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## Making marine ecosystem models operational: the NECCTON project



unesco

Intergovernmental  
Oceanographic  
Commission



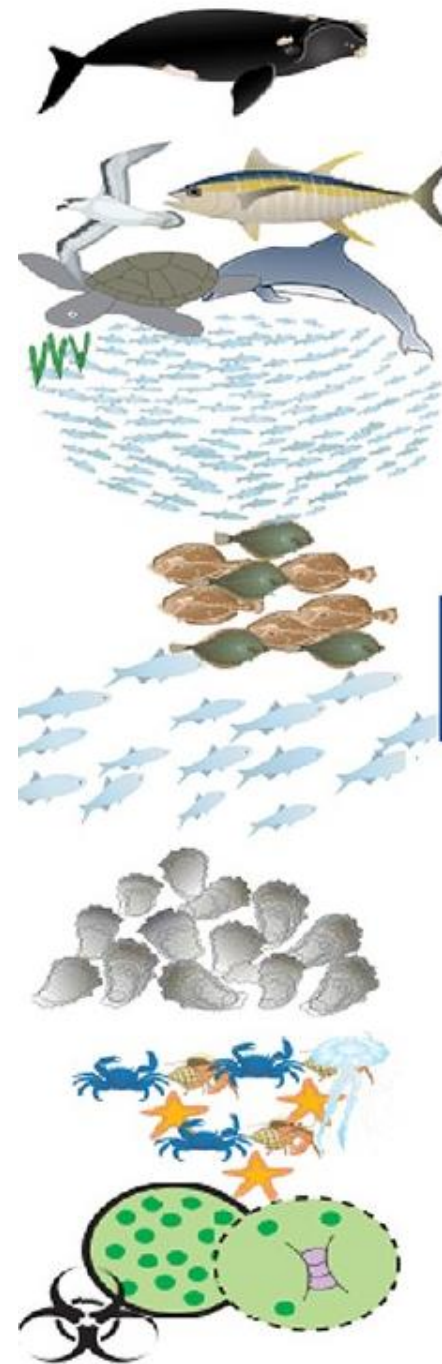
2021  
2030 United Nations Decade  
of Ocean Science  
for Sustainable Development

Connecting the world around Ocean Prediction: *A vision for the Decade and Beyond* – 8 April 2024

# Why NECCTON?



*ICES Journal of Marine Science*, 2023, 80, 2087–2098  
DOI: 10.1093/icesjms/fsad143  
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**Quo Vadimus**



## Why we need weather forecast analogues for marine ecosystems

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Marine ecosystems face many consequential pressures. Yet, we lack an integrative and predictive capacity to understand how marine ecosystems will respond to the cumulative impacts of these pressures, including climate change. It is not enough to detect responses after the fact; it has become imperative to know in advance where major biological resources or hazards will occur, when they will peak, and how that will impact economic performance. Although forecasts exist for some components of marine ecosystems, these are disparate and suffer from a lack of coordination. There is a need for coordinated, cross-ecosystem scale, integrated, marine ecosystem predictions and synthesis products. The value proposition relative to the blue economy is quite high, positively influencing billions if not trillions of marine sector dollars.



