

MEMORANDUM OF UNDERSTANDING
concerning cooperation on in-situ biogeochemical marine data
between
Copernicus Marine Environment Monitoring Service (CMEMS)
and
EMODnet Chemistry (EMODnet Chemistry)

Memorandum of Understanding
between

Copernicus Marine Environment Monitoring Service (CMEMS), represented by Pierre Bahurel – Mercator Océan, France, in his capacity of director CMEMS, and **CMEMS In Situ Thematic Assembling centre (CMEMS INSTAC)**, represented by Sylvie Pouliquen – IFREMER, France, in her capacity as coordinator CMEMS INSTAC, both duly authorised for the purposes hereof, hereinafter referred to as "**CMEMS**" of the one part,

and

EMODnet Secretariat, represented by Jan-Bart Calewaert – SEASCAPE, Belgium, in his capacity of Head of the Secretariat, and **EMODnet Chemistry (EMODnet Chemistry)**, represented by Alessandra Giorgetti – OGS, Italy, in her capacity of coordinator EMODnet Chemistry, and Dick M.A. Schaap, MARIS, The Netherlands, in his capacity of technical coordinator EMODnet Chemistry, both duly authorised for the purposes hereof, hereinafter referred to as "**EMODnet Chemistry**" of the other part,

WHEREAS:

a) **CMEMS is one of the six services of the Copernicus programme, EU Earth Observation flagship programme. The Marine Service provides regular and systematic reference information on the physical state, variability and dynamics of the ocean and marine ecosystems for the global ocean and the European regional seas. The products delivered by the CMEMS are provided free of charge to registered users through an interactive catalogue. These products encompass a description of the current situation (Analysis), the variability at different spatial and temporal scales, the prediction of the situation a few days ahead (Forecast), and the provision of consistent retrospective data records for recent years (Re-analysis). In November 2014, the European Commission signed a Delegation Agreement with Mercator Océan for the implementation of CMEMS. The service is delivered in an operational mode since 1st May 2015. Within CMEMS, the mission of CMEMS INSTAC is to provide integrated in situ products built from in situ observations acquired from outside CMEMS data providers to fit the needs of CMEMS internal and external users. It is a distributed centre composed of 6 regional centres working closely with the EuroGOOS ROOS (Regional Operational Observing System) and a Global centre well connected to the JCOMM networks (Joint WMO-IOC Commission for Oceanography and Marine Meteorology). CMEMS INSTAC is one of three pillars, with SeaDataNet and EuroGOOS, of the EMODnet Physics portal. The in situ products are either assimilated in forecasting models by Monitoring and Forecasting Centres (MFC) of CMEMS, used as ground truth for models from the MFCs or for Satellite Thematic Centre (TAC) product validation or provided to CMEMS users for research and downstream activities. CMEMS INSTAC is integrating data from different sources for operational oceanography needs. It is collecting and carrying out quality control in a homogeneous manner on the data. The focus of CMEMS INSTAC is on observations from**

automatic observatories at sea (e.g. floats, tide gages, moorings, gliders, ferrybox, drifters, SOOP, HF-radars) which are transmitted in (near) real-time to the shore and in situ historical data acquired by autonomous platforms and vessels. Initially CMEMS INSTAC scope concerned physical oceanography and meteorological data; nowadays there is a growing interest in also biogeochemical data. CMEMS INSTAC has started preparing at regular intervals global biochemical data collections (oxygen, chlorophyll and nutrients) as input for the CMEMS modellers. This process includes gathering of data from multiple sources and databases, such as BGC-Argo, Ferrybox, ICES, WOA, SOCAT, a.o., and QA-QC to validate the data and its metadata. The produced collections are made available to the modellers and published for downloading at the CMEMS user portal (through the CMEMS catalogue).

