EMODnet Ingestion and safe-keeping of marine data

Final Report

Reporting Period: 19/05/2016 – 19/05/2019

Date: 14/07/2019
Amended: 07/09/2019

Contents

1. Executive summary (750 words max)

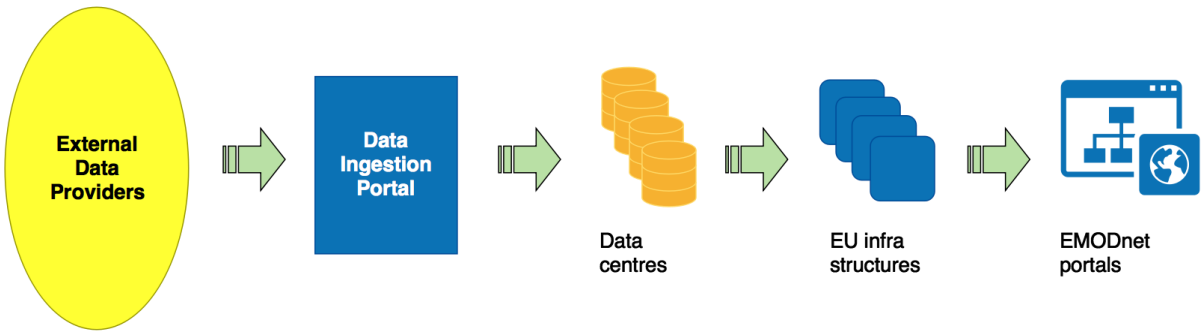
The '**EMODnet Ingestion'** project seeks to identify and reach out to organisations from research, public, and private sectors who are holding marine datasets and who are not yet connected and contributing to the existing marine data management infrastructures which are driving EMODnet. Those potential data providers should be motivated and supported to release their datasets for safekeeping and subsequent freely distribution and publication through EMODnet.

The project started as a new EMODnet initiative 19th May 2016 and has been undertaken over a contractual period of 3 years by a European consortium of 44 organisations from 29 coastal countries. Most partners are established data centres and the consortium also included coordinators of the EMODnet thematic data portal projects.

The first year was dedicated to developing the portal and its services for ingesting and publishing data sets, developing the pathways for processing of submissions, laying a basis for promotion and marketing activities, and making an initial inventory of potential data sources.

The EMODnet Data Ingestion portal has been launched early February 2017. It encourages data providers to share marine data and provides a submission service and marine data management guidance information. A low threshold is offered by splitting the completion of the submission form in 2 parts, whereby a data submitter only completes a part of the metadata together with the uploading of a data package. Each data submission is assigned to a competent data centre for completing the metadata of the submission. Those complete submissions are then published with their data packages ***'as is'*** at the portal in the View Submissions service, where users can search, browse and download the data packages.

As a next step assigned data centres elaborate selected submissions further to make (subsets of) the data fit for population into national, European and EMODnet thematic portals.



For this a network of qualified data centres has been established, divided over many European countries and expert in EMODnet data themes. The network comprises 50 data centres, recruited from the EMODnet Ingestion project consortium and the EMODnet thematic networks.

In the second year further technical results have been achieved such as launching:

- a prototype for ingesting operational oceanography data streams, in cooperation with EMODnet Physics, CMEMS-INSTAC and EuroGoos,
- a data wanted service with matching function, enabling users to post their data needs, challenging potential data providers. Users are alerted of posts matching published submissions.

However most of the efforts in the second and third years has been dedicated to marketing and outreach activities promoting the EMODnet Ingestion initiative and gaining momentum with the submission service and its processing chain of pathways. Promotional materials have been created such as leaflets, bookmarks, posters, stickers, roll-up infographic, standard presentations, and an excellent animation. EMODnet Ingestion has been presented at many European and international occasions, in particular by EMODnet Thematic coordinators, EMODnet Secretariate, EuroGOOS, and at meetings of relevant EU projects like SeaDataCloud, AtlantOS, EuroARGO, ODIP II, CMEMS, and promotional texts and web links have been integrated in each of the EMODnet portals.

This has been complemented with national promotion and outreach activities by each of the EMODnet Ingestion consortium members which act as EMODnet ambassadors. They have given a follow up to the earlier inventory of potential sources by actively approaching and motivating potential data holders and giving them support for making data submissions. And they have organised national meetings in order to make more organisations in their countries aware of EMODnet and ready for EMODnet Ingestion. This promotion and campaigning has resulted in a substantial number of portal visitors (at the height of the campaign a monthly average of **8.000 – 9.000** unique visitors was achieved which has now decreased to average monthly numbers of **1000 – 2000** unique visitors per months), more than 1900 views of the Ingestion animation on YouTube, and a increasing population of the Submission service and the View Submissions service. At 1st September 2017 there were only **11** submissions and none published. At the end of the 2nd year, 19th May 2018, there were already **175** submissions of which **163** published 'as is' and of these **13** also ingested into European portals. While at the end of the contract, at 19th May 2019, there are **619** submissions with **506** published '*as is'* and of these **205** elaborated to phase 2 and ingested into European portals. This is an excellent result which earns continuation by sustaining the EMODnet Ingestion service contract. At present the consortium is awaiting the outcome of its tender submission for another 2 years of service.

Image: EMODnet Data Ingestion movie on a mobile phone.

2. Highlights of the reporting period

- In the first months, the submission process and related metadata form have been analysed; as a result, the completion of the submission metadata form has been split in 2 parts to offer a low threshold for data submitters:
  - **Part 1 submission form**: a number of key fields to be completed by the data submitter, including uploading of a zip file with the data sets and related documentation;
  - **Part 2 submission form**: review of the received part 1 and consecutive completion of the additional metadata fields by an assigned data centre.

  and a distinction is made between 2 phases in the life cycle of a data submission:
  - **Phase I**: from submission to publishing of the submitted datasets package '*as is*'
  - **Phase II**: further elaboration of the data sets and integration (of subsets) in national, European and EMODnet thematic portals.

- The **EMODnet Data Ingestion portal** including several services has been officially launched, 7th February 2017, at www.emodnet-ingestion.eu. At that moment the portal gave access to:
  - General introduction and background information
  - Data Management Guidance and related documents
  - Data Submission service for Phase I, including:
    - Submission Forms service
    - User Management service
    - Process Tracking service
    - Key Indicators service
    - Functions for managing the process from submission till publishing, including assigning data centres
  - Help desk service
  - Operational oceanography exchange guidance
  - News
  - Use cases
  - Promotional material
  - Extranet for project members

- A **View Submissions** service was developed for publishing the submission forms and retrieving data packages '*as is*'; it is coupled to the Data Submission service by means of json export. The View Submission service was launched at the portal early October 2017, when a first set of data submissions had been completed for phase I.

- A network of qualified data centres has been established to fulfill pathways for going from submission at the EMODnet Data Ingestion portal to publishing in the EMODnet thematic portals. Currently this counts **50** data centres from EU countries and for the different EMODnet themes. They have been recruited from the EMODnet Ingestion consortium and from the EMODnet thematic consortia with support of the Thematic coordinators. In practice, data submissions are assigned to these qualified data centres depending on the country of the data provider and the type of EMODnet theme of the data. In this context, the Data Submission service was upgraded in November 2017 for phase 2 which concerns entering the URLs of portals where elaborated data sets might be found and entering DOIs for submitted scientific data sets, where available.

- The **Data Wanted service** has been launched at the portal in September 2017 allowing any user to formulate and post requests for data sets they are looking for. Early 2019 this has been complemented with a matching function which compares data wanted posts with published data submissions and alerts posting users about this.

- Near the end of the first year, a plan for promotion and outreach activities in the coming years involving all consortium members and supported by several promotion media was agreed. And an inventory of 466 potential data sources from 26 countries was compiled by all partners, providing a basis for the following outreach activities.

- The EMODnet Ingestion animation movie **'Wake up your data'** was finalised and with great success publicly launched in a cooperation with the EMODnet Secretariat early November 2017. The movie is posted on YouTube and prominent links can be found at the EMODnet Central and EMODnet Ingestion portals. So far more than 1900 views have been registered.

- End March 2018, the Sensor Web Enablement (SWE) pilot was launched. It concerns real time oceanographic monitoring systems, allowing direct standardised access to selected data types from selected monitoring instruments. SWE profiles for selected platforms and sensors were formulated and published, in synergy with other projects such as 'AtlantOS', 'BRIDGES', 'ODIP II', and 'SeaDataCloud'. The (N)RT oceanographic data streams from a number of operators can be discovered and viewed through a Pilot Viewing Service which is hosted at the EMODnet Physics portal and advertised at the EMODnet Ingestion and EMODnet Physics portals. Using the SWE pilot and SWE standards promotion has been made for uptake of SWE by operators for real time data exchange. In this frame several dedicated workshops were held for different observing communities.

- The **EMODnet Ingestion portal** was expanded over time with new sections and content, while a major upgrade included adopting the new EMODnet styling instructions as received from the

EMODnet Secretariate. The portal section on **ingesting operational oceanography** was compiled in dialogue with the Copernicus CMEMS-INSTAC, EuroGOOS and EMODnet Physics. As a result the **CMEMS-INSTAC portal** now also promotes using the EMODnet Ingestion service at its Submit data section .

- The number of **published data submissions ' as is'** in the **View Submissions service** increased gradually with **175** submissions of which **163** published 'as is' and of these **13** also ingested into European portals, at the end of the 2nd year, 19th May 2018. In the third year this gained even more momentum, and at the end of the 3rd year, there are **619** submissions with **506** published '*as is*' and of these **205** elaborated to phase 2 and ingested into European portals.

3. Challenges encountered

The following challenges have been encountered during the project. These have been discussed between partners and solved as can be seen in the table below.

Partner	Challenges encountered	Short description	Measures to address challenges
Technical Working Group	Analysis and design of submission process workflow	The challenge for EMODnet Ingestion is to offer a low threshold for potential data providers for providing data input while aiming for high quality output.	Submission form has been split in 2 parts: the first part is completed by the data submitter while a qualified data centre is assigned to review part 1 and the data package and then to complete part 2 of the submission form in communication with the data submitter.
Technical Working Group	Analysis and design of pathways from submission to publishing	The challenge for EMODnet Ingestion is to offer a relatively fast throughput of ingested data towards publishing while ingested data sets might give complications.	The workflow of the pathways has been divided over 2 phases. Phase I concerns the publishing of the ingested data package '*as is*' together with the completed and quality controlled submission form. Phase II concerns the further elaboration of (subsets) of the data package for integration into national database systems, European data infrastructures and EMODnet thematic portals which might much more efforts and time.
Technical Working Group	Providing technical means for engaging qualified data centres in the pathways and implementing tracking .	Ingested submissions must be checked and processed by qualified data centres while data submitters are kept informed about progress.	The submission service works with 3 actors - data submitters, data centres and master – which have different roles and authorisation levels. Data centres are maintained by master in an internal DC Catalogue and from there assigned to submissions. Data submitters are informed by tracking info in their submission forms of the data centre assignement and further logs that are kept by the data centre when processing.

Partner	Challenges encountered	Short description	Measures to address challenges
All partners	How to identify and approach potential data providers	How to identify, approach, and convince potential data providers	In the first year a guidance note was prepared by the coordinating team. It includes priority data subjects as established in discussion with the Thematic coordinators. It includes tips for the consortium members how to identify and locate potential data holders. Based upon this guidance document and template all consortium members had compiled national inventories. In the second and third years a follow-up has been given to the inventory by EMODnet members approaching identified data holders. A set of promotional items has been produced to support the EMODnet ambassadors in their activities. In addition more tips and suggestions have been formulated, derived from use cases and recieved feedbacks. In particular ideas how to mobilise national resources and how to motivate benefits to data providers 'what is in for them'. At the 3rd and 4th project plenary meetings most of the time was devoted to report per country the approaches, results, and further plans. This fed into brainstorming and provided a learning curve. As a result the number of submissions is increasing well and over the whole consortium.

Partner	Challenges encountered	Short description	Measures to address challenges
MARIS - HCMR	Organising engagement of all EMODnet Data Centres	Data will be submitted for various countries and data themes. The aim is that the pathways involve qualified national data centres for all themes.	Engagement of all data centres as involved in the EMODnet thematic networks is pursued. This has been promoted at the plenary meetings of each of the EMODnet thematic lots. Follow-up for registration and instructions has taken place between coordinators and individual data centres. This has resulted in 50 data centres that are engaged in the pathways of the submission service. Representatives from all thematic networks are involved. The test submission service facilitates data centres to practise with the submission process and how to treat submissions.
All data centres	Handling and elaborating ingested data sets at phase II	Data sets will be ingested by various organisations that are not used to prevailing standards and this will most likely complicate elaboration.	Data submitters are coupled to qualified data centres that already have experience and various internal tools for processing and digesting a range of formats. The data centres will be in dialogue with data submitters. The portal gives guidance information about common standards and practices. It is aimed for that data providers become more educated over time in order to streamline the pathway process. In the 2nd and 3rd years several data centres have been activated for handling and elaborating submissions. At first there were many questions about the process, roles, and required handling. Overtime a routine is establishing and also better understanding, both at the data centres and the masters. Also it has led to revisions in the submission service in order to make it smoother and overcoming early bugs.

4. Allocation of project resources

The following tables give the expenditure per partner per task and per work package over the full project.

	WP0			WP1				WP2		WP3	WP4	TOTAL EXP AFTER 3 YEARS
	Task 7. Tuning with EMODnet community	Task 10. Service continuity	Task 11. Project Management	Task 1. Web-portal	Task 5. Data Submission and Tracking service	Task 6. Data Wanted service	Task 8. Summary Records service	Task 2. Pathways for delivering data to final repositories	Task 4. Help-service	Task 3. Machine-to-machine transfers	Task 9. Outreach activities	
MARIS	0.52	0.11	1.1	1	0.65	0.6	0.5	0.55	0.1	0.5	0.56	**6.19**
HCMR	0.24	0.11	0.7	0.1	3.04	0	0.1	1.1	0	0.3	0.5	**6.19**
IFREMER					0.24	0.2	0	2	0.6	0.5	0.8	**4.34**
NERC-BODC					0.24			1.2		1	0.53	**2.97**
NERC-BGS					0.24			1.85			1	**3.09**
BSH					0.24			1.73			1	**2.97**
SMHI					0.24			1.5			0.73	**2.47**
IEO					0.24			1.3		0.25	0.68	**2.47**
OGS - NODC					0.24			1.5		0.45	0.9	**3.09**
OGS-IRI								0.74			0.5	**1.24**
RIHMI-WDC								0.88			0.6	**1.48**
ENEA								0.88			0.6	**1.48**
INGV					0.24			0.6			0.64	**1.48**
METU-IMS								0.88			0.6	**1.48**
AWI					0.24			1.03			1.2	**2.47**
ULG					0.24			0.74			0.5	**1.48**
IMR					0.24			1.43			0.8	**2.47**
AU-DCE					0.24			1.39			0.84	**2.47**
ICES					0.24			1.4			1.33	**2.97**
MI								1			0.48	**1.48**
IHPT								1			0.48	**1.48**
NIOZ								0.9			0.58	**1.48**
RBINS					0.24			0.9			2.08	**3.22**
VLIZ					0.24			1.8			1.05	**3.09**
MRI								0.9			0.58	**1.48**
FMI								0.8			0.68	**1.48**

	WP0			WP1				WP2		WP3	WP4	TOTAL EXP AFTER 3 YEARS
MSI								0.8			0.44	**1.24**
LHEI								0.8			0.44	**1.24**
SIO-RAS								0.8			0.44	**1.24**
IO-BAS								0.8			0.68	**1.48**
NIMRD								0.9			0.58	**1.48**
TSU-DNA								0.8			0.44	**1.24**
IOF								0.9			0.58	**1.48**
NIB								0.9		0.1	0.48	**1.48**
IOI-MOC								0.66			0.58	**1.24**
ORION								0.9			0.58	**1.48**
IOLR								0.9			0.58	**1.48**
CNR								0.6		0.25	0.63	**1.48**
CSIC								0.7		0.2	0.58	**1.48**
SHOM					0.24			1.6			1.25	**3.09**
Deltares					0.24			1.04			0.7	**1.98**
COGEA					0.24			1.3			1.55	**3.09**
ETT					0.24			0.45		1.4	1	**3.09**
GTK								0.68			0.8	**1.48**
GEUS								0.6			0.88	**1.48**
RWS								0.6			0.64	**1.24**
TOTALS	**0.76**	**0.22**	**1.8**	**1.1**	**8.25**	**0.8**	**0.6**	**46.73**	**0.7**	**4.95**	**34.09**	**100**
	WP0			**WP1**				**WP2**		**WP3**	**WP4**	**TOTAL EXP**
	2.78			10.75				47.43		4.95	34.09	100

The next table gives the overall expenditure per Work Package.

	Expenditure
WP0: Project Management	2.78
WP1: Construct and operate central Data Ingestion portal with services	10.75
WP2: Implement pathways to forward submitted data to the appropriate repository	47.43
WP3: Facilitate machine-to-machine transfers	4.95
WP4: Marketing and outreach activities	34.09
TOTALS	**100**

5. Progress in work packages and related tasks

Introduction:

The EU Tender specifications requested the following Tasks:

Task 1	Construct a web-portal
Task 2	Implement pathways for delivering data to final repositories
Task 3	Facilitate machine-to-machine transfers
Task 4	Operate a help-service for users to provide their data in the most appropriate format
Task 5	Allow providers of data to track the progress of their data from submission through to their storage in a repository
Task 6	Include a 'data wanted' function that allows users seeking certain types of information to specify their needs
Task 7	Participate in discussions with EMODnet partners in order to improve the efficiency of the whole collection, assembly and dissemination process
Task 8	Maintain a summary record of data delivered
Task 9	Engage in outreach activities towards significant holders of marine data whose data are not yet already available
Task 10	Service continuity
Task 11	Project Management

The EMODnet Ingestion consortium proposed a Work Plan that groups specific tasks, comparable in nature, under the same Work Packages (WP), also to make the execution with the large consortium easier and more effective.

Work Package No.	Work Package title	Covering tasks	WP leader
WP0	Project Management	Task 7 – EMODnet tuning Task 10 – service continuity Task 11 – Project Management	MARIS

Work Package No.	Work Package title	Covering tasks	WP leader
WP1	Construct and operate central Data Ingestion portal with services	Task 1 - web-portal Task 5 – tracking service Task 6 – data wanted service Task 8 – summary service	HCMR
WP2	Implement and operate pathways	Task 2 – pathways Task 4 – help service	IFREMER
WP3	Facilitate machine-to-machine transfers	Task 3 – machine-to-machine	ETT
WP4	Marketing and outreach	Task 9 - outreach	RBINS

All Work packages and related tasks have been completed. This is described in the following pages.

WP0 – Project Management:

The EMODnet Ingestion tender proposal was successfully submitted September 2015 to the Call 'EASME/EMFF/2015/011: Ingestion and safe-keeping of marine data'. The contract was officially effectuated 19th May 2016 with a 3 years duration. The EMODNet Data Ingestion project is undertaken by a European network of 44 organisations (governmental departments, marine research institutes and SME's) from 29 coastal countries, comprising 32 full partners and 12 sub-contractors, including 1 international organisation (ICES). Geographically the network has nodes in the countries around all European marine basins and it covers also all EMODnet data themes. Most partners are data centres and can be qualified as National Oceanographic Data Centres (NODC) or as National Geological Surveys or as National Hydrographic Agencies. Furthermore, the consortium includes the coordinators of the EMODnet thematic data portal projects for Bathymetry, Geology, Biology, Physics, Chemistry and Human Activities.

WP0 aims at managing and coordinating all project activities, ensuring timely delivery and high quality of results and products, and at maintaining collaboration and tuning with the overall EMODnet project organization.

The Coordinator established a Consortium Agreement between all partners and a series of bilateral Subcontracts between the Coordinator and each subcontractor. The Consortium Agreement version of 2 September 2016 has been fully signed by all 32 partners with the latest signature at 4th October 2016, while the latest of the series of 12 Subcontracts has been signed at 22nd December 2016. Copies of the Consortium Agreement and Subcontracts have been included in the extranet.

An extranet has been set up to manage all project documents concerning contractual affairs, project activities and minutes and presentations of project meetings. The extranet can be reached through the EMODnet Ingestion portal (https://www.emodnet-ingestion.eu) and all consortium members have received logon details for their account.

Furthermore, mailing lists have been activated to support internal communication:

- cg@emodnet-ingestion.eu for all consortium members
- twg@emodnet-ingestion.eu for TWG members

In particular the consortium mailing list has been used regularly by the Coordination team to give guidance and suggestions to consortium partners about the ongoing and planned activities and to clear up any questions.

Overall there were 4 plenary project meetings with all partners and subcontractors. The meetings were used to introducing and monitoring progress of the aims and planned activities. All presentations of the

meetings as well as extensive minutes and lists of actions have been made available at the EMODnet Ingestion extranet.

A progress meeting took place 14th February 2018 between EMODnet and Copernicus CMEMS with participation of EMODnet Ingestion partners MARIS, OGS, IFREMER, EuroGOOS and ETT, representatives of EU EASME, DG-MARE, and DG GROW, EMODnet Secretariat, and representatives of CMEMS to discuss cooperation and synergy options between EMODnet and CMEMS. This also included a discussion how CMEMS INSTAC might make use of EMODnet Ingestion and not promoting their own ingestion service. Later a follow-up was given by MARIS, IFREMER, EuroGOOS, and ETT which has resulted in adoption of EMODnet Ingestion by CMEMS INSTAC as channel for data submissions. This is now promoted at the CMEMS INSTAC portal.

MARIS participated in the EMODnet Steering Committee meetings where presentations were given of the project progress and discussions took place about tuning with the EMODnet Thematic portals. A further follow up was given by EMODnet Thematic projects for Geology, Physics and Seabed Habitats for advertising the EMODnet Ingestion portal at their portals and at their project meetings to recruit members of their thematic networks as qualified data centres for handling ingested data sets. This has been successful and the ingestion data centres matrix now counts 50 data centres qualified for the different EMODnet themes.

The following table gives a summary overview of the meetings which are relevant for the management and coordination of the EMODnet Ingestion project and its synergy and tuning of its activities with EMODnet overall and other EMODnet thematic projects.

Date	Location	Topic	Short Description
26 – 27 May 2016	Amsterdam, Netherlands	1st EMODnet Ingestion Projectgroup meeting	Presentations and discussions on aims and planned activities. Kick-off for the project.
10 June 2016	Brussels, Belgium	meeting of coordinator with EASME and DG-MARE	To discuss contractual procedures between EU and the consortium. Minutes of the meeting prepared by Coordinator and accepted by EASME.

Date	Location	Topic	Short Description
8 December 2016	Brussels, Belgium	progress meeting of MARIS, HCMR and RBINS with EASME, DG-MARE and EMODnet Secretariat	To discuss progress of development of the portal and data submission service. Planning for the launch of the portal and marketing activities
15 -16 February 2017	Brussels, Belgium	EMODnet Steering Committee meeting	Presenting progress on the project and contributing to discussions by MARIS and HCMR. It was agreed that all thematic lots and the EMODnet Secretariat would advertise the EMODnet Ingestion portal at the thematic and central portals. Synergy would be sought with the thematic networks for handling ingested data sets. This also applies for the Seabed Habitat Mapping lot.
10 – 12 April 2017	Limassol – Cyprus	2nd EMODnet Ingestion Projectgroup meeting	Monitoring the progress of the project, discussing coming activities, and providing input for preparing the 1st annual progress report to the EU.
30 – 31 May 2017	Espoo – Finland	EMODnet Geology kick-off meeting	Introducing EMODnet Ingestion and its planned cooperation with the Geology project and network by partners BGS, GEUS and GTK
5 – 6 July 2017	Genua - Italy	EMODnet Technical Working Group	Introducing EMODnet Ingestion and its planned cooperation with the overall EMODnet network
13 – 15 September 2017	Rome - Italy	EMODnet Steering Committee meeting	Presenting progress on the project and contributing to discussions by MARIS
22 September 2017	Antwerp-Belgium	EMODnet's Open Sea Lab Kickoff Event	Presentation of EMODnet Ingestion project by partner RBINS

Date	Location	Topic	Short Description
3 – 6 October 2017	Athens - Greece	EMODnet Seabed Habitats kick-off meeting	Introducing EMODnet Ingestion and its planned cooperation with the Seabed Habitats project and network by partner HCMR and JNCC
15-17 November 2017	Antwerp – Belgium	EMODnet 'Open Sea Lab' hackaton	Presentation of EMODnet Ingestion by partner VLIZ in workshop on marine open data and industry as data user and provider.
14 February 2018	Brussels - Belgium	EMODnet - CMEMS meeting	Discussing synergy between CMEMS INSTAC and EMODnet Physics, Chemistry, and Ingestion with participation of partners MARIS, IFREMER, OGS, ETT and EuroGOOS
21 – 23 March 2018	Majorca - Spain	EMODnet Steering Committee meeting	Participation and presentation of progress.
16 – 17 April 2018	Barcelona - Spain	3rd EMODnet Ingestion Projectgroup meeting	Presentations and discussions on progress with project activities, in particular with marketing, outreach and submissions. Planning further activities.
7 September 2018	Webconf	EMODnet communication and promotion	Discussion on tuning promotional and communication activities within the EMODnet network of portals towards external persons and entities
1 - 2 October 2018	Brussels - Belgium	EMODnet Technical Working Group meeting	Contributing to discussions on tuning technical developments within the EMODnet network
19 – 20 November 2018	Brussels - Belgium	EMODnet Steering Committee meeting	Contributing to discussions on overall progress of EMODnet and presenting progress of EMODnet Ingestion
3 – 4 April 2019	Rome - Italy	EMODnet Ingestion Final plenary project meeting	All consortium members have reported on their activities which has provided necessary input for the final project report.

As part of the contract there are several reporting obligations, which all have been fulfilled by MARIS. This concerned:

- Minutes of the contractual meeting of the Coordinator with EASME and DG-MARE on 10th June 2016;
- A total of 11 quarterly progress reports were submitted and accepted; note the first quarterly report covered 3.5 months and the third quarterly report covered 4 months to get in sync with normal quarters.
- First Annual progress report for the period of 19 May 2016 to 19 May 2017;
- Second Annual progress report for the period of 19 May 2017 to 19 May 2018.
- A follow-up has been given to the payment received by the EU for the 1st and 2nd years, gathering bank details and arranging bank transfers to all partners and subcontractors.
- Draft of Final progress report for the full project period of 3 years. This includes arrangements for handing over the project results to the EU by means of a transfer protocol and a digital transfer package on a USB stick with a copy of the website and related documents, software resources of the services, and export of metadata entries. Moreover, Annex III has been completed and signed.

WP0 contributed to the following Tasks:

- Task 7 – EMODnet tuning
- Task 10 – service continuity
- Task 11 – Project Management

These have been accomplished as described above.

WP1 – Construct and operate central Data Ingestion portal with services:

WP1 aimed at developing and operating the EMODnet Data Ingestion portal with services that facilitate data holders from public and private sectors to submit marine data sets and provide data management guidance, generating indicators about the performance, and upgrading the portal and services gradually on the basis of user feedback. The initial EMODnet Ingestion portal was launched in February 2017 and most of its planned services were realised in the first year. The portal itself is managed by means of an online Content Management System and it has been implemented with responsive design so that it can be used at multiple platforms (PC, tabs and smart phones).

The brainstorming about the portal and its services started at the project kick-off meeting and major progress with the specifications and developments was achieved at the Technical Working Group (TWG) meeting.

The EMODnet Data Ingestion portal should become a component of the present marine data management infrastructure and existing pathways towards the EMODnet data portals. The planned pathways should follow a common workflow: data are 1) submitted by data holding organisations and published '*as is*' at the Ingestion portal with support of assigned data centres; 2) validated, processed and stored in dedicated national data centres; 3) populated in the appropriate European infrastructure (such as SeaDataNet, EurOBIS and others depending of the theme), and 4) made part of EMODnet data portals.

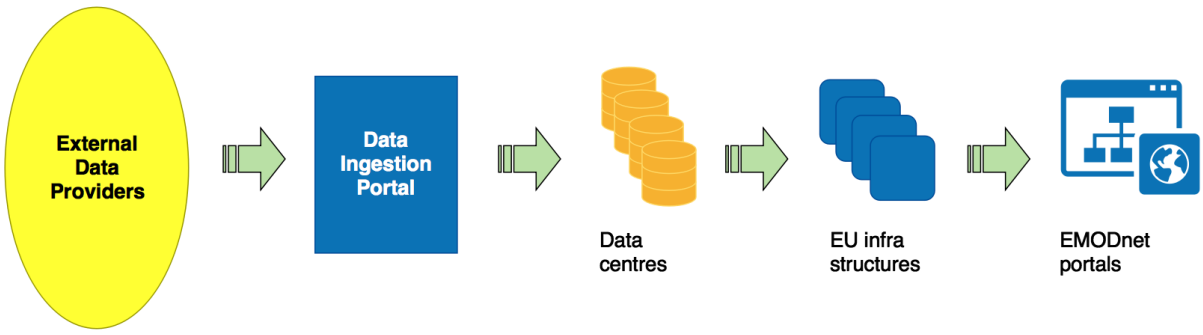


Image: overall workflow from external data providers to EMODnet portals

Submission Service:

Considerable efforts were dedicated to specifying and developing the online **Submission Service**. This was done by HCMR and MARIS together with a subcontractor GET from Greece and in tuning with the Technical Working Group. The EMODnet Data Ingestion portal focuses on data providers and their data

sets that are not yet handled and part of the mainstream arrangements and data handling processes of the EMODnet Data Centres. Potential data providers are marine data holders that are not yet routinely submitting data sets to national data centres and not (yet) used to practices and standards as used by the international marine data management community. Therefore, they must be supported to submit their data packages for open access and use in national data centres and EMODnet.

Potential data providers should submit marine dataset packages. Each package should consist of a collection of datasets and relevant documentation, accompanied by completing a **submission form** with a limited set of metadata to describe the datasets collection. For the submission form the ISO 19115-2 standard has been adopted and the form has been defined by HCMR, MARIS and GET also considering compliance with INSPIRE and practices at other ingestion systems, such as such as NOAAs Send2NCEI service. It is supported by SeaDataNet vocabularies and directories, while also free text is allowed when required terms cannot be found in the existing vocabularies and directories. These free text entries are called 'orphans'. The submission form and service have been developed to be user friendly and to capture easily and efficiently the information related to the data submissions. To make the threshold for submission relatively low the completion of the submission form has been split in 2 parts:

- **Part 1 submission form**: a number of key fields to be completed by the Data Submitter, including uploading of a zip file with the datasets and related documentation;
- **Part 2 submission form**: review of the received datasets package and part I metadata, and consecutive completion of the additional metadata fields of the submission form by the appointed Data Centre.

The submission service has been implemented by HCMR with technical support of GET and content support of MARIS. It provides mechanisms for effective documentation of data packages to be ingested. It also includes additional services such as for data tracking, key indicators, and entering and assigning Data Centres. The submission service works with roles for Data Submitter (DS), Data Centre (DC) and Master (M). There is a Dashboard (see image below) where the functions for each of the roles are displayed. The roles are maintained by the Master (MARIS and HCMR) and the Dashboard is dynamically displayed depending on the role(s) of the person that logs on.

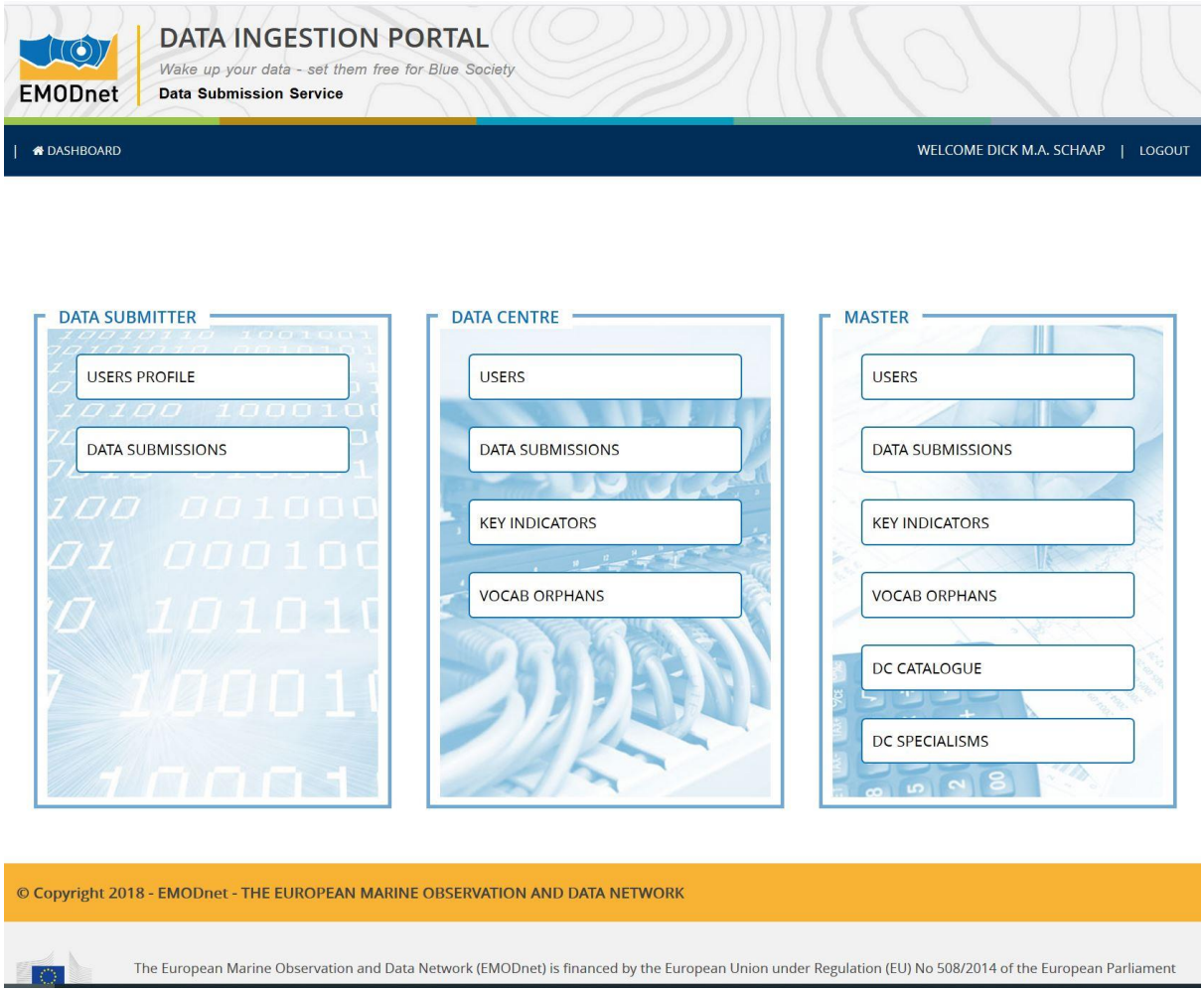


Image: Dashboard of the Submission Service with functions dependent of roles

The **Data Submission service** is a core service of the EMODnet Ingestion portal. It was launched together with the portal in February 2017 as part of the overall portal launch. Distinction is made between 2 phases in the life cycle of a data submission:

- **Phase I**: from data submission to publishing '*as is*'
- **Phase II**: further elaboration and integration (of subsets) in national, European and EMODnet thematic portals

This split gives a low threshold for data submitters and moreover allows to publish already in an early stage the original data package with high quality metadata. This is attractive as it will give more momentum to the EMODnet Data Ingestion service as it will prevent that a data submitter has to wait till the moment that the data package has been fully analysed and validated. Moreover, it will give more results as the original data package will be published next to possible validated datasets extracted from

the data package. The processing of phase I can be relatively short so that the received data package can be published 'as is' pretty soon after its submission.

The workflow process for **Phase I** from data submission to publishing of the submitted data package 'as is' is illustrated below.

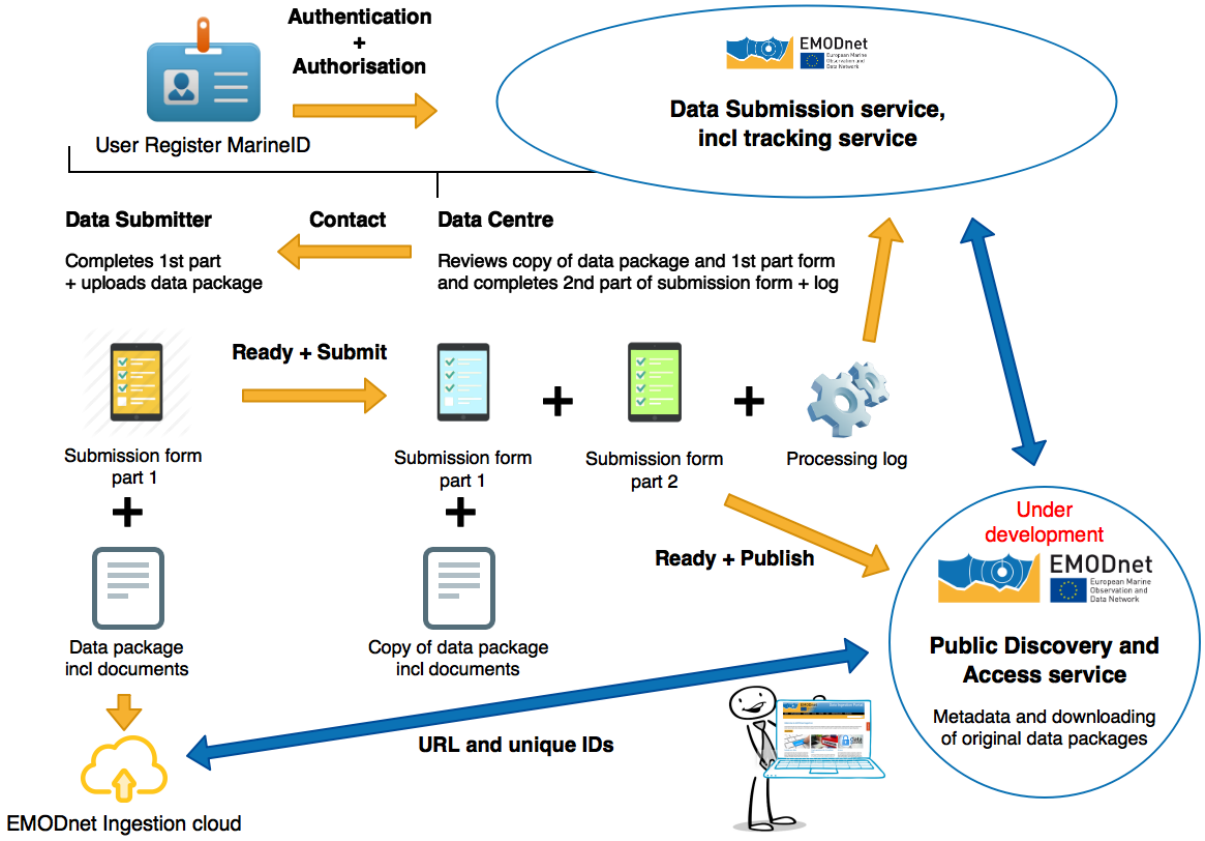


Image: Data Submission workflow for Phase I going from ingestion till publishing 'as is'

In **Phase II** the published datasets packages are further processed and curated by the assigned data centre, where possible and feasible. This happens, if needed in dialogue with the data submitter, in order to make these or subsets fit for long term storage and stewardship in their data management system and to share it with the appropriate European infrastructure and EMODnet thematic portal(s).