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Clean Ocean



Healthy & Resilient Ocean



Productive Ocean



Safe Ocean



Accessible Ocean



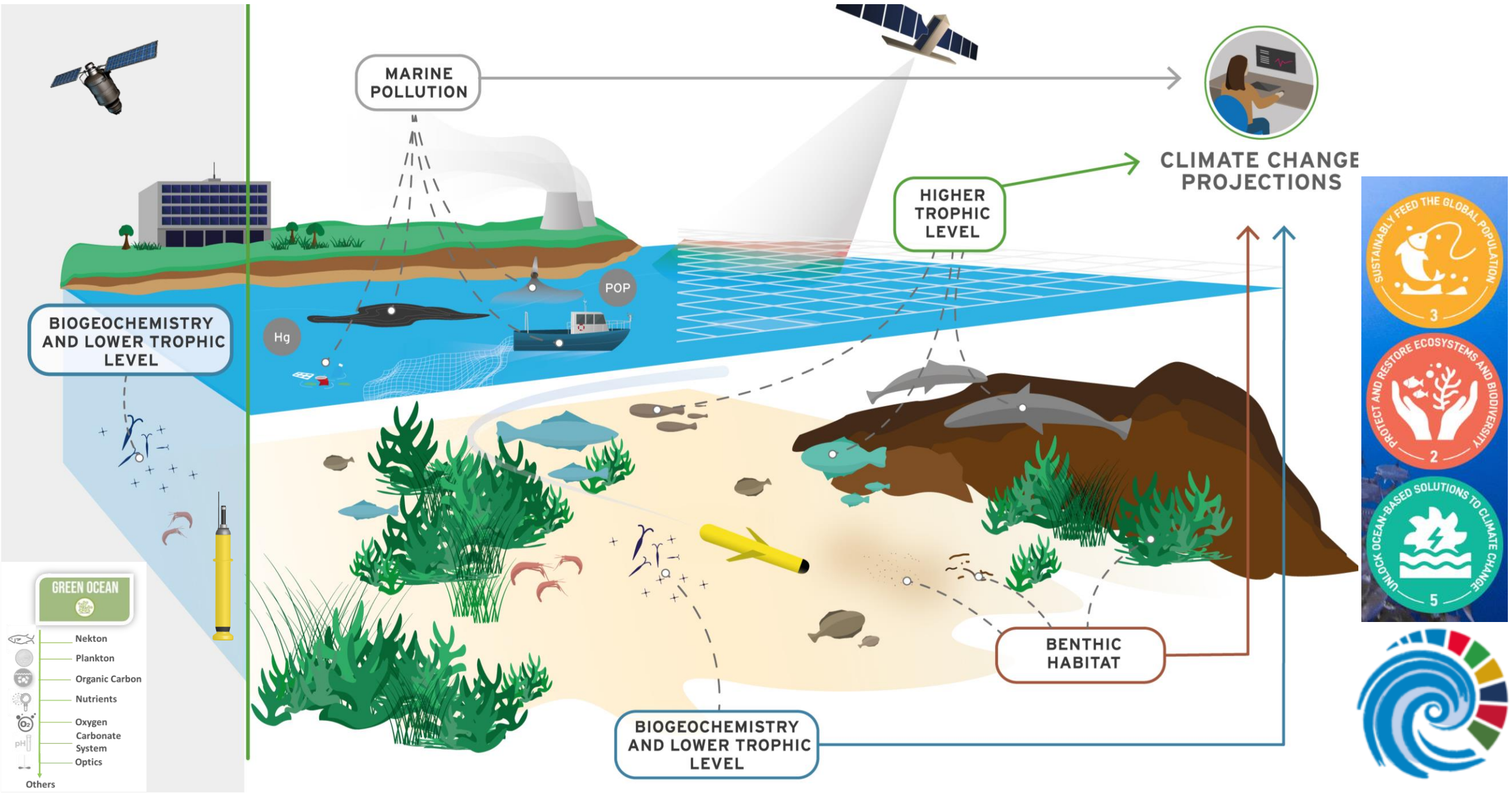
Predicted Ocean



Inspiring & Engaging Ocean



# NECCTON will advance the Copernicus Marine Service



# NECCTON & Marine Life 2030 & OP DCC: opportunities

**ML2030's vision:** by 2030 all have **access to information** on marine species and ecosystems important to local fisheries, culture, health, and livelihoods.

