealed (GDPR)	HELLENIC CENTRE FOR MARINE RESEARCH
13.4.2018	Substrate 250k	email not revealed (GDPR)	HELLENIC CENTRE FOR MARINE RESEARCH
16.4.2018	Sea-floor	email not revealed (GDPR)	Ghent University
16.4.2018	Minerals	email not revealed (GDPR)	ESPACE
16.4.2018	Substrate 100k	email not revealed (GDPR)	ESPACE

16.4.2018	Substrate 100k	email not revealed (GDPR)	ICM-CSIC
16.4.2018	Substrate 1M	email not revealed (GDPR)	ESPACE
16.4.2018	Substrate 1M	email not revealed (GDPR)	ICM
16.4.2018	Substrate 250k	email not revealed (GDPR)	ESPACE
17.4.2018	Coastal Behav.	email not revealed (GDPR)	Université de Toulouse - GET
17.4.2018	Sea-floor	email not revealed (GDPR)	Université de Toulouse - GET
17.4.2018	Substrate 100k	email not revealed (GDPR)	Université de Toulouse - GET
17.4.2018	Minerals	email not revealed (GDPR)	ESPACE
19.4.2018	Substrate 1M	email not revealed (GDPR)	Newcastle University
20.4.2018	Minerals	email not revealed (GDPR)	AZTI tecnalia
22.4.2018	Substrate 100k	email not revealed (GDPR)	University of Lisbon
25.4.2018	Events & Prob.	email not revealed (GDPR)	University of Southampton
25.4.2018	Sea-floor	email not revealed (GDPR)	University of Southampton
25.4.2018	Substrate 1M	email not revealed (GDPR)	University of Southampton
26.4.2018	Substrate 100k	email not revealed (GDPR)	ICM-CISC
29.4.2018	Substrate 250k	email not revealed (GDPR)	MIO
2.5.2018	Coastal Behav.	email not revealed (GDPR)	EMODnet Secretariat
2.5.2018	Substrate 250k	email not revealed (GDPR)	Cooper Marine Advisors Ltd
5.5.2018	Substrate 100k	email not revealed (GDPR)	Hellenic Center for Marine Research
7.5.2018	Sea-floor	email not revealed (GDPR)	Geological Survey of Italy - ISPRA
7.5.2018	Substrate 1M	email not revealed (GDPR)	IFREMER
7.5.2018	Substrate 250k	email not revealed (GDPR)	IFREMER
8.5.2018	Substrate 1M	email not revealed (GDPR)	DUTh
16.5.2018	Coastal Behav.	email not revealed (GDPR)	unipa
16.5.2018	Sea-floor	email not revealed (GDPR)	unipa
16.5.2018	Substrate 100k	email not revealed (GDPR)	BVg Associates
16.5.2018	Substrate 1M	email not revealed (GDPR)	BVG Associates
16.5.2018	Substrate 250k	email not revealed (GDPR)	BVG Associates
17.5.2018	Sea-floor	email not revealed (GDPR)	Ulster University
17.5.2018	Substrate 100k	email not revealed (GDPR)	DTU Aqua
17.5.2018	Substrate 250k	email not revealed (GDPR)	DTU Aqua
17.5.2018	Substrate 100k	email not revealed (GDPR)	wpd
18.5.2018	Substrate 250k	email not revealed (GDPR)	UTEC Geomarine
21.5.2018	Sea-floor	email not revealed (GDPR)	Técnico Lisboa
21.5.2018	Substrate 1M	email not revealed (GDPR)	IST
21.5.2018	Substrate 1M	email not revealed (GDPR)	IST
21.5.2018	Substrate 250k	email not revealed (GDPR)	IST
21.5.2018	Substrate 250k	email not revealed (GDPR)	Técnico Lisboa
21.5.2018	Sea-floor	email not revealed (GDPR)	IST
22.5.2018	Substrate 1M	email not revealed (GDPR)	Universidad de Murcia
22.5.2018	Sea-floor	email not revealed (GDPR)	UTEC Geomarine
22.5.2018	Substrate 100k	email not revealed (GDPR)	Cooper Marine Advisors Ltd
22.5.2018	Substrate 250k	email not revealed (GDPR)	Cooper Marine Advisors Ltd
23.5.2018	Coastal Behav.	email not revealed (GDPR)	iecs
23.5.2018	Events & Prob.	email not revealed (GDPR)	iecs
23.5.2018	Minerals	email not revealed (GDPR)	iecs
23.5.2018	Sea-floor	email not revealed (GDPR)	iecs
23.5.2018	Substrate 100k	email not revealed (GDPR)	IECS
23.5.2018	Substrate 1M	email not revealed (GDPR)	IECS
23.5.2018	Substrate 250k	email not revealed (GDPR)	IECS
24.5.2018	Substrate 100k	email not revealed (GDPR)	Justus Liebig University, Giessen
24.5.2018	Substrate 250k	email not revealed (GDPR)	Justus Liebig University
24.5.2018	Coastal Behav.	email not revealed (GDPR)	acedemia
24.5.2018	Coastal Behav.	email not revealed (GDPR)	nternational
24.5.2018	Sea-floor	email not revealed (GDPR)	ESB International
24.5.2018	Substrate 100k	email not revealed (GDPR)	ESB International
24.5.2018	Substrate 1M	email not revealed (GDPR)	ESB International
24.5.2018	Substrate 250k	email not revealed (GDPR)	ESB International
25.5.2018	Minerals	email not revealed (GDPR)	EMODnet Secretariat
25.5.2018	Substrate 100k	email not revealed (GDPR)	ABPmer
29.5.2018	Coastal Behav.	email not revealed (GDPR)	ESB International
29.5.2018	Sea-floor	email not revealed (GDPR)	ESB International
29.5.2018	Substrate 100k	email not revealed (GDPR)	ESB International
29.5.2018	Substrate 1M	email not revealed (GDPR)	ESB International
29.5.2018	Substrate 250k	email not revealed (GDPR)	ESB International
29.5.2018	Coastal Behav.	email not revealed (GDPR)	rganization type
29.5.2018	Substrate 250k	email not revealed (GDPR)	SSW
31.5.2018	Substrate 100k	email not revealed (GDPR)	Institute of biodiversity and ecosystem research-BAS

