



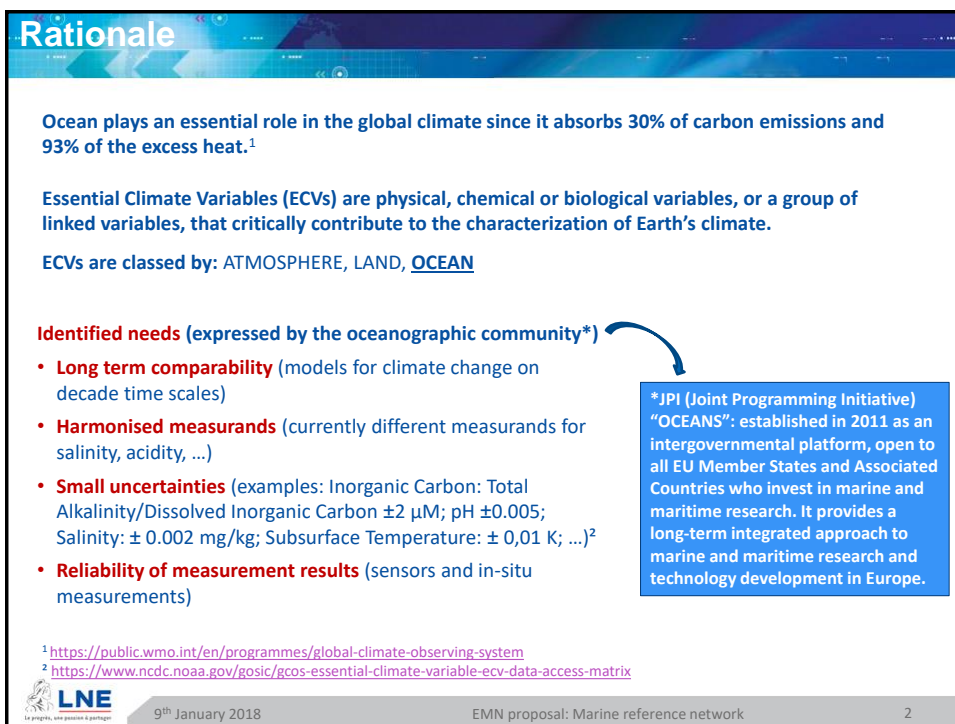
**Marine Reference Network**

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**MESURES ET RÉFÉRENCES**  
VECTEUR DE COMPÉTITIVITÉ  
ET DE SÉCURITÉ

le cnam

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**Rationale**

Ocean plays an essential role in the global climate since it absorbs 30% of carbon emissions and 93% of the excess heat.<sup>1</sup>

Essential Climate Variables (ECVs) are physical, chemical or biological variables, or a group of linked variables, that critically contribute to the characterization of Earth's climate.

ECVs are classed by: ATMOSPHERE, LAND, OCEAN

**Identified needs (expressed by the oceanographic community\*)**

- **Long term comparability** (models for climate change on decade time scales)
- **Harmonised measurands** (currently different measurands for salinity, acidity, ...)
- **Small uncertainties** (examples: Inorganic Carbon: Total Alkalinity/Dissolved Inorganic Carbon  $\pm 2 \mu\text{M}$ ; pH  $\pm 0.005$ ; Salinity:  $\pm 0.002 \text{ mg/kg}$ ; Subsurface Temperature:  $\pm 0,01 \text{ K}$ ; ...)<sup>2</sup>
- **Reliability of measurement results** (sensors and in-situ measurements)

\*JPI (Joint Programming Initiative) "OCEANS": established in 2011 as an intergovernmental platform, open to all EU Member States and Associated Countries who invest in marine and maritime research. It provides a long-term integrated approach to marine and maritime research and technology development in Europe.

<sup>1</sup> <https://public.wmo.int/en/programmes/global-climate-observing-system>  
<sup>2</sup> <https://www.ncdc.noaa.gov/gosic/gcos-essential-climate-variable-ecv-data-access-matrix>

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## Activities & Actors

### Activities

- Research devoted to the **definition of new or improved standards** for marine quantities
- **Development and/or metrological characterization of new instruments** for marine measurements
- Development of **calibration facilities for marine sensors**
- Definition of suitable **procedures for the determination of measurement uncertainties**

### Actors


**EURAMET NMIs and DIs (potential full EMN members):**  
 LNE (FR), PTB (DE), INRIM (IT), VSL (NL), CEM (ES)

**TECHNICAL STAKEHOLDERS (potential associated members – already expressed their interest):**

- **IFREMER** (Institut français de recherche pour l'exploitation de la mer, FR)
- **SHOM** (Service hydrographique et océanographique de la marine, FR)
- **IOW** (Institute for Baltic Sea Research in Warnemünde, DE)
- **OGS** (National Institute of Oceanography and Applied Geophysics, IT)
- **NIOZ** (Netherlands Institute for Sea Research, NL)
- **UPC** (universidad politécnica de catalunya, ES)
- **IMR** (Institute of Marine Research, NO)
- **AQUAREF** (laboratoire national de référence pour la surveillance des milieux aquatiques, FR)
- **Oversea NMIs** (NIST, NMIJ, ...)
- **Sensors' manufacturers** (at least 5)

**ORGANISATIONS (potential stakeholders or liaisons):**

- **JPI Oceans** (the 5 NMIs are already members)
- **JCS** (Joint Committee on the Properties of Seawater)
- **GOA-ON** (Global Ocean Acidification Observing Network): a meeting is scheduled on the 16th January
- **IOC-UNESCO** (Intergovernmental Oceanographic Commission)
- **GOOS** (Global Ocean Observing System)


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## Outputs

The EMN will provide:

- the **necessary tools to the marine and oceanographic communities, in order to ensure the traceability of the measurements of marine quantities** and to address any emerging need in this field,
- Inputs to **standardisation**,
- Support to **sensors' manufacturers**.

Several NMIs and DIs have already **established capabilities on some variables**.  
 The envisaged European network will build upon **interdisciplinary collaborations established in previous EMRP/EMPIR projects**.

**A complementary approach** will ensure useless duplications of activities.


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## Impact

- Support **national governments into the implementation of EU directives** (Marine strategy, the Common Fisheries Policy, ...) and **international conventions on climate** (COP21, ...)
- Reinforce the **EU metrology position** in the frame of the **climate science** (an European Ocean Observing System (EOOS) is under creation by EuroGOOS)
- Underpin the **international measurement infrastructure** in charge of **ocean observations to understand climate change**

**Who now develops and maintains standards for ocean science?**

Intergovernmental

Non-governmental

UN

UNESCO

WMO (1951)

ICES (1902)

IOC (1960)

CIPM (BIPM) (1875)

CCT  
CCQM

WCRP  
GO-SHIP  
JCOMM

ICSU

IUGG

IUBS

IAPWS (1929)

IAPSO (1922)

IAMAS

IABO

SCOR (1957)

SCSW

TPWS

JCS - Joint Committee on the Properties of Seawater (2013)

Legend:

- Green box: Standards/Formulations
- Blue box: Ocean-Focussed
- Blue circle: NMIs already active

Picture kindly provided by R. Pawlowicz, University of British Columbia (chair of IAPWS)

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