The validation and processing of data submissions will be made made easier for data centres if data submitters already apply standard data formats for their datasets collections and also provide relevant documentation as part of their submissions. That will greatly optimise the efforts and time needed for Phases I and II.

At the start the Submission service was only ready for phase I submissions. In May 2017 a temporary TEST Submission service was developed and released as a complete copy of the system in order to facilitate training by the Data Centres in the operation of the system and to get used to the roles of Data Submitter and Data Centre. Otherwise the production system would have to handle a lot of test submissions which would 'pollute' the actual contents. The use of the test system also brought forward a number of feedbacks. This concerned feedback about bugs, unclear instructions, and suggestions for improvements. An upgrading of the service has been undertaken where possible and useful, following the use experiences by data submitters and assigned data centres. The Submission service has also been made ready in November 2017 for phase 2 which concerns entering the URLs of portals where elaborated data sets might be found and entering DOIs for submitted scientific data sets, where available.

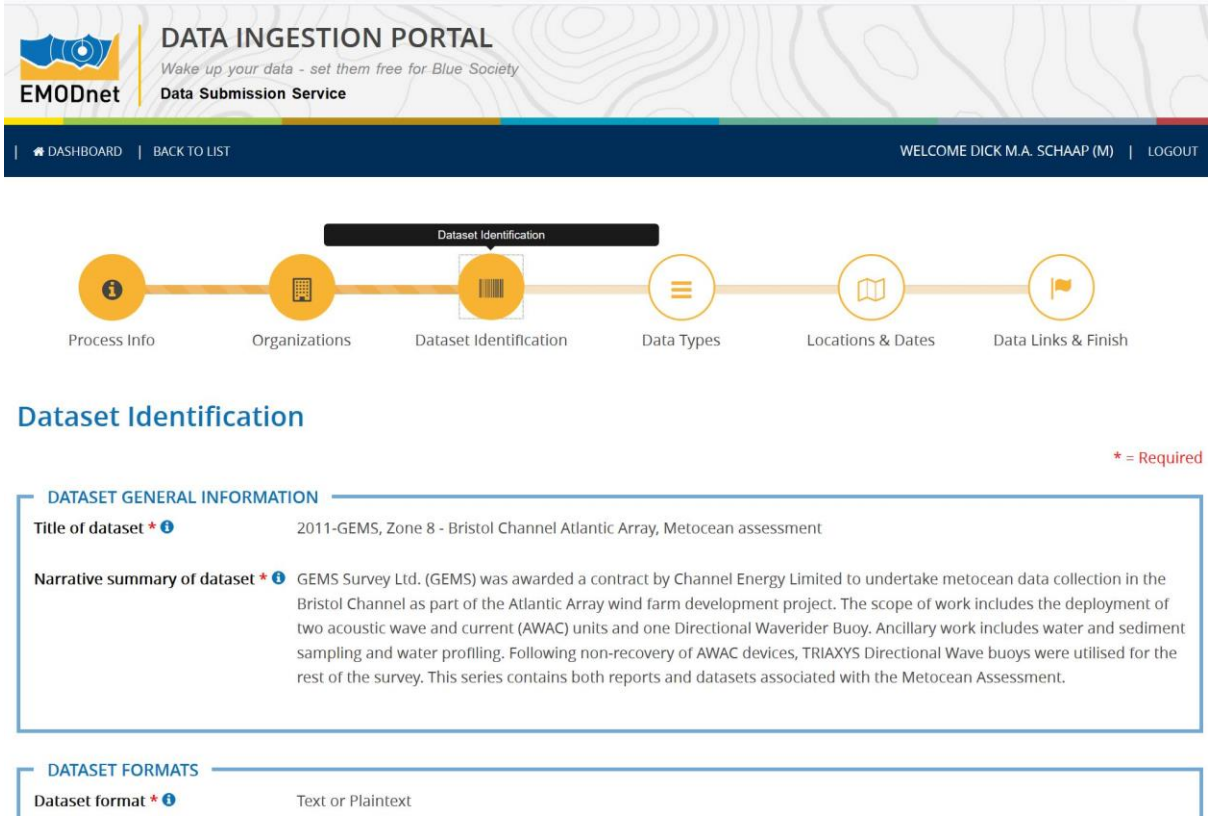


Image: Screenshot from the online Submission service

User registration:

The EMODnet Data Ingestion portal is public domain and all submitted data sets are considered as open data. However, a **user registration** is required for data providers to act as a data submitter for using the

Data Submission service with its range of functions. The user registration is required to ensure that data submitters have a unique logon which will be instrumental for managing their submissions and for tracking the further processing of their submissions. Data submitters must register once with **Marine-ID** in order to get a personal logon name and password. This is done by filling a web form and confirming that the user accepts the terms of use. The user will then receive a logon per email. Marine-ID is operated by IFREMER and also used by SeaDataNet and several other EMODnet portals for user registration, authentication and authorisation.

Data Centres Matrix:

The Masters can register specific data centres in the internal **Data Centres Matrix** from which Data Centres can be selected and assigned by the Masters for handling specific data submissions. This way Data Centres are coupled to specific Data Submissions, depending on country of data provider and data theme. The Data Centres can oversee in their Dashboard all data submissions in their account and undertake action for reviewing part 1 of submissions and completing part 2. This can be supported by direct communication between the Data Centre and the Data Submitter in order to get a better understanding of the submission and to allow for completing the submission form part 2.

Tracking Service:

A log is maintained of the steps in the workflow of the data submission service. Data Centres can also enter notes which are available as Process Info for both the Data Submitter and the Data Centre as well as the Master. This is administered as part of the **Tracking Service**. This is integrated in the Submission service to allow data providers to stay informed about the progress from data submission to publishing.

Orphans:

The Dashboard includes a function for Data Centres and Master to oversee possible 'orphans' in the submissions and to see if they can solve these by controlled terms from the SeaDataNet vocabularies and directories. If missing, they might have to take action for expanding and updating those with new terms, following the existing SeaDataNet governance procedures. Once updated, it is possible to edit the free text in the submission forms to controlled terms. It also might occur that the terms are already present but that the Data Submitter did not find them. In those cases, the DC and M can edit the submission forms using the 'orphans' function. Moreover, the Dashboard of DC and M contains a Key Indicators function as an additional way to give overviews of systems performance. This allows to set filters on the received collection of submission forms and to extract and oversee in graphics and tables the range of the received submission forms.

Extra vocabulary terms included:

The Submission service makes use of SeaDataNet controlled vocabularies where possible. These are managed and operated by BODC. This includes use of Measured phenomena: P08 > P03 > P02. However, some terms required by the theme 'Human Activities' were not collections of measurement phenomena,

but human activity keywords at broad and narrow granularity. Therefore, BODC established a new vocabulary 'HA2'. It consists of (fine granularity) human activity keywords in parallel to P02. It is mapped to P03 as well as P02 to form a common ontology. In the vocabulary interface and in the submission form it is solved by providing a concatenation of P02 and HA2: P08>P03>P02/HA2. This now provides the extra terms needed for describing human activity items.

Summary Records service:

Following the ToR the resulting metadata forms and associated data packages of phase 1 and 2 are to be made publicly available by means of the Summary Records service**.** For that purpose, the **View Submissions service** (aka Summary Records service) has been developed and publicly launched at the portal early October 2017 with a first 'harvest' of three submission metadata forms and their data sets which could be downloaded '*as is*'. From that point onwards there has been a steady increase of the number of published submissions as will be reported under key indicators. The **View Submissions service** as developed and operated by MARIS is regularly fed by harvesting JSON output from the **Submission service.** In February 2018 the service has been upgraded to handle also the extra information from phase 2 submissions. The first phase 2 submissions were completed by assigned data centres during March 2018.

The View Submissions service works with a facet search and the latest published submissions are displayed on top of the list. The facet search makes it easy to oversee the contents of the database by a number of facets such as sea area, observation type, parameters, instrument type, platform type, project/programme, data originator, data holder, and country. In addition, users can search for time period, geographical lat-lon box, and full free search. Each facet indicates its number of hits. Clicking on a facet gives downdrilling whereby the number of hits of all other facets are refreshed dynamically. This way a user can oversee what is in the database and can make his/her searches efficiently.

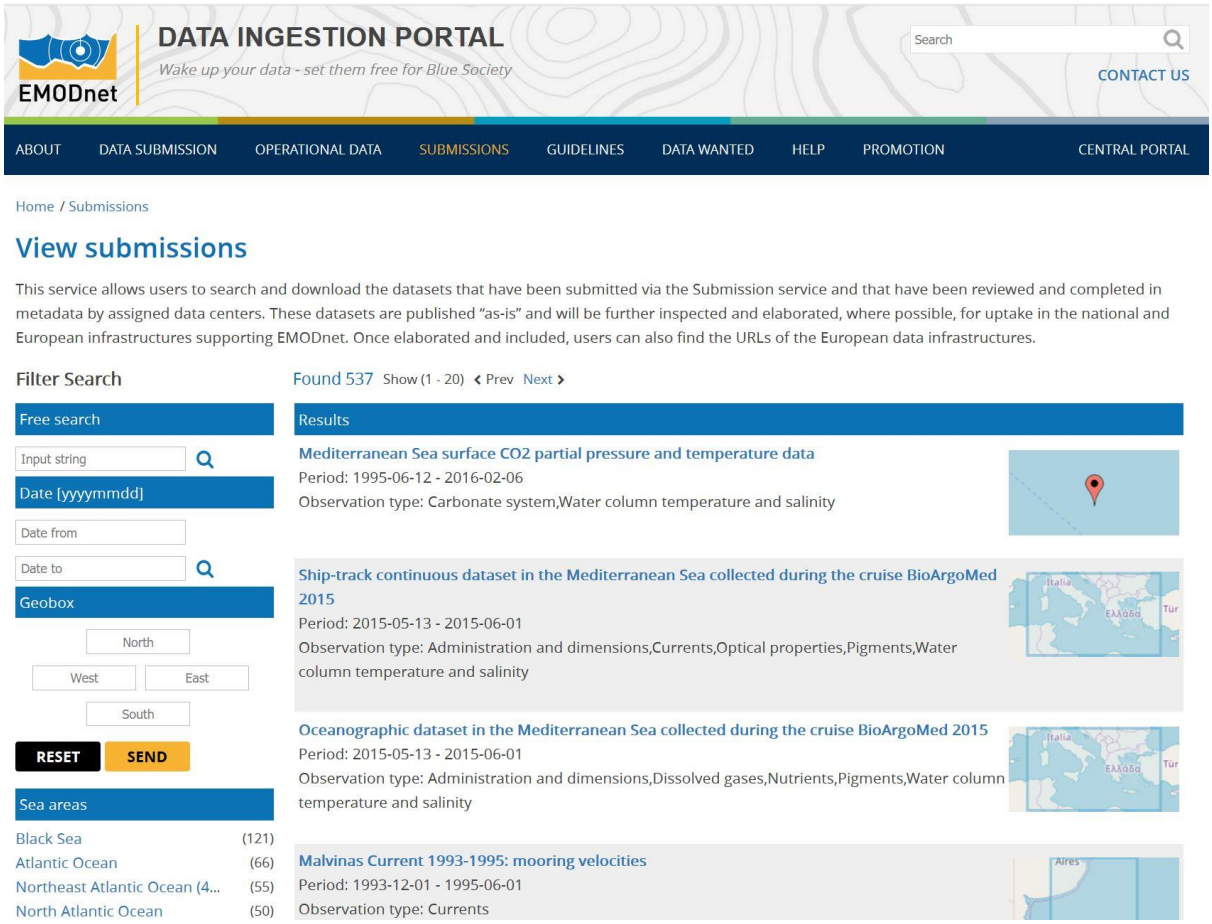


Image: Screenshot from the online View Submissions service

Public users can search for submitted data and download these '*as is*'. Moreover, it gives users the URLs for phase 2 completed submissions, where the elaborated datasets can be found, if applicable.

Data Wanted service:

The **Data Wanted service**, was developed by MARIS and launched at the portal in September 2017. The format for the Data Wanted service is extracted from the format of the View Submissions service. This service facilitates any user to formulate and post requests for data sets they are looking for. Those requests are managed in an online CMS and published as post-its. A registered user can submit multiple posts and, if needed, can disband its posts. All submitted posts are validated by the webmasters before publishing.

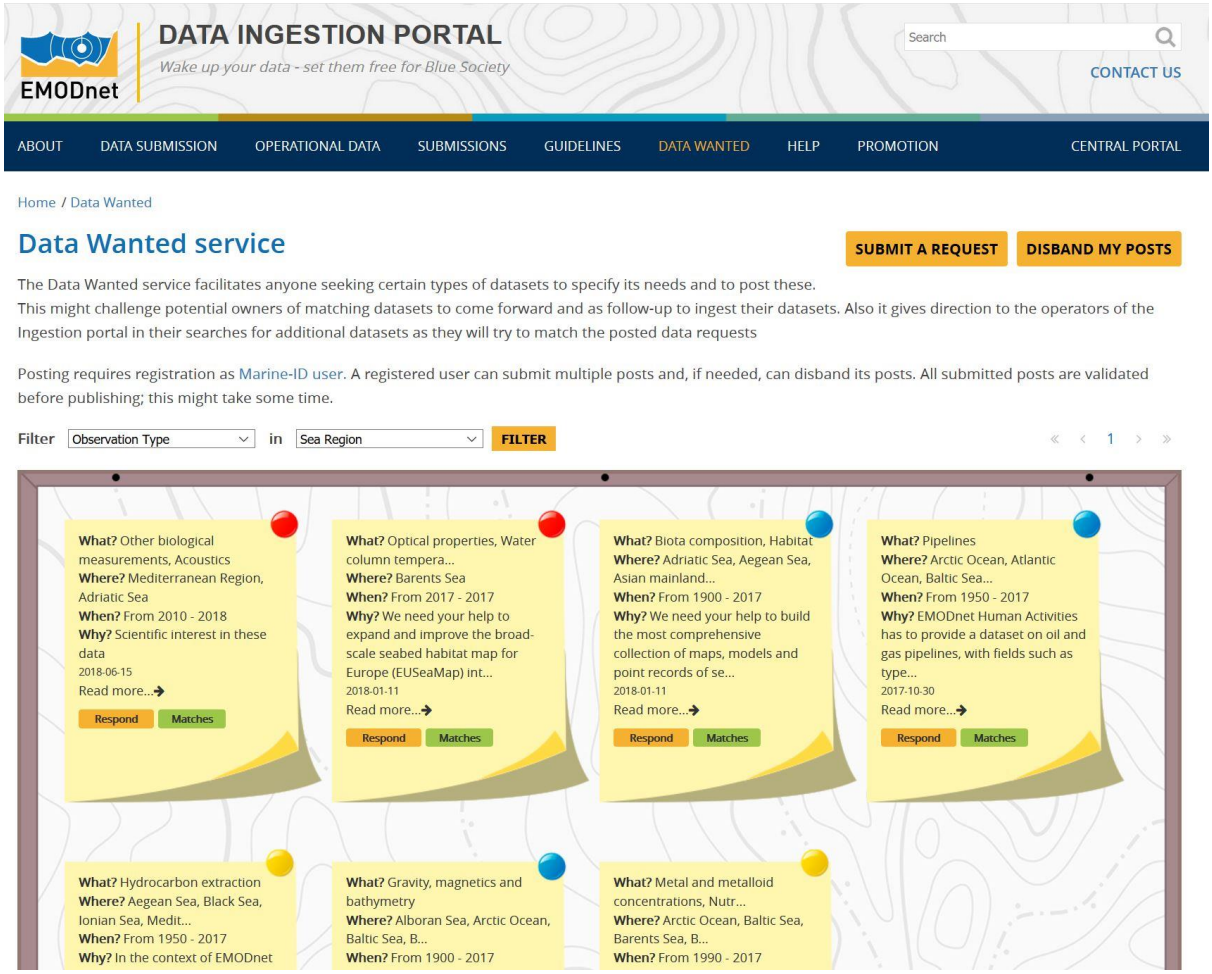


Image: Screenshot from the online Data Wanted service

The post-it's might challenge potential owners of matching datasets to come forward and as follow-up to ingest their datasets. Also, it gives direction to the operators of the Ingestion portal in their searches for additional datasets as they will try to match the posted data requests. The first post-it's were completed by EMODnet Thematic coordinators with their requests for additional data sets. Visitors of the service can browse the post-it's and can respond. These responses are also managed in the online CMS. Later on, also a '**matching service'** for data-wanted post-it's has been established. In practice a matching is made between published data submissions and data wanted post-its by means of a dynamic coupling table. If applicable, data wanted posts now feature a matching button which links directly to a subset of submissions in the View Submissions service. While originators of post-it's are alerted by email on a weekly basis and only if new matches have become available in that week, so that it will not be experienced as 'spamming'. The matching function is active at the portal (see images below) and the alert mailing service has been activated end of April 2019.

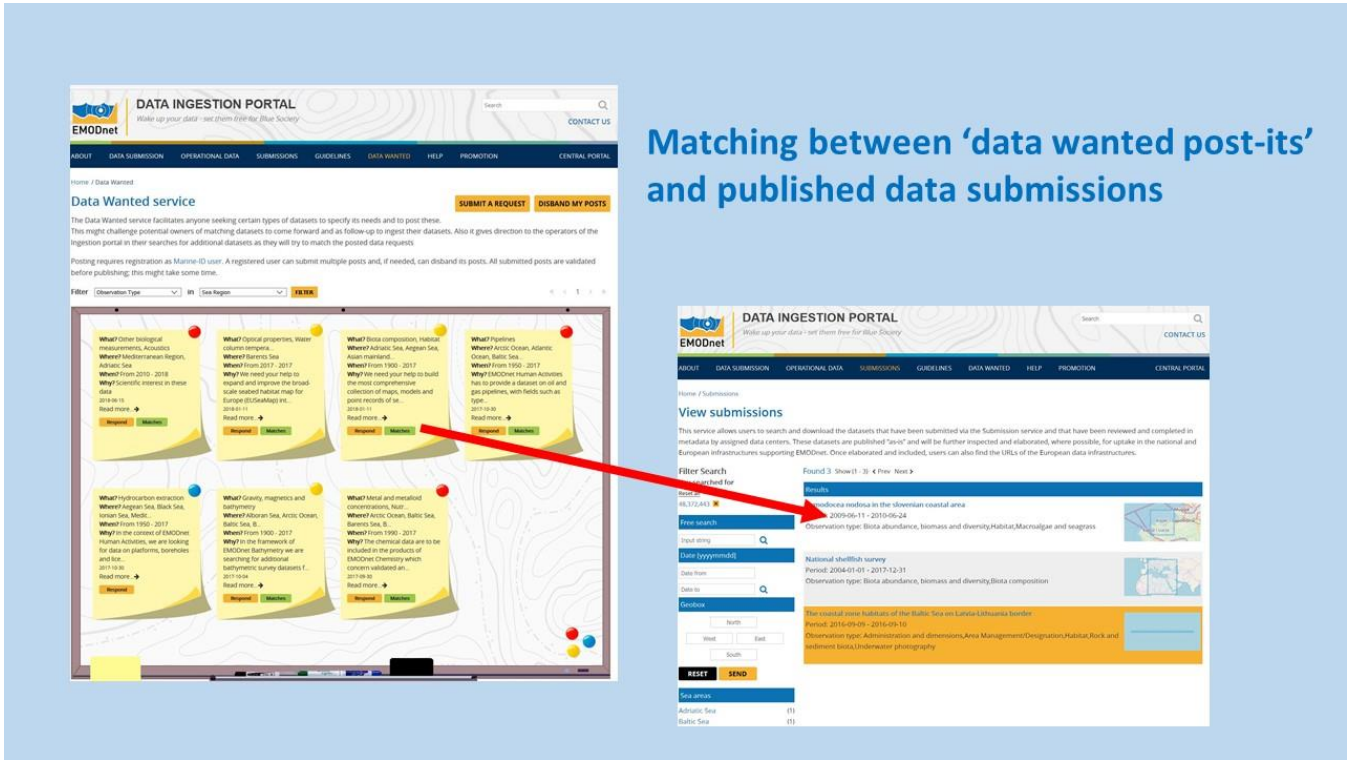


Figure: Data Wanted Matching service

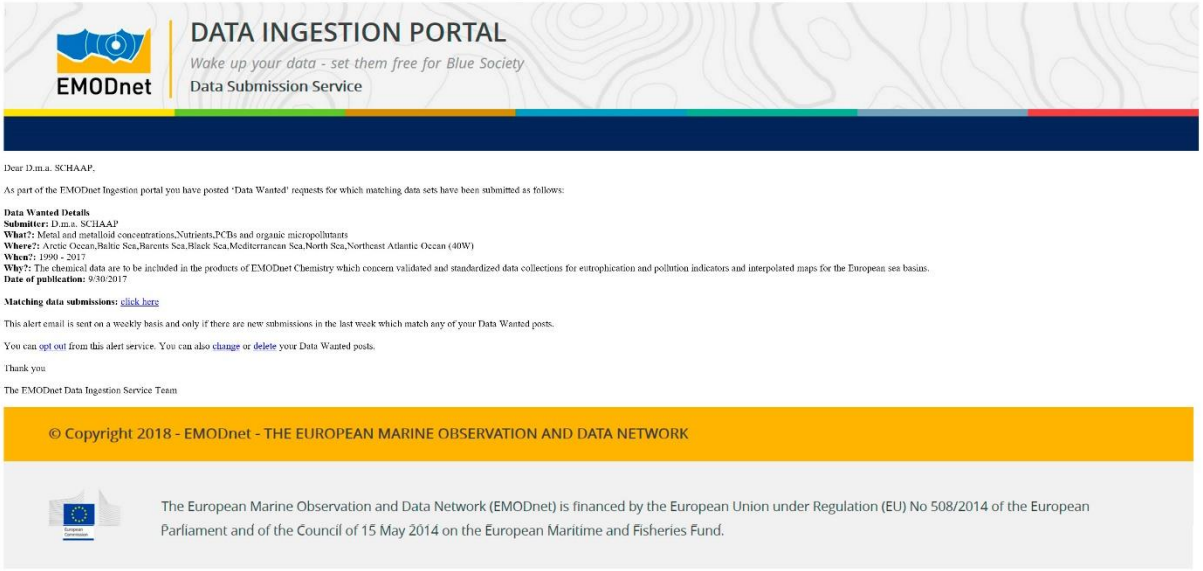


Figure: Example of the alert e-mail from the matching service

All services have been integrated by MARIS in the EMODnet Ingestion portal as part of the homepage and navigation menu. Upgrading was done on the portal for adopting the new styling that was developed by TRUST-IT in assignment by the EU for better harmonising the look & feel of the EMODnet portals.

Changes included inter alia an updated logo, new topbar and menu design, and adoption of 'open-sans' as font. And in discussion with EuroGOOS and CMEMS INSTAC the pages with information about how to join the European marine data exchange for operational oceanography were updated. Thereby, the position of ingesting operational data in the site map was prioritized to second position after submitting data files. Finally, a banner has been included in the homepage to promote the animation movie 'Wake up your data'.

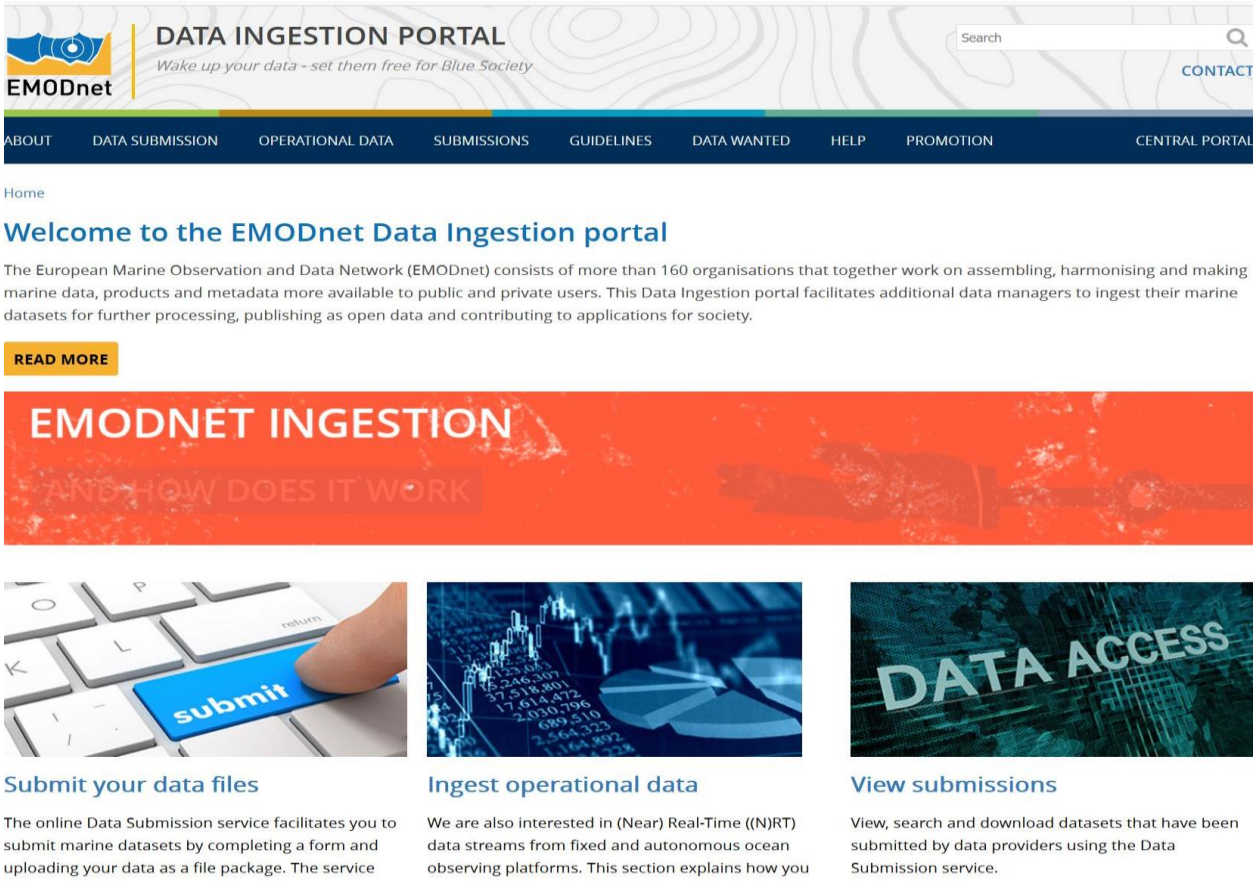


Image: impression of the upgraded EMODnet Ingestion portal with banner to the animation

As part of task 1 (web-portal) the EMODnet Ingestion portal has been maintained in the present quarter.

As part of task 8 (summary service) editing activities have taken place for the View Submissions service concerning replacing so-called orphan data for organisations, projects and cruises from free text into controlled EDMO, EDMERP and CSR terms. This improves the integrity of the metadata of the published data submissions for searches, reports and detailed pages.

Key Indicators:

From the Submission Service and Submission Viewing services a number of Key Indicators can be derived. These concern the number of submissions, their statuses of processing and publishing, involved data centres, data providers, etc. These indicators are used in the quarterly and annual progress reports. More information about these indicators will be given in chapter 8.

Marine Data Management guidance:

The assigned data centres review and curate data submissions in order to make these fit for long term storage and stewardship in their data management system and to share it with the appropriate EMODnet Data portal. However, there is a great variety of data types and formats around and as demonstrated in the regular practice of the data centres, it can take significant human efforts and time for processing, validating, converting and documenting of incoming data sets with the aim to include these in their data management systems. To ease and accelerate this process data submitters are encouraged to adopt common formats for metadata and data for the submitted datasets. For this purpose, a section on marine data management guidance has been included in the EMODnet Data Ingestion portal. Its gathering has been coordinated by HCMR and it includes guidance documents for preferred data and metadata formats next to relevant software.

Marine data include a very wide range of measurements and variables derived from a broad spectrum of multidisciplinary research projects and monitoring programmes. The data are collected by different institutes, governmental organizations or private companies using heterogeneous instruments and sensors installed in various observing platform. Depending on the data type, the acquisition systems, the delivery time frame or operations of the archiving centre, there is not a unique used data model and structure and the original measurement format may not be the same with the format that the archiving centre can accept. Alongside the data, additional information (metadata) is needed not only for quality control and archiving, but also for exchanging data or integration of them into regional or global data sets.

A summary of the basic data management guidelines used by the marine community is given at the portal with references to:

- **International Oceanographic Data and Information Exchange**
- **ICES Marine Data**
- **SeaDataNet marine and oceanographic data standards**
- **European Ocean Biogeographic Information System (EurOBIS)**
- **Marine Environmental Data and Information Network (MEDIN)**
- **International Hydrographic Organization (IHO)**

There is a vast range of software tools, both open and commercial licenses that can be applied for formatting and quality checking of marine data types. The following software references have been included:

- **Ices Marine Data Tools**
- **SeaDataNet Tools**
- **Integrated Publishing Toolkit (IPT) for biodiversity data**

WP1 contributed to the following Tasks:

- Task 1 - web-portal
- Task 5 – tracking service
- Task 6 – data wanted service
- Task 8 – summary service

These have been accomplished as described above.

WP2 – Implement pathways to forward submitted data to the appropriate repository:

WP2 aimed at specifying and implementing pathways (= task 2) for delivering data using the Data Ingestion portal to safe repositories, making use of and streamlining existing pathways where possible, and developing and operating a help service (=task 4).

As explained in WP1 a distinction is made between 2 phases in the life cycle of a data submission:

- **Phase I**: from data submission to publishing of the submitted datasets package '*as is*'
- **Phase II**: further elaboration of the datasets package and integration (of subsets) in national, European and EMODnet thematic portals.

The related processing steps to go from submission to publishing in EMODnet portals are considered '**pathways**'. Part 1 submission forms with data packages as received through the Data Submission service are assigned by the masters MARIS and HCMR to one of the members of the EMODnet Ingestion network of qualified data centres depending on the country of the data provider and the type of EMODnet theme of the data. For the pathways the principle is applied, where possible, that data from originators should be managed by data centres in their own country. This contributes to a greater acceptance, increased opportunity of success and encourages a longer-term perspective for the ingestion service. Assigned data centres will first of all give a follow-up, if needed in dialogue with the data providers, for reviewing part 1 and completing part 2 of the submission form in order to achieve phase I publishing in the View Submissions service. Where possible this is followed by validating and processing the received data packages to common standards for uptake and long-term storage in their data centres. From there the elaborated data sets are also populated in relevant European infrastructures that are feeding into the EMODnet Data portals.

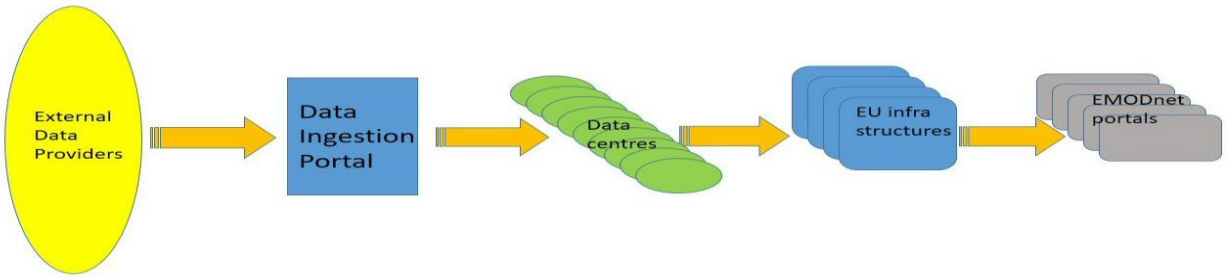


Image: EMODnet Ingestion workflow from submission to availability in EMODnet

Oceanographic and marine data include a very wide range of measurements and variables covering a broad, multidisciplinary spectrum of projects and programs. Oceanographic and marine data are collected by several thousands of research institutes, governmental organizations and private

companies in the European countries and non-European countries bordering the European seas. In the present European landscape, a leading role in marine data management is performed by dedicated data centres of marine research institutes - often acting as NODC -, national geological surveys, and hydrographic agencies. These data centres have the essential capabilities and facilities for data quality control, long term stewardship, retrieval and distribution. These centres are actively involved in national research and monitoring activities and have established arrangements for managing resulting data on a national and thematic basis. Moreover, these data centres work together on a pan-European and international scales in organisations such as IODE, ICES, EuroGeoSurveys, EuroGOOS, and IHO, and in EU data management infrastructures such as e.g. SeaDataNet and EurOBIS.

The existing pathways for the EMODnet thematic portals can be summarized as follows:

a. **EMODnet Chemistry**: marine chemistry data are routinely gathered by data centres (in particular NODCs) from data providers in their country (both from research and monitoring activities) and after QA-QC and processing stored in their databases. This is followed by populating metadata and data into the European **SeaDataNet** infrastructure, which is managed by the NODCs in Europe, and which then provides the basis for making chemistry data available for the EMODnet Chemistry portal and its products generation
b. **EMODnet Bathymetry:** marine bathymetry data are routinely gathered by data centres (national hydrographic services and marine research institutes) from data providers in their country (both from research and monitoring activities) and after QA-QC and processing stored in their databases. This is followed by populating metadata and data into the European **SeaDataNet** infrastructure, which is managed by the NODCs in Europe, and which then provides the basis for making bathymetry data available for the EMODnet Bathymetry portal and its products generation.
c. **EMODnet Physics:** this portal is built upon 2 data streams, Near Real Time (NRT) data from operational monitoring stations and archived data. The NRT data stream will be dealt with in WP3. The archived physical data sets are routinely gathered by data centres (in particular NODCs) from data providers in their country (both from research and monitoring activities) and after QA-QC and processing stored in their databases. This is followed by populating metadata and data into the European **SeaDataNet** infrastructure, which is managed by the NODCs in Europe, and which then provides the basis for making archived physical data available for the EMODnet Physics portal and its services.
d. **EMODnet Biology:** this portal is built upon a number of data streams from European infrastructures such as EurOBIS, SeaDataNet, ICES, depending on their type. Marine biological data sets are routinely gathered by data centres (NODCs and marine biological research institutes) from data providers in their country (both from research and monitoring activities) and after QA-QC and processing stored in their databases. Biodiversity data are populated with metadata and data into the European **EurOBIS** infrastructure, which is managed by VLIZ in

Belgium; fisheries data are populated with metadata and data into the international **ICES** infrastructure, which is managed by ICES based in Denmark; biochemistry and other types of biological data are increasingly populated with metadata and data into the European **SeaDataNet** infrastructure. These 3 major streams from EurOBIS, ICES and SeaDataNet are then made available for the EMODnet Biology portal and its products generation, using interoperability solutions, because the formats of metadata and data are not the same.

e. **EMODnet Geology:** earlier this portal focused more on generating and publishing data products and less on discovery and access of geology data itself. However there is a strategic implementation plan from the National Geological Survey Organisations (NGSO) underway for developing and implementing the European Geological Data Infrastructure (EGDI) under the umbrella of EuroGeoSurveys (EGS), based on the successes of earlier joint projects including OneGeology Europe. EGDI is now part of the EMODnet Geology portal and it gathers and provides pan-European datasets and information services about geology. More than 30 NGSO partners that are members of EGS (mostly national geological surveys) are working together. At the EMODnet Geology kick-off meeting it was decided also to refer by means of OGC web services to SeaDataNet geology that have been populated by national geology surveys and marine research institutes in the frame of the earlier EU Geo-Seas project. These data sets are part of the SeaDataNet CDI service infrastructure.

f. **EMODnet Human Activities**: Marine data on human activities are a peculiar case, compared with other marine data domains. It concerns a heterogeneous array of spatial datasets. More importantly, there is no community of reference at EU level for human activities at sea. Neither are there – generally speaking – agencies, institutes or governmental bodies at Member State level that are specifically mandated to collect marine data on human activities as a whole. There are a few EU sources, but data may be sourced from a multitude of sources at national level. A wide range of sources is currently feeding EMODnet Human Activities and its team carries out a series of controls, in terms of data quality, lineage, integrity, and completeness. In the case of Human Activities, ingested data sets are elaborated by the consortium led by COGEA, that is developing and operating the EMODnet Human Activities portal.

g. **EMODnet Seabed Habitats**: this lot was not a contractual partner in the EMODnet Ingestion consortium. However through the discussions in the EMODnet Steering Committee JNCC as coordinator committed itself to play a 'pathway' role for seabed habitat data ingestions and it engaged its project partners to be part of this pathway. They also held a training workshop at one of its project meetings using the test submission service in order to train its members.

This gives the following schematic view on how the EMODnet Data Ingestion portal and services are embedded and how the various actors and components have been structured for an integrated workflow from data providers towards EMODnet.