b) EMODnet (European Marine Observation and Data Network) is the long term marine data initiative initiated by EU DG MARE in 2008 to create an interoperable data sharing framework to make European in-situ marine data more easily accessible, interoperable, and free on restrictions on use following the FAIR¹ data principles. **EMODnet Chemistry** is one of the cornerstones of EMODnet and aims at collecting, validating, and providing access to marine chemistry data, and generating and publishing marine chemistry data products, in particular relevant for the implementation of the Marine Strategy Framework Directive (MSFD) and its stakeholders at national, regional and European levels. EMODnet Chemistry started in 2008 and the scope targets marine chemistry data sets and derived data products concerning **eutrophication, acidification, contaminants, and marine litter** for the European sea regions as defined by MSFD. For tuning its products and marketing their uptake as supporting MSFD implementation, EMODnet Chemistry has established regular dialogue and synergy with major MSFD stakeholders, - EU DG Environment, EEA, Regional Sea Conventions (OSPAR, HELCOM, UNEP-MAP, Black Sea Commission) - and is participating in MSFD technical groups - TG-DATA and TG-ML. EMODnet Chemistry has a Board of MSFD Experts, comprising marine chemical experts and representatives of the MSFD stakeholders. EMODnet Chemistry partners are national marine monitoring agencies, major marine research institutes and also it includes ICES. EMODnet Chemistry has adopted and adapted the **SeaDataNet** standards and services for gathering and giving access to an increasing volume of chemistry data sets brought together by EMODnet Chemistry and SeaDataNet partners. The knowledge and experience built up over time with handling and validating marine chemical data sets in cooperation with major marine chemistry experts, is used to refine guidelines for completing metadata and data formats and QA-QC procedures by data providers. From the data collection EMODnet Chemistry generates data products at a 12 months interval. The base collections of data for eutrophication (oxygen, chlorophyll-a, nitrate, phosphate, silicate, ammonium), acidification (pH and alkalinity), contaminants, and marine litter are validated, harmonised, and aggregated per MSFD region. A major challenge is to manage the heterogeneity, complexity, quality and large volume of the gathered data

¹ FAIR data are Findable, Accessible, Interoperable and Reusable

sets and to process these into harmonized and aggregated data collections, from which also map products are generated. The resulting products are published for users for browsing, interacting and visualizing by means of dedicated viewing services, while metadata and Digital Object Identifier (DOI) of the data products can be retrieved from a products catalogue service at the EMODnet Chemistry portal. The harmonized data products are used by MSFD stakeholders as part of the MSFD assessments and in November 2018 EEA has informed Member States (EIONET National Reference Centers) that data on eutrophication and contaminants will be collected by means of EMODnet Chemistry and ICES.

c) CMEMS INSTAC and EMODnet Chemistry recognize a common interest in biogeochemical data for different applications and users, and that there are several areas of development and operational activities that will benefit from cooperation between them.

THEREFORE,

CMEMS INSTAC and EMODnet Chemistry have agreed to cooperate in strategy, research, and operation, where mutually beneficial and desirable.

This Memorandum of Understanding formulates an initial number of areas and activities of cooperation, while this list can be updated over time in mutual agreement.

Section 1 – COOPERATION AREAS

1.1 Metadata and data exchange from EMODnet Chemistry to CMEMS:

- i) CMEMS will receive new EMODnet Chemistry releases of the aggregated, validated and harmonized data collection products, together with additional data sets outside the MSFD regions (unrestricted and SeaDataNet licensed) which cover the open ocean and are not yet aggregated, validated and harmonised at collection level. This exchange of biochemical data from EMODnet Chemistry to CMEMS INSTAC will start with oxygen, and chlorophyll-a, followed by nutrients.
- ii) The EMODnet Chemistry data collection products have a DOI and landing page and include CDI references inside the collection and landing page. The global extra data harvest will also be provided as fixed ODV collection including full CDI metadata and with a DOI for the whole collection. All DOI will point to an EMODnet Chemistry hosted dynamic landing page which includes references and acknowledgements to all included CDI records and related data providers. The releases of the open ocean collection in time will follow a comparable DOI naming as applied for Euro-Argo with a master DOI and snapshot monthly updated versions. CMEMS INSTAC will consider the EMODnet Chemistry data collection products as best versions as these have undergone extra QA-QC and harmonisation at product level. The additional global harvest data aims at being considered by CMEMS INSTAC as best version, because

these underwent validation by SeaDataNet data centres, although there is still harmonization required at collection level.