31.5.2018	Substrate 100k	email not revealed (GDPR)	creocean
1.6.2018	Substrate 250k	email not revealed (GDPR)	ABPmer
3.6.2018	Substrate 100k	email not revealed (GDPR)	PARTICULAR
6.6.2018	Substrate 250k	email not revealed (GDPR)	ABPmer
8.6.2018	Substrate 250k	email not revealed (GDPR)	BVG Associates
12.6.2018	Sea-floor	email not revealed (GDPR)	Bordeaux University
13.6.2018	Sea-floor	email not revealed (GDPR)	Higher educational
13.6.2018	Substrate 1M	email not revealed (GDPR)	Higher educational
13.6.2018	Substrate 250k	email not revealed (GDPR)	Higher educational
13.6.2018	Coastal Behav.	email not revealed (GDPR)	Biosferaxxi
13.6.2018	Events & Prob.	email not revealed (GDPR)	UPC
13.6.2018	Minerals	email not revealed (GDPR)	Biosferaxxi
13.6.2018	Sea-floor	email not revealed (GDPR)	BiosferaXXI
13.6.2018	Substrate 1M	email not revealed (GDPR)	UPC
13.6.2018	Substrate 1M	email not revealed (GDPR)	BiosferaXXI
13.6.2018	Substrate 250k	email not revealed (GDPR)	UPC
13.6.2018	Substrate 250k	email not revealed (GDPR)	BiosferaXXI
14.6.2018	Substrate 250k	email not revealed (GDPR)	Pelagian Ltd
15.6.2018	Substrate 100k	email not revealed (GDPR)	SEMRU - NUI-G & MIIS (Middlebury Inst. of International Studies)
16.6.2018	Substrate 250k	email not revealed (GDPR)	University of Aberdeen
17.6.2018	Substrate 1M	email not revealed (GDPR)	University of Aberdeen
18.6.2018	Substrate 1M	email not revealed (GDPR)	UTEC Geomarine
19.6.2018	Substrate 1M	email not revealed (GDPR)	plymouth university
19.6.2018	Substrate 250k	email not revealed (GDPR)	plymouth university
19.6.2018	Minerals	email not revealed (GDPR)	IGME
19.6.2018	Sea-floor	email not revealed (GDPR)	IGME
19.6.2018	Substrate 100k	email not revealed (GDPR)	IGME
19.6.2018	Substrate 1M	email not revealed (GDPR)	cls
20.6.2018	Events & Prob.	email not revealed (GDPR)	EcoAqua
21.6.2018	Coastal Behav.	email not revealed (GDPR)	GoBe consultants
21.6.2018	Sea-floor	email not revealed (GDPR)	GoBe consultants
21.6.2018	Substrate 1M	email not revealed (GDPR)	GoBe consultants
21.6.2018	Substrate 250k	email not revealed (GDPR)	GoBe consultants
25.6.2018	Substrate 100k	email not revealed (GDPR)	Quiet-Oceans
27.6.2018	Minerals	email not revealed (GDPR)	IGME
29.6.2018	Substrate 250k	email not revealed (GDPR)	Geomar
2.7.2018	Substrate 100k	email not revealed (GDPR)	University of St Andrews
2.7.2018	Substrate 250k	email not revealed (GDPR)	Hellenic Centre for Marine Research, Crete
3.7.2018	Substrate 100k	email not revealed (GDPR)	Universiteit Gent
5.7.2018	Substrate 100k	email not revealed (GDPR)	JNCC
5.7.2018	Substrate 250k	email not revealed (GDPR)	JNCC
6.7.2018	Sea-floor	email not revealed (GDPR)	DTU Aqua at Technical University of Denmark
6.7.2018	Substrate 1M	email not revealed (GDPR)	DTU Aqua at Technical University of Denmark
6.7.2018	Substrate 250k	email not revealed (GDPR)	DTU Aqua at Technical University of Denmark
6.7.2018	Substrate 250k	email not revealed (GDPR)	Universiteit Gent
7.7.2018	Substrate 1M	email not revealed (GDPR)	University of Latvia
7.7.2018	Substrate 250k	email not revealed (GDPR)	University of Latvia
9.7.2018	Events & Prob.	email not revealed (GDPR)	GoBe consultants
9.7.2018	Substrate 100k	email not revealed (GDPR)	Thales
10.7.2018	Substrate 250k	email not revealed (GDPR)	FPS Economy Belgian Government
11.7.2018	Sea-floor	email not revealed (GDPR)	The Renewables Consulting Group
11.7.2018	Substrate 100k	email not revealed (GDPR)	Quiet-Oceans
11.7.2018	Substrate 100k	email not revealed (GDPR)	DHI
12.7.2018	Substrate 100k	email not revealed (GDPR)	Cognite AS (Ocean data platform, non-profit)
12.7.2018	Substrate 100k	email not revealed (GDPR)	Pelagian Limited
15.7.2018	Substrate 100k	email not revealed (GDPR)	Aeolus
17.7.2018	Sea-floor	email not revealed (GDPR)	UoA
17.7.2018	Substrate 100k	email not revealed (GDPR)	Universiteit Gent
17.7.2018	Substrate 100k	email not revealed (GDPR)	CTN
17.7.2018	Substrate 250k	email not revealed (GDPR)	Irwin Carr Consulting
20.7.2018	Substrate 100k	email not revealed (GDPR)	Others
25.7.2018	Coastal Behav.	email not revealed (GDPR)	student
25.7.2018	Events & Prob.	email not revealed (GDPR)	student
25.7.2018	Sea-floor	email not revealed (GDPR)	student
25.7.2018	Substrate 100k	email not revealed (GDPR)	student
27.7.2018	Coastal Behav.	email not revealed (GDPR)	Democritus University of Thrace
27.7.2018	Substrate 100k	email not revealed (GDPR)	Scottish Association for Marine Science