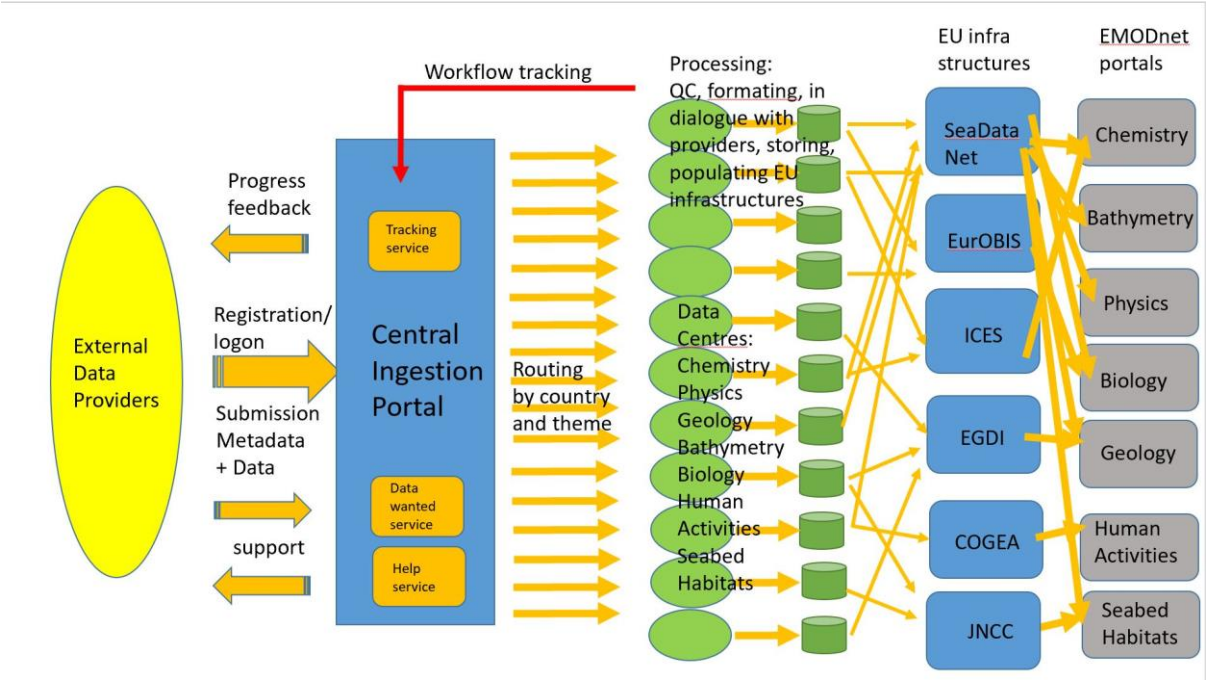


Image: EMODnet Ingestion workflow from submission to availability in EMODnet in more detail

As part of the operation for phase II the assigned data centres undertake the following steps:

- Retrieve a copy of the new submitted data package with its package metadata from the ingestion service
- First evaluation of type of data, data provider, status of package
- Inclusion in local workflow for validating and processing the data package
- Maintaining status information about workflow in the central Data Tracking service
- Contacting data providers by email or phone in case of questions
- Including the data sets if ok in the local database system
- Making the metadata and data part of their local data discovery and access system, possibly registering a Data Object Identifier (DOI) to a data set or to a group of data sets from the same data provider in case of a scientific data collection as extra encouragement to researchers
- Preparing the metadata and data sets for population into the appropriate European infrastructure such as SeaDataNet, EurOBIS or others
- Undertake final actions for publishing through the appropriate European infrastructure and feeding the related EMODnet portals
- Include the phase II publishing URLs in the submission forms in the Submission Service and the Summary Records service.

Involving only the EMODnet Ingestion consortium is not sufficient to cover most countries and EMODnet

themes. Therefore, also the groups of Data Centres which are involved in each of the EMODnet Thematic portals have been approached. This way the network of capable data centres has been expanded to cover all themes and a majority of European countries.

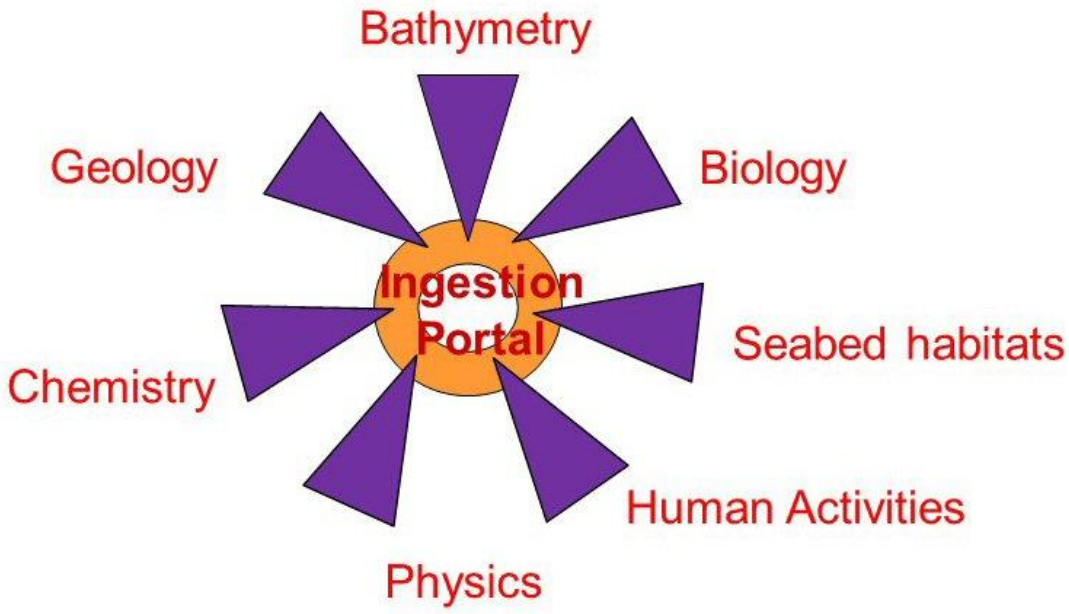


Image: involving all EMODnet thematic networks in the Ingestion pathways

This was arranged by MARIS asking all thematic coordinators to engage their networks in the pathways for EMODnet Ingestion and to bring this forward to their consortium members at their kick-off meetings. The idea received a positive response and each of the EMODnet Thematic lots included an EMODnet Ingestion presentation at its kick-off meeting to inform their network members and to request cooperation for the pathway tasks. In the first year this was already performed for EMODnet HRSM, EMODnet Physics, EMODnet Chemistry, and EMODnet Human Activities. In the second year this was followed up by EMODnet Geology, EMODnet Biology, and EMODnet Seabed Habitats.

As a follow-up MARIS received details of individual data centres with their contacts and has entered these into the Data Centre Matrix of the Submission service. They are actively involved in the processing of data submissions that are relevant for their expertise and country. It also includes giving instructions and training in the submission procedures. For that purpose, HCMR drafted concise manuals for Data Submitters and Data Centres for using the Data Submission service. These manuals are posted at the EMODnet Ingestion portal and are very useful as instruction material to users of the Submission service. The Data Centre Matrix of engaged data centres currently counts **50** qualified data centres. All relevant EMODnet themes are covered. Some centres can stand-in for multiple countries.

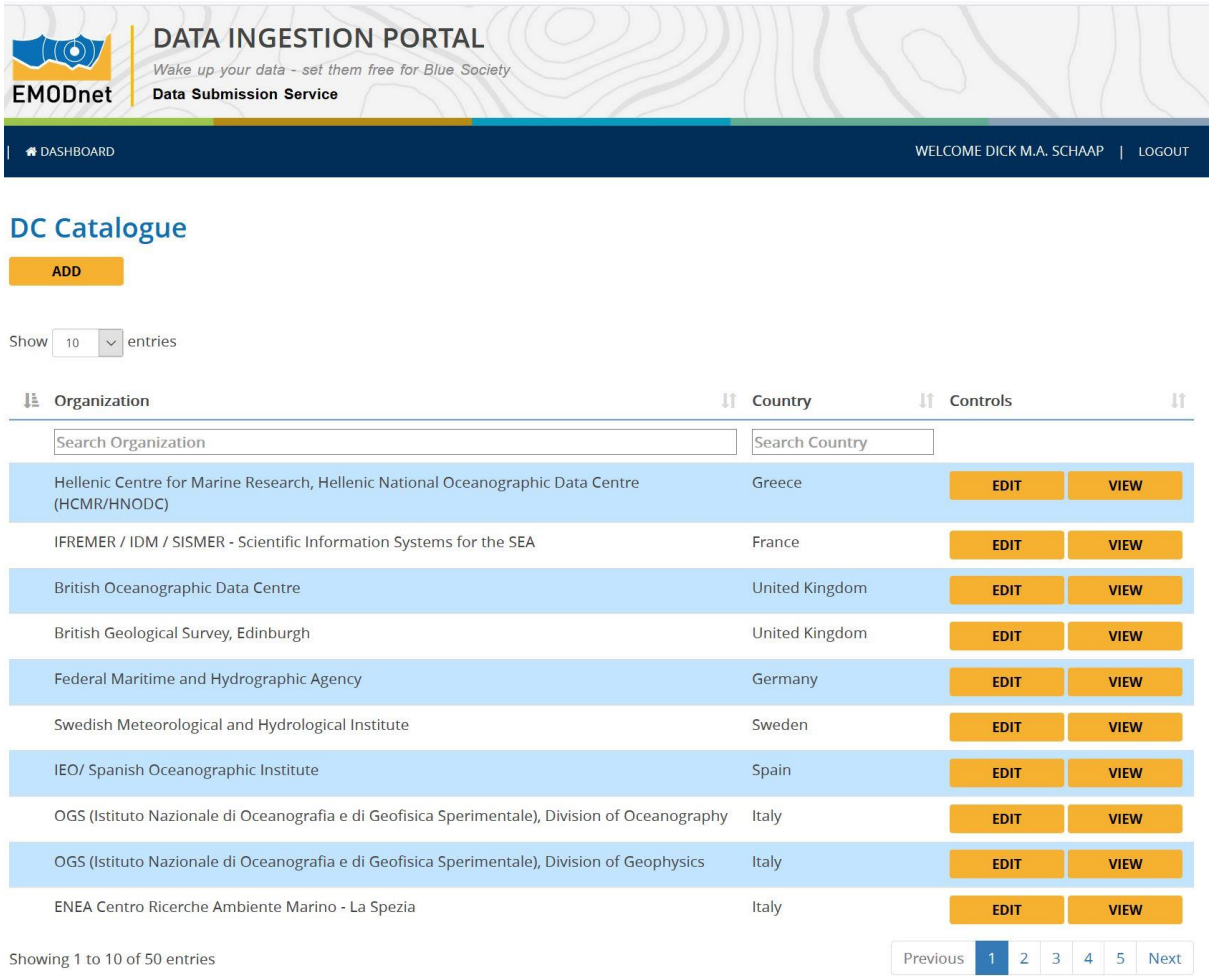


Image: screenshot of the Data Centre Matrix in the Submission service

On behalf of the European Geological Data Infrastructure (EGDI) as being developed and operated by the network of marine geological surveys in Europe, it has been decided that partner GEUS (Denmark) will function as EMODnet Ingestion data centre for completing and processing marine geology data set submissions and if possible, making these fit for publishing in EGDI. This in complement to capabilities at national data centres for handling marine geological data sets.

Comparable 'safety nets' have been agreed for marine biological data whereby VLIZ on behalf of EurOBIS will complement national capabilities of the EMODnet Ingestion data centres network, for bathymetric data whereby Shom will play this role, and for seabed habitats data whereby this role is divided over regions with each region having a leading data centre.

During the second and third project years excellent momentum has been gained with achieving data submissions and with completing these by assigned data centres to be published 'as is' in the View Submissions service. Many of the data centres have been actively involved in the processing of data

submissions that were relevant for their expertise and country. And many submitted data packages have been elaborated and populated into European data infrastructures driving EMODnet portals. The momentum and pace hav been gained under influence of the considerable marketing and outreach activities that have been undertaken by the EMODnet Ingestion consortium members. These activities will be reported under WP4 while the achieved submissions will be reported in the chapter 8 on key indicators.

Optimising pathways:

A number of activities have been undertaken for optimizing pathways, in particular by seeking coupling with existing mechanisms.

A (semi-)automatic coupling was established between SEANOE and EMODnet Ingestion. SEANOE is a French national science ingestion portal (www.seanoe.org) operated by IFREMER. It started in 2015 and now has > 300 entries. SEANOE has been adopted as extra service at the SeaDataNet portal, inviting European scientists to publish their scientific papers and associated data collections in return for a DOI which will facilitate their wider citation. The coupling facilitates that (selected) scientific submissions from SEANOE are harvested by EMODnet Ingestion for further metadata completion, publishing 'as-is', and elaboration of data sets for inclusion and publishing in national and European portals. It started with a mapping by IFREMER and HCMR between the data models of SEANOE and the EMODnet Submission service. This mapping revealed a number of items, such as fields which are optional in SEANOE but mandatory in EMODnet. In discussion between IFREMER as SEANOE manager and HCMR + MARIS as EMODnet Submission managers it was decided how to overcome the issues in a pragmatic way and to establish the coupling in practice. As follow-up already several SEANOE submissions have been exchanged for further population and elaboration in the EMODnet Ingestion portal.

For the Netherlands a use case on North Sea wind energy was developed (see also WP4). A number of data submissions from wind farm monitoring have been completed by Deltares together with RWS at the Ingestion portal which are published 'as-is'. These data sets concern bi-valves, pelagic fish, demersal fish and gillnets. A meeting between Deltares and VLIZ took place to discuss in more detail how metadata and data in the Dutch national AQUO standards could be converted to the EurOBIS standards, while also a meeting took place between Deltares and MARIS concerning conversion to SeaDataNet standards. The AQUO – EurOBIS conversion procedure has been essential for 'porting' biological monitoring data from the wind farms into EMODnet Biology, which has been brought into practice for several data submissions for the North Sea wind energy use case. The AQUO – SeaDataNet conversion procedure is relevant for 'porting' additional submissions for other disciplines from wind farm monitoring activities as well as from the national Rijkswaterstaat marine database into SeaDataNet and from there into several EMODnet thematic portals. Deltares has established the AQUO – SeaDataNet and AQUA – EurOBIS conversion procedures and has applied these for:

- converting a large volume of chemical and physical data sets from the national Rijkswaterstaat marine database into SeaDataNet formats. More than 8.500 CDI records have been generated and populated into the CDI service. In particular it concerns water quality data, namely for eutrophication which is highly relevant for EMODnet Chemistry. More CDIs are underway for contaminants data and physical parameters. These CDI submissions have become available in relevant EMODnet thematic portals;
- elaborating a number of ingestion submissions for biological data acquired in the context of the monitoring of wind farm impacts in the Netherlands North Sea sector into populations for EurOBIS ic EMODnet Biology. This is illustrated in the image below.

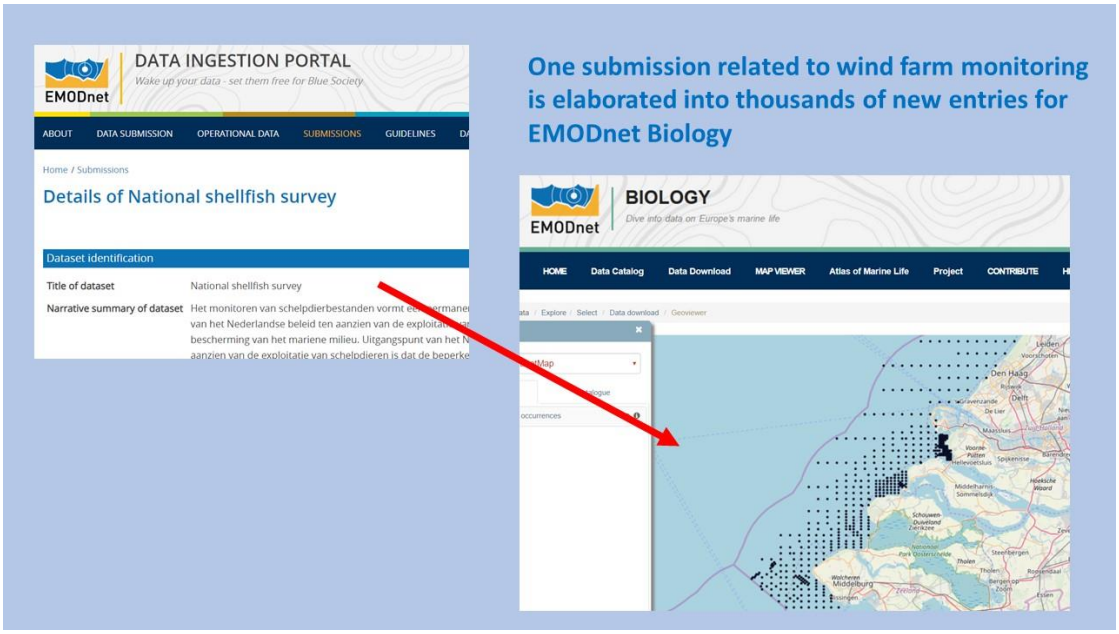


Figure: Example of submission elaborated into multiple entries in EMODnet portal

A comparable initiative has been agreed with the United Kingdom where Crown Estate has set up and operates the portal www.marinedataexchange.co.uk in the framework of North Sea wind energy developments. In deliberation with BODC and Crown Estate a number of manual selections and submissions have been derived from this portal and ingested into EMODnet Ingestion. However a (semi-) automatic harvesting from the UK portal to EMODnet Ingestion has not been achieved due to complexity.

Help desk service:

A Service-desk has been established at the Ingestion portal, which is accessible by telephone and email. The telephone service operates during EU working hours and e-mails are answered within 2 working days. All queries are tracked and a record is kept of all queries. Recorded queries are analysed to elaborate a Frequently Asked Questions (FAQ) section at the portal and to provide indicators such as

response time of the service-desk. The help desk service has been launched together with the launch of the portal. This required some engineering as the main domain **emodnet-ingestion.eu** is running at MARIS while the service desk runs at IFREMER. The email address support@emodnet-ingestion.eu has been plugged to the ticket system that IFREMER uses for IT and telecommunication support. An EMODnet sub-desk has been configured. In practice every incoming email is registered and forwarded to the right person for responding while keeping track. This email ticket system also allows to generate indicators. Answers to emails are sent to users again with support@emodnet-ingestion.eu as sender. The implementation of a direct telephone service gave some implications such as 1) cost of the phone call for a user, 2) not all people in IFREMER are fluent in English, 3) answers might take more time as it might require further analyses, 4) there is not always somebody available, 5) manual inputs of the calls in the database will be needed for the statistics. Considering these implications and also taking into account the relatively low traffic of the service, it was decided to implement an alternative solution: a user can ask by email to be called back, indicating the telephone number and the question. This way the question can be given to the right person for study and the emails are registered in the ticket system with tracking of follow-up. This is also operational at the portal since the launch in February 2017.

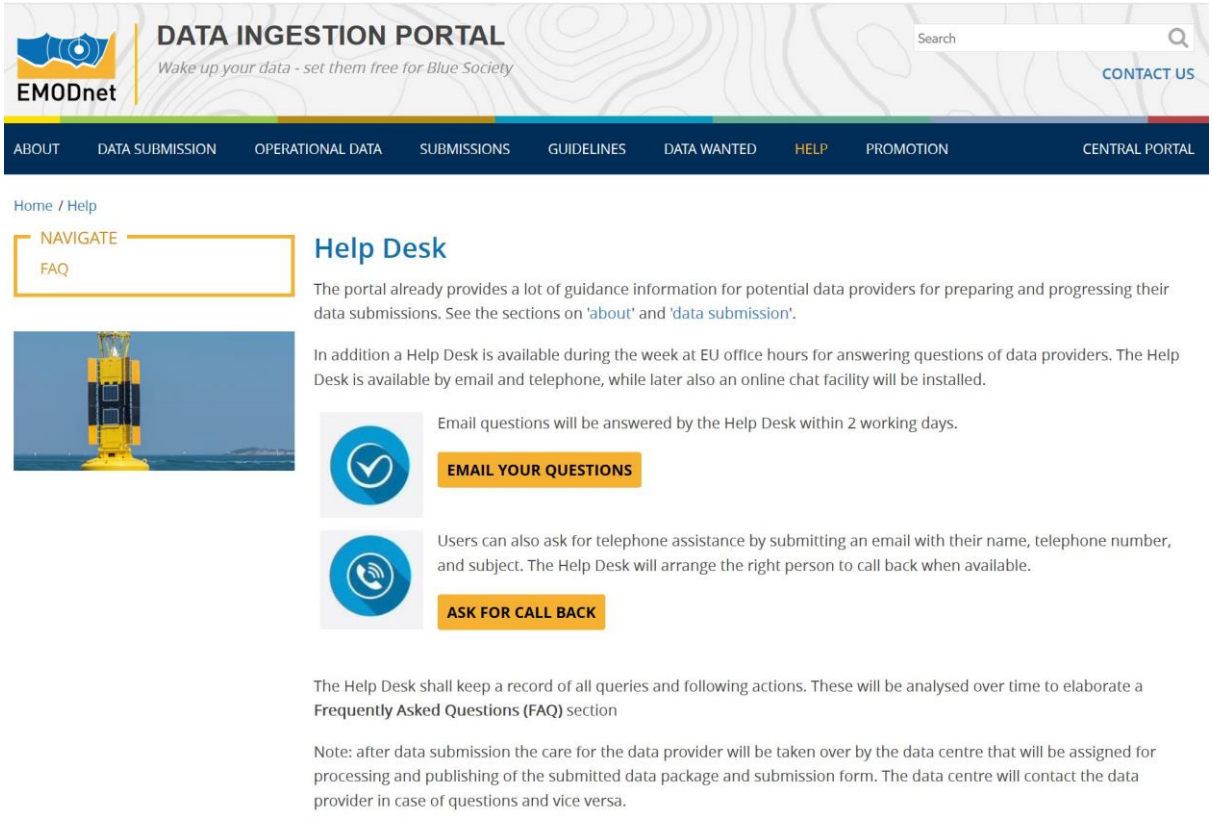


Figure: Help desk page at portal

A total of 25 requests were received and answered since the start. Several items have been included in the FAQ. More details are given in chapter 9.

WP2 contributed to the following Tasks:

- Task 2 – pathways
- Task 4 – help service

These have been accomplished as described above.

WP3 – Facilitate machine-to-machine transfers:

WP3 aimed at facilitating faster availability of data by establishing direct connections between monitoring stations and repositories and towards EMODnet by machine-to-machine transfers and at working out a scenario whereby monitoring data remain at the source repository and are available to EMODnet by services (= Task 3 – machine-to-machine).

The EMODnet Ingestion consortium has proposed to focus this at developments for operational oceanography and for the EMODnet Physics portal. It concerns two separate tasks:

- Establishing new connections to the existing EuroGOOS – Copernicus INSTAC Near Real Time (NRT) exchange progress
- Pilot for Real Time (RT) exchange using Sensor Web Enablement (SWE).

Near Real Time (NRT) oceanographic data exchange:

At the portal a separate section is dedicated to informing and promoting operators of operational oceanography networks to join the NRT data exchange. This is illustrated below.

The NRT machine-to-machine ingestion aimed at identifying and arranging additional NRT data stations for EMODnet Physics. These can originate from additional operators that are willing to get connected and share their NRT data freely in EMODnet Physics. At the launch of the Ingestion portal in February 2017 already standards and procedure for NRT data and a list of receiving repositories for NRT data had been published at the portal. The portal explained how the NRT exchange is organised between operators of observing stations and EuroGOOS – Copernicus (CMEMS INSTAC) and it includes a link to the EMODnet Physics portal to show how NRT stations can be displayed and used. Moreover, a set of stepwise instructions was included in the Ingestion portal explaining how to connect in practice and also a list of EuroGOOS – Copernicus contact persons who to contact depending on region.

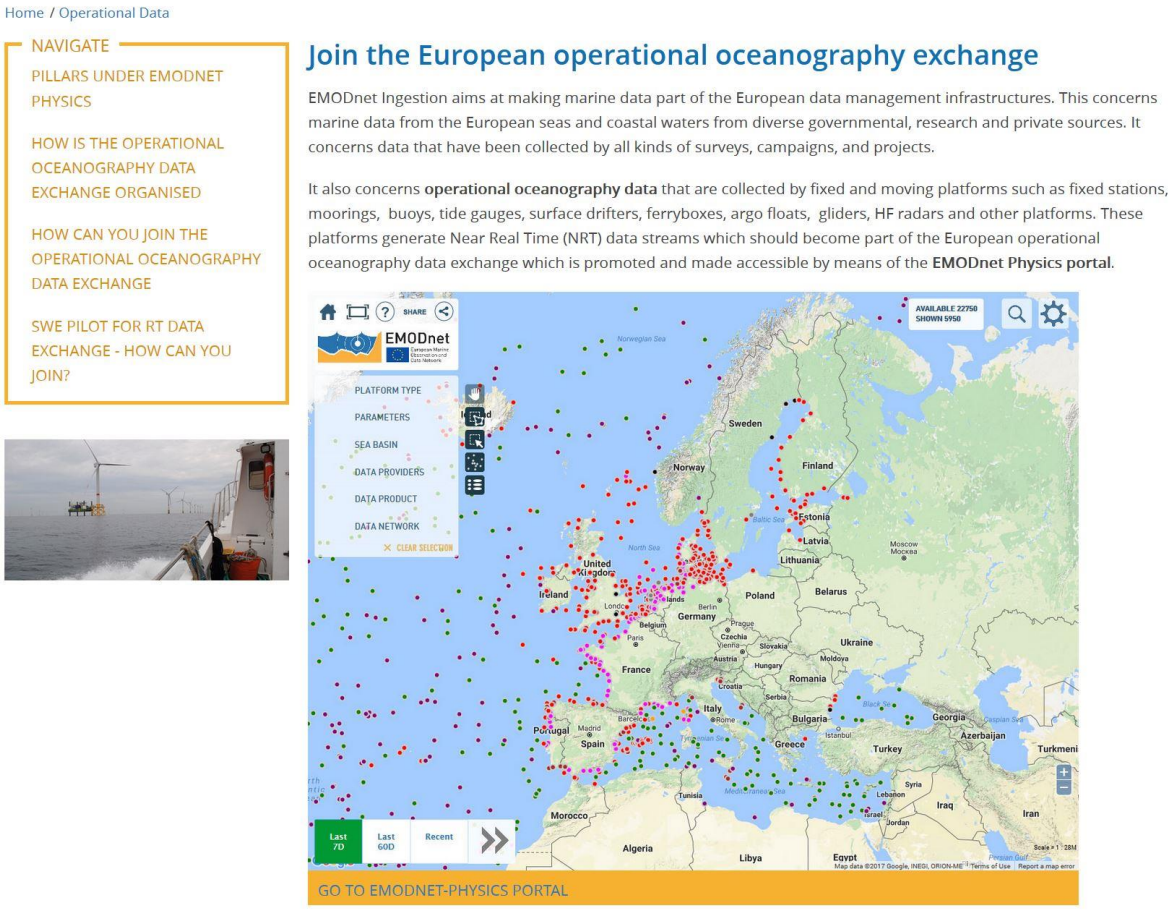


Image: NRT data exchange introduction page at the EMODnet Ingestion portal

In the second reporting year these guidelines and stepwise instructions for observing platform operators have been reviewed and amended in direct communication with CMEMS-INSTAC (Copernicus) and EuroGOOS. The workflow diagram has been amended, whereby it has been agreed that interested operators should contact theCMEMS INSTAC contact at cmems-sevice@ifremer.fr who will then bring the interested operator in contact with the right EuroGOOS – Copernicus contact person. This amendment was needed because it happened that interested operators contacted the wrong contacts which led to complications in the data flows. The amended workflow is given in the image above. It has also been included in the CMEMS INSTAC portal at their data submit page which now promotes the EMODnet Ingestion portal.

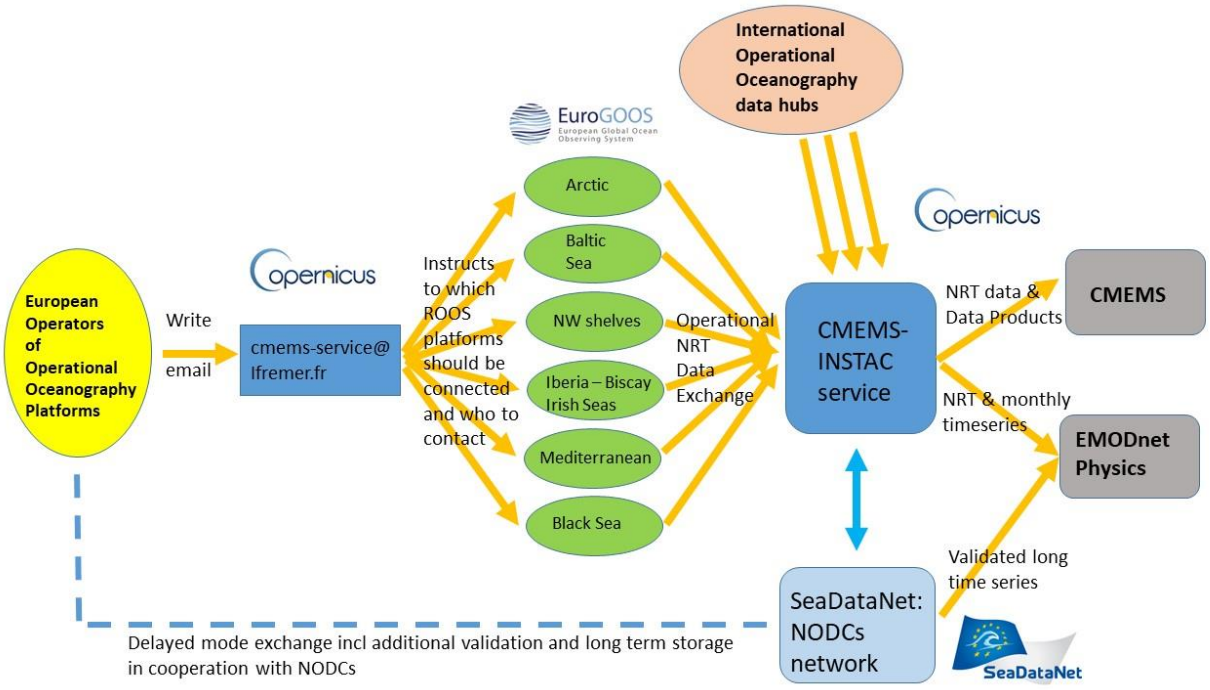


Image: amended workflow as published at the EMODnet Ingestion portal

For further promotion several events were organized in a synergy between EMODnet Physics and EMODnet Ingestion in order to inform potential NRT data contributors about EMODnet and to encourage and support them in making the NRT connections. The following events took place where EMODnet Physics and EMODnet Ingestion were promoted to the operational oceanography community.

Date	Location	Type	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
08/05/2018	Web	Technical meeting	O	SOOS - External – technical meeting to develop further the collaboration and optimise the services from EMODnet Physics to SOOSmap
9-10/5/2018	La Spezia, Italy	workshop	A	CMRE WS big data - External – Marine Big Data Workshop. After introducing the EMODnet program and lots in general we presented a focus on EMODnet Human Activities, Physics and Ingestion
12-14/05/2018	La Valletta, Malta	meeting	O	European Research Vessel Operators - External – EMODnet Physics and its features were presented to ERVO group. During the meeting we also discussed synergies and ERVO were informed/invited to the planned EMODnet Physics workshop on Ferrybox and EMODnet Ingestion
22-25/05/2018	Brussels, Belgium	Annual assembly	A	EuroGOOS GA - Internal/External – EuroGOOS Annual Assembly. State of art about EMODnet Physics and Ingestion and its interaction with the EuroGOOS partners were presented and discussed.

Date	Location	Type	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
28-31/05/2018	Liège, Belgium	conference	A	50th Liege Colloquium - External – EMODnet Physics was presented (poster) at the 50th Liege Colloquium. The event was focusing on long-term studies in oceanography and we presented how to find and use long term data in EMODnet Physics and promotion about EMODnet Ingestion.
31/05/2018	web	Technical meeting	O	Glider WS organisation - Internal – glider workshop organisation committee meeting
5-7/06/2018	Seville, Spain	Technical meeting	A	CMEMS DR - External – Copernicus Marine Environment Monitoring Service Design Review meeting. During the meeting, we also discussed the interaction between the new CMEMS DU, EMODnet Physics and Ingestion.
5-6/06/2018	Bucharest, Romania	meeting	A	TG NOISE - External – TG NOISE meeting.
08/06/2018	Trieste, Italy	workshop	O	EMODnet Day Italy - External – the workshop gave an overview of the state of art of EMODnet, its lots, the Ingestion facility and how some users are using the EMODnet data and services.
08/06/2018	Trieste, Italy	workshop	A	MEDCIS workshop - External – during the workshop, we discussed the EMODnet products and data vs data flow for MSFD
19-22/06/2018	La Spezia, Italy	exhibition	A	SEAFUTURE - External – exhibition for maritime and marine operators. The exhibition is mainly addressed to navy and sea security operators. It registered more than 2,000 visitors. **
22/06/2018	La Spezia, Italy	workshop	A	Session on - Understanding our marine universe: economic, scientific implications - External – oral presentation of the EMODnet program, projects with examples on some portal features and some case histories.
22/06/2018	Vigo, Spain	conference	A	EOF - External - international symposium on physical oceanography
25-28/06/2018	Oslo, Norway	Technical meeting	A	CMEMS TWG - External – Copernicus Marine Environmental Monitoring Service technical working group meeting.
26-27/06/2018	Rome, Italy	meeting	A	JericoNEXT SC - External – JericoNext Steering Committee. Synergies with EMODnet Physics and Ingestion were discussed
23/06/2018	Davos, Switzerland	conference	A	Polar 2018 - External – EMODnet Physics was proposed to be the INTAROS webmap engine.
27/06/2018	Davos, Switzerland	meeting	O	SOOS - External – technical meeting to discuss and plan EMODnet Physics developments for the SOOS community and SOOSmap

Date	Location	Type	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
10/07/2018	Web-meeting	meeting	O	International Glider Workshop - Organising committee technical meeting - 15 attendees
11-13/07/2018	Malta	training	O	EMODnet training session during the JERICO-NEXT summer school - A dedicated session in the program linked to the COPERNICUS Marine Environment Monitoring Service (CMEMS) and EMODnet, and together with the JERICO-NEXT Virtual Access portals were used to showcase the relevance of data streams through dedicated hands-on practical sessions (*). About 30 students
10-11/09/2018	Helsinki	TT meeting	A	SeaDataCloud Technical WG - Period technical meeting. SeaDataNet is one of the EMODnet Physics pillars. During the meeting, we discussed joint activities and services to close the gap between NRT and validated data. About 40 attendees
14/09/2018	La Spezia	meeting	A	Ligurian Integrated monitoring Project (PIM) kick-off - Kick-off of a local project on the development of a Ligurian Integrated monitoring infrastructure. The benefit of synergies with EMODnet Physics and Ingestion were discussed. 25 attendees
18-20/09/2018	Genova	workshop	O	International Glider Workshop - Goal of the workshop was to discuss the harmonisation of data formats and data flow to facilitate more operators to join an open data distribution and accessibility.
26-27/09/2018	Galway	meeting	A	JERICO-NEXT Annual Assembly - Interaction and synergies between JN and some of the EMODnet lots (Physics, Biology, and Ingestion) were discussed during the meeting. About 60 attendees
4-6/11/2018	Barcelona	Conference	A	IMDIS - International conference on Marine Data and Information Systems - 180 attenders
20-21/2018	Brussels	Meeting	A	DATAMEQ - DATAMEQ is the EuroGOOS working Group dealing with data harmonisation, standards and interoperability - 15 attendees
4-6/12/2018	Genova	meeting	A	MONGOOS AA - Annual assembly of the Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS), promoting partnerships and capacity building for GOOS in the Mediterranean Sea. MONGOOS is creating a continuous working framework with EuroGOOS and GOOS Africa - 30 attendees
10-11/12/2018	Porto	Conference	O	MARTECH - MARTECH workshop aims to bring together those working in MARine TECHnology for discussions and presentations of recent advances in the field and for cross-disciplinary knowledge exchange cutting across engineering and science - 40 attendees

Date	Location	Type	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
11/01/2019	call	meeting	O	Swiss Arctic Polar Expedition - meeting to discuss the services EMODnet Physics can offer to the project - external 1to1 meeting
23-25/01/2019	Southampton	workshop	A	External - ESA, European Space Agency, Atlantic from Space Workshop, Southampton. - approximately 40 people
11/02/2019	Genova	meeting	O	ARPAL Genova - meeting to present the EMODnet Physics features and link new and more in situ Ligurian Data - external 10 people
12-15/03/2019	Bijing, China	meeting	A	Joint Meeting of the Expert Team on WIS Centres (ET WISC) and Task Team on Data Centres (TT DC)
20-22/03/2019	Geneve, Switzerland	meeting	A	WMO, IPET-MOIS, Inter-Programme Expert Team on Integrated Marine Meteorological and Oceanographic Services within WMO and IOC Information Systems

This promotion and invitation to operational oceanography operators has been quite successful and through the collaboration of EMODnet Ingestion and EMODnet Physics the following new NRT stations and operators have come forward and been included by partner ETT in the EMODnet Physics portal.

Platforms	data provider	country
23 Ferrybox	StenaLines (via SMHI)	Sweden
3 Ferrybox	NIVA	Norway
30 tide gauge stations, Italian TG network, GLOSS	ISPRA	Italy
4 fixed stations, 2 gliders, 2 turtles, 2 Ferry Boxes	SOCIB	Spain
8 moorings	IZOR	Croatia
1 hydrophone, Vigo, Spain	Xunta Galicia	Spain
1 hydrophone	AZTI	Spain
2 MO buoys, Portofino – Capo Mele	ARPAL	Italy
2 ATM stations	UPC	Spain
22 River stations	MetNO	Norway
39 River Stations	SCHAPI - Service central d'hydrometeorologie et d'appui a la prevision des inondations	France
8 River stations	OPW - Office of Public Works of Ireland	Ireland
11 River Stations	EAUF - Service public d'information sur l'eau - France	France
24 River Stations	Augas de Galicia, Xunta de Galicia	Spain

8 River Stations	APA - Agencia Portuguesa do Ambiente - Portugal	Portugal
13 River Stations	Bizkaia - Gipuzkoa	Spain
10 River Stations	DGO2 - Direction générale opérationnelle de la Mobilité et des Voies hydrauliques – Belgium	Belgium
11 River Stations	RWS	Netherlands
9 River Stations	MetOffice UK	UK
2 River Stations	BSH	Germany
2 MO buoys	Uni. TUSCIA	Italy
HFR data (Brest bay: Pointe de Brézellec- Pointe de Garchine)	SHOM	France
HFR data	PLOCAN	Spain
HFR data MATROOS, Netherlands	RWS	Netherlands

Further activities are underway for connecting the following platforms:

platforms	data provider	country
8 Icelandic stations	HAFRO	Iceland
HFR data, Norway	MetNO	Norway
4 MO buoys, Malta	Univ. Malta	Malta
15 Lighthouses Ireland	Irish Lighthouses - Marine Inst.	Ireland

In addition, several historical datasets for physics have been identified by ETT as coordinator of EMODnet Physics and these have been ingested in the Data Submission service for further processing.