- iii) Any issues with the data and metadata to be found in the process for the CMEMS INSTAC products will be reported back by CMEMS to EMODnet Chemistry for correction by EMODnet central operators and associated data providers, where applicable.
- iv) CMEMS will keep the EMODnet Chemistry DOIs and SeaDataNet CDI references on board of its published data collections, so that users of the CMEMS INSTAC biochemical collections will be informed about the EMODnet Chemistry products and services in cooperation with SeaDataNet, and its data providers. CMEMS INSTAC will also include a clear statement in its CMEMS catalogue in the product description that this is produced by CMEMS in close cooperation with EMODnet Chemistry and mentioning also the data contributions and relevant DOIs.

1.2 **Metadata and data exchange from CMEMS to EMODnet Chemistry:**

- i) CMEMS INSTAC will promote and encourage potentially additional biochemical data providers from Europe to pass their data sets also to SeaDataNet data centres for further validation and long-term stewardship and inclusion in the EMODnet Chemistry activities. CMEMS INSTAC and EMODnet Chemistry will actively signal gaps and work to fill these together with the data providers. This is aimed at ensuring that the SeaDataNet CDI service will be populated with a maximum of chemistry data from European data providers;
- ii) CMEMS INSTAC will provide EMODnet Chemistry its global data products (validated data collections) with complementary data sets from international originators as potential extra input for the EMODnet Chemistry products.
- iii) Any issues found with the data and metadata will be reported back by EMODnet Chemistry to CMEMS INSTAC for correction by CMEMS operators and data providers, where applicable. EMODnet Chemistry will keep the CMEMS product references on board of its published data products, so that its users will be informed about the CMEMS INSTAC data products and service. In addition, EMODnet Chemistry will include a clear statement in its Sextant catalogue in the product description that this is produced by EMODnet Chemistry in close cooperation with CMEMS and mentioning the data contributions and relevant DOIs.

1.3 **Development of products:**

- i) The CMEMS INSTAC and EMODnet Chemistry products are different as the EMODnet Chemistry products are focused on fitness for MSFD purpose and cover MSFD regions while CMEMS focuses on in-situ data at global and regional scales required to

validate/complement satellite observations and constrain models through data assimilation.

- ii) However, there is much to gain from a close cooperation of the CMEMS INSTAC and EMODnet Chemistry for further developing the QA-QC methods, the chemistry harmonization and aggregation rules, in regular contact with chemistry experts, and dedicated supporting tools and services, which will provide support for both product workflows. Close cooperation and synergy will be very fruitful and provide a win-win situation; therefore, both parties will actively explore opportunities for working together and funding these activities, and maintaining a roadmap for the foreseen cooperation and synergy. This will concern the processing workflows, QA-QC methods, vocabularies, duplicates, harmonization and aggregation rules, provenance, error reporting, and also the data management aspect.
- iii) Together EMODnet Chemistry and CMEMS INSTAC, and including other external partner like SeaDataNet, will strive for developing the best European marine biochemical data resource and establishing an increasingly efficient method and infrastructure for supporting these aspects. There will be synergy with the comparable challenge for Temperature & Salinity data management, production chains, and supporting infrastructure.

1.4 **Distribution of products:**

- i) CMEMS and EMODnet Chemistry have their own portals for publishing their respective eutrophication products.
- ii) As part of the cooperation, CMEMS INSTAC will explore options for including also the EMODnet Chemistry data products with descriptions, DOIs and viewing links in its catalogue as this might generate additional interest from users.
- iii) Each party will include a clear statement about the CMEMS – EMODnet Chemistry cooperation in the product descriptions of its products including DOIs. This principle gives acknowledgement and will stimulate extra user traffic. CMEMS INSTAC and EMODnet Chemistry will inform each other at regular intervals (e.g. every 3 months) of number of downloads, web viewing statistics and user details, at macro level and in conformance to the new General Data Protection Regulation (GDPR), of the relevant products by users, so that both parties get insight in the re-use of their data contributions.