27.7.2018	Substrate 250k	email not revealed (GDPR)	Scottish Association for Marine Science
27.7.2018	Substrate 100k	email not revealed (GDPR)	hydromaster
27.7.2018	Substrate 250k	email not revealed (GDPR)	Partrac Ltd
31.7.2018	Substrate 250k	email not revealed (GDPR)	MARUM
1.8.2018	Substrate 1M	email not revealed (GDPR)	UGent
1.8.2018	Substrate 250k	email not revealed (GDPR)	Ugent
1.8.2018	Substrate 1M	email not revealed (GDPR)	Halliburton
1.8.2018	Substrate 250k	email not revealed (GDPR)	Hydrofix
2.8.2018	Events & Prob.	email not revealed (GDPR)	Oregon State University
3.8.2018	Coastal Behav.	email not revealed (GDPR)	Meridata Finland Ltd
3.8.2018	Substrate 100k	email not revealed (GDPR)	Meridata Finland Ltd
8.8.2018	Events & Prob.	email not revealed (GDPR)	SSC PAC
8.8.2018	Minerals	email not revealed (GDPR)	Research Center for Eco-Environmental Sciences, CAS, Beijing
8.8.2018	Sea-floor	email not revealed (GDPR)	SSC PAC
8.8.2018	Sea-floor	email not revealed (GDPR)	SSC PAC
8.8.2018	Substrate 100k	email not revealed (GDPR)	SSC PAC
8.8.2018	Substrate 250k	email not revealed (GDPR)	SSC PAC
10.8.2018	Minerals	email not revealed (GDPR)	Research Center for Eco-Environmental Sciences, CAS, Beijing
13.8.2018	Minerals	email not revealed (GDPR)	IGME
13.8.2018	Substrate 250k	email not revealed (GDPR)	Flanders Marine Institute
14.8.2018	Substrate 250k	email not revealed (GDPR)	ILVO
15.8.2018	Sea-floor	email not revealed (GDPR)	Geological Survey of Ireland
15.8.2018	Sea-floor	email not revealed (GDPR)	Geological Survey of Ireland
15.8.2018	Substrate 250k	email not revealed (GDPR)	Geological Survey of Ireland
20.8.2018	Sea-floor	email not revealed (GDPR)	EMODnet Secretariat
20.8.2018	Sea-floor	email not revealed (GDPR)	EMODnet Secretariat
21.8.2018	Substrate 100k	email not revealed (GDPR)	Pelagian Ltd
22.8.2018	Sea-floor	email not revealed (GDPR)	DeepOcean
22.8.2018	Sea-floor	email not revealed (GDPR)	DeepOcean
23.8.2018	Events & Prob.	email not revealed (GDPR)	IFREMER Centre de Brest GÃ©osciences Marines
30.8.2018	Minerals	email not revealed (GDPR)	Danmarks Tekniske Universitet
30.8.2018	Sea-floor	email not revealed (GDPR)	Danmarks Tekniske Universitet
30.8.2018	Substrate 100k	email not revealed (GDPR)	IVL Swedish Environmental Research Institute
30.8.2018	Substrate 250k	email not revealed (GDPR)	GTK
31.8.2018	Substrate 100k	email not revealed (GDPR)	KU Leuven
31.8.2018	Substrate 100k	email not revealed (GDPR)	MaREI Centre
31.8.2018	Sea-floor	email not revealed (GDPR)	Partex
31.8.2018	Substrate 100k	email not revealed (GDPR)	Jan De Nul Group
31.8.2018	Substrate 100k	email not revealed (GDPR)	Partex
11.9.2018	Coastal Behav.	email not revealed (GDPR)	EMODnet
12.9.2018	Events & Prob.	email not revealed (GDPR)	WavEC, Offshore Renewables
13.9.2018	Events & Prob.	email not revealed (GDPR)	UoA
13.9.2018	Events & Prob.	email not revealed (GDPR)	IGME
13.9.2018	Sea-floor	email not revealed (GDPR)	Enerco Energy
13.9.2018	Sea-floor	email not revealed (GDPR)	Enerco Energy
13.9.2018	Substrate 100k	email not revealed (GDPR)	Enerco Energy
14.9.2018	Substrate 100k	email not revealed (GDPR)	University of Helsinki
17.9.2018	Minerals	email not revealed (GDPR)	IGME
18.9.2018	Substrate 100k	email not revealed (GDPR)	University of Nairobi
18.9.2018	Substrate 100k	email not revealed (GDPR)	JNCC
18.9.2018	Substrate 250k	email not revealed (GDPR)	Private
18.9.2018	Substrate 250k	email not revealed (GDPR)	Quiet-Oceans
25.9.2018	Sea-floor	email not revealed (GDPR)	CCMAR
25.9.2018	Events & Prob.	email not revealed (GDPR)	Instituto Geologico y Minero de EspaÃ±a (IGME, Spain)
25.9.2018	Substrate 1M	email not revealed (GDPR)	Sharks of the Atlantic Research and Conservation Centre
27.9.2018	Coastal Behav.	email not revealed (GDPR)	Delft University of Technology
27.9.2018	Coastal Behav.	email not revealed (GDPR)	Delft University of Technology
27.9.2018	Events & Prob.	email not revealed (GDPR)	Delft University of Technology
27.9.2018	Substrate 1M	email not revealed (GDPR)	Delft University of Technology
27.9.2018	Substrate 1M	email not revealed (GDPR)	Geomara
1.10.2018	Coastal Behav.	email not revealed (GDPR)	Delft University of Technology
1.10.2018	Substrate 100k	email not revealed (GDPR)	ISMAR CNR
2.10.2018	Coastal Behav.	email not revealed (GDPR)	Ulster University
2.10.2018	Sea-floor	email not revealed (GDPR)	Ulster University101
2.10.2018	Sea-floor	email not revealed (GDPR)	Ulster University103
2.10.2018	Substrate 100k	email not revealed (GDPR)	Ulster University