Historical physics datasets	Origin
>1100 sea mammals data, 2004 – 2015,	MEOP group
3 fixed buoys (Civitavecchia, Gaeta), 2012 -2017	University of Tuscia - Italy
HFR data (Naples, Manfredonia, Trieste), RITMARE project	CNR ISMAR - Italy
HFR data (MESA, VADE), 2014-2015	SMH - Sweden
Repeated CTD (Galway Bay), 2016-2018	MI - Ireland

These submissions have been assigned to Data Centres and most of the submissions have been completed for phases I and II and can be found in the View Submissions service.

Real Time (RT) oceanography data exchange by means of a Sensor Web Enablement pilot:

The **Sensor Web Enablement (SWE) pilot** concerns real time monitoring systems, allowing direct standardised access to selected data types from selected monitoring instruments. There are several subtasks. This activity has been led by BODC with contributions from ETT, OGS, IFREMER, MARIS, and 52North. As part of the pilot four SOS servers have been connected in a Viewing service:

- **OGS-NODC**: http://nodc.ogs.trieste.it/sos/api/v1/
- **IFREMER Oceanotron**: http://151.1.245.87/ifremerproxy/api/services/?expanded=true&locale=en&valueTypes=all
- **NeXOS SOS Server**: http://nexos.demo.52north.org/52n-sos-nexos-test/api/
- **BODC**: http://linkedsystems.uk/52n-sos-webapp/api/v1/ fixed observatory data from historic ANIMATE project.

OGS-NODC provides data and metadata from six fixed monitoring stations located in the Adriatic Sea that provide information on sea physical parameters. The Oceanotron SOS provides data from IFREMER and, in particular, the ArgoNetCDFToProfile dataset that comprises temperature, salinity and

conductivity vertical profiles acquired by floats related to the ARGO network. The NeXOS SOS Server offers data acquired by different mobile platforms. BODC offers access to datasets in the form of links. However currently these cannot be displayed in the Client, but will be included in future updates.

SWE profiles were formulated for the related platforms and sensors. This was built on work in related EU projects to define SensorML and O&M templates such as 'AtlantOS', 'BRIDGES', 'ODIP' and "the Marine SWE profiles wiki" as well as in USA for IOOS. The resulting marine SWE profiles for selected platforms and instruments are shared with the SWE marine community using GitHub: https://odip.github.io/MarineProfilesForSWE/

Four types of profiles have been formulated for Version SWE 2.0. Distinction is made in platforms and sensors. Additional distinction is made on models and instances of platforms and sensors. The GitHub site includes a story that narrates how projects, people, technologies and vocabularies were brought together to formulate meaningful and semantically rich profiles for the marine domain. Two of the partners, i.e. OGS and BODC have implemented demonstrators that implement the SWE marine profiles. These demonstrators can be found at:
http://nodc.ogs.trieste.it/sos/client, where OGS publish marine observatories acquiring meteo-oceanographic data in (near) real time
and
http://linkedsystems.uk/52n-sos-webapp/, where BODC publish historic ANIMATE project data as a demonstrator from placing fixed observatory data on an SOS server.

In order to support new and existing partners to implement the above-mentioned profiles, OGS has also created specific URLs with working examples of sensors described with SensorML following the SWE Marine profiles and can be found at:

- An instance of a Wind Monitor-JR:
  http://europa.ogs.trieste.it/OGS_SOS/SensorML_3_0/Sensor_V3_E2M3A_WIND.xml
- An instance of SBE 37-SMP-ODO MicroCAT high-accuracy conductivity and temperature recorder: **http://europa.ogs.trieste.it/OGS_SOS/SensorML_3_0/Sensor_V3_E2M3A_CT.xml**

Building upon the SOS servers ETT with support of the other partners has developed the **EMODnet Real Time Oceanographic Data Client:** www.emodnet-physics.eu/RealTime

This is 'advertised' at the EMODnet Physics and EMODnet Ingestion portals. It is a web application that is able to provide (N)RT data and metadata from marine data centers that offer a machine to machine interface based on the Sensor Observation Service (SOS) standard of the Open Geospatial Consortium (OGC). Its goal is to offer a simple point of access to distributed (N)RT data in a transparent way: users can add and/or remove available sensor systems to/from the portal and thus access their data. The following figure shows the logical architecture behind the portal:

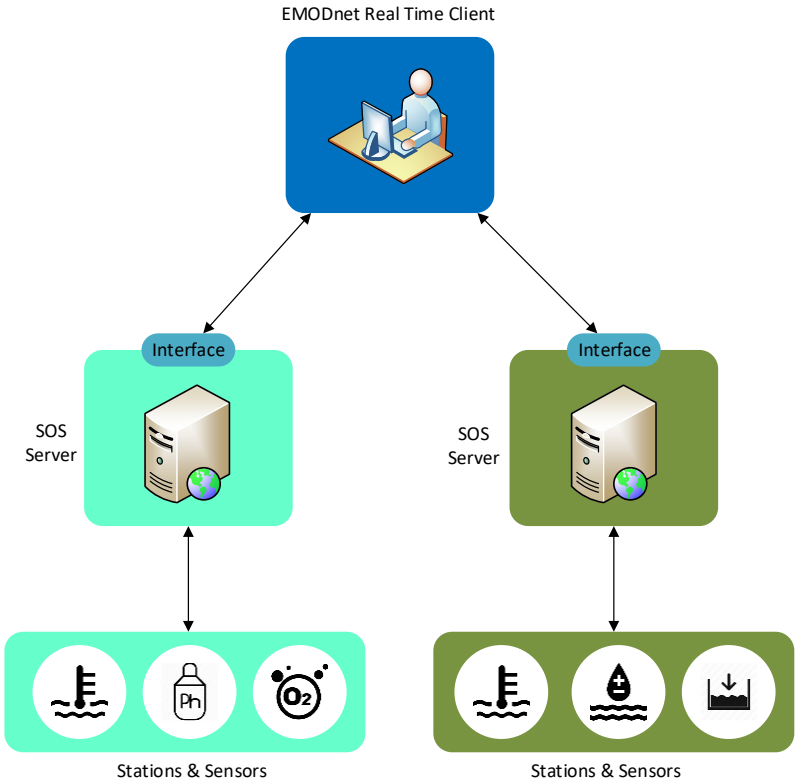


Image: EMODnet Real Time System Architecture

EMODnet Real Time is based on Helgoland client that is freely available on Github at https://github.com/52North/js-sensorweb-client.

Helgoland SOS viewer:

Helgoland is a software client for visual exploration and analysis of sensor web data developed by 52° North (https://52north.org). It is a lightweight web application that enables the exploration, analysis and visualization of sensor web data in various fields of use, e.g. hydrology, meteorology, environmental monitoring, traffic management. Using this application, users can easily explore stations or mobile sensor platforms in a map, select time series data by a list selection, visualize time series, trajectory or profile data and explore their metadata. The application is based on HTML, JavaScript and CSS and can connect to different Sensor Web endpoints (REST-APIs). These Sensor Web REST-APIs provide a thin access layer to sensor data via RESTful Web binding with different output formats (e.g. proxy solution is available that allows to encapsulate existing XML-based SOS severs for integration into the Helgoland client). The main features provide by Helgoland are:

- Access to SOS instances (through the proxy solution SOS 1.0.0 and 2.0 as well as specific extensions such as those required by the INSPIRE technical guidance on Download Services are supported)
- Diagram view of multiple time series, profiles, temporal zooming and panning, etc.
- Data export (PDF, Excel, CSV).

Sensor Observation Service:

The Helgoland client gives users simple access to SOS instances. SOS – Sensor Observation Service, provides a standardized interface for managing and retrieving metadata and observations from heterogeneous sensor systems. The OGC SOS standard defines a Web service interface that allows querying observations, sensor metadata, as well as representations of observed features. For connecting the Helgoland client to SOS servers, usually these servers need to provide some basic "core" operations.

The Pilot RT viewing service:
The main window menu of the **EMODnet Real Time Oceanographic Data Client** allows the user to select the features of interest, in particular different kind of data (time series, profiles, and trajectories), favourites and settings. Selecting a "data type" item, opens a second menu that provides tools for loading, harvesting and browsing data from different data providers (i.e. SOS servers)

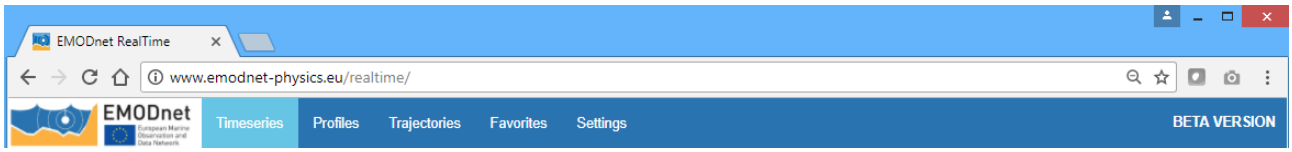


Image: EMODnet Real Time Menu

Timeseries

The timeseries item opens the custom menu for browsing timeseries data types with different features such as *diagram, map, ListSelection, permalink.*

Image: Time Series - Diagram page

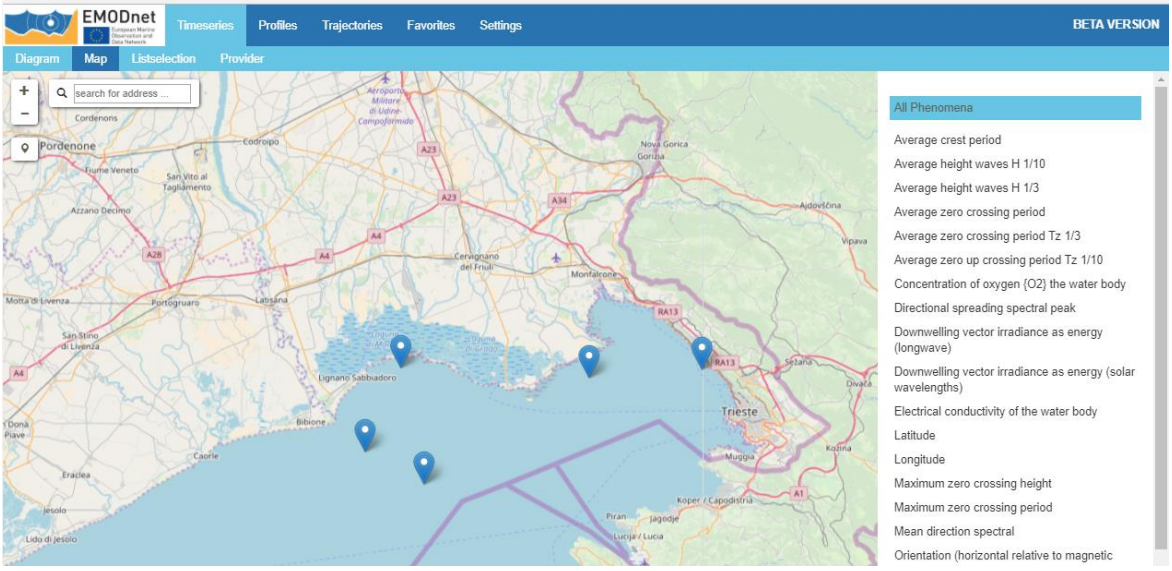


Image: Time Series - Map page

Profiles

The profile section provides features to harvest and view profile data. In the current version of EMODnet Real Time data from the Argo network are available through the OCEANOTRON SOS provided by IFREMER. The submenu offers: *Diagram, Selection.*

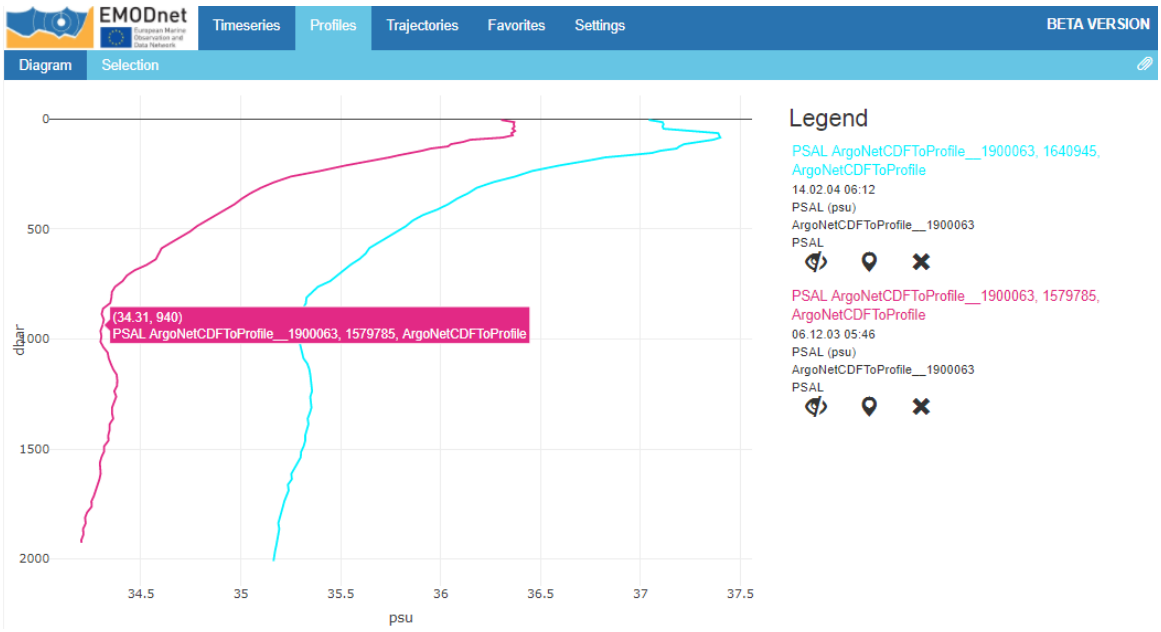


Image: Profiles – Diagram

Trajectories

The trajectories item opens the custom menu for browsing trajectories data types with different features: *View, Selection.*

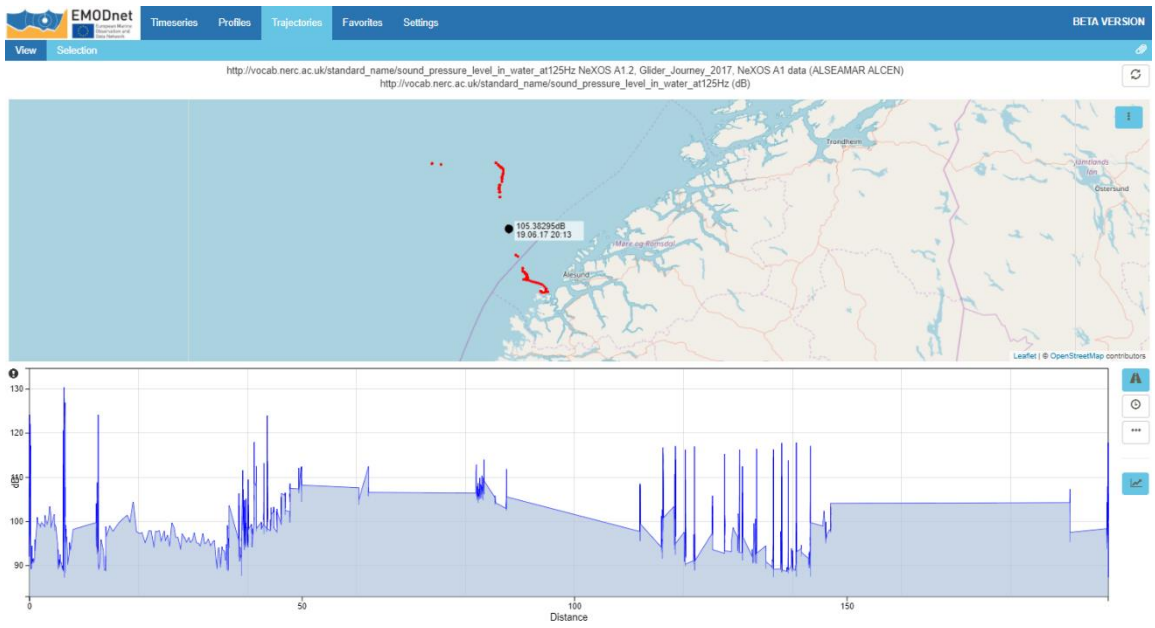


Image: Trajectories – View Page

A detailed guideline has been prepared and published to guide users through the pilot Viewer. These activities have been finalised in March 2018. The demonstrator is open for inserting additional platforms and sensors from other operators.

WP3 contributed to the following Task:

- Task 3 – machine-to-machine

This have been accomplished as described above.

WP4 – Marketing and outreach activities:

The aim of WP4 has been to market and promote the Data Ingestion service and its function in the overall EMODnet scheme, to identify and reach out to potential data sources and data providers, and to motivate data providers to participate with their data submissions (= Task 9 – outreach). The first year was mostly devoted to the technical development of the portal and its services and preparing for the wider marketing by the consortium members. Initial focus has been on establishing cooperation and synergy with the EMODnet community, in particular tuning with the EMODnet Secretariate which undertakes central promotion for EMODnet as a whole and the various EMODnet Thematic networks which are instrumental for the operation of the pathways as indicated in WP3. However also preparatory work has been undertaken for WP4 to be ready for wider outreach and promotion to potential data providers. In that framework, a dissemination and promotion plan was drafted, detailing target groups of potential data holders, which data types to chase up, and formulating a mix of promotional activities to support the marketing and outreach. In addition, a set of promotional items were designed and delivered.

Dissemination and promotion plan:

The dissemination and promotion plan was prepared by partner RBINS as WP4 leader. This plan provided a framework to leverage the aims of the EMODnet Data Ingestion project. The consortium has used this initial plan as a baseline.

Many data collected by public authorities, researchers and private operators of coastal or offshore facilities still do not arrive to the national or regional repositories and are thus unavailable to scientists and engineers for further purposes. This creates additional costs for those working on marine issues who will have the choice of accepting lower confidence in their analysis than would otherwise be the case, or being compelled to needlessly repeat observations.

There is therefore the need to streamline the data ingestion process so that data holders from public and private sectors can easily release their data for safekeeping and subsequent distribution through EMODnet (or other means).

The previous EMODnet dissemination activities have been done mainly by spreading information to established partners. However, EMODnet Data Ingestion asked for a change in the concept of dissemination in order to involve different communities and get a positive feedback from them. There is the need to engage in outreach activities towards significant holders of marine data whose data are not already available. In practice EMODnet Ingestion members must actively identify potential data sources and data providers and undertake marketing and support activities to motivate and convince data providers to make use of the EMODnet Data Ingestion portal.

The dissemination and promotion activities should aim at targeting a wide-ranging audience, from research, government and industry. The general goal is to make them aware of the EMODnet Data Ingestion service, and conscious about the need and the benefits of sharing and giving open access to marine data. Functionally, stakeholders can be classified into the following categories:

- Industry: This includes leadership companies and organizations from the diverse Ocean Business Community: shipping, oil and gas, fisheries, aquaculture, seabed mining, tourism, renewable energy, ports, dredging, mining, submarine cables, marine science, engineering and technology, the maritime legal, financial and insurance communities.

- Navy: The branch of the armed services of a state which conducts military operations at sea.

- Academia/research institutions: This includes organizations whose primary focus is higher education and research, such as universities and other academic institutes.

- NGO: This includes non-governmental organizations. They are not-for-profit organization that are independent from states and international governmental organizations.

- Government: This includes representatives from different levels of governmental organizations such as the European Commission, inter-governmental organizations or local governments. This category includes policy makers, regulatory, legislative, administrative or public authorities.

The table below summarises the different groups and sub-groups, and reasons for communicating with them.

Stakeholder affiliation & group	Why we want to reach these stakeholders
Industry	• Engage them in a dialogue about unlocking, mobilizing and safe-keeping of marine data, its use and re-use and potential value for innovation • Support discussion on usability and standards • Raise awareness amongst the private sector of guidelines and standards developed by initiatives for marine information
Navy	• Engage them in a dialogue about unlocking, mobilizing and safe-keeping of marine data, its

	use and re-use and potential value for innovation • Support discussion on usability and standards • Raise awareness amongst the private sector of guidelines and standards developed by initiatives for marine information
Research funding agencies	• Engage in dialogue about how research funding policies can be adapted to include a data management strategy in their grants and calls for proposals • Encourage universities and data repositories to adopt a data management strategy
Academia -Universities -Research institutes -Discipline specific networks	• Enable researchers to participate in dialogue around marine data management and safe-keeping • Implement guidelines and standards developed by initiatives for marine information • Encourage academic organizations and researchers to conduct further research
NGO	• Engage them in a dialogue about unlocking, mobilizing and safe-keeping of marine data, its use and re-use and potential value for innovation • Support discussion on usability and standards • Raise awareness amongst the not-for-profit sector of guidelines and standards developed by initiatives for marine information
Policy makers	• Inform them about progress by the consortium • Engage them in a dialogue about unlocking, mobilizing and safe-keeping of marine data, its use and re-use and potential value for innovation • Encourage academic organisations and researchers to make use of the Data Ingestion service for safe-keeping their marine data

Table: Stakeholders and reasons for communicating with them.

An understanding of stakeholder interest, motivations and drivers is essential for effective dissemination and prioritisation. Understanding stakeholder motivations enables the consortium to effectively engage, communicate with and promote future dialogue between different stakeholders. The combination of the stakeholders' relevance to EMODnet Data Ingestion and motivations will help the consortium define targeted communication strategies for different groups of stakeholders. Stakeholders are often varied and heterogeneous, with different levels of interest or power.

Identification of potential data sources:

In the workplan a coordinated action of the data centers, which are partners in the EMODnet Ingestion consortium, had been planned to analyse their national situation and to identify potential data sources of possible interest to EMODnet and their providers. The plan was then to analyse these national overviews together as a second step in order to identify the best candidates for a successful and useful ingestion. These candidates will be approached in outreach activities to collect more details and to discuss and support actual data submissions.

For implementation all consortium members have been requested to prepare a national inventory of potential data providers and data sources to prepare for the 2nd Plenary Group meeting (10-12 April 2017). For that purpose, MARIS prepared and distributed to all a guidance document. This guideline gives an overview of the data types that have priority for the EMODnet thematic portals and it gives general guidance and hints how the EMODnet Ingestion members might compile their national overviews. Finally, it gave a template for reporting identified potential data providers and possible sources. The following section gives an extract of the guideline.

Thematic data priorities:

The following overview has been prepared based upon input received from EMODnet Thematic portal coordinators in various forms and at various occasions.

Bathymetry portal

Data sets	**Bathymetric survey data sets**: plummets, single beam, multibeam, LIDAR, and other survey data, preferrably high resolution surveys, for all coastal waters and coastal zones along the European sea regions. Also demand for high resolution survey data sets for offshore waters in European sea regions.
Possible providers	Industry (e.g. oil & gas industry, renewable energy, survey companies, ..), local and regional authorities, harbours and ports as well as hydrographic offices and marine research institutes which are not yet in the EMODnet Bathymetry (HRSM) consortium.

Chemistry portal

Data sets	**Chemistry data sets:** relevant for determining eutrophication such as nutrients, chlorophyll, and oxygen, and determining pollution such as contaminants in water, seabed and biota **Marine litter data sets**: marine litter, collected on beaches, in fishermen's nets, or in specific surveys, both macro-objects (nets, bottles etc.) as well as fragments and microparticles in the water column, sediments and on beaches..
Possible data providers	Industry, local and regional authorities, as well as marine research institutes and monitoring agencies which are not yet reporting through data centres in the EMODnet Chemistry consortium. Moreover NGOs and voluntary groups that are active in the monitoring of marine litter.

Physics portal

Data sets	**Near real time physical oceanography data sets from operational monitoring stations**: for which their operators might want to join the European NRT data exchange as organised through EuroGOOS and CMEMS InSTAC. **Historical time series of physical oceanography data collection campaigns and stations**
Possible data providers	Industry, local and regional authorities, as well as marine research institutes and monitoring agencies operating physical oceanography stations which are not yet connected to EuroGOOS or CMEMS for inclusion in EMODnet Physics; or that have historical physical oceanography time series that are not yet included in EMODnet Physics through SeaDataNet.

Biology portal

Data sets by taxonomic / functional groups	**Angiospermae and macroalgae:** Data are almost lacking in EurOBIS. **Fish:** There is basically no fish data for the Black Sea and very few fish for Northern Baltic Sea, Mid and East Mediterranean Sea and the Arctic Ocean. Requested are data from fisheries surveys. **Zooplankton and phytoplankton:** Currently few data in the regions not covered by the CPR surveys: most of the Mediterranean, the Black Sea, Baltic Sea, the Arctic Ocean, Sea of Jan Mayen and the Northern parts of the Iceland Sea.

Parameters	Data on **species traits** is also a priority, more specifically taxonomy, geography body size, environment, habitat, depth, reproduction, mobility, skeleton and diet.
Possible data providers	Industry (fisheries sector, ..) , local and regional authorities, as well as marine research institutes and monitoring agencies which are not yet reporting to EurOBIS or through data centres in the EMODnet Biology consortium.

Geology portal

Data sets	**Geotechnical sites data**; **Marine gravimeter/ gravity data; Magnetometer/ magnetic gradiometer data; Single Channel Seismic Data; Multi Channel Seismic Data; Species and benthos data by grab or core; Sampling sediment and rock characteristics; Sidescan sonar data; Backscatter; and Geological maps.**
Possible data providers	Industry (e.g. oil & gas industry, renewable energy, survey companies, geotechnical consultants, ..), local and regional authorities, harbours and ports as well as marine research institutes which are not yet contributing to EMODnet

Human activities portal

Data sets	**Locations and metadata for: Aqua culture data sets**: sea water, brackish and freshwater aquaculture farms; **Military purpose areas**; **Cables**: power and telecommunication cables; **Nuclear energy plants**; **Pipelines**: gas, oil and water pipelines; **Transport**: shipping accidents, density, emissions and real-time traffic
Possible data providers	Industry (maritime, aquaculture, energy, cables, ..), harbours, ports, local and regional authorities, as well as marine research institutes and governmental organisations which are not yet contributing to the EMODnet Human Activities portal.

Seabed habitats portal

Data sets	**Habitat maps from surveys; Habitat maps produced by research groups.**
Possible data providers	Industry (ecology consultants, energy sites developers, ..), local and regional authorities, as well as marine research institutes and governmental organisations which are not yet contributing to the EMODnet Seabed Habitats portal.

Result of initial inventory and tuning activities:

Almost all Ingestion data centre members responded and submitted their national inventories in time before the analysis meeting, while a few missing partners brought their inventories to the meeting. Anyway, RBINS made a first analysis to prepare the total overview for discussion and refinement at the plenary meeting**.** At the 2nd Plenary Meeting itself a major activity has been dedicated to going through the total inventory by EMODnet theme to analyse the results in order to identify the best candidates for which follow-up activities will be undertaken by the national members. The thematic sessions were coordinated by each relevant thematic coordinator who asked for further details and considered whether provided data options are priority or not. This way a number of thematic sessions took place to filter and mark-up the total inventory:

- Bathymetry – MARIS
- Geology – GTK
- Chemistry – OGS
- Human Activities – COGEA
- Biology – VLIZ
- Physics - ETT

This activity resulted in a filtered total inventory which required some further elaboration and cleaning, also incorporating some late entries. This final editing has been done by RBINS.

It has delivered an overall inventory of EMODnet Ingestion members, comprising **in total 26 countries reporting 466 potential new data sources.** There was quite a spreading in the number of entries per country. Some countries only provided a few entries (5 – 9) while there were also countries with > 50 entries. Partly maybe due to the size of a country, but also maybe due to differences in aggregation and dedication. Over the whole, all data themes are well represented. This can be illustrated by the following 2 graphs.

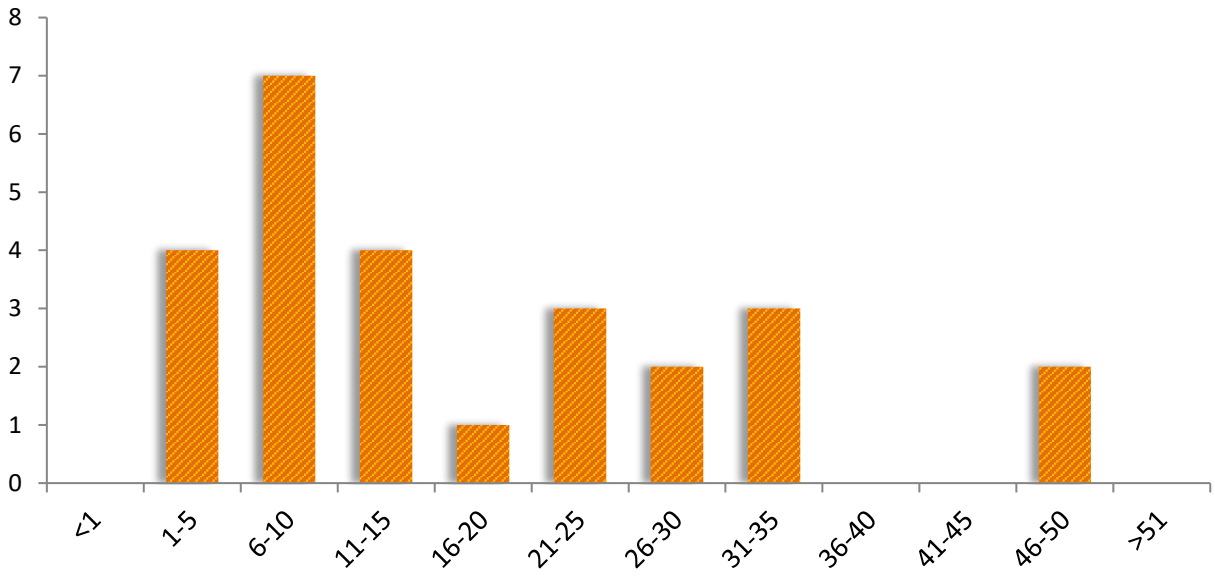


Image: Total number of data sources per numbers of country

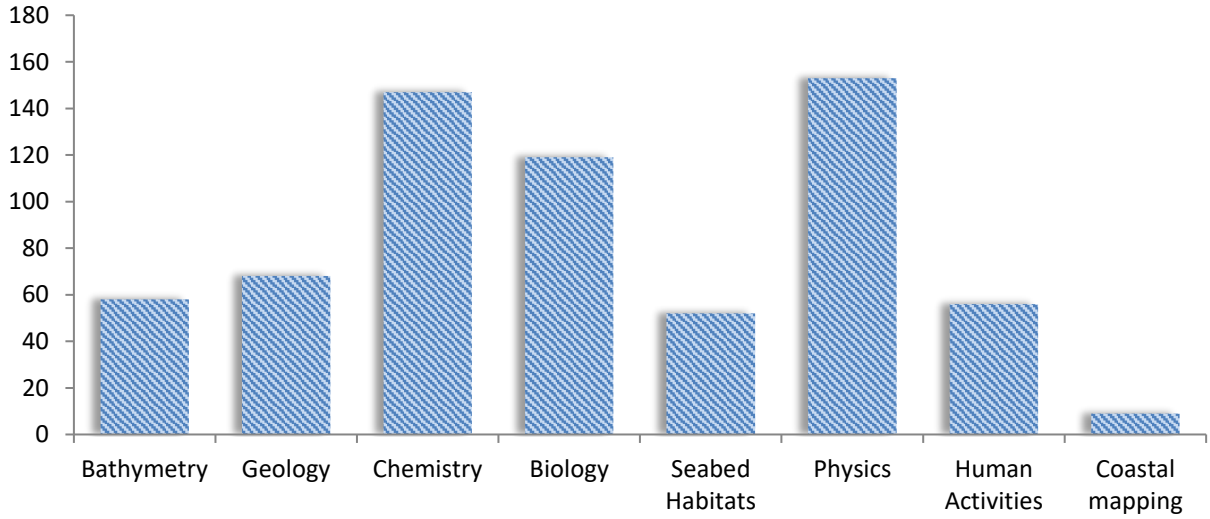


Image: number of entries per EMODnet themes

The resulting inventory was considered as a 'shopping list' and each data centre consortium member was tasked to undertake actions towards the identified data providers. For that reason, consortium members first of all had to prepare themselves well for representing EMODnet and EMODnet Ingestion. The members function as EMODnet ambassadors. Therefore, each member had to become well aware of the EMODnet background, learn how to operate and demonstrate the EMODnet Thematic portals, and become very knowledgeable in the procedures and used formats for the EMODnet Ingestion portal and well experienced in using the Submission service. The latter required serious practicing with the test submission service. Once well trained, consortium members went out to approach potential data

providers in order to learn more about their potential data sources and to explore possibilities for setting up a meeting to present EMODnet and to discuss their possible cooperation with EMODnet Ingestion.

Implementation of marketing and outreach activities:

The second year marked the start and implementation of an extensive promotion and marketing campaign involving all the EMODnet Ingestion members and till the end of the 3 years contract. It has been done in synergy with the central promotion as undertaken by the EMODnet Secretariat and making also use of the EMODnet Thematic networks which are deeply involved in the pathways of processing and uptake of submitted data sets.

The marketing and promotion followed the initial plan and aimed at engaging different communities by understanding their needs and establishing win – win situations. Outreach activities were pointed towards significant holders of marine data whose data are not already available. This was done by central promotion activities and by network activities whereby individual members approach and have dialogues with potential data holders. Also, they gave guidance and if needed helped data providers doing submissions on their behalf in order to create low thresholds and to overcome the risk that data providers are made interested but then cannot find time or give priority to the actual submission.

The promotion has been done through presence at various conferences and events such as Oceanology International 2018 and IMDIS 2018, by Twitter, by the EMODnet portals, by the Ingestion animation, and otherwise. This has resulted in very good web statistics after quite a short period of circa 8.000 - 9.000 portal visitors per month with an average clickrate of 6 pages, while the animation has passed 1.900 views. The network marketing has been performed by the EMODnet Ingestion 'ambassadors' with quite some success as can be seen from the scores of of the Submission service which at the end of the 2nd year, 19th May 2018, reached **175** submissions of which **163** published 'as is' and at the end of the contract, 19th May 2019, **619** submissions with **506** published '*as is*' and of these **205** elaborated to phase 2 and ingested into European portals.

Dissemination and promotion tools:

The dissemination uses a variety of media included promotional items which were designed and produced by partner RBINS. A number were prepared in the first year. Several were added in the second year.

- Leaflet
  The first leaflet was produced by RBINS. It is an A4 (two sided) paper containing information on the project as a whole but also on specific use cases. In the first leaflet this concerns the Netherlands and United Kingdom use cases for marine renewable energy developments. The use case has a data description, an analysis of the problems/obstacles and a solution. This formula

can be repeated for future leaflets with different use cases. 4,000 leaflets were printed on a high quality paper and sent to all partners in October 2017 for wider distribution to interested parties at events and meetings. The leaflet is also available as PDF at the portal.

Image: A first leaflet

- Poster & Banner
  A poster in the similar style as the leaflet, but with less text and strong visuals instead, has been designed. This is to be used at communication boards or entrances of event venues for example, to be able to attract audience to a stand. The poster is approx. 50x70cm in size. Initially an amount of 10 copies will be printed at RBINS. Furthermore, a roll-out banner (2 meters high by 70 centimetres wide) has been designed according to the style of the poster. It can be utilised for press conferences, workshops and other similar events. The image below gives an artist impression of a poster at an underground station.

Image: artist impression of poster

- Roll-up infographic
  The roll-up infographic is posted as PDF in the promotion section of the portal. Two roll-up banners were shipped to partners hosting or attending a workshop, an event or a conference. One roll-up banner is hosted at the EMODnet Secretariat office. The roll up banner is 2 meters high by 70 centimeters wide. This was a very popular item that has been used by a lot of partners at conferences, workshops and many similar events.

Image: EMODnet Data Ingestion roll up banner

- Animation
  The 3 minutes animation movie was finalized and launched on the EMODnet Secretariat YouTube channel on November 7, 2017. The tweet by @EMODnet (> 3,600 followers) announcing the

movie (https://twitter.com/EMODnet/status/927801926057709569) was picked up very well and has been retweeted by oa. EASME, ICES, MARS, EuroGOOS, PrimeFish Project, CETAF & AORA. A retweet by @RBINSmuseum (12K followers) was again retweeted by BELSPO. In the first two weeks after the launch, the movie had over 400 views, after this big surge, the movie currently has achieved more than 1,900 views. The animation movie has been integrated in the homepages of the EMODnet Ingestion portal and central EMODnet portal. And it is used at many events to present EMODnet Ingestion.

Image: EMODnet Data Ingestion movie on a mobile phone.

- Promotion at EMODnet portals
  Following the agreement at the EMODnet Steering Committee meeting of February 2017 all coordinators of the EMODnet Thematic portals have included a promotion text and a link to the Data Ingestion portal in their portals.

- Sticker
  In line with the animation and the roll-up infographic we created a round sticker that had a similar visual identity at the front and a QR code at the back, that was redirecting to the Youtube animation. A first batch of 4,000 stickers were printed and distributed in November 2017, following the launch of the movie. This became a very successful item and not only the partners

asked for more stickers, but also the EMODnet Secretariat asked for a second print. We printed and circulated another 5,000 stickers in March 2019.

Image: EMODnet Data Ingestion sticker, front and back

- Business Card
  By the end of 2018, the EMODnet Secretariat asked all thematic lots leaders and Ingestion if there was an interest in having an EMODnet business card. The template was developed by the Secretariat and we printed and handed these out to all interested partners. A good business card is a potential client's first contact with an EMODnet ambassador, so we very much welcomed this item.

Image: EMODnet Ingestion Business Cards

- Presentations at external events & conferences
  Conferences are a means of developing national and international connections with governmental, non-governmental, industry or academic leaders, and engaging in a direct, face-to-face communications and discourse. In the second and third years EMODnet partners have presented the EMODnet Data Ingestion service at a large number of relevant events and conferences targeting the marine scientific community at large and specific scientific and industrial sectors. This also includes relevant EU meetings, such as e.g. WG-DIKE (Marine Strategy Framework Directive WG on Data and Information Knowledge Exchange) and the MSP Member States Expert Group. The events and conferences are listed in Chapter 6 together with Workshops and other types of meetings, organised or joined by EMODnet Ingestion partners and giving opportunities for promoting and marketing EMODnet Ingestion and identifying potential leads.

- Bookmarks
  A set of 4 different bookmarks has been designed and printed (two sided) on paper containing a short motto, colourful illustration and the portal address. All project members have received a set of these bookmarks which can be used as hand-outs when visiting potential data providers.