**NECCTON's vision:** by 2030 operational capability to predict and disseminate **FAIR model products** for fish, benthic and pollution, to support biodiversity conservation and sustainable management of fisheries

1. NECCTON will contribute actively to the ML2030 community of practice with feedback on **models' needs for obs** of marine life and ecosystems
2. ML2030 could support NECCTON in the **standardization** of marine ecosystem (model output) products, for subsequent use in the OP DCC
3. ML2030 could **share observations** with NECCTON
4. NECCTON and ML2030 could **co-create new case studies**



France

## New Copernicus capability for ocean food networks

Developing new modelling products of fisheries, pollution and benthic habitats to better inform ocean policymakers and stakeholders.

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#OceanDecade Endorsed Actions



2021-2030 United Nations Decade of Ocean Science for Sustainable Development



# NECCTON Key-facts

- Endorsed by UN Ocean Decade - Marine Life 2030
- Horizon Europe - Copernicus evolution project
- Coordination: S Ciavatta - Mercator Ocean int.
- Duration: 4 years (Jan 2023-Dec 2026)
- Budget: 10M Eur
- Partners: 23
- The outputs are FAIR

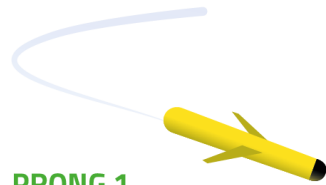
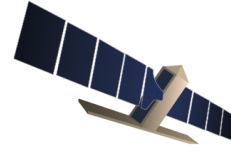


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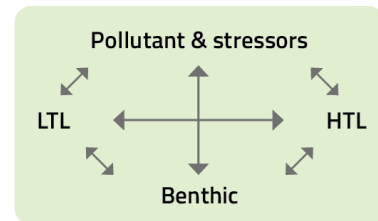
# The 3-prong approach



## PRONG 1

### Conceptual innovation: Process integration

→ to better represent marine ecosystems  
(Objectives O1-O4; WP5-WP8)



New marine  
ecosystem  
models and products



# The 27 NECCTON model products



## Pelagic Biogeochemistry

- Mesozooplankton biomass
- Micronekton biomass
- Suspended particulate matter (SPM)
- POM (Particulate Organic Matter)
- DOM (Dissolved Organic Matter)
- Reflectance

## Benthic

- O<sub>2</sub> near bottom
- pH near bottom
- Light at bottom
- CO<sub>2</sub> flux to bottom
- Carbon in sediment
- Macrozoobenthos
- Benthic flora
- Sedimentary rates

## Nekton

- Small-pelagic biomass
- Apex predator
- Marine mammals
- Unspecified fish and biomass
- Higher Trophic Level Habitat
- Demersal fish

## Stressors

- Plastic
- Persistent Organic Pollutants
- Mercury
- Oil
- Fisheries pressure
- Climate change stressor index
- Stressors
- Multi-stressor index