2.10.2018	Substrate 1M	email not revealed (GDPR)	Ulster University
2.10.2018	Substrate 250k	email not revealed (GDPR)	Ulster University
2.10.2018	Substrate 250k	email not revealed (GDPR)	IHCantabria
3.10.2018	Substrate 100k	email not revealed (GDPR)	GTK
4.10.2018	Substrate 1M	email not revealed (GDPR)	y
8.10.2018	Sea-floor	email not revealed (GDPR)	wpd offshore solutions GmbH93
9.10.2018	Events & Prob.	email not revealed (GDPR)	ULPGC
9.10.2018	Minerals	email not revealed (GDPR)	ULPGC
9.10.2018	Minerals	email not revealed (GDPR)	ULPGC
9.10.2018	Sea-floor	email not revealed (GDPR)	ULPGC83
9.10.2018	Sea-floor	email not revealed (GDPR)	ULPGC85
9.10.2018	Sea-floor	email not revealed (GDPR)	ULPGC87
9.10.2018	Substrate 1M	email not revealed (GDPR)	ULPGC
9.10.2018	Substrate 250k	email not revealed (GDPR)	ULPGC
9.10.2018	Substrate 1M	email not revealed (GDPR)	cefas
15.10.2018	Sea-floor	email not revealed (GDPR)	MOR Environmental69
15.10.2018	Substrate 100k	email not revealed (GDPR)	MOR Environmental
15.10.2018	Substrate 100k	email not revealed (GDPR)	Student
16.10.2018	Substrate 250k	email not revealed (GDPR)	UCC, University ge Cork
16.10.2018	Substrate 250k	email not revealed (GDPR)	UCC
16.10.2018	Substrate 250k	email not revealed (GDPR)	UCC
17.10.2018	Sea-floor	email not revealed (GDPR)	University of Southampton57
17.10.2018	Substrate 250k	email not revealed (GDPR)	University of Southampton
17.10.2018	Substrate 250k	email not revealed (GDPR)	UCC
17.10.2018	Substrate 100k	email not revealed (GDPR)	Private
19.10.2018	Substrate 100k	email not revealed (GDPR)	UCL, Univeristy in London
19.10.2018	Substrate 1M	email not revealed (GDPR)	UCL, Univeristy in London
19.10.2018	Substrate 250k	email not revealed (GDPR)	GTK
19.10.2018	Substrate 250k	email not revealed (GDPR)	Fugro GB Marine
20.10.2018	Substrate 250k	email not revealed (GDPR)	University of Barcelona
22.10.2018	Substrate 1M	email not revealed (GDPR)	University of Groningen
24.10.2018	Coastal Behav.	email not revealed (GDPR)	Plymouth University
24.10.2018	Sea-floor	email not revealed (GDPR)	Plymouth University33
24.10.2018	Substrate 100k	email not revealed (GDPR)	Plymouth University
24.10.2018	Substrate 250k	email not revealed (GDPR)	Ulster University
24.10.2018	Substrate 250k	email not revealed (GDPR)	Plymouth University
24.10.2018	Substrate 100k	email not revealed (GDPR)	waterman
26.10.2018	Minerals	email not revealed (GDPR)	GTK
26.10.2018	Minerals	email not revealed (GDPR)	GTK
27.10.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews.
27.10.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews.
28.10.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
29.10.2018	Substrate 1M	email not revealed (GDPR)	University of St Andrews
29.10.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
30.10.2018	Substrate 100k	email not revealed (GDPR)	Research institute for agriculture, fisheries and food
31.10.2018	Substrate 250k	email not revealed (GDPR)	St Andrews
1.11.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
1.11.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
1.11.2018	Substrate 100k	email not revealed (GDPR)	IO-BAS
2.11.2018	Substrate 250k	email not revealed (GDPR)	University of St Andrews
2.11.2018	Sea-floor	email not revealed (GDPR)	fisherman3
2.11.2018	Substrate 250k	email not revealed (GDPR)	fisherman
6.11.2018	Coastal Behav.	email not revealed (GDPR)	Cathie Associates
6.11.2018	Events & Prob.	email not revealed (GDPR)	Cathie Associates
6.11.2018	Minerals	email not revealed (GDPR)	Cathie Associates
6.11.2018	Sea-floor	email not revealed (GDPR)	GEOCONSULT ENGENHARIA
6.11.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
6.11.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
6.11.2018	Substrate 100k	email not revealed (GDPR)	Cathie Associates
6.11.2018	Substrate 1M	email not revealed (GDPR)	Cathie Associates
6.11.2018	Substrate 250k	email not revealed (GDPR)	Orsted
6.11.2018	Substrate 250k	email not revealed (GDPR)	Cathie Associates
7.11.2018	Substrate 100k	email not revealed (GDPR)	CCMAR
13.11.2018	Substrate 250k	email not revealed (GDPR)	NEXTGEOSOLUTIONS
14.11.2018	Substrate 250k	email not revealed (GDPR)	IPMA
14.11.2018	Coastal Behav.	email not revealed (GDPR)	NEXTGEOSOLUTIONS
15.11.2018	Substrate 100k	email not revealed (GDPR)	Instituto Português do Mar e da Atmosfera (IPMA, I.P.)
15.11.2018	Substrate 250k	email not revealed (GDPR)	IPMA

17.11.2018	Coastal Behav.	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Minerals	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Sea-floor	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Sea-floor	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Substrate 100k	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Substrate 1M	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Substrate 250k	email not revealed (GDPR)	Montpellier Faculty of Sciences
17.11.2018	Minerals	email not revealed (GDPR)	IGME
20.11.2018	Coastal Behav.	email not revealed (GDPR)	University College Cork
20.11.2018	Coastal Behav.	email not revealed (GDPR)	University of Groningen
20.11.2018	Events & Prob.	email not revealed (GDPR)	University of Groningen
20.11.2018	Sea-floor	email not revealed (GDPR)	University College Cork
20.11.2018	Substrate 100k	email not revealed (GDPR)	University College Cork
20.11.2018	Substrate 100k	email not revealed (GDPR)	University College Cork
20.11.2018	Substrate 100k	email not revealed (GDPR)	University of Groningen
20.11.2018	Substrate 100k	email not revealed (GDPR)	GTK
23.11.2018	Substrate 100k	email not revealed (GDPR)	Hydromaster
27.11.2018	Events & Prob.	email not revealed (GDPR)	TUDelft
27.11.2018	Minerals	email not revealed (GDPR)	TUDelft
27.11.2018	Sea-floor	email not revealed (GDPR)	TUDelft
27.11.2018	Sea-floor	email not revealed (GDPR)	TUDelft
27.11.2018	Substrate 100k	email not revealed (GDPR)	TUDelft
27.11.2018	Substrate 100k	email not revealed (GDPR)	RSHUU
27.11.2018	Substrate 1M	email not revealed (GDPR)	TUDelft
27.11.2018	Substrate 1M	email not revealed (GDPR)	RSHHU
27.11.2018	Substrate 250k	email not revealed (GDPR)	TUDelft
27.11.2018	Substrate 250k	email not revealed (GDPR)	RSHHU
27.11.2018	Coastal Behav.	email not revealed (GDPR)	TUDelft
29.11.2018	Substrate 100k	email not revealed (GDPR)	DOC
29.11.2018	Substrate 1M	email not revealed (GDPR)	fertoing ltd.
3.12.2018	Events & Prob.	email not revealed (GDPR)	UAC
5.12.2018	Substrate 100k	email not revealed (GDPR)	Cathie Associates
5.12.2018	Substrate 100k	email not revealed (GDPR)	Cathie Associates
5.12.2018	Substrate 100k	email not revealed (GDPR)	Cathie Associates
5.12.2018	Substrate 250k	email not revealed (GDPR)	Cathie Associates
6.12.2018	Sea-floor	email not revealed (GDPR)	Royal Belgian Institute of Natural Sciences
6.12.2018	Sea-floor	email not revealed (GDPR)	GEUS
6.12.2018	Substrate 250k	email not revealed (GDPR)	CNR
6.12.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
6.12.2018	Sea-floor	email not revealed (GDPR)	Cathie Associates
6.12.2018	Sea-floor	email not revealed (GDPR)	Vattenfall Vindkraft A/S
6.12.2018	Substrate 100k	email not revealed (GDPR)	Mr
6.12.2018	Substrate 100k	email not revealed (GDPR)	Vattenfall Vindkraft a/s
6.12.2018	Substrate 1M	email not revealed (GDPR)	Cathie Associates
6.12.2018	Substrate 250k	email not revealed (GDPR)	Cathie Associates
11.12.2018	Sea-floor	email not revealed (GDPR)	University of Malaga
12.12.2018	Sea-floor	email not revealed (GDPR)	Vattenfall
13.12.2018	Substrate 250k	email not revealed (GDPR)	university
13.12.2018	Sea-floor	email not revealed (GDPR)	-
13.12.2018	Sea-floor	email not revealed (GDPR)	test
13.12.2018	Substrate 250k	email not revealed (GDPR)	ca foscari
14.12.2018	Coastal Behav.	email not revealed (GDPR)	EDPR UK
14.12.2018	Sea-floor	email not revealed (GDPR)	EDPR UK
14.12.2018	Sea-floor	email not revealed (GDPR)	EDPR UK
14.12.2018	Substrate 1M	email not revealed (GDPR)	mubruscker
14.12.2018	Substrate 250k	email not revealed (GDPR)	EDPR UK
17.12.2018	Substrate 100k	email not revealed (GDPR)	Ulster University
17.12.2018	Substrate 250k	email not revealed (GDPR)	Ulster University
17.12.2018	Sea-floor	email not revealed (GDPR)	privada
17.12.2018	Sea-floor	email not revealed (GDPR)	privada
17.12.2018	Sea-floor	email not revealed (GDPR)	privada
18.12.2018	Substrate 250k	email not revealed (GDPR)	University of Ulster Coleraine
18.12.2018	Substrate 250k	email not revealed (GDPR)	University of Ulster Coleraine
20.12.2018	Substrate 100k	email not revealed (GDPR)	ogs
20.12.2018	Substrate 250k	email not revealed (GDPR)	GEUS
2.1.2019	Substrate 1M	email not revealed (GDPR)	University of Gothenburg
9.1.2019	Substrate 250k	email not revealed (GDPR)	University of Sheffield
11.1.2019	Sea-floor	email not revealed (GDPR)	Acoustical Consultancy