Image: EMODnet Data Ingestion bookmarks

- Workshops
  Several EMODnet partners used workshops to discuss, present and help a target audience with the EMODnet Data Ingestion Portal. Workshops were set up at the national level to engage multiple stakeholders, to demonstrate EMODnet thematic portals and the EMODnet Ingestion portal and solicit feedback. Workshops also provide different stakeholders with an opportunity to get together. The held Workshops are listed in Chapter 6.

- EMODnet Ingestion portal
  The initial portal at https://www.emodnet-ingestion.eu has been upgraded for its homepage and menu. It included adopting the new styling that was developed by TRUST-IT in assignment by the EU for better harmonising the look & feel of the EMODnet portals. Changes included inter alia an updated logo, new topbar and menu. The website has been continually updated throughout the course of the project, and thus acts as a dynamic and up-to-date source of information for stakeholders interested in open access to research data.

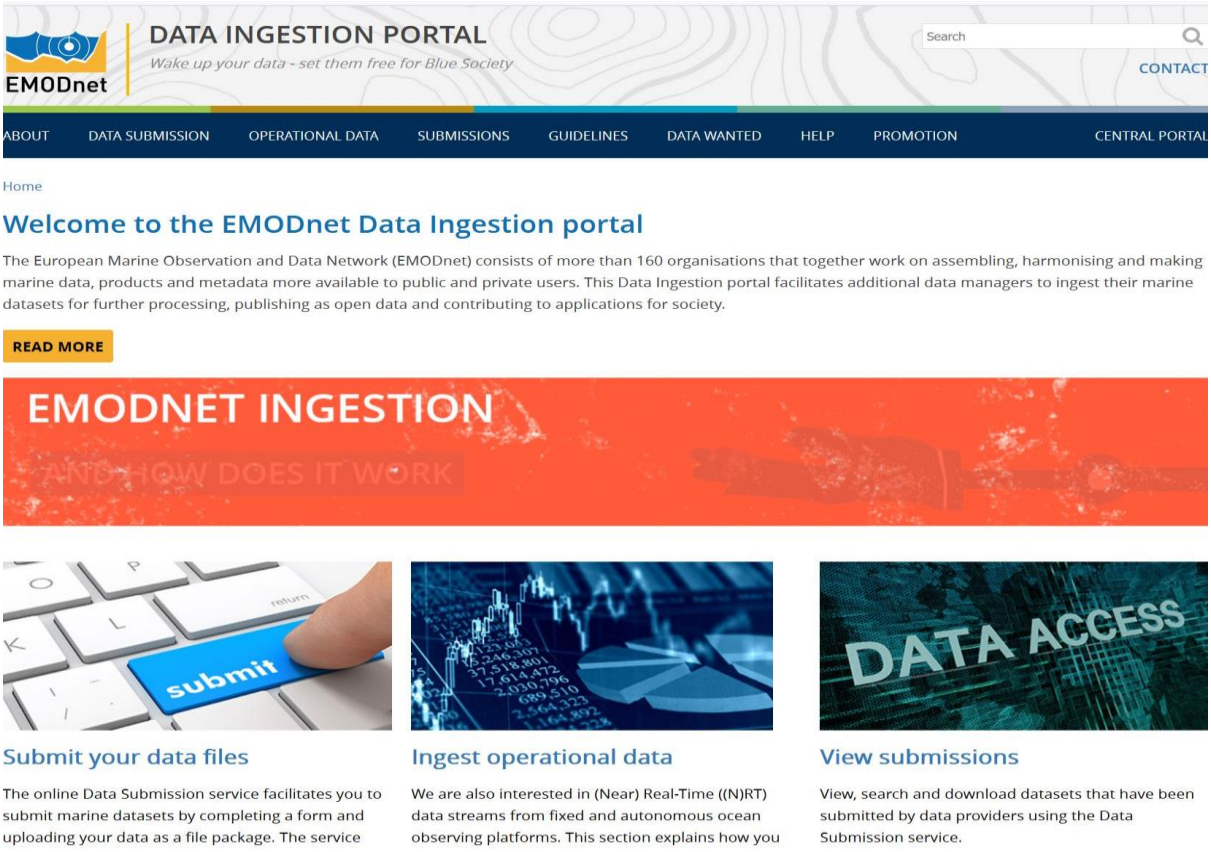


Image: impression of the EMODnet Data Ingestion portal

Guidance rules and tips:

A number of guidance rules and tips were formulated over time and suggested to the consortium members as ways to take up their marketing and outreach activities. The members should identify potential data providers as organisations that are not yet involved in regular data exchanges with the EMODnet data centres. The overview of thematic data priorities should be taken as a checklist for the searches and identification of potential providers. The consortium members should try to cover input for each theme; however, the quality of the inventory of potential data providers is more important than the quantity i.e. number of identified data providers. Quality is depending on judgement of the consortium members concerning the data resources that might be managed, the willingness to cooperate, the possible leverage that might be exercised, the existing contacts through joint projects and networks, and any other relevant criteria. Concerning industry, it is not easy to achieve cooperation in releasing data; therefore, it is advised to focus and identify for this group data providers and related projects in which the national government might have a form of leverage. For instance, various industrial activities at sea require licenses which obligate parties to perform environmental monitoring and to make these data available for public release. Also, governmental and controlling bodies often have rights on all or most of the data collected in the frame of the preparation of licensed activities (*e.g.* geotechnical investigations). However, these monitoring and preparatory investigation data might not be published

by the related authorities or at their own websites without exchange to your data centres. Concerning research communities there might be research programmes with data acquisition which are funded by the government and for which data management is not yet arranged, but again some form of leverage might be exercised for releasing the data. Or again the data might be published at their websites but not yet shared with your data centres. Concerning government there might be several regional and local bodies that are collecting and managing marine and coastal data sets which are public but not yet exchanged with the data centres.

To gather entries and prepare the national lists it was suggested to brainstorm with colleagues in the organisation as there might be various projects, programmes and networks in which their organisation is involved with potential data providers and through which already established contacts exist. Also, colleagues might give suggestions which can be followed up with google searches to get more insight in the potential. Ingestion members are strongly encouraged to involve colleagues from their wider organisation and not only from their data centre division in the brainstorming and identification process.

To lower the threshold, it was recommended that consortium members as 'EMODnet ambassadors' help data providers to undertake the submissions; it even can be that the consortium members make the submissions themselves, of course in full understanding with the data providers as originator and/or data holding organisation.

If it is expected that a data provider will have more and regular data submissions, then effort should be directed towards making the data provider a regular and direct supplier to the data centre of the consortium member or even connect the data provider directly to the European data infrastructure such as node for SeaDataNet, EurOBIS etc. This includes educating and instructing the data providers in standards to be applied and how to get connected. This implicates that a new data provider at first might submit through the Submission Service, to be followed by becoming a direct connected data node. Both achievements are relevant as both result in more data sets available for the community through EMODnet.

The latter also applies to the operational oceanography exchange, whereby the NRT connection through CMEMS INSTAC and EuroGOOS will be direct, while historical time series can be submitted in first instance through the Submission Service.

Activities per country

Belgium:

Belgium is represented in EMODnet Ingestion by RBINS and VLIZ. RBINS leads WP4 while VLIZ is coordinating the EMODnet Biology project and operating the EurOBIS infrastructure. Different data

providers from industry, academia, research institutions, navy and public sector have been approached to be informed about the EMODnet project and the Ingestion facilities, with different degrees of success.

- **International Marine & Dredging Consultants (IMDC)** is a partner in the CREST project in which VLIZ also participates. IMDC is a regular user of EMODnet data and has expressed their willingness to collaborate despite there are many difficulties due to data ownership.
- **Dredging, Environmental and Marine Engineering NV (DEME)** is an EMODnet Associated Partner. An option is data gathered for a beach nourishment project in Nieuwpoort (near-shore hydrographic survey). Near-shore bathymetry surveys have been submitted which were evaluated by the Belgian National Hydrographic Survey. However the quality of data processing was not fit for further uptake.
- **Freshwater Aquaculture (Aqua4C / Omega Baars)**: It took several attempts and has resulted in release of data for Ingestion.
- The identified Waterbirds Database from **Instituut voor Natuur- en Bosonderzoek (INBO)** is a long-term monitoring project on the Belgian Continental Shelf since 1992. Discussions with NBO direct towards a favorable decision. Follow-up is planned at a later date.
- The STARESO project by **Université de Liege (Ulg)** and the according RACE database was a possible additional data source. However partial funding was requested for their efforts.
- A successful meeting took place with **EGUERMIN (Belgian-Netherlands Naval Mine Warfare School)**. Possible data submissions concern REMUS100 data, Multi-Beam Echosounder (MBES) data and water column data concerning North Sea, Baltic Sea and Mediterranean Sea. Follow-up has taken place, however because of complexity of dividing between open and restricted data and the unfortunate incident of a long-term illnes of our primary contact we are still in a negotiation phase.
- VLIZ is collaborating with **CEFAS** to ingest in the EMODnet Biology portal a large dataset of benthic species that originates from over 700 surveys from multiple sources in industry and government spanning over 50 years. This by-passes the Submission service and be ingested directly into EMODnet Biology..
- EMODnet Biology actively looks for new data providers and for the ingestion of new datasets and has established a data grant programme. This facilitates data delivery from new data providers to EMODnet Biology. This will facilitate a considerable direct ingestion into EMODnet Biology. This concerns for instance: a) **Marine biodiversity in southern Mozambique**, data from an expedition in April 2018, from Meise Botanic Garden, Royal Belgian Institute of Natural Sciences, Royal Museum of Central Africa, and Ghent University, with over 250 species of marine macroalgae (seaweeds) and echinoderms, and b) **Van Heurck diatom collection**, housed at the National Botanic Garden.
- VLIZ has elaborated several submissions which were submitted by Deltares and RWS in the Netherlands from biological monitoring of North Sea windfarms. These concerned shell fish

and bi-valves. These submissions have resulted in thousands of entries into EMODnet Biology. See also progress under WP2.

EMODnet Ingestion has been promoted in several events with a focus on both the national and international marine community. Since Brussels hosts the official seats of the European Union, they are also well placed to keep promoting EMODnet Ingestion at several international events, in tandem with the EMODnet Secretariat. The events are included in the list in Chapter 6.

Bulgaria:

Bulgaria is represented in EMODnet Ingestion by IO-BAS. Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **Bulgarian Ports Infrastructure (BPI Co.)** manages the infrastructure of the public transport ports of national importance.
- **Bulgarian Ship Hydrodynamics Centre (BSHC),** Varna. BSHC performs wide spectrum of fundamental and applied research in the fields of ship hydrodynamics, aerodynamics, water transport and energy saving, ocean engineering, sea and river crises and disasters, marine ecology and coastal protection, facilities for fisheries and aquacultures, marine renewable energy sources, technology transfer, national security and defense
- **Marine Sound** is a non-profit organization, which carries out its activity in the public interest. This has resulted in submission of Ferrybox data sets for 2015 and 2016 of which the 2015 data already have been were elaborated by IO-BAS to phase II and are now available in SeaDataNet and EMODnet Physics. The 2016 data processing is underway.
- **Black Sea NGO Network (BSNN)** is a regional association of NGOs from all Black Sea countries. The BSNN members, currently over 60, are brought together by the common concern for the decreasing environmental quality of the Black Sea. They have submitted Marine Litter data from Bulgarian Black Sea beaches which is published.
- **GeoMarine** is leading Bulgarian environmental and sustainability consultant company with more than 20 years of experience in the fields of environmental, health, safety, social and sustainability consulting services. They have submitted data from environmental monitoring activities in Bulgarian waters for a gas pipeline project (South Stream). The data has been processed by IO-BAS to phase II and are now available in SeaDataNet.
- **Basin Directorate for Water Management in the Black Sea Region** was established by the Minister of Environment and Water in 2002, in accordance with Directive 60/2000 of the European Union and national legislation and regional division of the Ministry.
- **Black Sea - Danube Association of Research and Development (BDCA)** - an independent non-profit research organisation - a grouping of universities, consultancy, other organisations, and individuals engaged in research, training, engineering and advisory activities in coastal protection against flooding and erosion, construction of harbour and

coastal structures, and environmental protection on the western Black sea coast and lower Danube.

- **Institute of Biodiversity and Ecosystem Research (IBER)** - Significant national and international researches are carried out in IBER in theoretical and applied aspects of ecology, biodiversity, environmental conservation and sustainable use of biological resources. The Institute has high qualified staff train working in the area of botany, mycology, zoology, ecology, hydrobiology, conservation biology, environmental genetic, evolutionary biology and other closely related scientific areas. The people who have been contacted declared that they would provide the data to Ingestion portal.

EMODnet Ingestion has been promoted in national and European events such as the European Maritime Day 2018 in Burgas – Bulgaria. The events are included in the list in Chapter 6.

Croatia:

Croatia is represented in EMODnet Ingestion by IOF. Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **HAOP** representatives to discuss possibilities to open MSFD monitoring data for public.
- **Centre for Marine Research** to discuss submission of their marine data.
- **DVODKUT firm Zagreb** to discuss possible exchange of their data collection in Pelješac Channel
- **Institute Rugjer Boskovic and CAEN to di**scuss possibilities to open MSFD monitoring data for public.
- **University of Zagreb** to discuss possible exchange of their sea level data sets.
- **University of Split, Faculty of engineering**
- **Croatian Waters**
- **Croatian Agency for Environment and Nature**
- **Division for Marine and Environmental Research**
- **Ministry of environment and energy**
- **Primorsko-Goranska County**
- **Blue world Institute**
- **Meteorological and Hydrologic Service**

Activities have resulted in submissions for HF radars sea-surface and waves data directly to EMODnet Physics, Phytoplankton, Zooplankton and Benthic data directly to EMODnet Biology, and Underwater noise data sets and Marine litter data to the Submission service. The latter have been published. EMODnet Ingestion has been promoted in national events which are included in the list in Chapter 6.

Cyprus:

Cyprus is represented in EMODnet Ingestion by ORION. The activities of ORION have focused on the Cyprus government, in particular:

- **Cyprus Ministry of Agriculture, Rural Development and Environment** that is involved in the recent offshore energy developments. International Oil & Gas companies are exploring the Cyprus waters for oil & gas resources, and bidding started in 2016. Companies have to submit an Environmental Impact Assessment including performing Environmental Baseline Surveys (EBSs). All data for the EBSs are to be collected by large international consultancies such as Fugro, Gardlines etc in assignment by the Oil & Gas companies. Copies of all data collected have to be submitted by law to the Cyprus Government (Ministry of the Environment). This data collection over 4 years will generate large volumes of data sets (seawater profiles (CTD), sediment sampling (chemical analyses, benthos, etc.), bathymetry, current data, metocean data, etc.). This might represent Terabytes of data. However there are no standards prescribed yet and there is no systematic data management in place for handling and re-using the data sets. Meetings of ORION and MARIS with the Ministry have resulted in interest of Cyprus government for a dedicated **Cyprus Offshore Data Management Plan** (**CODMP**) to secure the long- term stewardship and availability of the collected data sets in a standardised way for potential user groups. This should use SeaDataNet standards and have synergy with EMODnet Ingestion. A 2-step approach has been proposed of a definition study followed by actual development of an integrated system. Early July 2018 a meeting with all governmental stakeholders has taken place to discuss the Terms of Reference for a **Cyprus Offshore Data Management System** (**CODMS**) and its development plan. Many stakeholders from ministries were present and seemed positive towards the proposal. However, so far no concrete decisions have been taken by the Cyprus government which implies no data from the offshore oil/gas activities in the EEZ of Cyprus have been provided and submitted so far.
- As part of an INTERREG programme a **HERMES buoy network for coastal monitoring** has been deployed in June 2018 with involvement of ORION. It concerns four locations at Albania, Greece, Bulgaria, and Cyprus, measuring currents, waves, and sea level among others. Data of the Cyprus buoy has been ingested by ORION.

In total ORION has made 7 data submissions which after elaboration have resulted in multiple records in the SeaDataNet CDI service, making these data also available for EMODnet.

Denmark:

Denmark is represented in EMODnet Ingestion by Aarhus University (AU-DCE) and GEUS. The latter is technical coordinator of the European Geological Data Infrastructure (EGDI). Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **Femern A/S** is positive towards releasing the large data set from the Femern belt EEA. However they are involved in a legal process in Germany, which delays release. Regular contact is planned.
- **Rambøl A/S**, the consulting company that collected the data for the North Stream pipeline project in the Baltic sea has been contacted without success. Other contacts will be tried. DONG Energy Wind power concerning offshore wind farms
- **Danish Coastal Authority** concerning beach nourishment
- **Vejdirektoratet** concerning construction work and bridges
- **ORBICON/NCC/De Cloed** concerning aggregate mapping
- **Danish Environmental Agency** concerning aggregate mapping.

Activities have resulted so far in data sets from the **COCOA project** of the BONUS program B "Viable ecosystems", funded jointly by the EU and the Danish Research Council that were submitted and processed. It concerns high-frequency measurements of dissolved oxygen, water temperature and salinity of three sites in Roskilde Fjord (Denmark) in 2015. The second set concerns eelgrass campaign oxygen dynamics from the same location and time period. Additional submissions concern **COCOA_EMB77** nutrients data and **HYPER** hypoxia data of the Baltic. Several submissions have been added for microplastic in sediments and marine waters in inner Danish waters, North Sea region and West coast of Greenland. And submissions were done for high frequency datasets. EMODnet Ingestion has been promoted in national events which are included in the list in Chapter 6.

Estonia:

Estonia is represented in EMODnet Ingestion by TUT Department of Marine Systems (MSI). Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative. However, from the contacts it appeared that relevant Estonian institutions are already engaged in data submissions to EMODnet through MSI:

- **Maritime Administration** which has bathymetry data sets which are included in EMODnet Bathymetry
- **Estonian Environment Agency** has provided public data which has been uploaded to EMODnet Chemistry by MSI
- **Estonian Environmental Research Centre**, which has data on dangerous substances and chemistry. MSI is already submitting collected litter data to EMODnet Chemistry
- **Estonian Ornithological Society** with bird observations. MSI is already sending collected data to EMODnet Biology
- **Pro Mare MTÜ** has seal observations. MSI is already sending collected data to EMODnet Biology
- **Environmental Inspectorate** has dangerous substances, chemistry, and radioactivity data. However, no response was received to MSI requests

- **Hoia Eesti Merd MTÜ** has litter in coastal areas. MSI is already sending collected litter data to EMODnet Chemistry.

Most are direct submissions and on a regular basis, which is a good thing. Together with the **Estonian Research Centre** a project data set was identified for heavy metals and dioxins that was not yet included. This submission has been completed and published.

Finland:
Finland is represented in EMODnet Ingestion by GTK and FMI. Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **LuTU- Baltic Sea group** is a team of national experts from the universities, research institutes and authorities who are setting up the assessment of marine habitat types in Finland (2016-2018). Marketing was done in the expert group meetings (2017-2018), also by an EMODnet Data Ingestion presentation.
- **Finnish Marine Research Infrastructure (FINMARI)** is a cross-institutional consortium of research institutes, universities and a state-owned company, all with a strong interest in marine research. Marketing was done in management group meetings (2017).
- **Helsinki University.** A lecture on EMODnet were given at the Department of Environmental Sciences (2017, 2019) and the Department of Geosciences and Geography (2019).
- **EuroGeoSurveys Marine Geology Expert Group.** Marketing in EGS expert group meeting by means of a presentation (2017 and 2018).
- Other potential data providers have been contacted via email, phone, and personally in meetings such as **Metsähallitus, Parks & Wildlife Finland; Centre for Economic Development, Transport and Environment; Alleco Ltd; Finnish Naval Academy, Research Centre; City of Helsinki; University of Helsinki, Tvärminne Zoological station; Turku University; Turku University of Applied Sciences.**
- In addition, New data Questionary (on usage and/or willingness to submit data) were sent to possible national data providers in June 2018 (in connection with EMODnet Geology project).
- Recently GTK has contacted and discussed with **Nord Stream 2** to receive their data acquired along the track of this planned major pipeline through the Baltic Sea for ingestion. Follow-up meetings are planned as this might provide a very interesting and large data collection.

This has resulted in a number of data submissions, such as datasets of the FINMARI infrastructure for the UTO platform (water column temperature and salinity data) and geological data (e.g. polymetallic nodules and sedimentation rates data) from Metsähallitus, Parks & Wildlife Finland, Turku University, and from Centre for Economic Development, Transport and Environment Finland. Geological data have been submitted directly to GTK, by passing the Submission service. GTK has submitted data to EMODnet Geology, and data is available on EMODnet Geology Portal. In addition seabed substrate and bathymetry

data was submitted. Metsähallitus, Parks & Wildlife Finland, provided this again directly to GTK. These data will be used in scientific projects, but not to EMODnet as the data is restricted. EMODnet Ingestion has been promoted in national events which are included in the list in Chapter 6.

The earlier contact with the BONUS programme secretariate, based in Helsinki – Finland, was activated again and it is considered how several data collections as acquired during BONUS might be ingested in the Data Submission service and worked up to be included in the Data Centres and EMODnet portals. The BONUS sectretariate has been asked to identify which BONUS datasets might not have been incorporated yet in established Data Centres and thus would have a value as new datasets for the community. An extra difficulty is that the BONUS secretariate only has metadata, while for the data submission support will be required from the data owners in the Baltic region. The first follow-up is expected from BONUS.

France:

France is represented in EMODnet Ingestion by IFREMER and Shom. In France, most of organizations conducting regularly observations at sea are directly or indirectly involved in EMODNet thematic lots: bathymetry, biology, habitats, physics, chemistry, geology. Data flows are well established, and data from research and hydrographic sectors are already part of EMODnet datasets. That includes data that are collected by monitoring facilities in the scope of Environmental European Directives such as the Water Framework directive and the Marine Strategy Framework Directive. As a consequence, in order to enlarge data sources, specific data providers have been targeted by marketing actions. That are:

- **Major Oil and Gas companies.** However, these companies already report, when public, the marine monitoring data collected by their offshore implementations, using others initiatives such as SIMORC, or alternatively, in some cases, via Copernicus Marine Services.
- **Consultant SME's** that are contracted by national and regional agencies to perform observation at sea for local studies. In this case, data policies and licenses are regulated by the contracts and are not, up to now, in general, released in public domain. However, data policies will certainly evolve in the coming months, as new regulations about data are entering in force.
- **Public bodies** such as Brittany region that drive a lot of local bathymetric and hydrographic surveys in French harbors. They are not (yet) willing to make the required effort to submit their data themselves as it has no priority. However to overcome this, their data are collected by Shom which adds them in EMODnet Bathymetry.

The most positive feedback was coming from researchers that are producing data that are not already part of existing data flows, for example:

- Observations that are conducted for specific research objectives and are not part of national or international observation programs,

- Observations that are performed as part on student training sessions at sea,
- Observations using specific instruments and, by the way, specific data formats, that cannot be ingested directly without extra effort in EMODNet thematic lots.

In these cases, the motivation of researchers comes from the obligation, prescribed by the publishers of leading scientific journals, to make available in a permanent archive all data related to a scientific paper. It includes the minting of a DOI (Digital Object Identifier) to cite and to retrieve the related datasets. As a consequence, France has proposed to build a link between some permanent archives and the Ingestion portal. This is described in more detail under WP3.

Data submissions have been achieved for subsurface currents in the Atlantic, observed using sub surface floats, which is really a unique and valuable datasets; biochemical analyses made in water sampling done during sea cruises in the framework of the GeoTraces international program; CTD data coming from Spain/France vessel shared time and that were not properly incorporated in France or Spain data flows; and bathymetric data that are acquired in routine about French Research Vessel Pourquoi Pas? Furthermore, recently though the coupling of SEANOE and EMODnert Ingestion several extra submissions have been achieved and published concerning scientific data collections (see also WP2). Finally, EMODnet Ingestion has been promoted in national and European events which are included in the list in Chapter 6.

Georgia:
Georgia is represented in EMODnet Ingestion by TSU-DNA. Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **GAMMA Consulting Ltd** that have been conducting long term observations on dynamics of Georgian seashore area of the Black Sea and holds corresponding data in bathymetry. After discussions they have submitted 18 coastal bathymetry data sets which are published and have a status Phase II complete.
- **Laboratory Research Centre Ltd**. located in Port of Poti. After discussions they have submitted 54 nutrients data sets, all of which have been published and most elaborated to Phase II.
- **NAPIRDACVA Ltd** that holds bathymetric data, has been contacted and after negotiations submitted 9 datasets, which were completed the Phase II.
- **Black Sea Aquaculture Company LLC** is a first offshore (1.5 miles from coast) marine aquaculture company in Georgia located in Poti area, they hold data on trout monitoring. An agreement has been reached and 15 datasets were ingested and published in EMODnet Ingestion.

All parties are willing to continue collaboration and sharing data sets by means of EMODnet Ingestion.

Germany:

Germany is represented in EMODnet Ingestion by BSH - DOD. As the German focal point for oceanographic data, the DOD is in contact with a variety of scientific institutions, who report data of ongoing research and monitoring programs on a regular basis. The DOD uses this standing to follow-up on regular data submissions with all of its frequent contacts and points out the possibility of the low-threshold submission through the EMODnet Ingestion Portal. On the new website of the BSH, the EMODnet Ingestion Portal is represented by the EMODnet Logo and a brief description in German as one of the DOD's project activities and also referenced with a direct link to the portal. Different data providers have been approached to be informed about the EMODnet project and to cooperate with the Ingestion initiative.

- **Baltic Sea Research Institute Warnemünde (IOW)** has indicated its willingness to make a large number of datasets available, that are not yet part of any European data infrastructure.
- **Biogeochemistry and Marine Chemistry Group at the Hamburg University** wants to release data from prof **Uwe Brockmann** which is mainly nutrient data from the North Sea.
- **GEOMAR** considers processing and ingesting monitoring data from the years 1997 – 2014 from the Labrador Sea. This will require technical assistance by DOD.
- **BSH Offshore Department** is newly formed and deals with biological and geological data from investigations of designated areas for wind energy parks. A major obstacle is that nearly all data from the official investigations is classified, since this information is a fundamental economic factor in the auctioning process for wind energy licenses within the German Exclusive Economic Zone. Data from the official preliminary investigations for areas that will not be further developed might be declassified at some point and will then be considered for submission.

Despite promises not many data submissions have been achieved, except for submissions concerning CTD and nutrient data from Baltic Sea research projects in cooperation with Sweden. EMODnet Ingestion has been promoted in national events which are included in the list in Chapter 6.

Greece:

Greece is represented in EMODnet Ingestion by HCMR. HCMR contacted several potential data providers. Positive response was received so far from:

- **University of Aegean and University of Patras** that have agreed to submit unique vector data about seagrass meadows in Greek waters, orthophotomaps of coastal areas, at resolution 30-50 cm, CTD, current meter data and drifters, and bathymetric data. Both providers have been introduced with the procedure but there have been big delays with the submissions despited the frequent reminders.
- **A Cooperation Network of NGOs for the Marine Environment** of the A.C. Laskaridis Charitable Foundation for submitting beach litter data. In addition, the Network is interesting for developing a data system for their holdings and HCMR is exploring several options for

data sharing including the Data Ingestion submission service for having access to the Network data holdings.

Submissions have been achieved concerning CTD, bottle data and Floating Microplastics from national and European HCMR research projects that were not yet included in the HCMR Data Centre. These submissions have been worked up and included in SeaDataNet. EMODnet Ingestion has been promoted in national and European events which are included in the list in Chapter 6.

Iceland:
Iceland is represented in EMODnet Ingestion by MFRI. MFRI is leading in marine and freshwater resources in Icelandic waters and the arctic. MFRI has arranged with EMODnet Physics to include real time monitoring stations with coastal temperature thermometers at Reykjavík harbor and Grímsey harbor through Arctic ROOS. Work has been undertaken for publishing more data from coastal thermometers around Iceland through the Submission service and SeaDataNet. These concern time series of some decades which are updated every six months. Icelandic companies and researchers were approached that could have marine data.

Ireland:
Ireland is represented in EMODnet Ingestion by MI. They contacted several potential data providers.

- **IDA** which is a Public Sector Bodies Data Collaboration Group with EPA, Met Eireann, CSO, OPW, GSI and NPWS
- **Departments within MI**
- **NUIG** that manage historic data sets of interest

The activities have resulted so far in a number of submissions through the EMODnet Ingestion portal for the SmartBay's Galway Bay Observatory CTD data, Kinvara Bay time-series, historic weather station data from 2 discontinued locations and NUIG's long-term Galway Bay time-series. These have been submitted, published and the SmartBay Observatory and weather station data have been elaborated for inclusion in SeaDataNet generating 15 new entries. Further metadata are being collated from the originators in order for the time-series from Kinvara Bay and Galway Bay to be included within SeaDataNet.

Discussions are still ongoing about submitting MI's phytoplankton and benthic faunal data sets. After discussion the EPA's eutrophication data were submitted directly to ICES rather than through the EMODnet Ingestion portal.

EMODnet Ingestion has been promoted in national and European events which are included in the list in Chapter 6. This includes the **EuroGOOS and EMODNet Physics Data Workshop**, which was hosted by MI in Galway – Ireland, bringing together EMODnet partners EuroGOOS, ETT, BODC and MI with invited

UK and Irish oceanography community of CIL, OPW, NUIG, UCC, MaREI, AFBI, MSS, SAMS, MEDIN, SmartBay, and MI.

Israel:

Israel is represented in EMODnet Ingestion by IOLR (Israel Oceanographic and Limnological Research). IOLR conducts scientific research in the fields of oceanography, limnology, mariculture and marine biotechnology. IOLR includes ISRAMAR (Israel Marine Data Center), which acquires archives and distributes data and information on Israel's marine environment. In framework of EMODnet ingestion ISRAMAR made contacts to:

- **Maritime School in Haifa university and Maritime College in Michmoret,** who carry out educational cruises in the coastal water of Israel. Data of 7 cruises (35 casts) of Haifa University were received with physical and chemical data and were elaborated for direct inclusion in the SeaDataNet CDI service. Data of 32 cruises (64 casts) of Maritime College in Michmoret with physical and chemical data passed the same processing and have been populated in the CDI service.
- Several attempts were made to obtain data of waves and currents, measured on the permanent stations by **Israel Port Authority**. Unfortunately a permission for free distribution of the data was not recieved.

Italy:

Italy is well represented in EMODnet Ingestion by OGS, ETT, ENEA, CNR, INGV and COGEA. ETT is coordinator EMODnet Physics, OGS is coordinator EMODnet Chemistry, COGEA is coordinator EMODnet Human Activities, and INGV has been coordinator of EMODnet MedSea Checkpoint. They have approached various data providers to inform them about the EMODnet project and to cooperate with the Ingestion initiative.

- **EMSO (European Multidisciplinary Seafloor and water column Observatory) ERIC. EMSO** consists in a system of regional facilities placed at key sites around Europe, from North East to the Atlantic, through the Mediterranean, to the Black Sea. Observatories are platforms equipped with multiple sensors, placed along the the water column and on the seafloor. They constantly measure different biogeochemical and physical parameters, that address natural hazards, climate change and marine ecosystems. EMSO ERIC is interested in facilitating the integration of EMSO data within EMODnet.
- **Environmental Science Department of the University of Bologna**, working on different topics (Pollutants data in the Adriatic, Progetto CAMP-Italy, Monitoring Mediterranean Marine Protected Areas, Reef Check Foundation, https://www.reefcheckmed.org/), where Professors/Researchers and students were informed about EMODnet and the Data Ingestion service.

- **Castalia Consorzio** Stabile S.C.p.A. brings together 33 shipbuilders and companies operating in the territorial and offshore sea, specialised in maritime activities, marine antipollution and emergency services.
- Institutes leading in Italian Marine Strategy project, such as **CNR - ISMAR and CNR – IAMC, and CoNISMa**, commissioned by the Italian Ministry of Environment – MATTM
- **Stazione Zoologica di Napoli (SZN) "Anton Dohrn"** research community. However they responded that SZN does not release data for portals such as EMODNET, because of the Institution's internal data policy.
- **CNR – ISMAR** stated they are willing to provide physical data which will be given a follow-up.
- **CNR – IAMC** has provided physical (CTD) data, dedicated to marine pollutant investigation. The data has been submitted and published.
- **ENEA** has submitted measurements of radionuclides in sediments and in the water column, physical (CTD) and chimical data.
- **Università di Roma "Tor Vergata"** has released the 2017 monthly global marine phytoplankton production maps, obtained with a neural network model. This has been submitted and is published.
- **University of Pavia** proposes to provide marine mammal beaching data. A NRT connection might be fit as this data is continuously updated.
- **Adriatic LNG** oil platform has been approached by OGS to ingest their data on environmental monitoring. The ingestion is ongoing.
- **Regional Environmental Protection Agency of Emilia Romagna** region (ARPA ER) is willing to ingest hydrology data (e.g. river discharge, water levels, precipitation and temperature parameters collected by fixed stations in the Emilia Romagna region). Preferred is an NRT connection with EMODnet Physics. ETT has given a follow-up as part of WP3.
- **JRC** will collate data on location and production of algae aquaculture establishments in Europe, which was agreed at a workshop organised by the FAO and the COST Association. JRC has agreed to submit the data via the Data Ingestion portal for uptake by COGEA for EMODnet Human Activities.
- The Italian **Ministry of Economic Development (MISE)** was contacted by OGS-IRI and they provided a dataset of 34 seismic lines.These lines were originally from Italian National Agency for Hydrocarbon exploitation (AGIP) which in 1964 performed the survey. Data were uploaded and made available through the OGS SNAP portal and also directly populated into the SeaDataNet CDI service, by-passing the Submission service.
- **PORTODIMARE**, an Interreg ADRION project, is creating a common platform (Geoportal) for data and information related to coastal and marine areas of the Adriatic-Ionian Region, by integrating existing databases, portals and tools developed by previous EU-funded projects (e.g. SHAPE, ADRIPLAN), local and national administrations and other initiatives. A meeting

took place in Rome, Italy on 15 January 2019 between ISMAR and Cogea. ISMAR expressed interest in making available the datasets developed in the framework of PORTODIMARE through EMODnet. It was agreed that this will be done through EMODnet Data Ingestion.

The Italian activities have resulted in many submissions for a variety of data types such as sea level stations, nutrients observations, and HFR radar stations. These submissions have been processed and are published. Several have also been elaborated for phase II by inclusion in SeaDataNet.

INGV promoted EMODnet and EMODnet Ingestion through the blog of INGV Environmental department and the related social media (facebook). Below a list of posts and some interesting statistics from facebook about the reached users is given:

- **EMODnet Day Italy** advertisement posted on June 6, 2018 https://ingvambiente.com/2018/06/06/emodnet-day-italia-dati-marini-al-servizio-di-industria-e-settore-pubblico-per-uno-sviluppo-sostenibile/
- **Marine Data and the Blue Growth** posted on June 6, 2018 https://ingvambiente.com/2018/06/06/dati-marini-e-crescita-blu/
- 6 May 2019 Post Facebook linking to EMODnet Bathymetry. It reached 12.3K persons and got 500 reactions/comments.
- 19 April 2019 post Facebook promoting the Coastal evolution map by EMODnet Geology, it reached 10,4K persons with 278 reactions/comments.
- 11 April 2019 Post Facebook about Marine Traffic maps by EMODnet Human Activity. It reached 4,2K persons with 137 reactions/comments.
- 11 November 2018 Post about the Mediterranean Bathymetry, promoting EMODnet bathymetry. It reached 1,7K persons with 103 reactions/comments.

EMODnet Ingestion has been promoted in a range of national and European events which are included in the list in Chapter 6. The Italian partners together organised the EMODnet Italy Day which took place in June 2018.

Latvia:

Latvia is represented in EMODnet Ingestion by LHEI. A "round table" meeting was organised at LHEI in September 2017 where plans about the marine habitats monitoring were discussed. It was decided to publish LHEI dataset about marine habitats on Latvian - Lithuanian border in EMODnet Ingestion portal. It will be the first step of LHEI to meet the requirements of EMODnet Sea Habitats and to develop the best approach on how to build a database regarding the sea habitat observations. Different data providers have been approached and informed about the EMODnet project and cooperation with the Ingestion initiative. Partners from National Research Program and INTERREG Program could be potential data providers interested in publication and sustainable use of project data. So far 3 datasets were

submitted: seabed habitats dataset, marine beach litter survey results 2012-2017 for Latvia and currents in the Gulf of Riga 2016/2017. The data holder of the marine beach litter survey results is **NGO Foundation for Environmental Education — Latvia**. The template of beach and waste description as prescribed by EMODnet Chemistry was completed by NGO and LHEI for inclusion in EMODnet Chemistry. Data source and holder of the latest submitted dataset of GPS measurements by surface drifters is **Institute of Electronics and Computer Science**, partner in National Research Program. LHEI has offered support to other potential data providers in Latvia. One potential data provider **Latvian Environment, Geology and Meteorology Centre** (LEGMC) was identified. They are data holders of coastal erosion monitoring, Coastal habitat and species monitoring as well as monitoring data about radionuclides Sr90, Cs137 in water and sediments. Invitation to submit data to EMODnet DI portal was sent to LEGMC. **Food and Veterinary Service** was previously identified as a potential data provider. However, their data was considered inappropriate for submission to EMODnet Ingestion because datasets contain information about dioxins and furans, PCB, Hg, Cd and Pb in all fish used only for food without specification about their initial source of origin.

EMODnet Ingestion has been promoted in a range of national and international events which are included in the list in Chapter 6.

Malta:
Malta is represented in EMODnet Ingestion by the University of Malta (UoM). They have approached various data providers to inform them about the EMODnet project and to cooperate with the Ingestion initiative.

- **Environment Resource Authority**
- **Transport Malta**
- **Water Services Corporation**

These organisations have provided data for submission, which have been published and elaborated to phase II by inclusion in SeaDataNet CDI service. They required support by UoM to convert data to standard data transport formats. EMODnet Ingestion has been promoted in a range of national events which are included in the list in Chapter 6. A major event was the JERICO-Next summer school, which was organised and hosted by UoM, 9th-14th July 2018, in Malta.