**OBSERVATIONS**  
In-situ and satellites



**MODELS**  
Calib., assim. & ML



**HINDCASTS**  
Decadal



**PROJECTIONS**  
Multi-decadal



44 datasets

10+ datasets



# Thirteen case studies co-created with stakeholders

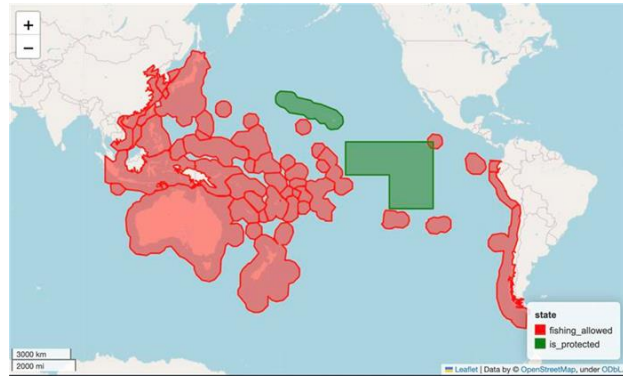
| ID | Title   |
|----|---|
| 1  | Monitoring a Natura 2000 marine protected area in the Adriatic Sea  |
| 2  | Ensemble of species distribution models to determine hot spots of aggregation supporting management plans and MPA definition in the Mediterranean Sea |
| 3  | Mapping sources of pollutants transported towards Mediterranean aquaculture farm areas  |
| 4  | Mapping the impact of fish trawling on functional biodiversity of the Black Sea   |
| 5  | Ensemble model evaluation and projection of small pelagics in the Bay of Biscay   |
| 6  | Climate-smart MPA planning in the North West European Shelf   |
| 7  | Monitoring plankton diversity and dynamics in the Parc Naturel Marin d'Iroise (PNMI)  |
| 8  | Monitoring pollution of marine protected areas surrounding Svalbard   |
| 9  | Modelling and projecting fisheries potential in the Arctic Atlantic Ocean   |
| 10 | Marine protected area monitoring and assessment in the Baltic Sea   |
| 11 | Spatial Management of Tuna Stocks and Fisheries under Climate Change  |
| 12 | Monitoring marine mammals in the Azores region  |
| 13 | Forecasting climate change impact on potential catches of open ocean large pelagic fish   |



✓ **Biodiversity conservation**  
 ✓ **Fisheries management**

# Spatial Management of Tuna Stocks and Fisheries under Climate Change (co-created case study 11)

Defined Marine Protected and Fisheries areas



Tools to generate fishing scenarios



Pacific Community  
Communauté du Pacifique

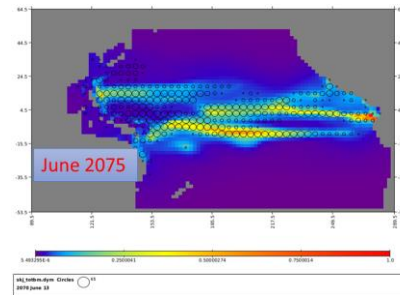
Step 4: Select the climate change scenario and IPCC model(s)

- RCP 2.6
- RCP 4.5
- RCP 8.5
- IPSL
- GFDL
- MPI
- NORESM
- ...

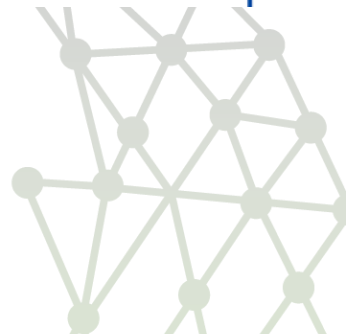
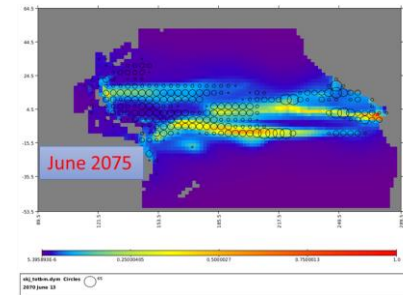
Run the simulation