11.1.2019	Substrate 1M	email not revealed (GDPR)	Acoustical Consultancy
11.1.2019	Substrate 250k	email not revealed (GDPR)	Private
12.1.2019	Substrate 250k	email not revealed (GDPR)	DTU Aqua
16.1.2019	Sea-floor	email not revealed (GDPR)	ARUP
17.1.2019	Substrate 100k	email not revealed (GDPR)	Bangor University
17.1.2019	Sea-floor	email not revealed (GDPR)	tennet
17.1.2019	Sea-floor	email not revealed (GDPR)	tennet
17.1.2019	Substrate 1M	email not revealed (GDPR)	tennet
17.1.2019	Substrate 250k	email not revealed (GDPR)	tennet
17.1.2019	Substrate 250k	email not revealed (GDPR)	ARUP
18.1.2019	Sea-floor	email not revealed (GDPR)	Bangor University
21.1.2019	Substrate 100k	email not revealed (GDPR)	NOVELTIS
23.1.2019	Substrate 250k	email not revealed (GDPR)	MaREI, UCC
24.1.2019	Substrate 250k	email not revealed (GDPR)	University of St Andrews
25.1.2019	Substrate 250k	email not revealed (GDPR)	University of St Andrews, Sea Mammal Research Unit
25.1.2019	Substrate 250k	email not revealed (GDPR)	University of St Andrews, Sea Mammal Research Unit
28.1.2019	Substrate 1M	email not revealed (GDPR)	Edinburgh University
28.1.2019	Substrate 250k	email not revealed (GDPR)	Edinburgh University
28.1.2019	Substrate 1M	email not revealed (GDPR)	Ifremer
28.1.2019	Substrate 250k	email not revealed (GDPR)	Ifremer
29.1.2019	Minerals	email not revealed (GDPR)	Edinburgh University
29.1.2019	Substrate 1M	email not revealed (GDPR)	IFREMER
29.1.2019	Substrate 1M	email not revealed (GDPR)	Danish Geodata Agency
30.1.2019	Sea-floor	email not revealed (GDPR)	Marine Intitute
30.1.2019	Substrate 100k	email not revealed (GDPR)	Marine Intitute
30.1.2019	Substrate 1M	email not revealed (GDPR)	Marine Intitute
30.1.2019	Substrate 250k	email not revealed (GDPR)	Marine Intitute
1.2.2019	Substrate 100k	email not revealed (GDPR)	cmre
3.2.2019	Substrate 250k	email not revealed (GDPR)	ENSP
4.2.2019	Substrate 1M	email not revealed (GDPR)	NATO STO CMRE
5.2.2019	Substrate 100k	email not revealed (GDPR)	Principle Power Inc
6.2.2019	Coastal Behav.	email not revealed (GDPR)	University of Groningen IMT School for Advanced Studies
6.2.2019	Coastal Behav.	email not revealed (GDPR)	University of Groningen & IMT
6.2.2019	Events & Prob.	email not revealed (GDPR)	University of Cagliari
6.2.2019	Sea-floor	email not revealed (GDPR)	University of Groningen & IMT
6.2.2019	Sea-floor	email not revealed (GDPR)	University of Groningen & IMT
6.2.2019	Sea-floor	email not revealed (GDPR)	University of Cagliari
6.2.2019	Substrate 1M	email not revealed (GDPR)	University of GRoningen IMT School for Advanced Studies
6.2.2019	Substrate 250k	email not revealed (GDPR)	University of Groningen IMT School for Advanced Studies
6.2.2019	Substrate 100k	email not revealed (GDPR)	FFI
6.2.2019	Substrate 1M	email not revealed (GDPR)	FFI
6.2.2019	Substrate 100k	email not revealed (GDPR)	WSP
8.2.2019	Events & Prob.	email not revealed (GDPR)	Fugro
9.2.2019	Sea-floor	email not revealed (GDPR)	UHI
12.2.2019	Substrate 250k	email not revealed (GDPR)	University of Vigo
14.2.2019	Substrate 100k	email not revealed (GDPR)	Gumushane university
14.2.2019	Substrate 1M	email not revealed (GDPR)	Gumushane university
14.2.2019	Substrate 250k	email not revealed (GDPR)	Gumushane university
15.2.2019	Substrate 100k	email not revealed (GDPR)	Istanbul University
18.2.2019	Sea-floor	email not revealed (GDPR)	University of Aberdeen
18.2.2019	Substrate 1M	email not revealed (GDPR)	university of aberdeen
18.2.2019	Substrate 250k	email not revealed (GDPR)	University of Aberdeen
18.2.2019	Sea-floor	email not revealed (GDPR)	TNO
18.2.2019	Substrate 100k	email not revealed (GDPR)	Royal Dutch Marine
18.2.2019	Substrate 100k	email not revealed (GDPR)	TNO
18.2.2019	Substrate 1M	email not revealed (GDPR)	Royal Dutch Marine
18.2.2019	Substrate 250k	email not revealed (GDPR)	Royal Dutch Marine
21.2.2019	Events & Prob.	email not revealed (GDPR)	Alcatel Submarine Networks Ltd
28.2.2019	Substrate 1M	email not revealed (GDPR)	Principle Power Inc.
28.2.2019	Substrate 250k	email not revealed (GDPR)	Principle Power Inc
1.3.2019	Coastal Behav.	email not revealed (GDPR)	Universidad de Sevilla
1.3.2019	Substrate 1M	email not revealed (GDPR)	Edinburgh University
1.3.2019	Substrate 1M	email not revealed (GDPR)	IFREER
2.3.2019	Substrate 1M	email not revealed (GDPR)	FRE3729 ECOMERS CNRS/UNS
4.3.2019	Substrate 100k	email not revealed (GDPR)	UCC
5.3.2019	Substrate 1M	email not revealed (GDPR)	suleyman demirel university
5.3.2019	Events & Prob.	email not revealed (GDPR)	IGME
5.3.2019	Sea-floor	email not revealed (GDPR)	IGME