Netherlands:
Netherlands is represented in EMODnet Ingestion by Deltares, NIOZ and Rijkswaterstaat (RWS), while MARIS is EMODnet Ingestion coordinator. Deltares and RWS have focused their activities on the use case of delivering Dutch national monitoring data (Wozep) to EMODnet by means of the Ingestion Service. The licensing process for the planning, construction and operation of offshore wind parks need data and

knowledge on the effects on ecology. Rather than performing a monitoring and evaluation for each individual offshore wind park, the Dutch government has set up an integrated monitoring and research program in cooperation with other North Sea countries for all wind parks. The Dutch contribution is the Offshore Wind Ecological Program (WOZEP). The monitoring and research is performed by research institutes and commercial consultancy companies. The monitoring data from this Dutch program, and from the other countries are extremely valuable to reuse and it has been agreed to ingest these into the relevant EMODnet portals. RWS and Deltares, together with Wageningen Marine Research, work together on this. RWS as the contractor ensures that data will become available as open data after the monitoring projects are finished. Deltares and Wageningen Marine Research have set up data management processes to facilitate the curation and distribution of monitoring data and to arrange the ingestion to EMODnet via SeaDataNet and EurOBIS.

In practice monitoring data are delivered to Wageningen Marine Research (biological data) or Deltares (biological data and other data). Datasets are standardized to the Dutch AQUO standard, and published as web services. For assimilation into EMODnet, these datasets have been submitted to the EMODnet ingestion portal. After submission, the datasets have been elaborated by Deltares for further transformation to a suitable EMODnet format. Two different work flows have been developed and implemented by Deltares for this purpose:

- An AQUO2OBIS transformation, designed by VLIZ and Deltares to make the biological data fit for inclusion in EMODnet biology. Biological data and metadata have already been submitted using the EMODnet ingestion portal and are now available in EMODnet Biology (see also WP2).
- A SeaDataNet NetCDF file server has been set up for other data (concentrations of substances, other observations) at Deltares. A workflow has been set up to retrieve regular monitoring data from the RWS web services and to convert these to SeaDataNet CDI records, which has already been applied for several thousandss of new CDI entries.

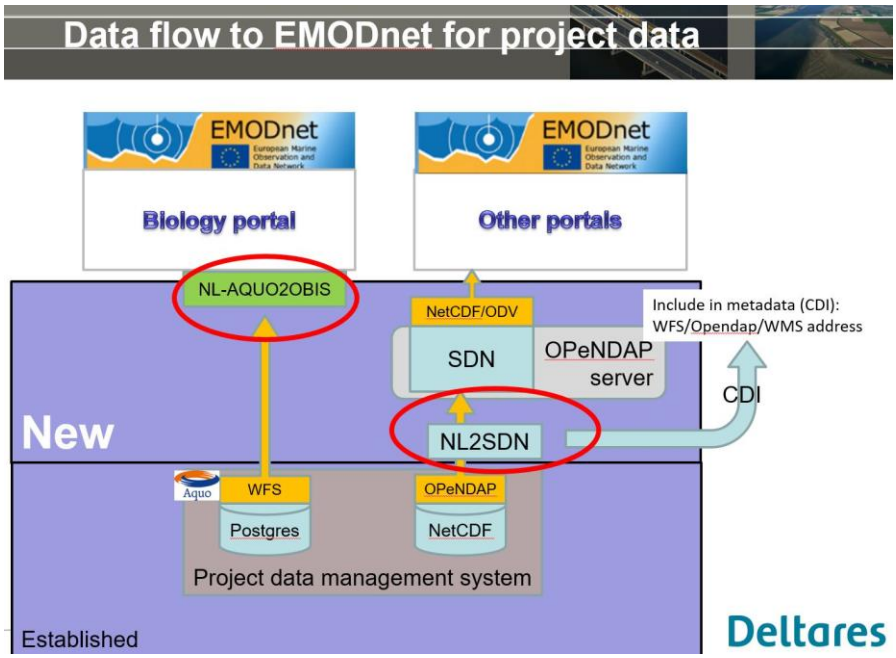


Image: Implemented pathways for the WOZEP data streams

The international cooperation of knowledge and data-exchange related to wind park developments (inclusive ecological effect studies) started as an informal network (2016/2017) initiated by the Danish government, the so-called Copenhagen-Initiative". In this informal network RWS promoted the use of and delivery of data to EMODnet. At that time also the CEAF working group *(Cumulative Effects Assessment Framework)* started its activities. During this period this informal network transformed to a more regular/formal network under the umbrella of a political declaration. International cooperation (by national funding) on research on the effects of wind parks starting as "The Copenhagen initiative'' is now, through the Dutch initiative, part of a larger network according to the accomplished "Political declaration on energy cooperation between the North Sea Countries" as a work package in support group I (SG-1). SG-I deals with the development of a common Cumulative Effects Assessment Framework (CEAF) and the data needed for these analyses. The work program of SG-1 contains an explicit reference to EMODnet and the EMODnet Ingestion project for ingestion, delivery, and interoperability of marine data.

In 2018, an EMFF-funded MSP project SEANSE was started to develop methodologies to quantify cumulative effects in support to the coordination task of the political declaration (see above). The goals of SEANSE are in short:

1. Develop a coherent approach to SEAs (Strategic Environmental Assessment).
2. Create a coherent understanding of how and when to use SEA as a support tool for decision making in MSP through knowledge transfer and information exchange between North Sea countries.

3. Demonstrate the benefits of the implementation of a coherent SEA approach for the preparation of national MSPs.
4. Facilitate the efficient implementation of the "Political Declaration on energy cooperation between the North Seas Countries.

Within SEANSE, case studies are ongoing for "East-Anglia" and "IJmuiden ver", "Dogger Bank", "German Bight" plus a few smaller cross-boundary areas. To support the use of international data, EMODnet is mentioned specifically as an important source of data in the SEANSE Description of Work. Moreover, it is mentioned that any data generated during the project may be delivered to EMODnet (through the Ingestion portal). There is also a large overlap of partners/institutes between SEANSE and EMODnet Ingestion. SEANSE started in February 2018, and will operate until January 2020. Similar projects as SEANSE operate in other European Marine Regions.

Several data submissions from WOZEP have been completed to the Ingestion portal. These data sets concern bi-valves, pelagic fish, demersal fish and gillnets. As indicated above Deltares has elaborated the metadata and data for these submissions from the national AQUO standards to the EurOBIS and SeaDataNet standards for inclusion in the EMODnet portals. The AQUO - SeaDataNet conversion procedure is used for additional WOZEP submissions as well as from the national Rijkswaterstaat marine database.

In addition to the use case other potential data sets have been identified, such as project monitoring data from beach nourishment and Rotterdam harbor extension projects. These are mostly ecological data. EMODnet Ingestion has been promoted in a range of national and European events which are included in the list in Chapter 6.

Norway:
Norway is represented in EMODnet Ingestion by IMR. The partners in the Norwegian infrastructure project **NMDC** were contacted and asked for any data that could be submitted to EMODnet Data Ingestion. Four partners so far have replied that their data can be used.

- The plan was to start with **NIVA** chemical data sets. However it appeared that their NMDC data lacked latitude and longitude, which is still being completed.
- **Gabriel** is a measuring station in Store Lungegårdsvann, Bergen. The station is located next to a **Norwegian high school**, who uses the data in Physics lectures. The station measures temperature, wind speed and air pressure. A confirmation is awaited
- **Anderaa** is a Norwegian company who creates instrument solutions for oceanographic and other environmental measurements. Aanderaa has been contacted and asked for potential data that might be shared.

- The **Norwegian Public Roads Administration (NPRA)** have wave and current measurements in Bjørnafjorden, Hordaland, Norway. The NPRA plans to build a fixed link carrying the road E39 across Bjørnafjorden in Hordaland, Norway. The fixed link shall cross the 5km wide and up to 600m deep Bjørnafjorden. NPRA has requested information on the hydrographical conditions at the fjord crossing location. Waves, currents, wind, temperature and salinity at multiple locations were measured across the fjord, while tidal measurements were acquired at two locations north and south of the fjord. The data is measured during the period from deployment on 6th of January 2015 to 15th of April 2017. NPRA has been contacted for their permission. The final confirmation has not been given yet.

So far a number of data submissions have been achieved. These concern temperature measurements from the **Norwegian aquaculture industry** from 2005 to 2017. The Norwegian aquaculture industry is the second biggest export industry in Norway and it consists of more than 1000 fish farms spread out along the coastline of Norway. Another set of submissions concern HF radar data and wind mast data from the **Norwegian Meteorological Institute**. The HF radar data is measurement of ocean velocity that are radial in direction relative to the radar location and representative of the upper 0.3-2.5 meters of the ocean. The data is owned by the Norwegian Metorological Institute (MET), who is a member of the Norwegian national infrastructure NMDC. In the near future, MET will make the data available for download through the NMDC.no portal. Another potential submission concerns CTD data from the company **Petroleum Geo-Services ASA (PGS)** covering the last 10 years. PGS deliver services to companies in the oil and gas industry worldwide. They provide a broad range of reservoir and seismic services. The CTD data is used for a better sound velocity in the water when shooting seismics. Unfortunately the license PGS has set on the data is Creative Commons – Attribution – NonCommercial – ShareAlike (BY-NC-SA). This license is not supported by EMODnet Data Ingestion.IMR has not been able to obtain a clarification from PGS that they will agree on a more open licence. Furthermore, data from **NIVA ferryboxes** where submitted to IMR for ingestion. The data has been elaborated and included in SeaDataNet CDI service. Data from vessels Nuca Arctica, Polarstern, Simon Stevin and various ship of opportunity has been submitted to IMR for ingestion. Most of the data have been ingested and are now in phase 1.

EMODnet Ingestion has been promoted at the annual meeting of NMDC which includes 16 institutes from Norway. The event is included in the list in Chapter 6.

Portugal:

Portugal is represented in EMODnet Ingestion by IHPT. IHPT at first did a mailshot to 38 identified contacts. However this appeared not to be successful at all. Therefore a more personal approach was adopted. Contact was made with the following institutions / data providers:

- **Information Analysis Department** which manages AIS data. They were positive but needed help for preparing the data for submission. IHPT has computed the aggregate AIS data with the number of ships in a cell by year and submitted these. In March 2019 the Human Activities portal published a new data layer – AIS density maps. The portuguese AIS data could contribute to this effort. IHPT will keep on track on this issue.
- The **CoResyf – Coastal Waters Research Synergy Framework project** colleagues ingested Satellite Derived Bathymetry for two Portuguese Coastal Regions. This is a new experimental technique. Therefore, further processing was givenm to the IHPT EMODnet Bathymetry representative to explore the possible integration and merging of this data product in the next EMODnet Bathymetry edition.
- The **Directorate General of Territory** which manages coastal lidar survey data. The IHPT EMODnet Ingestion team ingested 4 datasets with the LIDAR DEM datasets for all Portuguese Coastal area. This dataset will be further integrated in the EMODnet Bathymetry DTM in the next EMODnet Bathymetry edition. From DGT IHPT also 2 datasets were ingested for tide gauges for sealevel and water temperature.
- The **University of Lisbon** which manages several R&D projects data sets. The IHPT team has helped them to ingest 4 datasets, 2 about chorophyl and 2 about Cococcolithophore.

This has resulted in several submissions and publishing. This positive outcome is based on the shift of the strategy: initially IHPT approached data providers to convince them to ingest their data by themself which did not work. In the last year IHPT undertook the data submission on behalf of data providers, keeping them referenced as owners and holders of information. The EMODnet Ingestion network proved to be a good way of sharing know-how and helping each other with some particular marine data theme expertise. EMODnet Ingestion has been promoted at a national event which is included in the list in Chapter 6.

Romania:

Romania is represented in EMODnet Ingestion by NIMRD. They contacted a number of potential data providers.

- **Maritime Hydrographic Directorate,** the national authority in maritime hydrography, maritime cartography, who manage temperature, salinity, and currents data sets. However, there is a low probability of getting the data released.
- **NGO Mare Nostrum** who has data about Cetaceans (dolphins) and Beach Litter. They are positive and follow-up is underway.
- **NIMRD researchers** who manage T & S and marine litter datasets which are not yet included in the NIMRD NODC.

So far several submissions (T &S datasets) have been achieved and published (phase 1 and 2 completed). Marine litter datsets have been submitted directly to EMODnet Chemistry. EMODnet Ingestion has been promoted at national and international events which are included in the list in Chapter 6.

Russian Federation:

Russia is represented in EMODnet Ingestion by RIHMI-WDC and SIO-RAS. They have approached nearly 50 organizations, such as 12 organizations of Roshydromet, 5 organizations of RAS, 3 organization of Russian Navy, 4 organizations of Fisheries Agency, and 17 potential data providers in the field of oceanography within the framework of the operation of the National ESIMO system. These contacts have so far resulted in multiple submissions concerning pollution data, hydrometeo data, chemistry data, CTD data, MBT data, Secchi data, climatic data of Barents and Black Seas (wave heights), climatological data of Labrador Sea, trajectories of cyclones (maximum wind velocity). In result prepared from:

- **RIHMI** – 7 data sets;
- **WDC-B** - 8 data sets;
- **Arctic and Antarctic Institute** – 1 data set;
- **Atlantic Research Institute for Fishery and Oceanography** – 12 data sets;
- **Roshydromet** – 2 data sets;
- **PJSC «Novorossiysk Commercial Sea port»** - 1 data sets;
- **FGBU Chernomor-Azov Directorate for Technical Supervision of the Sea** – 2 data sets;
- **The Atlantic branch of the SIO RAS** – 1 data sets;
- **The South branch of the SIO RAS** – 2 data sets.

The submissions have been published and a number of been elaborated for inclusion in SeaDataNet. EMODnet Ingestion has been promoted at a national event which is included in the list in Chapter 6.

Slovenia:

Slovenia is represented in EMODnet Ingestion by NIB. They contacted a number of potential data providers.

- **Geodetic Institute of Slovenia** (bathymetry, coastal mapping). This was positive and submissions have been achieved.
- **Geological Survey of Slovenia** (sedimentological data, drills) – no information received so far
- **DeFishGear project** (microplastics). Positive and working on gathering data for submission.
- **Slovenian Environmental Agency** (T,S, Silicate, Phosphate, Nitrite, Nitrate, Ammonium, DO). SEA is still deciding on submission mode.
- **Institute for Water of the Republic of Slovenia** (beach litter) This was positive and submission has been achieved.
- **Fisheries Research Institute of Slovenia** (socio-economic data on marine fisheries). Needs further discussion.
- **Slovenian Environmental Agency** (aquaculture). This was positive and submission has been achieved.

- **Port of Koper** (dredged areas, dredged material amount). Positive and working on gathering data for submission.
- The **Institute for the Protection of Cultural Heritage of Slovenia** (ship wrecks, submerged archaeology and landscapes) Positive and has agreed to prepare a submission.
- **National Institute of Biology** (seabed habitats) has provided submissions.

So far submissions have been achieved and published for beach Litter in the Slovenia Coastal Waters, Marine Aquaculture Areas, Contaminant concentrations, Floating macrolitter, - Slovenian marine and coastal archeological heritage, in Slovenian Territorial Waters, and cymodocea nodosa in the Slovenian coastal area. EMODnet Ingestion has been promoted at a few national events which are included in the list in Chapter 6.

Spain:

Spain is represented in EMODnet Ingestion by CSIC and IEO. They approached several potential data providers in the research and industry sectors to inform them about the EMODnet project and to cooperate with the Ingestion initiative. Following the response there were dialogues with:

- **ECO-DIVE**: It is a SMR dedicated for Diving, Diving Courses on the coast of Malaga and Granada.
- **ESGEMAR S.A**. It is an SMR dedicated to marine geological studies and it operates in a diverse range of areas and sectors from marine technical assistance, support, training and research.
- **SUBMON**: It is a SMR dedicated to marine studies. It is a Technical consultancy company which operates in a diverse range of areas and sectors from marine technical assistance, support, training and research.
- **CSIC- Spanish National Research Council**. CSIC comprises different institutes and scientific groups distributed throughout Spain. For the Emodnet Ingestion Portal, the following were contacted as potential data providers: The Continental Margins Group-GMC- from the Institute of Marine Science-**ICM-CSIC**; the Marine Geoscience department from the Andalusian Earth Science Institute, **IACT-CSIC**; the Faculty of Geology, from the **University of Granada**; the Faculty of Marine Sciences from the **University of Vigo**; and the Faculty of Marine Sciences from **University of Cádiz.**
- **IEO departments** that are managing a wide range of marine science, although many are already organised through the Spanish NODC at IEO. Several scientific data sets have been submitted and elaborated for inclusion in SeaDataNet.

Several submissions have been achieved from ECO-DIVE; GMC-ICM; IACT-CSIC; University of Granada, University of Vigo, CSIC and IEO. Types of data concern: bathymetry; velocity profiles; submarine photos by scuba diving; physical parameters. Follow up to phase II is underway for inclusion in EMODnet Bathymetry and other relevant EMODnet portals, while also part has already been elaborated to phase II. EMODnet Ingestion has been promoted at national events which are included in the list in Chapter 6.

Sweden:

Sweden is represented in EMODnet Ingestion by SMHI. SMHI initially collated an inventory of 25 potential new data suppliers/data sets of which 18 were prioritized for EMODnet. SMHI has approached the data providers, although with varying success. In addition, new potential data sources were identified from the **County Administration Boards** along the coast and **universities.** In order to simplify the process for the data submitters, SMHI has agreed to receive some datasets directly and submit these to the Ingestion portal on behalf of the original data owner / providers.

Several submissions have been achieved and processed by SMHI, whereas other datasets hav been forwarded to other data centres to process. Some of the datasets are published at the SeaDataNet CDI service for inclusion in thematic EMODnet lots. Data consists of physical, biological, and chemical data sets. Also, marine litter data for the Swedish OSPAR and HELCOM areas were compiled, formatted and delivered to Ingestion portal. Several issues with format harmonization of the Swedish HELCOM area were solved in collaboration with the data provider Keep Sweden Tidy. A national NODC for litter data is lacking in Sweden. Discussions with the Swedish Agency for Marine and Water management were initiated to bring this question to the table as well as the problems of data harmonization. A number of national events have been organized to inform about EMODnet and to encourage data holders to share their marine data through the Ingestion initiative. These events are included in the list in Chapter 6.

Turkey:

Turkey is represented in EMODnet Ingestion by METU-IMS. They have approached a number of potential data holders in Turkey to discuss sharing marine data through EMODnet Ingestion.

- **Marine Research Centre (MTA)**, who collect and manage data about Marine Geology, Geophysics, Bathymetry, and Physical Oceanography. A cooperation protocol will be signed between METU-MTA and submissions are planned, starting with CTD data.
- **Ministry of Environment and Urbanisation**, who are in charge of pollution, eutrophication and ecological quality monitoring and assessment (M&A) in all Turkish Seas (including coastal and marine waters) compliant with the requirements of Regional Seas Conventions, national needs and related EU Directives (WFD & MSFD). They conduct bi-annual monitoring surveys in winter and summer at > 250 stations. The actual monitoring is performed by TÜBİTAK MAM, METU, and İU. METU is now working on a cooperation protocol for publishing data.
- **TR - Research & Development**, is a company developing AUV & Gliders for geophysical (e.g. Multibeam Bathymetry, Side Scan Sonar) and oceanographic (CTD, Dissolved Oxygen, pH, Redox) data acquisition. There exists a collaboration between TR and METU for common scientific projects. A start will be made with T & S data.
- **Kyrenia University and Near East University**, who have a partnership with METU in scientific projects in the Cilician Basin and Levantine sea region. The first submission has been achieved and published for Kyrenia Time Series with CTDs in 2015.

Turkey:

Turkey is represented in EMODnet Ingestion by METU-IMS. They have approached a number of potential data holders in Turkey to discuss sharing marine data through EMODnet Ingestion.

- **General Directorate of Mineral Research and Exploration, Marine Research Centre (MTA)**, who collect and manage data about Marine Geology, Geophysics, Bathymetry, and Physical Oceanography. A cooperation protocol will be signed between METU-MTA and as follow-up submissions are planned, starting with CTD data.
- **Ministry of Environment and Urbanisation**, who are in charge of pollution, eutrophication and ecological quality monitoring and assessment (M&A) in all Turkish Seas (including coastal and marine waters) compliant with the requirements of Regional Seas Conventions, national needs and related EU Directives (WFD & MSFD). They conduct bi-annual monitoring surveys in winter and summer at > 250 stations. The actual monitoring is performed by TÜBİTAK MAM, METU, and İU. METU is now working on a cooperation protocol for publishing data.
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- **Kyrenia University and Near East University**, who have a partnership with METU in scientific projects in the Cilician Basin and Levantine sea region. The first submission has been achieved and published for Kyrenia Time Series with CTDs in 2015.
- **Republic of Turkey Ministry of Agriculture and Forestry, Central Fisheries Research Institutes**, in Trabzon, Black Sea and Antalya, Mediterranean. Discussions are ongoing about possibly releasing fish data.

United Kingdom:

United Kingdom is represented in EMODnet Ingestion by NERC-BGS and NERC-BODC. Both are closely involved in the Marine Environmental Data and Information Network (MEDIN), which continues to act as a central hub for UK marine data. MEDIN has a network of Data Archive Centres (DACs); in addition to BGS and BODC, this includes DASSH (species and habitats) and the Met Office (marine meteorology) amongst others. BGS is also liaison to EMODnet Geology and has extended its marketing to the European marine geology community by means of several presentations at European events. There were events with **MAREMAP, Marine Alliance for Science and Technology for Scotland (MASTS) and Scottish Alliance for Geoscience, Environment and Society (SAGES) communities**. The MAREMAP network comprises a large number of research, governments and industry organisations. Through the presentations, e-mails and direct marketing contacts a large community was reached. As a follow-up dialogues have taken place with:

- **Peel Ports**: BODC and OceanWise met to explore providing NRT tide gauge data from Peel Ports Liverpool sites to EMODnet Physics, and delayed-mode data via BODC. OceanWise handles these data on behalf of Peel Ports at several UK locations and Peel Ports are willing to make data more easily available to the scientific community. Some further investigation is required to check that the data are of sufficient quality and include all of the recommended metadata. Some of these sites are long time series, and BODC already holds some of the historical data. No further progress, as priority was given to Marine Scotland Science data (below).
- **Marine Scotland Science (MSS):** Further discussions with the Marine Laboratory, Aberdeen, resulted in CTD data from 2016 and 2017 that were made available to BODC. In total data sets from 21 cruises have been entered into the Ingestion system and published 'as-is'. Of those already 8 cruises have completed for Phase 2 giving access to approximately 500 CTDs in the SeaDataNet portal and related EMODnet portal; work is ongoing for elaborating the data of the remaining 13 cruises.
- **Western Channel Observatory (WCO):** Initial discussions with the operators of the Western Channel Observatory have been quite positive. This should result in near real time physical data from the long term E1 and L4 sites, offshore from Plymouth in the English Channel, becoming available to EMODnet Physics. The delayed-mode quality controlled data are already archived at BODC. Further discussions resulted in agreement that the near real time temperature and salinity data can be made available.
- **Channel Coastal Observatory (CCO):** Initial discussions with the operator took place. CCO is responsible for 14 tide gauges and is willing to share the historical data and to continue to supply quality controlled data in the future. Real time data from a few sites is already available from the EMODnet Physics site. Further discussions with CCO concluded that the tide gauge data can be made available. However progress stalled due to change of personnel at CCO. To be picked up again in next phase of EMODnet Data Ingestion. Initial discussions have also taken place regarding backscatter and seismic data.
- **Agri-Food and Biosciences Institute (AFBI):** Several coastal monitoring time series may be available in the coming year. AFBI are leading a recently launched EU INTERREG project, COMPASS (Collaborative Oceanography and Monitoring for Protected Areas and SpecieS), which includes data management. Thus onward supply of AFBI data to recognised data centres (e.g. BODC, BGS and DASSH), potentially via EMODnet Data Ingestion, is anticipated. The project is still in its early stages, but the intention is still that data will be made available in the future.
- **Crown Estate Scotland**: initial discussions about Scottish renewables data took place and further dialogue is planned.

- **Scottish marine environmental data**: discussions with Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH) and Marine Scotland have taken place regarding MPA (Marine Protected Area) and other data. BGS plan to follow up these initial discussions.
- **Hartley Anderson:** initial and further discussions have taken place with this potential data supplier.
- **Cefas:** 3 reprocessed backscatter datasets were received by BGS and then submitted to the EMODnet Ingestion Portal.
- **MCA/UKHO:** submission of sample data have been processed by BGS via EMODnet Ingestion portal.

Progress was made with the use case for the **Marine Data Exchange (MDE)** which has been set-up by the Crown Estate (TCE). As part of its active management of the UK seabed, offshore renewable energy developers provide data to The Crown Estate and this is freely available through the Marine Data Exchange (MDE). MDE was developed in 2012 and provides a platform to store, manage and share the data collected during the planning, building and operation of offshore renewable energy projects. BODC has been working with TCE to make a sample of these data available through EMODnet Data Ingestion as a proof of concept, but in the longer term a strategy is required to provide a machine to machine link between the MDE metadata and the Ingestion Portal. Potential solutions for this that require further investigation could be the use of SEANOE or more direct bulk ingestion from the MEDIN harvested metadata records. Two example datasets, one from the Bristol Channel Atlantic Array and the other from the Isaly Offshore Wind Farm, have progressed through both Phase 1 and Phase 2, with 16 time series of wave data and currents (ADCP) from the former and 6 time series of wave data from the latter now available from the SeaDataNet data portal. Metadata and data for several more MDE metadata for data sets relevant to DASSH and BGS will be added to the Data Ingestion Portal. In addition, at the request of TCE, BODC have assisted with the submission of five shapefiles through Phase 1, for onward transmission to EMODnet Human Activities. As indicated a number of national and European events have been joined to inform participants about EMODnet and to encourage data holders to share their marine data through the Ingestion initiative. These events are included in the list in Chapter 6.

6. Meetings held during project

A number of project meetings took place to monitor the project progress. Also meetings took place with the EU, EMODnet Steering Committee and other EMODnet lots for tuning developments. In addition a large number of events were organised or joined by EMODnet Ingestion partners to market and promote EMODnet overall and in particular EMODnet Ingestion.

Date	Location	Topic	Short Description
16-18 May 2017	Moscow - Russian Federation	XV International Scientific and Technical Conference "Modern Methods and Means of Oceanological Research"	Russian contribution to the international exchange of oceanographic information in frame the EMODnet Ingestion project.
26 – 27 May 2016	Amsterdam – The Netherlands	EMODnet Ingestion Project kick-off meeting	To start the project, meet the partners, and to communicate the overall approach
10 June 2016	Brussels - Belgium	Contractual kick-off with EASME and DG MARE	To discuss contractual procedures between EU and the consortium.
11 – 13 October 2016	Gdansk - Poland	IMDIS 2016 Conference	To present EMODnet Ingestion to an international audience of marine data managers
7 – 8 November 2016	Athens - Greece	Technical Working Group meeting	To discuss progress and further planning of the portal, associated services, pathways and promotion.
8 December 2016	Brussels - Belgium	Progress meeting with EASME, DG MARE and EMODnet Secretariate	To discuss progress in particular for the portal, submission service and outreach
25-27 January 2017	Helsingør - Denmark	Dansk Havforskermøde- The Danish Marine Reasearch Meeting	The EMODNET Ingestion project has been presented via a poster during the poster session at the meeting.
15 – 16 February 2017	Brussels - Belgium	EMODnet Steering Committee meeting	To present set-up, progress and tuning with other lots
23 February 2017	The Hague - Netherlands	Use case meeting with RWS and Deltares	To discuss approach for NL use case with wind farms monitoring data
20 March 2017	Venice - Italy	EMODnet HRSM Kick-off meeting	To introduce EMODnet Ingestion and its planned cooperation with HRSM project and network
10 – 12 April 2017	Limassol - Cyprus	2nd EMODnet Ingestion Projectgroup meeting	To present and discuss progress with the portal and services; to discuss inventory of potential data sources and the plan for outreach

Date	Location	Topic	Short Description
19 April 2017	Milan - Italy	EMODnet Physics 3 kick-off meeting	To introduce EMODnet Ingestion and its planned cooperation with Physics 3 project and network
4 May 2017	Bologna - Italy	SeaDataCloud TTG meeting	To introduce EMODnet Ingestion and its planned cooperation with SeaDataCloud
17 May 2017	Trieste - Italy	EMODnet Chemistry 3 kick-off meeting	To introduce EMODnet Ingestion and its Chemistry 3 project and network
18 – 19 May 2017	Poole – United Kingdom	European Maritime Day 2017	Presentations and promotion of EMODnet overall and EMODnet Ingestion by partners MARIS and COGEA and EMODnet Secretariat.
20 May 2017	Aarhus - Denmark	Opening of new marine geological facilities at Aarhus University	Presentation of EMODnet Geology and Ingestion to Danish marine geology stakeholders by partner GEUS.
30 – 31 May 2017	Ostend - Belgium	Marine Science meets Maritime Industry	Presentation of EMODnet Ingestion project by partner VLIZ and RBINS to Belgian maritime companies and marine scientists.
30 – 31 May 2017	Espoo – Finland	EMODnet Geology kick-off meeting	Introducing EMODnet Ingestion and its planned cooperation with the Geology project and network by partners BGS, GEUS and GTK
10 June 2017	Varna - Bulgaria	IO-BAS seminar	Meeting with IO-BAS staff to present EMODnet Ingestion and to brainstorm about potential data holders and sources
21 – 29 June 2017	Paris – France	29th Session of the IOC Assembly	EMODnet Data Ingestion was presented to a number of delegates, among them GOOS Africa, Morocco, Canada, US, India
5 – 6 July 2017	Genua - Italy	EMODnet Technical Working Group	Introducing EMODnet Ingestion and its planned cooperation with the overall EMODnet network
29 – 31 August 2017	Bergen - Norway	NMDC Annual Meeting	Meeting with Norwegian research institutes and their data managers. EMODnet Ingestion was presented and promoted by partner IMR.
5 – 7 September 2017	Singapore - Singapore	GOOS Regional Alliance Forum VIII	Presentation of EMODnet Physics and EMODnet Ingestion project by partner EuroGOOS
6 – 7 September 2017	Skiathos = Greece	Underwater Acoustic Conference Europe 2017	Presentation of EMODnet Physics and EMODnet Ingestion project by partner ETT
7 - 9 September 2017	Constanta - Romania	ProMare 2017 International Symposium	Presentation of EMODnet Ingestion project to Black Sea research community by partner NIMRD

Date	Location	Topic	Short Description
11 – 15 September 2017	Ostend - Belgium	IODE's Quality Management System Essentials for NODCs and ADUs training course 2017	Promotion of EMODnet Ingestion by partner SMHI to internatioal course participants.
13 – 15 September 2017	Rome - Italy	EMODnet Steering Committee meeting	Presenting progress on the project and contributing to discussions by MARIS
17 September 2017	Gothenburg - Sweden	Big data workshop at Gothenburg University, Dep of Marine Sciences	Presentations of EMODnet and EMODnet Ingestion projects by partner SMHI.
22 September 2017	Antwerp-Belgium	EMODnet's Open Sea Lab Kickoff Event	Presentation of EMODnet Ingestion project by partner RBINS
25 September 2017	Riga - Latvia	LHEI seminar	Meeting with LHEI staff to present EMODnet Ingestion and to brainstorm about potential data holders and sources
25 – 28 September 2017	Brussels - Belgium	Copernicus Marine Week	Presentations of EMODnet Physics and EMODnet Ingestion project by partners MARIS, ETT and EuroGOOS
29 September 2017	Varna - Bulgaria	European Night of Scientists- FRESH EU project	Promotion of EMODnet Ingestion at IO-Bas stand.
3 – 5 October 2017	Bergen - Norway	EuroGOOS International Conference	Presentation of EMODnet Ingestion project by partners EuroGOOS and ETT
3 – 6 October 2017	Athens - Greece	EMODnet Seabed Habitats kick-off meeting	Introducing EMODnet Ingestion and its planned cooperation with the Seabed Habitats project and network by partner HCMR and JNCC
5 – 6 October 2017	Brussels - Belgium	FAO-COST Workshop on European Algae Production	Presentation of EMODnet Human Activities and EMODnet Ingestion by partner COGEA
5 – 6 October 2017	Den Helder - Netherlands	North Sea Days	Promotion of EMODnet Ingestion to Dutch marine government and research community by partners RWS and Deltares
9 – 11 October 2017	Rome - Italy	EMSO ERIC All Regions Workshop	Promoting EMODnet Ingestion by partner ENEA to members of the marine science and industry community

Date	Location	Topic	Short Description
11 October 2017	Halmstad - Sweden	Coastal waters workshop	Promoting EMODnet Ingestion by partner SMHI to Swedish county Administration boards
12 October 2017	La Spezia - Italy	ENEA Workshop	Introducing European marine data management infrastructures, EMODnet and EMODnet Ingestion by partner ENEA to researchers and members of ENEA, CNR-ISMAR, ISPRA Environment
18 October 2017	Gothenburg - Sweden	SMHI seminar	Meeting with SMHI staff to present EMODnet Ingestion and to brainstorm about potential data holders and sources
24 October 2017	Barcelona - Spain	PANACeA's Knowledge Sharing Event	Presentation of EMODnet, EMODnet Med Checkpoint and EMODnet Ingestion by partner INGV and EMODnet Secretariat at this Interreg event
25 October 2017	Sopot - Poland	HELCOM State & Conservation meeting	Presentations of EMODnet Physics and EMODnet Ingestion by partners EuroGOOS and ET
25 – 27 October 2017	Bucharest - Romania	Romanian Research Salon	Presentation of EMODnet and EMODnet Ingestion by partner NIMRD at this national event organized by Romanian Ministry of Research and Innovation. Promotion of EMODnet Ingestion via NIMRD stand.
2 November 2017	Karlskrona - Sweden	Coastal waters workshop	Promoting EMODnet Ingestion by partner SMHI to Swedish county Administration boards
14 – 16 November 2017	Athens - Greece	MONGOOS Annual Meeting	Presentations of EMODnet Physics and EMODnet Ingestion project by partners INGV, HCMR, ETT and EuroGOOS
15-17 November 2017	Antwerp – Belgium	EMODnet 'Open Sea Lab' hackaton	Presentation of EMODnet Ingestion by partner VLIZ in workshop on marine open data and industry as data user and provider.
20 November 2017	Galway - Ireland	Data management seminar at NUIG, Ocean and Earth Sciences	Introducing data management best practices and European marine data management infrastructures and data flows to 4th year students by partner MI.

Date	Location	Topic	Short Description
20 November 2017	London – United Kingdom	NOOS annual meeting	Presentations of EMODnet Physics and EMODnet Ingestion project by partner EuroGOOS
20 November 2017	Online	MED Working Webinar on Integrating Data	Presentation of EMODnet Ingestion by partner INGV to Interreg project partners
21- 23 November 2017	Geneva - Switzerland	WMO, TT-eWIS (WMO Task Team) meeting	Presentation of EMODnet Ingestion project by partner EuroGOOS
21 – 23 November 2017	Obninsk – Russian Federation	"Modern information technologies in hydrometeorology and related fields" Conference	Presentation of EMODnet Ingestion project by partner RIHMI-WDC
27 – 28 November 2017	Bergen - Norway	Arctic ROOS Annual Meeting	Presentation of EMODnet Ingestion project by partner EuroGOOS
29 – 30 November 2017	Naples - Italy	UfM (Union for Mediterranean) Regional Stakeholder Conference	Promoting EMODnet Ingestion to UfM network of public, research and private organisations from 28 countries of the European Union and 15 countries of the Southern and Eastern Mediterranean.
30 November 2017	Umea - Sweden	Coastal waters workshop	Promoting EMODnet Ingestion by partner SMHI to Swedish county Administration boards
10 – 12 January 2018	Lyngby - Denmark	Nordic Geological Winter Meeting 2018	Prmotion of EMODnet Ingestion by partner GEUS to members of the Geological Society of Denmark
23 January 2018	Oporto - Portugal	EUDAT – SeaDataCloud Workshop	Presentations on EMODnet Ingestion and the SWE pilot by MARIS, BODC and ETT
23 – 25 January 2018	Athens - Greece	CMEMS INSTAC meeting	Presentations of EMODnet Physics and EMODnet Ingestion projects by partners ETT and EuroGOOS and discussion on cooperation

Date	Location	Topic	Short Description
31 January 2018	Ostend - Belgium	IODE ODIS meeting	Presentations of EMODnet Ingestion and possible synergy with ODIS by partners MARIS and EuroGOOS
31 January 2018	Ravenna-Italy	Environmental Science Department of the University of Bologna	Two hours seminar within the course of Management and Prevenction of Environmental Impact by INGV partner.
31 January – 1 February 2018	Hamburg - Germany	WOZEP meeting	WOZEP deals with offshore wind energy developments. EMODnet Ingestion was presented by partner RWS.
12 – 16 February 2018	Galway - Ireland	EuroGOOS and EMODnet Physics Data Workshop	Presentation of EMODnet Physics and EMODnet Ingestion project by partners EuroGOOS, ETT, BODC, and MI to Irish and invited UK oceanography community of CIL, OPW, NUIG, UCC, MaREI, AFBI, MSS, SAMS, MEDIN, SmartBay, and MI
12 – 14 February 2018	Brussels - Belgium	WG DIKE and TG DATA meetings	Promotion of EMODnet Ingestion by partners RWS, MARIS and OGS
14 February 2018	Brussels - Belgium	EMODnet – CMEMS meeting	Discussing synergy between CMEMS INSTAC and EMODnet Physics, Chemistry and Ingestion with participation of partners MARIS, IFREMER, OGS, ETT and EuroGOOS
26 – 28 February 2018	Edinburgh – United Kingdom	MAREMap and MIM (MAREANO-INFOMAR-MAREMAP) meetings	Presentation of EMODnet Ingestion project by partner BGS
1 March 2018	The Hague – The Netherlands	SEANSE kick-off meeting	Strategic Environmental Assessment North Seas Energy (SEANSE) project meeting with several partners (RWS, Shom, BSH, RBINS). Use of EMODnet and EMODet Ingestion for data manangent of MSPs is promoted.
7 March 2018	London – United Kingdom	Civil Hydrography Annual Seminar	Presentation of EMODnet Ingestion project by partner BGS

Date	Location	Topic	Short Description
9 March 2018	Riga - Latvia	National 'Fish Fund' stakeholder meeting	Prsenting EMODnet Ingestion and discussing potential data sources for MFSD descriptor D9 – Chemical data for seafood by partner LHEI.
15 March 2018	Utrecht – The Netherlands	WOZEP Mid Term Evaluation Workshop	WOZEP deals with offshore wind energy developments. Importance of sharing data through EMODnet Ingestion is promoted by partner RWS to stakeholders from Netherlands, Denmark and Belgium
13 – 15 March 2018	London – United Kingdom	Oceanology International 2018	Promotion of EMODnet Ingestion at stands of MARIS and EMODnet secretariate. Presentations by partners MARIS, ETT and EuroGOOS as part of Ocean-ICT-Expo, EMODnet Bathymetry Workshop, and SWE Workshop.
14 – 15 March 2018	Portorož - Slovenia	14th meeting of the Member States Expert Group on Maritime Spatial Planning	Presentation of EMODnet Human Activities and EMODnet Ingestion by partner COGEA
20 – 22 March 2018	Aix-en-Provence - France	MERIGEO conference	Presentations on EMODnet portals and EMODnet Ingestion by partners Shom and IFREMER to French governmental and regionals agencies (spatial planning …) and researchers.
21 March 2018	Bredene - Belgium	VLIZ Marine Science Day (VMSD) 2018	Presentation of EMODnet Ingestion and promotion at EMODnet stand by VLIZ and RBINS to over 300 marine and coastal scientists in Flanders and its neighboring regions
21-22 March 2018	Obninsk, Russian Federation	"Optimizing information resources" Meeting	Promotion of EMODnet Ingestion Activities at Meeting of the data providers of the Russian national ESIMO system
21 – 23 March 2018	Majorca - Spain	EMODnet Steering Committee meeting	Participation and presentation of progress.