1.5 **Teaming up in relevant projects and joined activities:**

- i) CMEMS and EMODnet Chemistry, together with other partners like for instance SeaDataNet, will explore further opportunities and team up in new relevant projects

to strengthen the mutual cooperation, the technical basis for marine chemistry data exchange, management, delivery, and product development, the availability of validated and harmonised data collections, and the sustained operation of the CMEMS INSTAC, EMODnet Chemistry, and SeaDataNet. In particular this is relevant for selected EU initiatives such as the European Open Science Cloud, and Blue Cloud as well as new phases of ESFRI, Copernicus and EMODnet.

- ii) CMEMS INSTAC and EMODnet Chemistry will keep Mercator Ocean and EMODnet Secretariat informed about progress and report on achievements and remaining challenges during the regular the EMODnet-CMEMS coordination meetings.

Section 2 – ENTRY IN FORCE, DURATION and TERMINATION

This Memorandum of Understanding is valid until 31st March 2021, and shall enter into force on the day of its signature by the signatories on behalf of CMEMS INSTAC and EMODnet Chemistry. The Parties agree to continue the cooperation beyond the end dates, at the best of their capacities.

Both CMEMS INSTAC and EMODnet Chemistry have the right to terminate the Memorandum of Understanding, if they have motivated reasons to do so. The termination has to be done in writing from one party to the other party.

Section 3 – FUNDING and OPPORTUNITIES

The activities will be performed by CMEMS INSTAC and EMODnet Chemistry in their best manner and without financial implications to each other.

CMEMS and EMODnet Chemistry will both seek to identify and pursue opportunities for joint participation in new proposals and projects of mutual interest and which can provide external funding for enlarging efforts for (part of) the formulated cooperation activities.

Article 4 – ENTIRE AGREEMENT, AMENDMENTS and SEVERABILITY

This Memorandum of Understanding constitutes the entire agreement between CMEMS and EMODnet Chemistry.

Amendments or changes to this Memorandum of Understanding shall be valid only if made in writing and signed by authorised signatories of CMEMS INSTAC and EMODnet Chemistry.

If one or more of the provisions contained in this Memorandum of Understanding or any documents executed in connection herewith are found by a competent court or authority to be invalid, illegal, or unenforceable in any respect under any applicable law, including competition law, the validity, legality, and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired, provided, that in such case

CMEMS INSTAC and EMODnet Chemistry oblige themselves to use all reasonable efforts to achieve the purpose of the invalid provision by a new legally valid stipulation that cause the same or similar (economic) benefit or burden.

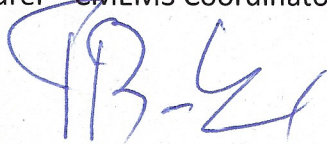
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Signed in three copies,

Signed:
(On behalf of CMEMS)

Date: 26/06/2019

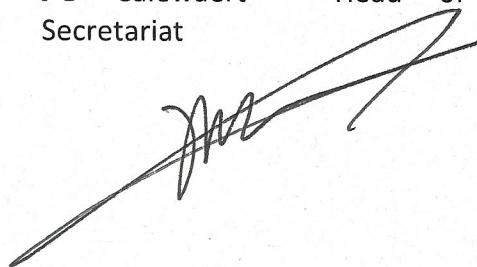
P Bahurel – CMEMS Coordinator



Signed:
(On behalf of EMODnet)

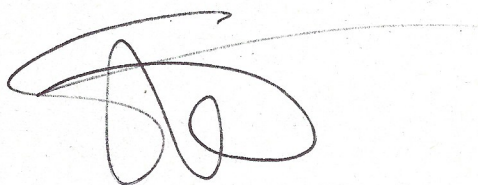
Date: 26.06/2019

J-B Calewaert – Head of EMODnet Secretariat



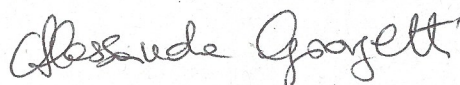
Date: 22/5/2019.

S Pouliquen – CMEMS INSTAC Coordinator



Date: 22-05-2019

A Giorgetti – EMODnet Chemistry Coordinator



Date: 3 Sept 2019

DMA Schaap – EMODnet Chemistry technical coordinator