5.3.2019	Sea-floor	email not revealed (GDPR)	IGME
5.3.2019	Substrate 100k	email not revealed (GDPR)	IGME
5.3.2019	Substrate 100k	email not revealed (GDPR)	UCC
5.3.2019	Substrate 1M	email not revealed (GDPR)	IGME
10.3.2019	Events & Prob.	email not revealed (GDPR)	Heriot-Watt University
10.3.2019	Minerals	email not revealed (GDPR)	Heriot-Watt University
10.3.2019	Sea-floor	email not revealed (GDPR)	Heriot-Watt University
10.3.2019	Sea-floor	email not revealed (GDPR)	Heriot-Watt University
10.3.2019	Substrate 100k	email not revealed (GDPR)	Heriot-Watt University
10.3.2019	Sea-floor	email not revealed (GDPR)	CGS
10.3.2019	Substrate 250k	email not revealed (GDPR)	CGS
11.3.2019	Substrate 100k	email not revealed (GDPR)	Bologna University
11.3.2019	Substrate 1M	email not revealed (GDPR)	Bologna University
11.3.2019	Substrate 250k	email not revealed (GDPR)	Bologna University
11.3.2019	Substrate 100k	email not revealed (GDPR)	Research
11.3.2019	Substrate 100k	email not revealed (GDPR)	Federal Institute for Geoscience and Natural Resources (BGR)
11.3.2019	Substrate 100k	email not revealed (GDPR)	Research
11.3.2019	Substrate 100k	email not revealed (GDPR)	Federal Institute for Geoscience and Natural Resources (BGR)
11.3.2019	Substrate 1M	email not revealed (GDPR)	Research
11.3.2019	Substrate 1M	email not revealed (GDPR)	Research
11.3.2019	Substrate 250k	email not revealed (GDPR)	Research
11.3.2019	Substrate 250k	email not revealed (GDPR)	Research
11.3.2019	Substrate 250k	email not revealed (GDPR)	Research
11.3.2019	Substrate 250k	email not revealed (GDPR)	Research
11.3.2019	Substrate 250k	email not revealed (GDPR)	IEO
11.3.2019	Substrate 250k	email not revealed (GDPR)	IEO
13.3.2019	Substrate 100k	email not revealed (GDPR)	univercity
13.3.2019	Substrate 100k	email not revealed (GDPR)	Gavin And doherty
19.3.2019	Substrate 100k	email not revealed (GDPR)	University College Cork
19.3.2019	Substrate 100k	email not revealed (GDPR)	Institute of oceanology, BAS
20.3.2019	Substrate 1M	email not revealed (GDPR)	FRE3729 ECOMERS CNRS/UNS
20.3.2019	Coastal Behav.	email not revealed (GDPR)	Mr.
21.3.2019	Minerals	email not revealed (GDPR)	Federal Institute for Geosciences and Natural Resources (BGR)
22.3.2019	Minerals	email not revealed (GDPR)	University College Cork
22.3.2019	Minerals	email not revealed (GDPR)	University College Cork
25.3.2019	Substrate 100k	email not revealed (GDPR)	Inverness College
25.3.2019	Substrate 100k	email not revealed (GDPR)	IfGDV
26.3.2019	Sea-floor	email not revealed (GDPR)	IGME
26.3.2019	Sea-floor	email not revealed (GDPR)	marinespace ltd
27.3.2019	Substrate 1M	email not revealed (GDPR)	Universita Politecnica Delle Marche
27.3.2019	Substrate 100k	email not revealed (GDPR)	Arup
2.4.2019	Substrate 1M	email not revealed (GDPR)	Technical University of Denmark
2.4.2019	Substrate 1M	email not revealed (GDPR)	shom

Indicator 6 - User statistics to determine the main pages utilised and identify user navigation routes

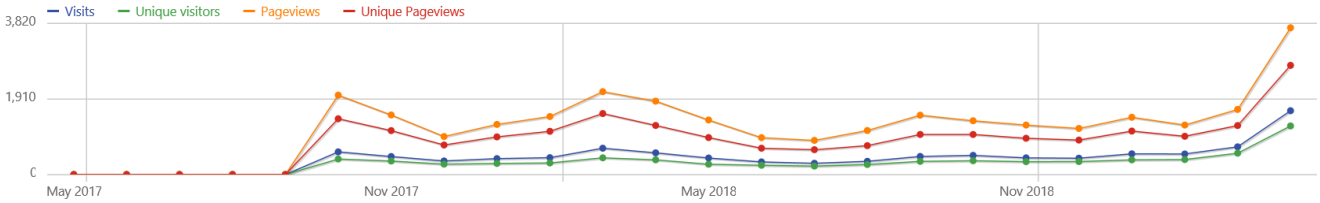
Results of MATOMO analytics on the web page

Period: 2017.09.27 – 2019.04.11

- 8,899 visits
- 3min 20s average visit duration
- 38% left the website after one page
- 3.5 actions (page views, downloads, outlinks and internal site searches) per visit
- 26,472 pageviews 19,196 unique pageviews
- Referrer types: 5,712 direct entries1,529 websites, 1,504 search engines, 154 social networks

From above we can conclude that users on average click 3.5 times on the portal before leaving again. We can assume they find the relevant content within that amount of clicks, but to know for sure we would have to do user interviews.