No spatial closure



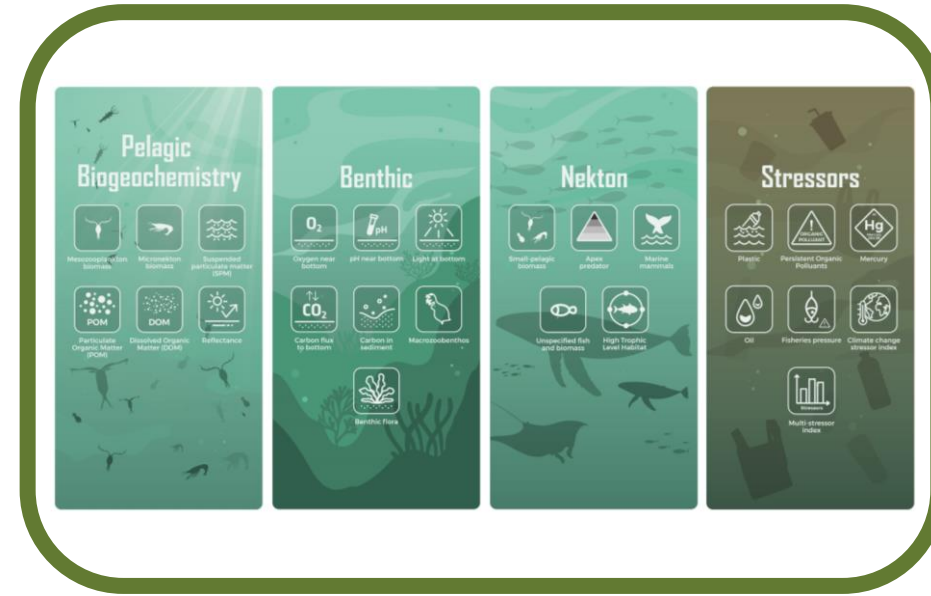
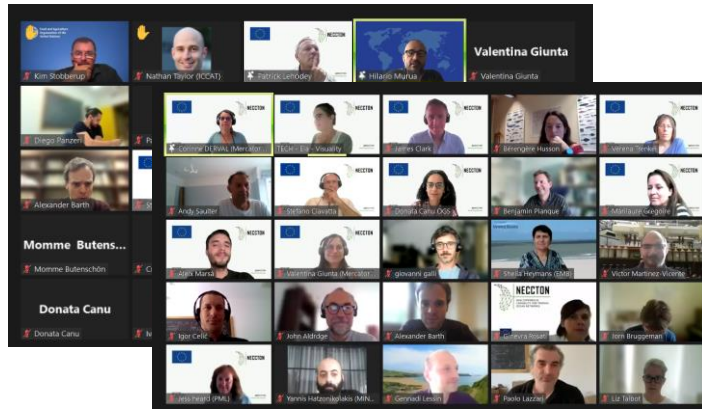
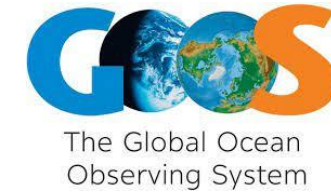
Spatial closure



European Digital Twin Ocean



# Links with other EU and global networks and programmes

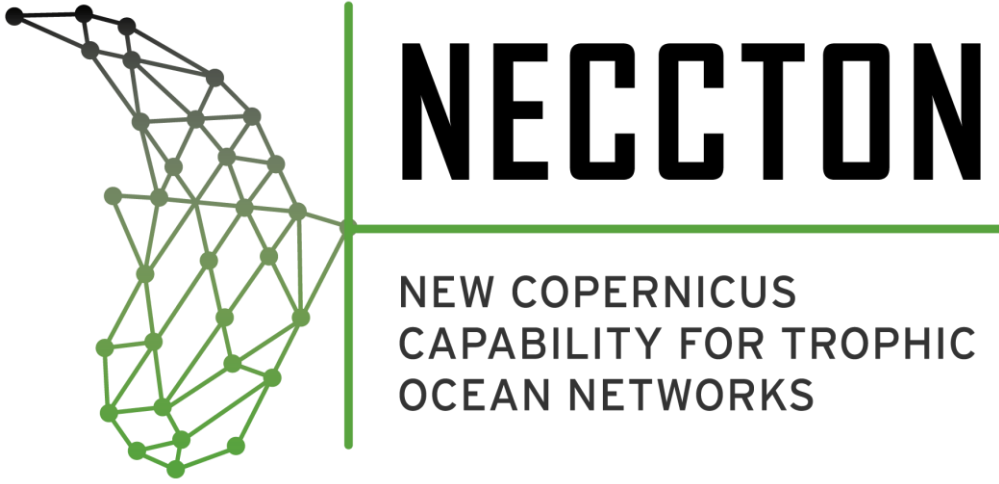




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# Thank you



Join mailing list

[www.neccton.eu](http://www.neccton.eu) [neccton@mercator-ocean.eu](mailto:neccton@mercator-ocean.eu)



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