Date	Location	Topic	Short Description
20 – 21 March 2018	Majorca - Spain	EMODnet Technical Working Group meeting	Participation and presentation of progress.
23 March 2018	Rome - Italy	Meeting with Adriatic LNG	Presenting and discussing uptake of EMODnet Ingestion for environmental monitoring data by partners OGS and ISPRA
26-27 March 2018	Gothenburg - Sweden	National meeting for water management and monitoring (Vattenmiljöseminariet)	Informing about and promoting the project to participants at the conference.
27 March 2018	Galway - Ireland	Workshop Chemical Oceanography: Coastal, Shelf and Ocean Biogeochemistry Research in Ireland at Marine Institute	Presentation of EMODnet and EMODnet Ingestion project by partner MI to Irish scientists from EPA, Trinity College Dublin, NUIG, DIM, WIT, Sligo IT, MSS, AFBI, SAMS and MI
10 – 12 April 2018	Vienna - Austria	EGU 2018	Presentations and promotion of EMODnet and EMODnet Ingestion at several sessions by ETT, EuroGOOS, MARIS, and INGV. Several presentations and distribution of promoting material about EMODnet and Data Ingestion at the ENVRI Plus stand from ENEA and INGV.
11 April 2018	Athens - Greece	Marine Litter day with Greek NGO's	Presentation of EMODnet Ingestion by partner HCMR to Greek NGO's.
16 – 17 April 2018	Barcelona - Spain	2nd EMODnet Ingestion Projectgroup meeting	Presentations and discussions on progress with project activities, in particular with marketing, outreach and submissions. Planning further activities.
18 April 2018	St. Paul's Bay - Malta	Marine Intelligence – the value of data for sea-based applications	A half-day seminar related to the CALYPSO-South project aimed at highlighting the importance networking between data scientists to share data with prmotion of EMODnet Ingestion by partner UoM.

Date	Location	Topic	Short Description
21 April 2018	Hamburg - Germany	BSH Open Day	Promotion of EMODnet and EMODnet ingestion by posters and leaflets to general audience, scientists from other departments and neighboring institutions.
24 April 2018	London, UK	MEDIN 10th anniversary - Open Meeting "Sharing marine data – past, present and future"	EMODnet and EMODnet Data Ingestion promoted by partners BODC and BGS.
26 April 2018	Sopot - Poland	SWE Workshop	Presentations and promotion of EMODnet Physics, EMODnet Ingestion and SWE to Polish oceanographic community of IMGW, PIG, IO PAN, and MIG by partners MARIS, BODC, MI, ETT and EuroGOOS
9 – 10 May 2018	La Spezia - Italy	Maritime Big Data Workshop	Promotion of EMODnet Human Activities and EMODnet ingestion by partner COGEA at Workshop organised by NATO CMRE.
12-14 May 2018	La valetta Malta	European Research Vessel Operators	Promotion of EMODnet Ingestion.
16 -17 May 2018	Gothenburg - Sweden	Sea and Coast Fora 2018	Promotion of EMODnet Ingestion by poster, leaflets and film by partner SMHI to Swedish Maritime auditorium including industry and the Crown Princess.
22-25May 2018	Brussels Belgium	EuroGOOS Annual Assembly.	Promotion of EMODnet Ingestion.
31 May – 01 June 2018	Burgas - Bulgaria	European Maritime Day	Promotion of EMODnet Ingestion by partners IO-BAS and COGEA and EMODnet Secretariate in presentations and stand.
4 June 2018	Roja - Latvia	Lectures in a frame of Camp «Par drošu jūru» («Safe sea»)	Promotion of EMODnet Chemistry and EMODnet ingestion by partner LHEI by short presentation and leaflets to general audience and other lecturers from neighboring institutions.

Date	Location	Topic	Short Description
4-5 June 2018	Gothenburg – Sweden	National meeting for water management and monitoring (Havs- och vattenforum)	Informing about and promoting the project to participants at the conference.
6 – 7 June 2018	Herrsching - Germany	SDB Day 2018	EMODnet Bathymetry and EMODnet Ingestion presented to internationa bathymetry community by partners MARIS and Shom.
8 June 2018	Helsinki - Finland	"Maailman Merien Päivä" (World Ocean Day) seminar	EMODnet Ingestion presented to national data producers and providers, and data users by partners GTK and FMI.
8 June 2018	Trieste - Italy	EMODnet Day Italy	To present and promote EMODnet overall and EMODnet Ingestion to Italian marine community by partners OGS, INGV, ETT, ENEA CNR, Cogea, and EMODnet Secretariat
11-13 July 2018	La Valetta Malta	JERICO-NEXT summer school	EMODnet training session.
19 – 21 June 2018	Lisbon - Portugal	5th Hydrographic engineering Meeting	Promotion EMODnet Ingestion by IHPT in the 5th Hydrographic engineering Meeting for Marine Experts: EMODnet Ingestion Stand , Oral presentation about EMODnet Ingestion Marine and SeaDataCloud Projects , Published a paper on conference proceedings.
19 – 23 June 2018	La Spezia - Italy	Sea Future 2018 Exhibition and Convention	Partners ETT and Cogea present and promote EMODnet Physics and EMODnet Ingestion to the Italian maritime community.
20 – 22 June 2018	Vigo - Spain	International Symposium on Marine Science 2018	To present and promote EMODnet Human Activities and EMODnet Ingestion by AZTI

Date	Location	Topic	Short Description
21-23 June 2018	Constanta - Romania	4th International Conference Water2018	Presentation and promotion of EMODnet Ingestion at Intenational Conference by partner NIMRD. Presentation of EMODnet Ingestion project by partner NIMRD to the professors of Faculty of Civil Engineering/"Ovidius" University, Constanta
22 June 2018	Peterborough - United Kingdom	PSA Data Workshop	Presentation and promotion of EMODnet ingestion by BGS at Workshop organised by Cefas/NMBAQC.
25 – 26 June 2018	Albania	EMODnet Geology	Promotion by BGS
28 - 29 June 2018	Galway - Ireland	Harnessing Our Ocean Wealth trade show	EMODnet Ingestion banner displayed
7 September 2018	Webconf	EMODnet communication and promotion	Discussion on tuning promotional and communication activities within the EMODnet network of portals towards external persons and entities
18-20 September 2018	Genova, Italy	International Glider workshop	Promotion of EMODnet Ingestion.
19 sept 2018	Antwerpen - Belgium	INSPIRE Conference organized by NL en B	Promoting EMODNET Ingestion during workshops and informal discussions by RWS
26 - 27 September 2018	Nykoping - Sweden	Marine Monitoring Days 2018	Promotion of EMODnet Ingestion by poster, leaflets and film by partner SMHI mainly to Swedish municipalities and to Swedish County Administration boards.
26-28 Sept 2018	Hamburg - Germany	Wind Energy Europe Conference Hamburg	Promotion of EMODnet in General and Ingestion by partner RWS at Wind Europa Conference and Exhibition in Hamburg by RWS

Date	Location	Topic	Short Description
1 Oktober 2018	Brussel - Belgium	DIKE meeting MSFD	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
1 - 2 October 2018	Brussels - Belgium	EMODnet Technical Working Group meeting	Contributing to discussions on tuning technical developments within the EMODnet network
2 October 2018	Rome-Italy	INGV Environmental Department Conference	Presentation "*Marine data and scientific competitiveness"* promoting EMODnet and Data Ingestion initiative
1 – 3 October 2018	Newfoundland, Canada	Shallow water survey conference	Presentationa and promotion by BGS
4 – 5 October 2018	Texel – The Netherlands	North Sea Days 2018	This event is focused on Dutch marine government and research community. Partners NIOZ, MARIS, Deltares and RWS has organized a dedicated EMODnet session.
10 Oct 2018	Varna -Bulgaria	XIV International Scientific Conference on Marine Science and Technology "Black Seas 2018"	Promotion of EMODnet Ingestion and distributing dissemination matherials
10 October 2018	Spain- Alboran Sea	Talk	Talk to national and international colleagues to promote the importance of the Emodnet project during the Fauces 2 cruise onboard the Sarmiento de Gamboa. Also, handing out leaflets and bookmarkers onboard
14 – 17 October 2018	Lisbon - Portugal	PiE-2018 Conference	Promotion EMODnet Ingestion by IHPT through an EMODNet Ingestion Stand.
23 october 2018	St Nazaire – France	AFHy Technical meeting	Promotion of EMODnet Bathymetry and EMODnet Ingestion to French hydrographers by Shom
22-23 October 2018	Brussels - Belgium	JMP – Eunosat meeting in Brussels	Further promotion of the use of EMODNET Ingestion Portal during JMP-Eunosat meeting by RWS

Date	Location	Topic	Short Description
5 – 7 November 2018	Barcelona - Spain	IMDIS 2018 Conference, organised by SeaDataNet	Promotion of EMODnet Ingestion and other lots by presentations and posters by MARIS, ETT, IHPT, and others
12 November 2018	Galway - Ireland	Data management seminar at NUIG, Ocean and Earth Sciences	Introducing data management best practices and European marine data management infrastructures and data flows to 4th year students by partner MI.
12 November 2018	Gothenburg, Sweden	Swedish National Data Centre	Promotion of EMODnet Ingestion.
13 – 14 November 2018	Copenhagen - Denmark	EIONET Marine Workshop	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
15-16 November 2018	Bucharest - Romania	International Conference SEAS-DELTAS-RIVERS	Presentation of Romanian NODC and EMODnet Ingestion at Intenational Conference by partner NIMRD.
19 – 20 November 2018	Brussels - Belgium	EMODnet Steering Committee meeting	Contributing to discussions on overall progress of EMODnet and presenting progress of EMODnet Ingestion
21 November 2018	Rome-Italy	INGV-Castalia initiative	INGV presented EMODnet and the Data Ingestion at Castalia premises in Rome (2 hours)
21-23 November 2018	Brussels - Belgium	EOOS Conference in Brussels	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS, Deltares and MARIS
30 – 31 November 2018	Split, Croatia	EMODnet HRSM	Promotion by BGS
3-4 December 2018	Copenhagen - Denmark	TG Data meeting	Presentation and Promoting progress and importance of EMODNET Ingestion during TG Data meeting in Copenhagen by RWS, MARIS, Deltares and ??

Date	Location	Topic	Short Description
7 December 2018	Amsterdam – The Netherlands	1st meeting of the Blue Bioeconomy Forum	To present EMODnet and encourage data submission via EMODnet Data Ingestion
8 December 2018	Glasgow - United Kingdom	Underwater Archaeology Conference	Presentation included promotion of EMODnet ingestion by BGS at conference organised by Historic Environment Scotland
10-11 December 2018	Porto, Portugal	MARTECH workshop	Promotion of EMODnet Ingestion.
23-25 january 2019	Odense - Denmark	Dansk Havforskermøde- The Danish Marine Reasearch Meeting	The EMODNET Ingestion 'Wake up your data' promotion material has been handed out to relevant contacts and they have orally been informed on the services that EMODNET Ingestion offers.
25 January 2019	The Hague – The Netherlands	National EIONET –NL meeting	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
4-5 February 2019	Copenhagen - Denmark	Closing workshop on JMP – Eunosat Project	Further promotion of the use of EMODNET Ingestion Portal during JMP-Eunosat meeting by RWS
14 Febr 2019	Lisbon - Portugal	OECD meeting	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS and Deltares
26 February 2019	Helsinki - Finland	FINMARI Researcher Day	Presentation of EMODnet Ingestion by partners GTK and FMI to Finnish marine research community
26 February 2019	Brussel - Belgium	DIKE meeting MSFD	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
5 – 7 March 2019	Tallinn - Estonia	INTERREG (EU's Interreg Baltic Sea Region Programme) CW Pharma project meeting	CW Pharma project meeting with several international partners from Denmark, Estonia, Finland, Germany, Latvia, Poland and Sweden. Importance of data sustainable use and sharing of open-data through EMODnet Chemistry and EMODnet Ingestion is

Date	Location	Topic	Short Description
			promoted by partner LHEI to project leaders and partners.
13 March and 15 May 2019	Athens- Greece	Meetings with the Cooperation Network for the Marine Environment of the A.C. Laskaridis Charitable Foundation	To promote the EMODnet Chemistry marine litter data management and explore options for data sharing through the Data Ingestion submission service, by partner HCMR.
14 -15 March 2019	London - United Kingdom	Civil Hydrography Annual Seminar	Presentation and promotion by BGS at seminar organised by MCA
18-19 March 2019	Brussels - Belgium	SEANSE project meeting	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
26 – 27 March 2019	Brussels - Belgium	JRC Algae workshop	To present and promote EMODnet Human Activities and encourage data submission from algae producers via EMODnet Data Ingestion (Cogea)
26-27 March 2019	Obninsk, Russian Federation	"Optimizing information resources" Meeting	Promotion of EMODnet Ingestion Activities at Meeting of the data providers of the Russian national ESIMO system
28 March 2019	Rotterdam - The Netherlands	International networking Day for Rijkswaterstaat	Promoting role and importance of EMODNET (Ingestion) during informal discussions by RWS
3 – 4 April 2019	Rome - Italy	EMODnet Ingestion Final plenary project meeting	All consortium members reported on their activities which provided necessary input for the final project report.
11 April 2019	Rijswijk – The Netherlands	Meeting on archiving of project monitoring data	Promoting EMODnet as archive via ingestion portal
16 April 2019	Scheveningen – The Netherlands	Knowledge Exchange Day for WOZEP (wind pilots)	Promoting progress and importance of EMODNET Ingestion during informal discussions by RWS
24-26 April 2019	Genua - Italy	Ferrybox workshop meeting	Presentation (By RWS) of new ferry-routes and relationship with EMODNET Portals and

Date	Location	Topic	Short Description
			informal promotion of Ingestion Portal by RWS
29 April 2019	Liege	FOCUS General Assembly	Information on EMODnet Ingestion to the FOCUS research unit (Freshwater and Oceanic sCience Unit of reSearch; https://www.focus.uliege.be) to encourage scientists and PhD students sharing ocean measurements.
30 April 2019	Delft – The Netherlands	Digishape meeting	Promoting EMODnet ingestion and EMODnet in general as a datasource for pilot project Digitwin by Government, knowledge institutes, dredging company
4th May 2019	Barcelona, Spain	Conference	Conference at Institute of Marine Science, in May. Content: the general importance of Spatial Data Infrastructure, European regulations, the general EMODNET project, the Ingestion Portal
8-9 May 2019	Bucharest - Romania	International Conference "Sustainable Development at the Black Sea"	Promotion of EMODnet Ingestion by partner NIMRD at Intenational Conference organized under the auspices of the Romanian Presidency of the Council of the European Union
8 May 2019	Liverpool, UK	Past, present and future: successes and challenges in managing marine data – A celebration of the 50th Anniversary of BODC	EMODnet and EMODnet Data Ingestion promoted by partner Ifremer/Maris presentation and promotional material available.
9 May 2019	Scheveningen – The Netherlands	Knowledge Exchange Day for Northsea projects	Promoting importance of EMODNET Ingestion with posters and flyers during informal lunch-discussions by RWS and RBINS
16 – 17 May 2019	Lisbon - Portugal	European Maritime Day 2019	To promote EMODnet Ingestion by partner COGEA and EMODnet Secretariat in presentations and stand.

Date	Location	Topic	Short Description
17-18 May 2019	Constanta - Romania	International Conference SEA-CONF 2019 and "Sailing to the future" Exhibition	Promotion of Romanian NODC and EMODnet Ingestion, EMODnet Chemistry, SeaDataCloud to the stakeholders from marine industry, research and education via NIMRD stand.

7. Outreach and communication activities

The outreach and communication activities are undertaken as WP4 and have been reported in Chapter 5 in the section concerning WP4 and in Chapter 6 concerning events and meetings with promotion and outreach activities.

8. Updates on performance indicators

The intensive marketing campaign for EMODnet Ingestion in the second and third years by all consortium members as reported under WP4 has resulted in increasing awareness in marine and maritime communities in Europe. This was further stimulated by the fact that all EMODnet Thematic portals and Central EMODnet portal have included references and links to the EMODnet Ingestion portal.

Web Statistics

The web portal visitor statistics are given below.

Month	Unique visitors	Number of visits	Pages	Hits
Apr-17	5,617	6,128	9,846	19,068
May-17	5,935	6,424	15,824	25,282
Jun-17	5,754	6,206	49,675	53,944
Jul-17	5,789	6,175	51,582	57,601
Aug-17	7,121	7,563	53,292	59,510
Sep-17	8,404	9,048	56,856	71,498
Oct-17	8,260	9,150	60,049	80,101
Nov-17	9,271	10,409	58,818	76,237
Dec-17	8,460	9,370	57,147	64,709
Jan-18	9,207	10,342	62,154	73,552
Feb-18	7,653	8,569	60,311	70,556
Mar-18	8,318	9,279	58,554	71,636
Apr-18	7,889	9,054	58,163	75,463
May-18	7,803	9,044	58,264	72,124
Jun-18	7,950	9,245	54,681	64,393
Jul-18	7,624	9,043	57,140	65,527
Aug-18	5,057	5,975	53,504	60,418
Sep-18	4,159	4,973	51,380	66,515
Oct-18	4,600	7,815	73,248	94,113
Nov-18	3,242	6,169	59,384	74,035
Dec-18	2,427	4,226	55,018	66,330
Jan-19	2,097	2,752	52,163	66,683
Feb-19	2,059	3,945	50,399	64,380
Mar-19	1,853	2,557	68,136	89,209
Apr-19	1,759	2,264	93,317	109,697
May-19	1,517	2,186	96,535	112,093

Table: web statistics of Ingestion portal

The visiting statistics reached a height of circa 8.000 – 9.000 visitors per Month and an average number of 6 – 10 browsed pages between September 2017 and the middle of 2018. Thereafter, the number of monthly unique visitors have decreased gradually, most probably because a lot of people were introduced earlier and already aware of the initiative; at the same time the number of visited pages has further increased to 25 – 30 browsed pages per visit. This could be because of the increasing number of submissions, their processing and browsing of published submissions.

Submission statistics

The number of submissions in the Submission service has steadily increased over time. And the number of submissions that have been completed and published by assigned data centres in the View Submissions service have been kept in good pace with the submissions. And quite a number of submissions have been elaborated to phase II and populated into European infrastructures such as SeaDataNet and EurOBIS through which data sets are now available in EMODnet portals. The following graphics and table give the increase in time.

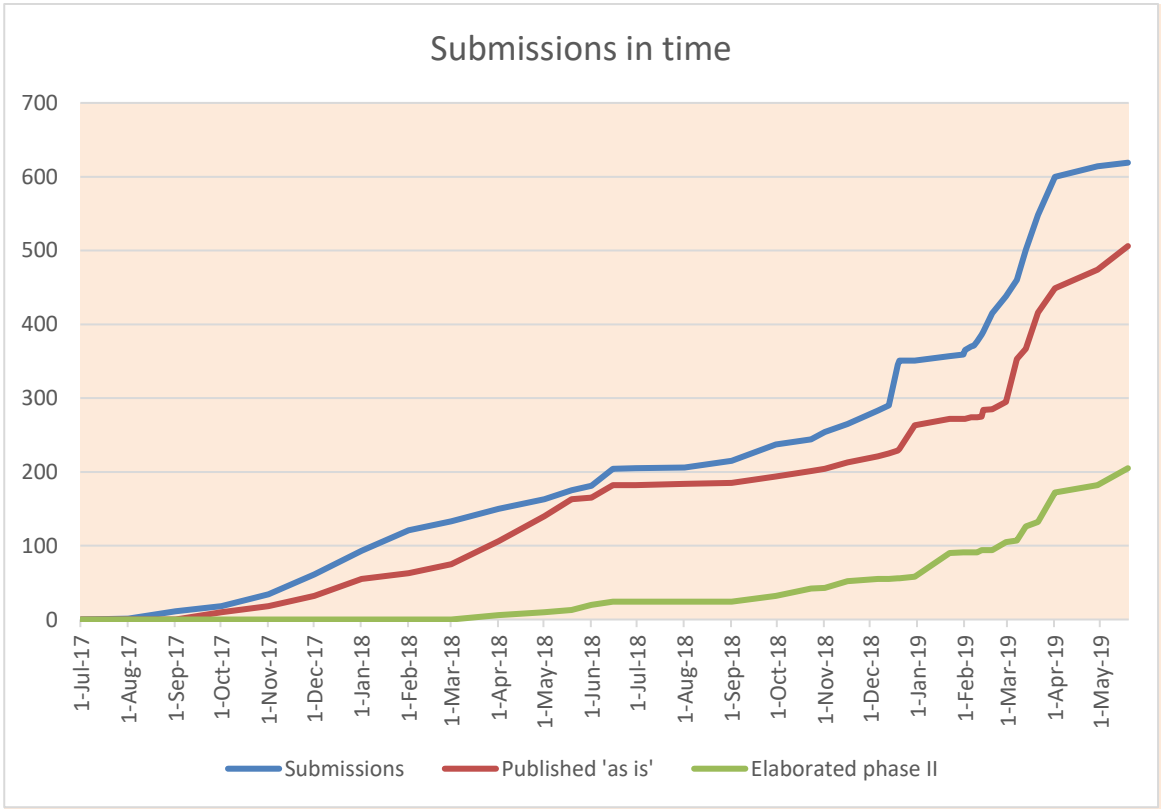


Image: submissions in time

Date	Submissions	Published 'as is'	Elaborated phase II
1-Jul-17	0	0	0
1-Aug-17	1	0	0
1-Sep-17	11	0	0
1-Oct-17	18	10	0
1-Nov-17	34	18	0
1-Dec-17	61	32	0
1-Jan-18	93	55	0
1-Feb-18	121	63	0
1-Mar-18	133	75	0
1-Apr-18	150	106	6
1-May-18	163	140	10
19-May-18	175	163	13
1-Jun-18	181	165	20
15-Jun-18	204	182	24
30-Jun-18	205	182	24
1-Aug-18	206	184	24
1-Sep-18	215	185	24
30-Sep-18	237	194	32
23-Oct-18	244	201	42
1-Nov-18	254	204	43
16-Nov-18	265	213	52
6-Dec-18	283	221	55
13-Dec-18	290	225	55
19-Dec-18	345	229	56
20-Dec-18	351	231	56
30-Dec-18	351	263	58
22-Jan-19	357	272	90
31-Jan-19	359	272	91
1-Feb-19	365	272	91
5-Feb-19	370	274	91
7-Feb-19	371	274	91
9-Feb-19	377	274	91
12-Feb-19	386	275	94
13-Feb-19	390	284	94
19-Feb-19	415	285	94
28-Feb-19	438	295	105

Date	Submissions	Published 'as is'	Elaborated phase II
7-Mar-19	460	353	107
13-Mar-19	501	367	126
21-Mar-19	548	416	132
1-Apr-19	600	449	172
29-Apr-19	614	474	182
19-May-19	619	506	205

Table: submissions in time

Analysis of possibly discarded submissions

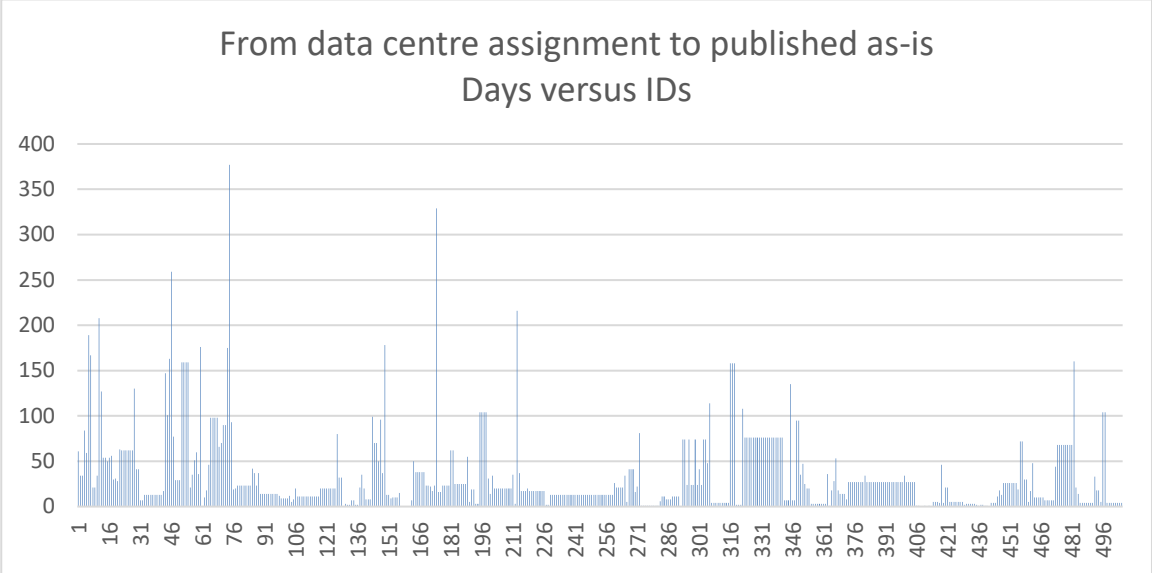
In total 619 submissions were registered during the project period. Of these, 31 submissions were not completed by submitters to the level that the masters of the Ingestion service could assign the submissions to a data centre for further completion. These 31 submissions were missing mandatory metadata and/or the actual data sets, and therefore these remained at status 10 (=drafting form part 1 by Data Submitter) (28 submissions) or 15 (= Package upload pending) (3 submissions). In several cases it appears to be test submissions where people tried out somewhat. In other cases, it might be that people started and then did not have the requested information and/or simply lost interest to continue.

This implies that out of the 619 submissions, 588 submissions achieved status 20 (=Form part 1 submitted by Data Submitter) after which the master of the Ingestion service could assign a data centre to process these, in order to achieve phase I (publishing 'as-is') and later possibly phase II (elaborated and included in European infrastructure, feeding into EMODnet). Data submitters can follow this process themselves by login to the Ingestion service and checking their account which only displays their submissions with all relevant details, such as assigned data centre, achieved status, any remarks from the assigned data centre, possible rejections etc.

During the project, of those 588 already 506 reached phase I, while 205 reached phase II. From the gap of 82 submissions between 588 at status 20 and 506 achieving status 80, a subtotal of 10 submissions were rejected by the assigned data centres for various reasons. Those reasons were included in the submission records by the assigned data centres and the data submitters were informed by alert e-mails, advising them to login to the Ingestion service for checking out the reasons and possibly improving and resubmitting. Overall there remained 78 submissions that were not yet completed to phase I at the end of the project.

Deeper analysis of processing times

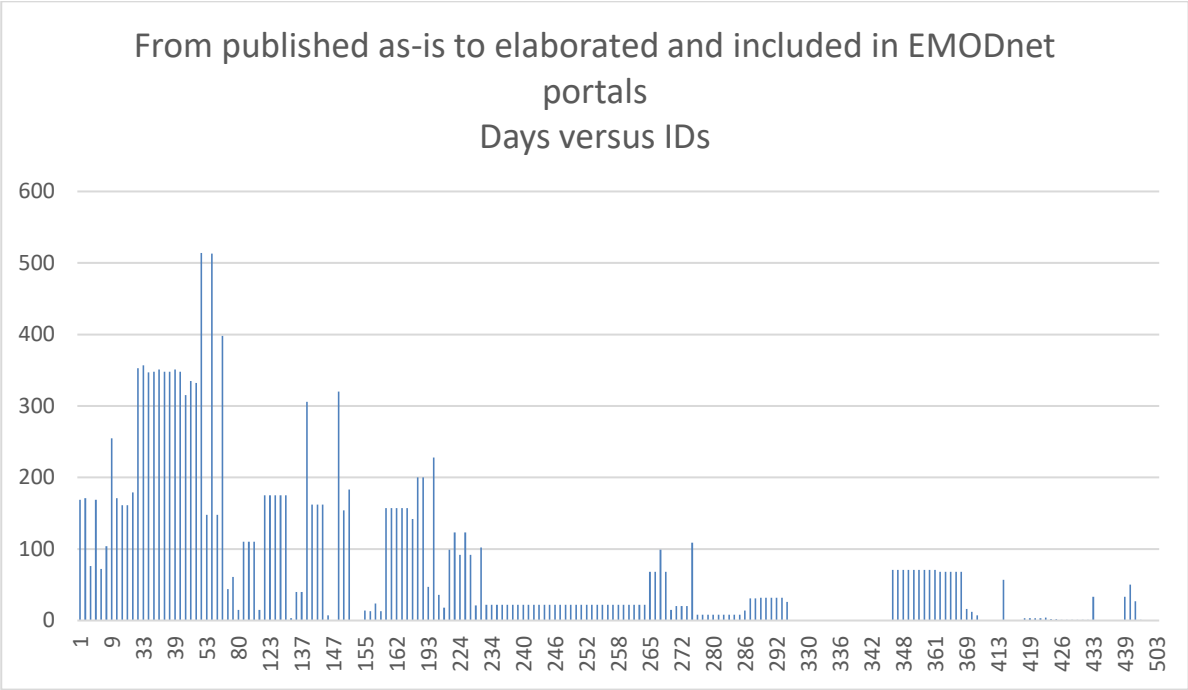
The following two charts indicate the time that it takes from submission of a data set to publication “as is”, and to further elaboration and integration in final repositories.



Graphics: Number of days between data centre assignment (status 20) and published as-is (status 80) for all 506 published submissions

The vertical axis in the chart above gives the number of days between submissions being assigned by masters of the Ingestion service to an appropriate data centre and published ‘as-is’, when the data centre has completed the metadata. While the horizontal axis gives the ID of each published submission, whereby ID = 1 is the first submission record that was published in time and the ID on the most right side is the latest published submission record. The horizontal axis counts the 506 published ‘as-is’ submissions. From the chart it can be seen that the processing started slowly, because data centres had to get used to working with the system and the actual processing. Later the time delay becomes much lower, as it becomes more a routine. Delays might occur because of extra questions to data submitters to get additional information for completing the submissions. Data submitters can always follow the processing of their submissions by login to the Ingestion service and checking their account with their submissions. Other reasons for delay can be that there are 50 assigned data centres in the EMODnet Ingestion network, whereby some got many submissions to process while others relatively less, which influences developing their routines. Also, there are holiday periods encountered in which data centres can offer less capacity as the efforts are vested into selected staff. To speed up the process, the masters of the Ingestion service have adopted a routine for regularly alerting assigned data centres about their outstanding submissions and encouraging them to undertake actions. This contributes to achieving more performances.

The next chart below indicates the time that it takes from publication “as is” to further elaboration and integration in final repositories.



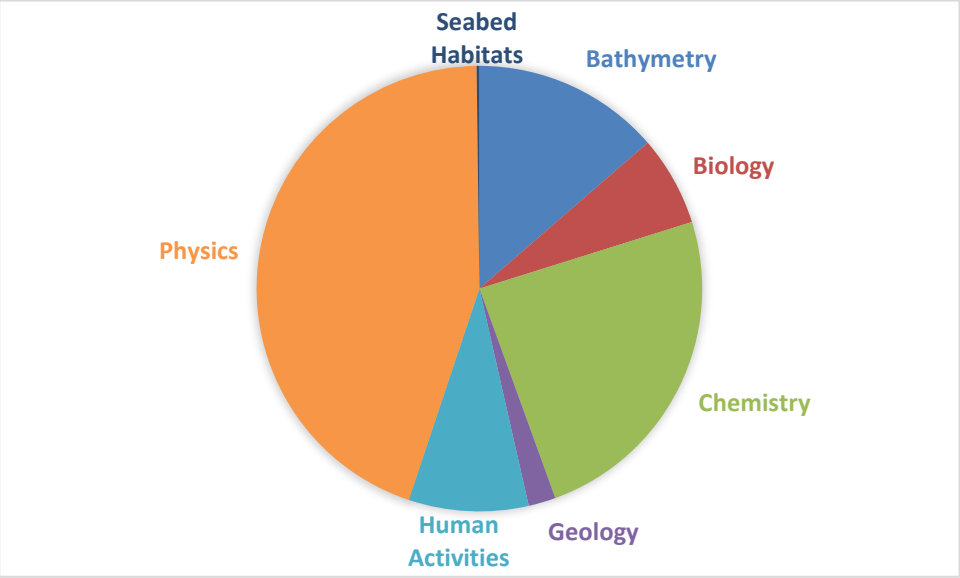
Graphics: Number of days between published as-is (status 80) and data elaborated and included in European infrastructures feeding EMODnet portals for all 205 published submissions

The vertical axis gives the number of days between published ‘as-is’ and data sets elaborated. Published ‘as-is’ implicates that the assigned data centre has completed the metadata, while data sets elaborated means that the assigned data centre has elaborated the data sets to common formats and has populated the elaborated data into European infrastructures, such as SeaDataNet, EurOBIS and others, which then feed into EMODnet portals. The horizontal axis gives the ID of each published submission that reached the phase II status (=120), sorted by their numbers. In total this concerns 205 IDs. From the chart it can be seen again that the data centres over time got more routine in elaborating and processing incoming data sets to the required levels, although for selected submissions (205 out of the 506 records). It also shows that in many cases the submissions were elaborated almost in one go from published ‘as-is’ to elaborated. The processing itself can be very time consuming for the assigned data centres as it requires activities like additional meta data check and enrichment, data files check and corrections (sometimes very heterogeneous quality and formats are encountered), data format conversions, and communications with data submitters (with delays and no reply situations). This is illustrated by the fact that at the end of the project 205 out of the 506 published submissions have been elaborated to phase

II, leaving 301 submissions for further processing. Most probably not all of these 301 will be fit for elaborating as their data sets might be in proprietary or exotic formats, and/or missing sufficient documentation and quality information. Some cases might also be discarded as the possible result will not balance the overall effort needed. This decision is at the discretion of the assigned data centres.

Classification of published data submissions

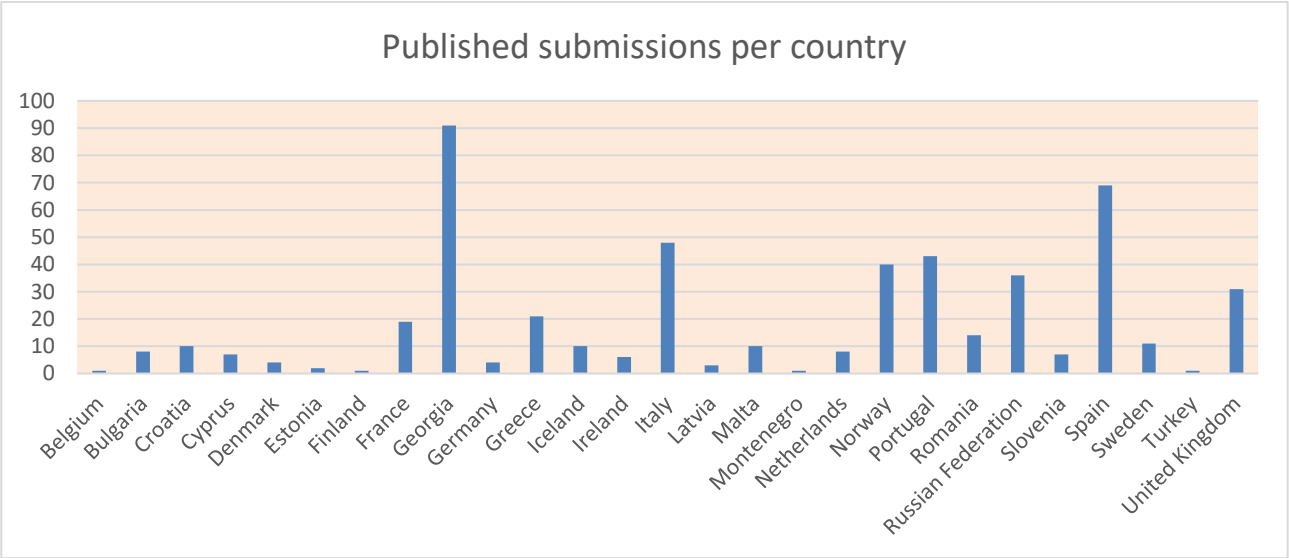
The 506 published submissions till 19 May 2019 can be classified by data theme, country of submission, assigned data centre, data originator and/or data holding centre.