Page views, unique page views, visits and unique visitors per month (since MATOMO counts whole months the sum of visits etc. don't match with the figures above. Project lasted only until 11th April but MATOMO reports until 30th April):



Month	Visits	Unique visitors	Pageviews	Unique Pageviews
2017-Oct	574	393	2005	1410
2017-Nov	456	342	1505	1110
2017-Dec	344	264	961	747
2018-Jan	403	282	1266	952
2018-Feb	427	294	1466	1093
2018-Mar	666	424	2093	1541
2018-Apr	549	373	1854	1241
2018-May	419	262	1378	935
2018-Jun	320	236	932	666
2018-Jul	286	214	863	628
2018-Aug	335	254	1112	731
2018-Sep	458	334	1499	1013
2018-Oct	486	350	1358	1013
2018-Nov	422	326	1250	917
2018-Dec	414	329	1164	871
2019-Jan	524	372	1447	1099
2019-Feb	521	380	1250	967
2019-Mar	701	540	1644	1238
2019-Apr	1612	1228	3706	2757
Total	9917	7197	28753	20929

Indicator 7 - List of what the downloaded data has been used for

We activated a comment possibility to the download form mid-November 2017. 37% of the users state academic/educational or research, about 24% are from the private sector, 26% government/public sector, 7,5% are private users and the rest 5,5% unspecified users, all stated word-by-word in Indicator 5. Data has been reported to be used for instance for:

- Substrate info for Finnish navigational charts
- Off-shore wind farm development by several different users
- Commercial use (chart plotter)
- Habitat mapping
- Cetacean study, fisheries studies
- Academic Research

- Publication
- Academic dissertations, PhD studies
- Studies for MSFP, MPA

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

WP9. We publicly offer the following OGC standard web services without registration or statistics:

- Web Map Service (WMS)
- Web Feature Service (WFS)
- Catalogue Service (CSW)

Products available through web services are:

- WMS (raster access)
  - Seabed Substrate maps **http://drive.emodnet-geology.eu/geoserver/gtk/wms**
  - Sea-floor (bedrock) **http://drive.emodnet-geology.eu/geoserver/bgr/wms**
  - Coastal Behavior **http://drive.emodnet-geology.eu/geoserver/tno/wms**
  - Events and Probabilities **http://drive.emodnet-geology.eu/geoserver/ispra/wms**
  - Marine Minerals **http://drive.emodnet-geology.eu/geoserver/gsi/wms**
  - Submerged Landscapes **http://drive.emodnet-geology.eu/geoserver/bgs/wms**
- WFS (vector access)
  - Seabed Substrate maps **http://drive.emodnet-geology.eu/geoserver/gtk/wfs**
  - Sea-floor (bedrock) **http://drive.emodnet-geology.eu/geoserver/bgr/wfs**
  - Coastal Behavior **http://drive.emodnet-geology.eu/geoserver/tno/wfs**
  - Events and Probabilities **http://drive.emodnet-geology.eu/geoserver/ispra/wfs**
  - Marine Minerals **http://drive.emodnet-geology.eu/geoserver/gsi/wfs**
  - Submerged Landscapes **http://drive.emodnet-geology.eu/geoserver/bgs/wfs**
- CSW (catalogue access)
  - **http://drive.emodnet-geology.eu/geonetwork/srv/eng/csw**

The organisations concerned are gtk = Geologian Tutkimuskeskus, (GTK, Finland); bgr = Federal Institute for Geosciences and Natural Resources (BGR, Germany); tno = Geological Survey of the Netherlands (TNO, NL); ispra = Istituto Superiore per la Protezione e la Ricerca Ambientale. Servizio Geologico d'Italia (ISPRA, Italy); gsi = Geological Survey of Ireland (GSI, Ireland); bgs = UKRI – British Geological Survey (UKRI, United Kingdom)

11 Recommendations for follow-up actions by the EU

Please, give a list of recommendations and suggestions for the EU to consider and take action.

[Max 1 page]

WP4

Construction of 3-D models of the geology of the sea floor (possibly in cooperation with the geophysics lot)
Reconstruct the European sea floor in time slices (keywords: palinspastic reconstruction, backstripping)
Reconstruct the genesis of the European sea floor

WP7

While information on marine minerals continues to be located, standardised and submitted; the facility to update data and reflect key components of each marine mineral occurrence is a fundamentally important aspect of the project WP.

The WP has begun to focus on mapping sub categories of marine minerals. These require further work to really constrain a best practice and defined naming and styling convention. This work is in the preparatory phase.

While it is important that the geological occurrences of marine minerals are mapped for a number of reasons; the WP has also begun to focus on the quantitative aspect of occurrences that have been measured for their economic value. Further work is required to establish a defined approach to this that will fit all partners' data and be standardised. While research into semantics continues so the most appropriate be chosen, it is anticipated that potential resource maps can be trialled for two mineral types.

Geophysical data are used to locate and quantify mineral occurrences. This project could move toward facilitating the inclusion of magnetics and gravity maps where available. These may be useful as a research platform for stakeholders to use and compare. It is important to note that including these data may pose issues associated with moving more toward a database model, rather than viewer with standardised maps. Not all partners would have access to these geophysical data that are often sensitive or confidential.

12 Annex: Tasks specified in Section 1.4.1.

Progress of each of the tasks specified in Section 1.4.1., of the Tender Specifications

Task 1: Develop a common method of access to data held in repositories:

In corporation with other EU projects (EGDI, EPOS, ProSUM), we develop and implement a common method of access to data held in locally distributed repositories. In EMODnet Geology, we are in the data discovery phase, where 28 partners have been asked to share descriptions (metadata) and spatial location of true ground samples and geophysical surveys. We now have 12 of 19 borehole indexes delivered, harvested and merged into a first simple pan-European entity index viewable on the portal web map. We are currently creating similar indexes for geophysics (13 of 24 partners delivered) and backscatter (one or two partners can deliver). We are in dialogue with data managers in the EGDI, EPOS, and ProSUM to decide the best approach to have these data sets harmonized and make them seamlessly downloadable to users on request.

Simple borehole descriptions are still supplied through Geo-Seas but a new, fully mapped coded database has been prepared for publication via the EMODnet portal. It also includes some measured particle size from WP5.

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

To allow users access more geological relevant data sets from within the portal, we added new external data sources to the map viewer under paragraph "Other Portals"; EMODnet Bathymetry, Geo-Seas, and Seismic Portal. Now, users can select between all free data layers available in these data sources.

WP5. Using partner input (new data from 21 partners) and analysis of publicly available satellite data, we created three digital maps for coastline behaviour as part of WP5, as well as an inventory on coastal hotspots and a list of coastal resilience definitions. The first map shows satellite-based coastline migration, the second map field-observation-based coastline migration, and the third map coastline type.