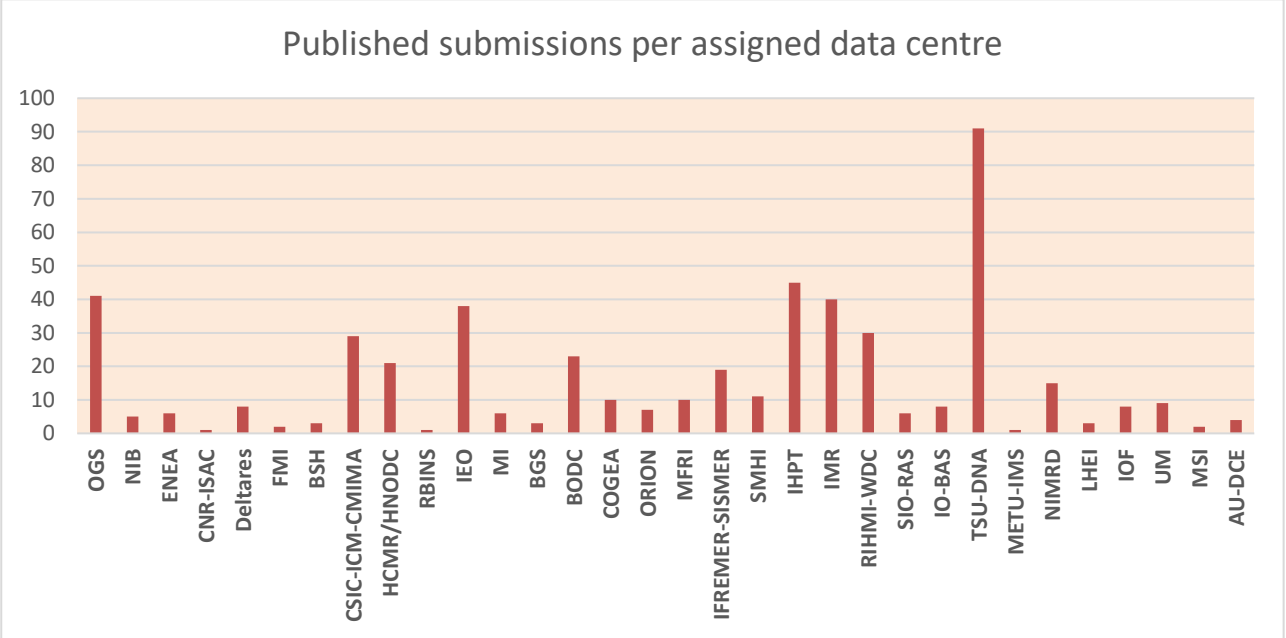
Graphics: published submissions per Data Theme

Theme	No	%
Bathymetry	69	13.64
Biology	33	6.52
Chemistry	123	24.31
Geology	10	1.98
Human Activities	44	8.70
Physics	226	44.66
Seabed Habitats	1	0.20
TOTAL	**506**	**100**

Table: published submissions per Data Theme



Graphics: submissions per Country of originator or data holding centre of the submitted data sets



Graphics: Published submissions per Assigned Data Centre

DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
Scientific - Research Firm "GAMMA"	18	Company	Georgia
NoordzeeWind BV	5	Company	Netherlands
Deltares	5	Company	Netherlands
ESGEMAR/ Esgemar S.A. Estudios geologicos marinos	7	Company	Spain

DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
GEMS Survey Ltd	1	Company	United Kingdom
SSE Renewables	1	Company	United Kingdom
Partrac - Head office	1	Company	United Kingdom
GeoMarine Ltd.	1	Company	Bulgaria
Water Services Corporation	3	Company	Malta
Laboratory research centre LTD	54	Company	Georgia
AQUA4C	1	Company	Belgium
Holmen Papper Ab	1	Company	Sweden
Napirdatsva Ltd	9	Company	Georgia
Petro Celtic Varna Office	1	Company	Bulgaria
Eco-Dive	1	Company	Spain
Black Sea Aquaculture Company LLC	10	Company	Georgia
Black Sea Basin Directorate	1	Government	Bulgaria
ARPA Emilia-Romagna - Struttura Oceanografica Daphne	2	Government	Italy
Rijkswaterstaat Water, Traffic and Environment	6	Government	Netherlands
The Crown Estate	7	Government	United Kingdom
Environmental Agency of the Republic of Slovenia	1	Government	Slovenia
Malta Environment and Planning Authority - Environment Protection Directorate	1	Government	Malta
Department of Fisheries and Marine Research, Division of Marine Biology and Ecology	1	Government	Cyprus
Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory	3	Government	United Kingdom
ISPRA-Institute for Environmental Protection and Research	17	Government	Italy
Department of Transport, Tourism and Sport	1	Government	Ireland
Portuguese Environment Agency	4	Government	Portugal
PdE/ Harbours Authority. Physical Environment Department	1	Government	Spain

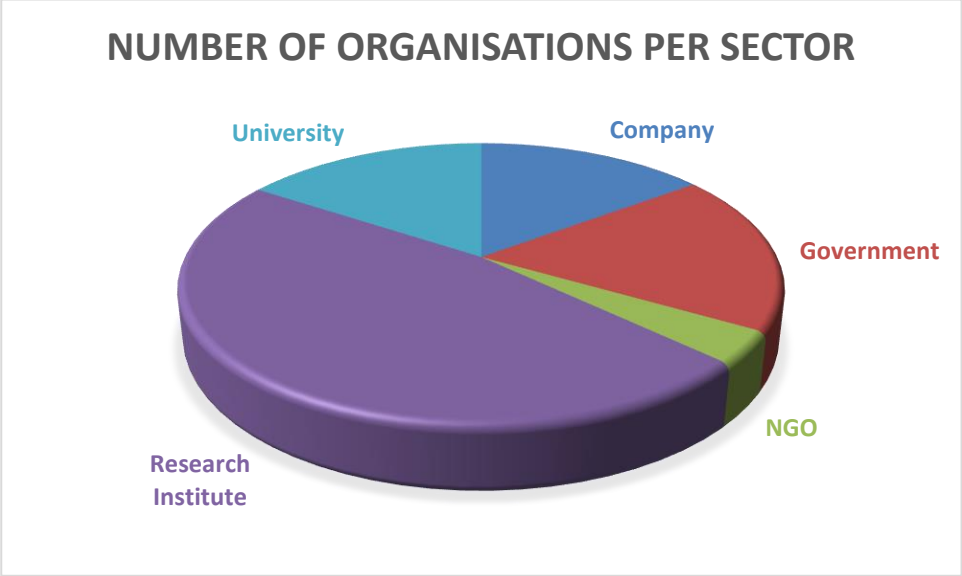
DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
Directorate-General for Territorial Development	6	Government	Portugal
Black Sea–Danube Coastal Association for Research and Development	1	Government	Bulgaria
Environment and Resources Authority	5	Government	Malta
Ministry of Agriculture, Forestry and Food of Republic of Slovenia	2	Government	Slovenia
Portofino Marine Protected Area	2	Government	Italy
ARPA Liguria	1	Government	Italy
Director General of Health - Information and Analysis Services Directorate	33	Government	Portugal
Transport Malta - Maritime Division (ex. Malta Maritime Authority)	1	Government	Malta
Black Sea NGO Network	1	NGO	Bulgaria
ORION	6	NGO	Cyprus
NGO MARINE SOUND	2	NGO	Bulgaria
The Keep Sweden Tidy Foundation	2	NGO	Sweden
IFREMER	1	Research Institute	France
Leibniz Institute for Baltic Sea Research Warnemünde	1	Research Institute	Germany
LABORATORY OF SCIENCES OF MARINE ENVIRONMENT (LEMAR)	1	Research Institute	France
Finnish Environment Institute	1	Research Institute	Finland
Baltic Sea Research Institute Warnemuende, Marine Geology Department	1	Research Institute	Germany
Norwegian Meteorological Institute	28	Research Institute	Norway
National Institute of Biology - Marine Biology Station	1	Research Institute	Slovenia
CNR, Institute of Marine Sciences S.S. of Lerici (SP)	3	Research Institute	Italy
Wageningen Marine Research, IJmuiden	2	Research Institute	Netherlands
ENEA Centro Ricerche Ambiente Marino - La Spezia	12	Research Institute	Italy
IACT-UGR-CSIC / Andalusian Earth Sciences Institute	5	Research Institute	Spain

DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
IEO/ Santander Experimental Aquaculture Facilities	1	Research Institute	Spain
IEO/ Vigo Oceanographic Centre	10	Research Institute	Spain
IEO/ Malaga Oceanographic Centre	1	Research Institute	Spain
IEO/ Murcia Experimental Aquaculture Facilities	19	Research Institute	Spain
Norwegian Institute of Water Research (NIVA)	3	Research Institute	Norway
Hellenic Centre for Marine Research, Institute of Oceanography (HCMR/IO)	18	Research Institute	Greece
Finnish Meteorological Institute	1	Research Institute	Finland
Marine Scotland Science	21	Research Institute	United Kingdom
Institute of Marine Biology (IMBK)	1	Research Institute	Montenegro
Institute of Marine Sciences, Barcelona	7	Research Institute	Spain
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	3	Research Institute	Greece
CSIC-ICM/ Institute of Marine Sciences	12	Research Institute	Spain
GEOMAR Helmholtz Centre for Ocean Research Kiel	1	Research Institute	Germany
IGME, Geological Survey of Spain	5	Research Institute	Spain
CNRS Paris Institute of Earth Physics, Marine Geoscience Laboratory	1	Research Institute	France
Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences	1	Research Institute	Bulgaria
IEO/ Spanish Oceanographic Institute	16	Research Institute	Spain
Marine Institute	5	Research Institute	Ireland
Estonian Environmental Research Centre	1	Research Institute	Estonia

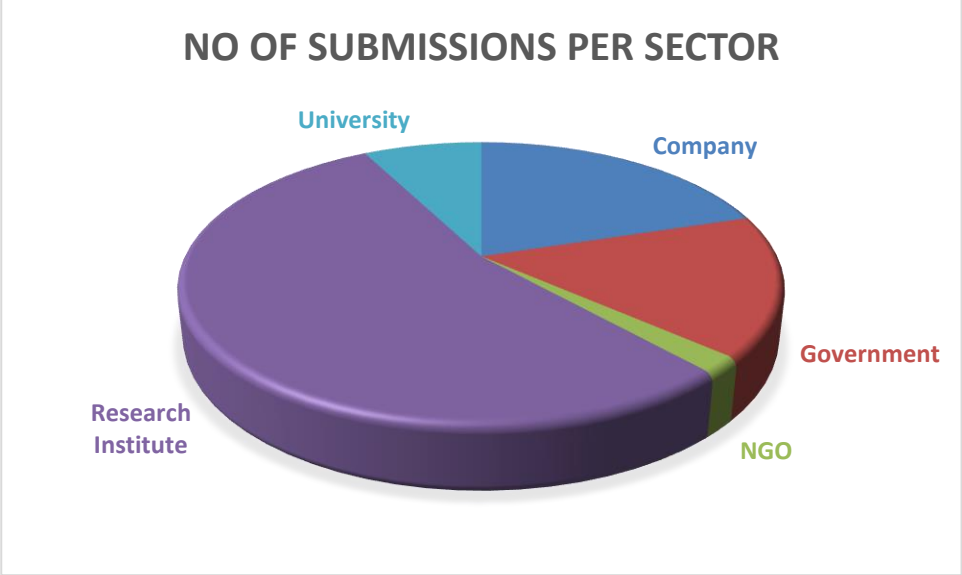
DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
British Geological Survey, Edinburgh	3	Research Institute	United Kingdom
Ocean Physics and Satellite oceanography laboratory (LOPS) - UMR 6523 CNRS-Ifremer-IRD-UBO	2	Research Institute	France
Foundation for Environmental Education — Latvia	1	Research Institute	Latvia
Marine and Freshwater Research Institute	10	Research Institute	Iceland
National Research Council of Italy - Institute for Marine and Coastal Environment (IAMC) (Sezione Capo Granitola)	1	Research Institute	Italy
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	15	Research Institute	France
Institute for Water of the Republic of Slovenia	3	Research Institute	Slovenia
ULPGC-IOCAG/ Institute of Oceanography and Global Change	1	Research Institute	Spain
Institute of Electronics and Computer Science	1	Research Institute	Latvia
Swedish Meteorological and Hydrological Institute	7	Research Institute	Sweden
Institute of Marine Research - Norwegian Marine Data Centre (NMD)	1	Research Institute	Norway
Joint Research Centre (JRC)	6	Research Institute	Italy
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	30	Research Institute	Russian Federation
Atlantic Scientific Research Institute for Marine Fishery and Oceanography	12	Research Institute	Russian Federation
Arctic and Antarctic Research Institute, Roshydromet (Saint-Petersburg)	1	Research Institute	Russian Federation
P.P.Shirshov Institute of Oceanology, RAS	7	Research Institute	Russian Federation
P.P.Shirshov Institute of Oceanology, Southern branch	4	Research Institute	Russian Federation

DATA ORIGINATOR / HOLDING CENTRE	No	SECTOR	COUNTRY
National Institute for Marine Research and Development "Grigore Antipa"	14	Research Institute	Romania
Latvian Institute of Aquatic Ecology	1	Research Institute	Latvia
Institute of Oceanography and Fisheries	10	Research Institute	Croatia
World Data Centre-B For Oceanography	6	Research Institute	Russian Federation
University of Tuscia-Viterbo	3	University	Italy
UVIGO/ University of Vigo	5	University	Spain
Stockholm University, Department of Meteorology	1	University	Sweden
University of Algarve, Marine Sciences Centre	2	University	Portugal
University of Leipzig	1	University	Germany
ULPGC/ Las Palmas University. Department of Physics	1	University	Spain
University Bayreuth	3	University	Germany
University of Bergen / Geophysical Institute	8	University	Norway
University of Kyrenia	1	University	Turkey
Marine and Environmental Sciences Centre - Faculty of Sciences of the University of Lisbon	2	University	Portugal
University of Rome Tor Vergata	1	University	Italy
IISTA/ Andalousian Interuniversitary Institute for the Reseach on the Earth System	1	University	Spain
Institute of Marine Sciences, Middle East Technical University	1	University	Turkey
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	9	University	Malta
Marine Systems Institute at Tallinn University of Technology	1	University	Estonia
Aarhus University, Department of Bioscience, Marine Ecology Roskilde	4	University	Denmark
NUI Galway	1	University	Ireland

Table: published submissions per data originator or data holding centre organisation



Graphics: Number of data originator or holding centre organisations per sector

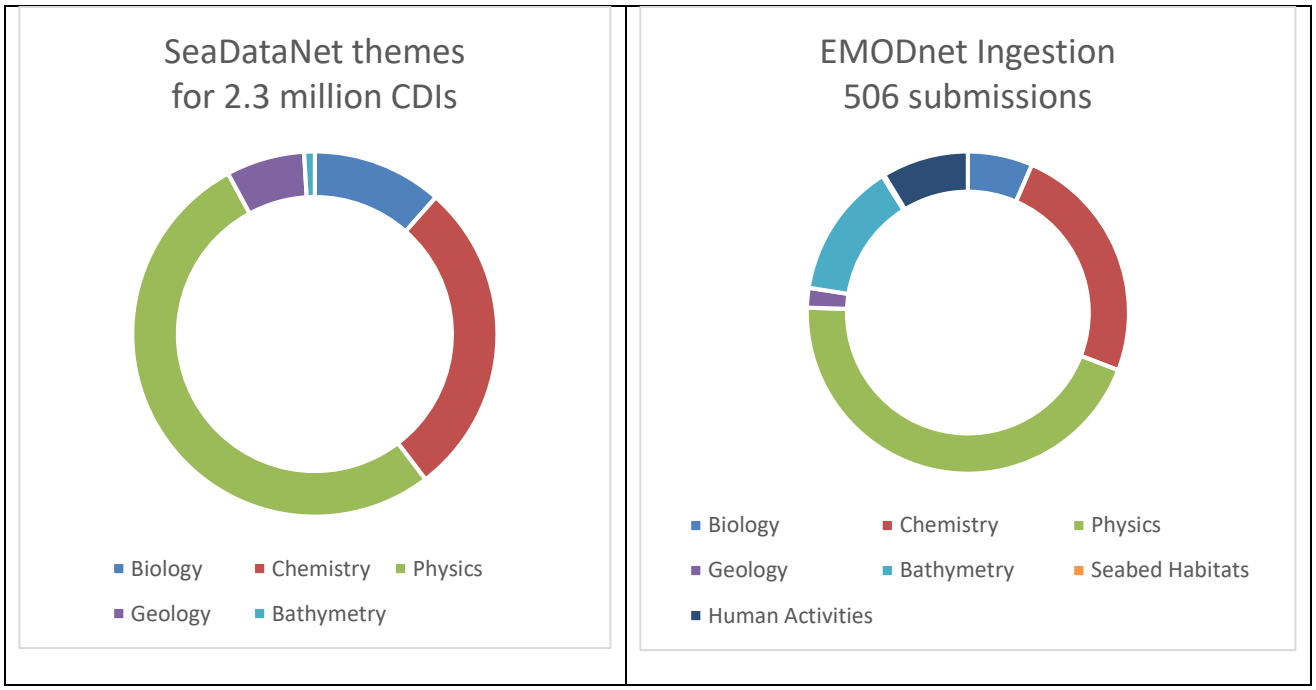


Graphics: Number of published submissions per sector

The above reported Ingestions all concern submissions of data sets made to the Submission service and then completed for publishing at the View Submission service. As indicated earlier, there are also direct ingestions which by-pass the Submission service. This is the case for ingestions by oceanography operators to the European operational oceanography data exchange as described in WP3. Also, there is a mission in EMODnet Ingestion to educate data providers and to arrange that regular submissions will go directly to the appropriate data centres and no longer through the Submission service.

Evaluation of submissions:

The 'data theme' key indicator of the published submissions shows that nearly 45% of the submissions concern data for physics, followed by chemistry (circa 24%), bathymetry (circa 14%), human activities (circa 9%), biology (circa 6%), geology (circa 2%) and seabed habitats (circa 0.5%). This might look like an unbalance; however, one should realise that in practice most marine data acquisition efforts concern physics data, followed by chemistry, biology and geology, while data acquisition efforts for bathymetry and seabed habitats are much less. This overall image can also be demonstrated by the data resources as managed by SeaDataNet and resulting from more than 110 data centres from 34 countries around European seas. The overview below gives a comparison of the division of data per theme in the Ingestion service and the SeaDataNet CDI service. This implicates that in practice it is easier to achieve submissions for physics compared to e.g. bathymetry because there are far less data sets and data holders around for bathymetry than for physics.



Graphics: comparison of division per data theme of data sets enlisted in the SeaDataNet CDI service and the EMODnet Ingestion Submission service

The 'country' key indicator of the published submissions shows that Georgia (91), Spain (69), Italy (48), Portugal (43) and Norway (40) are leading in number of submissions for data from their country, followed by other countries from the consortium with less submissions. This illustrates differences in achievements between the consortium members. However, one has to be careful in comparing absolute numbers as submissions can concern quite different types of data and might be organised in one large file or a number of smaller subfiles. For instance, the 40 submissions for Norway include monthly time

series for a few HF radar stations which are submitted individually per month. The same pattern can be seen for the submissions of Georgia, which for a large part concern water quality data sets from the same data originator for different time periods, and bathymetry submissions for a specific area in Georgia. For Italy a comparable pattern can be seen whereby multiple submissions relate to different stations from the same monitoring network. Moreover, the consortium has multiple partners from Italy which implicates that more acquisition efforts have been undertaken in Italy compared to other countries. Harmonising ingestion submissions between countries for specific data types is not feasible as data sets are resulting from different external originators. It should be noted that such differences in data handling also exist between the SeaDataNet data centres, whereby one data centre might exchange for example sea level data as monthly timeseries while another data centre offers annual timeseries. In the marine data management community, there is a great variety in types of data and parameters as well as practices for managing data sets. SeaDataNet provides standards for formats and vocabularies and as such contributes to harmonised discovery and access. However, harmonisation and standardisation of the full process from acquisition to distribution, involving a large number of mutually independent players and with different roles, is a major challenge which will take much more years and developments.

Considering to what extent did the ingestion portal receive data sets without previous contact by a consortium partner, the following can be concluded. Overall 159 submissions of the 506 published data submissions were submitted directly by external data submitters, while the other 347 submissions were supported for submission by the EMODnet Ingestion ambassadors. In total the 159 submissions concern 32 different organisations. In how far these 32 organisations were influenced by the promotion activities of the EMODnet Ingestion ambassadors, cannot be established.

In Chapter 5 - WP4 a detailed overview is given of the efforts undertaken by each of the countries and their consortium members for promotion, marketing and outreach to potential data providers. The achieved submissions are the result of those efforts, whereby some countries appear to be more effective in their approach than other countries. The WP4 detailed overview has been compiled based upon reports made by each of the consortium partners at the plenary project meetings also with the objective to let partners learn from each other and to give them more insight how potential data providers might be best identified and approached.

The ‘organisation type’ key indicator of the published submissions shows that most data sets are originating from research organisations (circa 54%, submitted by 51 organisations), while private industry provides circa 20%, submitted by 16 organisations. The larger contribution from the research sector can be explained by the fact that the consortium partners in practice are well known within the scientific data community and their organisations have established relations with external parties, mostly scientific, through various projects and other activities. This makes it easier to identify and approach potential data providers in those scientific circles than reaching out to parties that are further

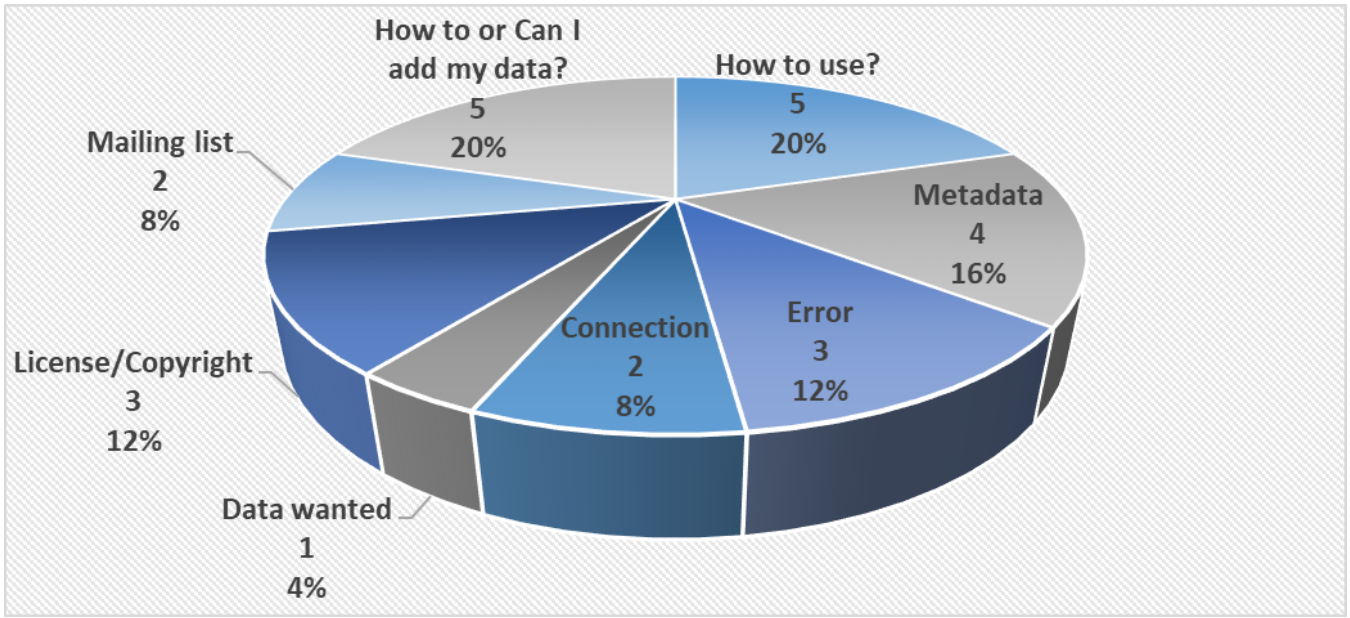
away from their community. Moreover, it is well known that motivating private industry to share data is a tough challenge.

9. Feedback from users

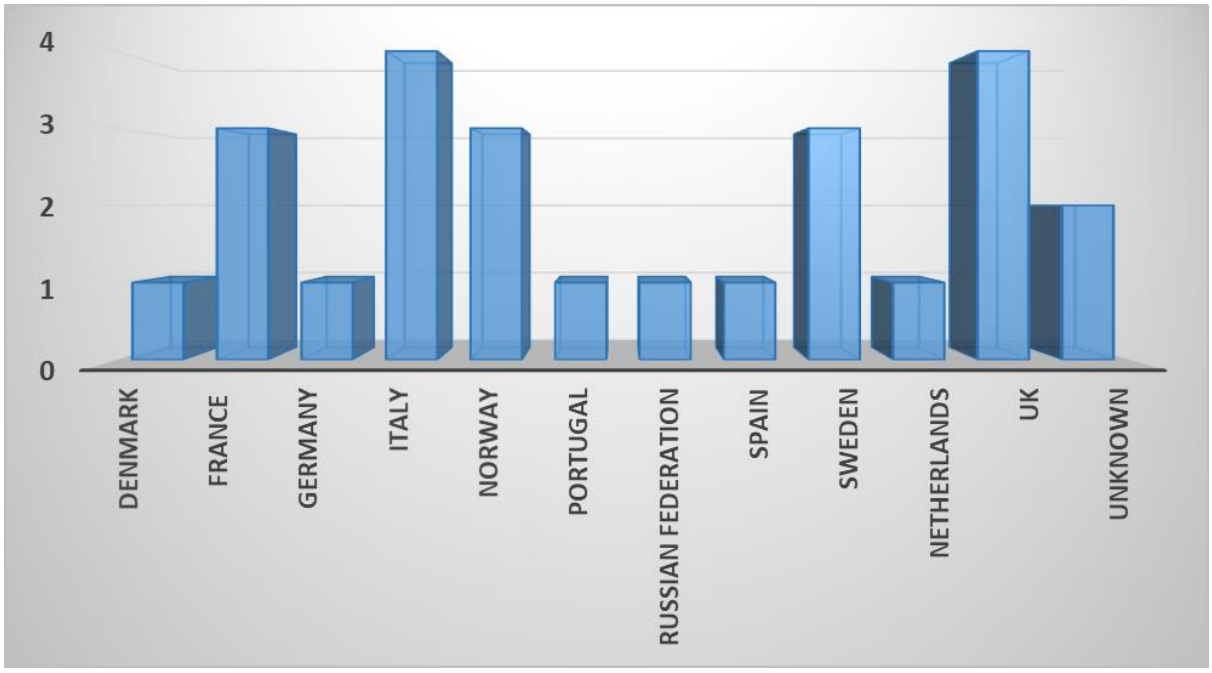
The feedback is arranged through the Help desk which is promoted at the home page of the EMODnet Data Ingestion portal and this provides means to give feedback by email and/or to ask to be called back by telephone. Over the project duration in total 25 helpdesk questions have been received and no request for call back. The questions were related to the following subjects:

- How to use the system?
- Which metadata should be input?
- Some actions give an error – help needed
- Problem with the connection
- Data wanted: user looking for specific data
- Which license to put on the data?
- Addition to EMODnet-ingestion mailing list

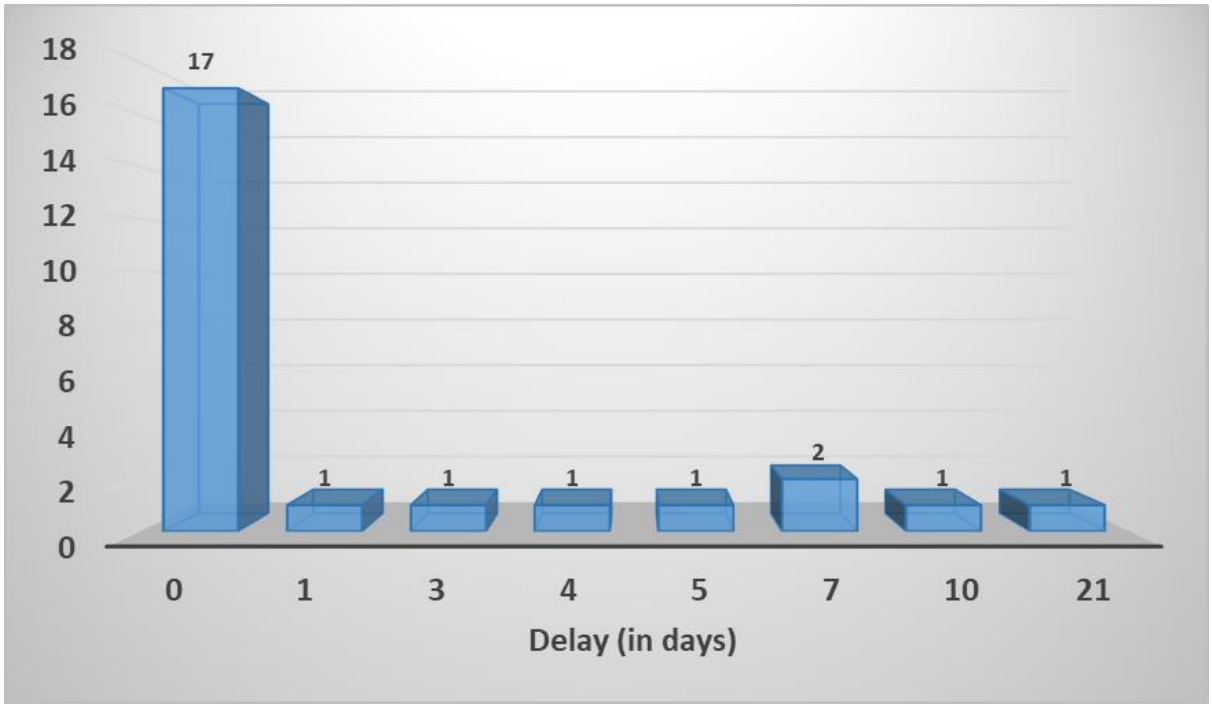
The figure below gives the division of questions on these subjects by absolute numbers and relative percentage of all questions.



Graphics: received number of questions per subject



Graphics: no of questions per country



Graphics: speed of answering questions

Most of the questions received a direct reply, except for a few questions which needed some further discussion and were answered some days later.

Derived from the received questions an **FAQ page** has been opened at the EMODnet-ingestion portal at the helpdesk section. Currently it contains 5 FAQs:

1. What are the data requirements for data providers?
2. What kind of license is applicable to a dataset?
3. Do I need to register to submit data?
4. I don't manage to connect with Marine-ID
5. Does EMODnet ingestion provide DOI?

The FAQ list is expanded, depending on the questions received by the helpdesk.

EMODnet Ingestion practice for attribution of DOIs

DOI stands for Digital Object Identifier and is a character string (a "digital identifier") used to provide a unique identity of an object such as an electronic document or data set. Metadata about the object is stored in association with the DOI name and can be retrieved at an internet 'landing page' which gives metadata about the object and includes locations where the actual object can be found. The DOI for an object must be permanent.

The use of DOIs for scientific data publishing facilitates citing those data sets by their originators and getting citations from others in the community, which contributes to the career perspectives of the scientists. The use of DOIs by researchers is further motivated by publishers of leading scientific journals, prescribing that all data related to a scientific paper must be made available in a permanent archive. Publishing a dataset also implies a commitment to persistence of the data. DOIs have to be minted or given out by an established authority, like for instance 'DataCite' (see https://datacite.org). They are a leading global non-profit organisation that provides persistent identifiers (DOIs) for research data and other research outputs. Organizations within the research community can join DataCite as members to be able to assign DOIs to all their research outputs. DataCite then develops additional services to improve the DOI management experience, making it easier for members to connect and share their DOIs with the broader research ecosystem and to assess the use of their DOIs within that ecosystem.

In the EMODnet Ingestion service, DOIs can be entered by the Data Submitter during submission, if the researcher already has a DOI for its data sets. Later on, DOIs can also be entered by assigned Data Centres as part of the workflow for processing submitted data sets. In addition, DOIs might be imported during submission from coupled systems such as in the case of the exchange between the SeaDataNet SEANOE system and EMODnet Ingestion.

The oceanographic data centres, involved in EMODnet Ingestion, follow the best practices for publishing ocean data and papers as documented in the **Ocean Data Publication Cookbook** (Leadbetter, A., Raymond, L., Chandler, C., Pikula, L., Pissierssens, P., Urban, E. (2013) Ocean Data Publication Cookbook. Paris: UNESCO, 41 pp. & annexes. (Manuals and Guides. Intergovernmental Oceanographic Commission, 64), (IOC/MG/64)). This cookbook can also be downloaded from the ODIP portal. This "Cookbook" has been written for data managers and librarians who are interested in assigning a permanent identifier to a dataset for the purposes of publishing that dataset online and for the citation of that dataset within

the scientific literature. This cookbook provides a step-by-step guide to the data publication process and showcases some best practices for data publication.

The oceanographic data centres have adopted the general principle to assign DOIs not to single data sets, but to collections such as all data sets from a specific scientific cruise with a research vessel or to collections of oceanographic observations from a specific network, for example Euro-Argo. This has been adopted to prevent too many DOIs at a micro-scale, which would undermine the impact and usefulness of using DOIs for data citation. Also, oceanographic data centres already have other persistent identifiers in use at the granular data level, such as CDI identifiers in the case of SeaDataNet.

This implies that the assigned data centres in EMODnet Ingestion will not mint and assign a DOI for every data submission but will act selectively, looking for scientific and larger data collections which after elaboration fit their DOI policy.

10. Lessons learned

From the marketing and outreach activities a number of lessons have been learned:

1. In principle almost everybody contacted is in favor of the ingestion initiative and is willing to cooperate for sharing data that are not restricted in a way;
2. However, going from intention to action is quite an effort for most data providers. Many national authorities/data providers do not give it a high priority to share data in international context, and many data providers are busy with other activities;
3. In those cases, it is welcomed that EMODnet ambassadors can provide the necessary support to submit the data sets on behalf of the data providers. This will save the providers time for learning the system, while the data is ingested. However, this is not a solution for regular returning submissions of a data providers as they need to be educated for better structuring their data;
4. Contacting and convincing potential data providers can be time consuming. It helps if there are already links with the target data providers, e.g. through colleagues in projects;
5. Processing submissions with activities like meta data check and enrichment, data files check and corrections (sometimes very heterogeneous quality and formats are encountered), communications with data submitters (delays, no reply) can be very time consuming for assigned data centres; Phase I is OK, but Phase II elaboration is more difficult and uses much more resources of the assigned data centres.
6. Small businesses tend to be too busy for providing any information;
7. It is more effective to contact and convince high-level management than the work floor as the high-level managers might see wider perspectives of the cooperation;
8. Several potential providers have expressed interest in rather connecting their existing portals to EMODnet Ingestion than ‘wasting’ time on manually preparing and submitting data sets. At the same time, they realise that connecting can be quite a development project;
9. A relatively small number of submissions so far are relevant for Seabed Habitats. This might be caused by the fact that most consortium members are more familiar with domains like bathymetry, physics, chemistry, etc.) and possibly because the Seabed Habitat consortium already has contact with most known data holders;
10. Researchers can be quite reluctant to share data also because they consider that holding on to data may give more chances to participate in funded projects;
11. There is still a lot of promotion needed to make everybody aware about EMODnet and its potential benefits.
12. The data submission service has proven to be a very efficient way at internal institutional level to gain a controlled access to scientists' data that are not yet included in the national archives.

13. When data submission is wrong there is the need to delete the record and submit a new one going again through the validation process. Review and amendment of the submission workflow might be considered in a next phase to handle these cases more efficient. Also it would be handy to be able to change an assigned contact person (for the same data centre) over time;
14. Commercial entities are sometimes reluctant to publish data with an open license such as CC BY 4.0. as they rather would like to have a non-commercial restriction on their data (e.g. CC BY-NC 4.0).

11. Suggestions for follow-up projects

From the experiences with EMODnet Ingestion it can be concluded that there are (too) many data providers that are not aware of the international standards and infrastructures for making their data interoperable and reuseable for other applications.

This strengthens the need for continuing the EMODnet Ingestion mission and operation. The mission should be aimed at making more stakeholders in the marine data community, both users and providers, aware and informed about European marine data management and the larger benefits of sharing data. This can be implemented by continuing the marketing and outreach campaign activities that are undertaken in the current project. Thereby there should also be sufficient resources available for elaborating submitted data sets as these can have many formats, lacking quality indications or quality control, and having limited metadata.

Another activity should be aimed at exploring, finding and implementing ways for connecting more providers by means of direct exchanges with their portals and systems. This includes an evolution of the Ingestion portal with more machine-to-machine exchanges. Although it should be realised that setting up such exchanges largely will depend on the question in how far data providers already are using standards, both for IT services and for the formatting and documenting of their data sets. The technical coupling can be quite challenging in practice and represent considerable projects and efforts required.

12. Hand-over protocol

Description of EMODnet Ingestion portal and services and solutions for hand-over of results as part of the EMODnet Ingestion contract with reference EASME/EMFF/2015/1.3.1.3/SI2.727770:

1. The **EMODnet Ingestion portal** (https://www.emodnet-ingestion.eu) is a website which gives information pages. The website is driven by a Content Management System (licensed by MARIS), while content is stored in a relational database management system.
   Transfer solution: For hand-over, HTML pages of each page of the website have been generated, except for the services. This concerns the status per 19th May 2019. The HTML website can be started by clicking on the Index.html page. These web pages give information on the various menu options, and give access to several presentations and documents which can be downloaded from the website and are now included in the website zip file. In addition, there are links included to relevant open knowledge resources at the world wide web. The information related to Operational Oceanography submissions is part of the web portal and included. This includes a link to the SWE Demonstrator which has been developed together with EMODnet Physics and is hosted at the EMODnet Physics portal.

   The portal includes 3 operational services which are specified below.

2. The **Data Submission service** facilitates users to submit data sets and enter associated metadata, and it enables assigned data centres to review and complete the metadata for publishing 'as-is' and including URLs for DOI landing pages and for European portals where the data in elaborated form can be retrieved, if applicable. The service has been developed by HCMR as part of the contract.
   Transfer solution: The Data Submission service is considered as a foreground result and an export of the software sources of the online service per 19th May 2019 has been made which is handed over to EASME as a digital resource. In addition, a copy is given of the submission metadata records (which include URLs to the related original data sets and elaborated data sets, where applicable) per 19th May 2019 which are also considered as foreground results and license-free. The transfer of those is done by means of MS-ACCESS tables which correspond to the relational database model as used by the Data Submission service software.

3. The **Viewing Submissions service** facilitates users to discover and browse through completed and published data submissions, including following possible URLs to DOI landing pages and elaborated data as included in European portals. The service has been developed by MARIS as part of the contract.

Transfer solution: The Viewing Submissions service is considered as a foreground result and an export of the software sources of the online service per 19th May 2019 has been made which is handed over to EASME as a digital resource. In addition, a copy is given of the submission metadata records as published per 19th May 2019 which are also considered as foreground results and license-free. The transfer of those is done by means of MS-ACCESS tables which correspond to the relational database model as used by the Viewing Submissions service software.

4. The **Data Wanted service** facilitates any user to formulate and post requests for data sets they are looking for. These requests are published at the portal as post-it's. It also includes a matching function which compares data wanted posts with published data submissions and alerts posting users about this. The service has been developed by MARIS as part of the contract.
   Transfer solution: The Data Wanted service including matching function is considered as a foreground result and an export of the software sources of the online service per 19th May 2019 has been made which is handed over to EASME as a digital resource. In addition, a copy is given of the post-it metadata records as published per 19th May 2019 which are also considered as foreground results and license-free. The transfer of those is done by means of MS-ACCESS tables which correspond to the relational database model as used by the Data Wanted service software.

All these results are handed-over to EASME by electronic transfer of digital software and data resources. There are no pre-existing rights applicable.