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

All data products are listed on the "Products" page with links and examples to web services, data download and online Web-GIS. These options are by identified use-cases selected to be the most efficient way in helping users access our products and services, whether it is desktop GIS software, handheld devices, large-scale data projects or casual data browsing.

We are making our data products cover even more use-cases by allowing registered users online access to a read-only database (PostgreSQL). This approach is to our knowledge without precedent but could for some users prove to be a highly efficient way to access and integrate EMODnet Geology data into their existing environment.

Regarding metadata, we have a running service (GeoNetwork) enrolled into nightly harvesting by EMODnet main portal and EGDI MICKA. This way, users browsing both EMODnet main portal and EGDI will easily discover our data products.

Task 4: Develop a web portal allowing users to find, visualise and download data:

The web portal was constructed and up and running during the first three months of the project. We are continuously extending the functionality and usability of the portal. Data products are now well described and made easily available for both download, online map view, and as web services. On request, we can even offer users access to a PostgreSQL database where all data are available for SQL analysis. Most recently, we upgraded the layout and styling to align with the other EMODnet portals.

Task 5: Ensure the involvement of regional sea conventions:

The three regional sea conventions (RSC's) have been officially invited to our three project meetings. The RSC's did not responded to the any of the invitations by end of October 2017, and the EMODnet geology decided to pay a visit to HELCOM. Thus, a promotional letter "Introduction to the EMODnet geology project" was sent to HELCOM secretariat on November 27th with an offer of visit such that EMODnet Geology could be presented to the HELCOM secretariat at their office. Unfortunately, this offer did not succeed. Finally the Barcelona Convention responded positively to the last invitation to attend our project meeting in Budva in the end of March "*Even though we are very interested to participate to this event, our tight schedule does not allow it.*" The coordination of EMODnet Geology hope that they will attend in the future, or we will pay a visit to their secretariat. Once we have contact with them we will see what they need from us. This will be postponed to the next phase of EMODnet, provided that our consortium is granted the contract.

Task 6: Facilitate interoperability with data distributed by non-EU organisations:

An analysis on interoperability with data (standards and protocols) distributed by non-EU organisations is in progress. Now, we are co-operating with Geoscience Australia, and this issue will be discussed and further co-operation planned during the Resources for Further Generations conference, which will be held in Vancouver in June 2018. EMODnet Geology Consortium is together with Geoscience Australia having a session called "Marine Geoscience and Geospatial Data Crossing Borders" The main driver for this action is international collaboration between various sea-floor mapping programmes and brainstorming on a road map for future global seafloor mapping initiatives. We see that the European approach is best tested and well running, a single standard for one continent. Thus, co-operation with similar global initiatives is important at this moment, such that global standards and protocols in acquisition and processing of seafloor data into user-friendly products can be assured. For the same reason we will also approach the ambitious Seabed 2030 project by GEBCO and Nippon Foundation in order try to add a geological component to their agenda.

Partners of the EMODnet Geology consortium are participating in the Atlantic Seabed Mapping pilot, initiated by the Atlantic Seabed Mapping International Working Group (ASMIWG), which was established by the Trilateral Galway Statement Implementation Committee.

EMODnet Geology initiatives, methods and products have been presented at various international fora, such as the American Geophysical Union Fall Meeting (for a comprehensive list see paragraph 6. Outreach and communication activities), where good acceptance was gained from researchers from China, Korea, Australia and America, and future cooperation was discussed.

Task 7: Install a process to monitor performance and deal with user feedback:

We are now linked to a monitoring system hosted by the main portal (Piwik). Here we can login and extract performance and user statistics. The portal offer users the possibility to write feedback. We receive a few each month and answer within 1-2 working days in case of questions. We participate in all statistical initiatives put forward by the EMODnet Secretariat and Steering Committee.

Task 8: Operate a help desk offering support to users:

We continuously run our help desk according to rules set in the Tender Specifications. We receive on average four support questions per month which are handled within 1-2 working days.

13 List of abbreviations and acronyms

AGU	American Geosciences Union
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (German Federal Institute for Geosciences and Natural Resources)
BGS	UKRI – British Geological Survey
BP	Before present
BSH	Bundesamt für Seeschiffahrt und Hydrography
BSSC	Baltic Sea Science Congress – series
CC	Creative Commons
CGMW	Commission of the Geologicl Map of the World
DOI	Digital Object Identifier
GeoHab	Marine Geological and Biological Habitat Mapping – conference series
GeoNetwork	a catalog application to manage spatially referenced resources
GeoServer	an open source server for sharing geospatial data
GEUS	Geological Survey of Denmark and Greenland
GIA	Glacial isostatic adjustment
GIS	Geographical Information System
GSI	Geological Survey of Ireland
GSL	Geological Soceity of London
GTK	Geologian Tutkimuskeskus - Geological Survey of Finland
EEA	European Environment Agency
EGDI	European Geological Data Infrastructure
EGDI MICKA	European Geological Data Infrastructure, MICKA metadata catalogue
EGU	European Geosciences Union
EMSC	European-Mediterranean Seismological Centre
EPOS	European Plate Observing System
EuroGeoSurveys	The Geological Surveys of Europe
FTP	File transfer protocol
GIS	Geographical Information System
INSPIRE	Infrastructure for Spatial Information in Europe
IOW	Institute of Baltic Sea Research
INQUA	International Union for Quaternary Research
IQUAME 2500	International Quatenary Map of Europe, scale 1: 2,5 Million)

ISPRA	Istituto Superiore per la Protezione e la Ricerca Ambientale
IUGS	International Union of Geological Sciences
LGM	Last glacial maximum
Maxent	Maximum Entropy Modelling
Matomo	tracks online visits to websites and displays reports on these visits for analysis.
OGC	Open Geospatial Consortium
PostgreSQL	object-relational database management system
ProSUM	Prospecting Secondary raw materials from the Urban Mine and Mining waste
QC	Quality Control
RFG	Resources for Future Generations conference, Vancouver, BC, Canada, 2018
RSC's	Regional Sea Conventions (HELCOM, OSPAR...)
SCU	Smallest cartographic unit
SHOM	Service Hydrographique et Océanographique de la Marine, France
SLD	Styled Layer Descriptor
SPLASHCOS	COST action - Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf
SQL	Structured Query Language
TNO	Geological Survey of the Netherlands
Web-GIS	a pattern, or architectural approach, for implementing a modern GIS. It's powered by web services—standard services that deliver data and capabilities, and connect components.
WFS	Web Feature Service
WMS	Web Map Service
WordPress	a free and open-source content management system
WP	Workpackage