WP5 – Coastal Adaptation

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Contributing Partners: AZTI, COGEA, DMI, EOMAP, ETT, GTK, SSBE, TNO

Marine Knowledge Expert Group meeting

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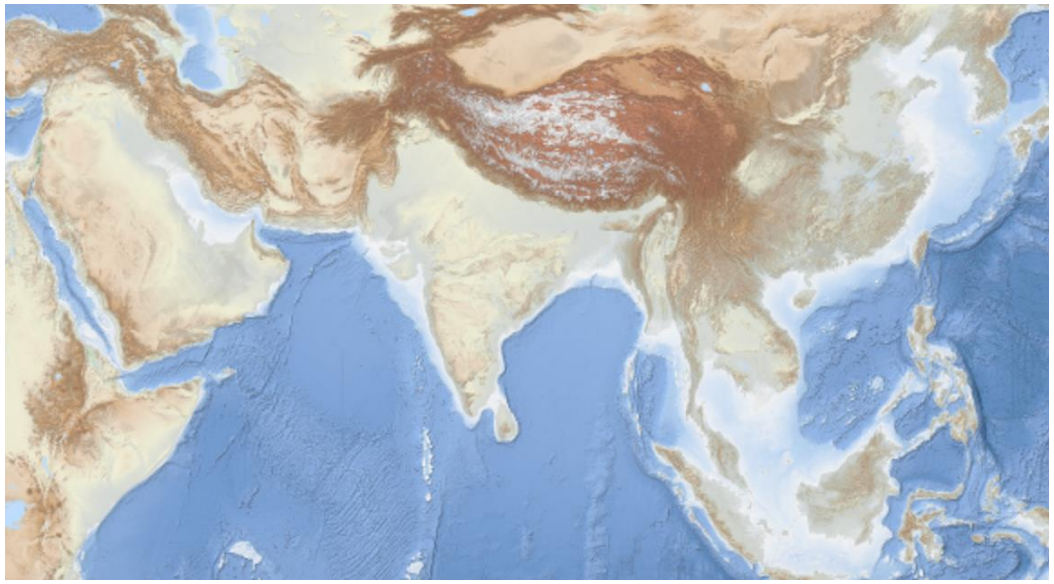
The project “International Ocean Governance: Strengthening international ocean data through the EU’s ocean diplomacy with China” is financed by the European Commission EuropeAid/139904/DH/SER/CN.

WP5 objective



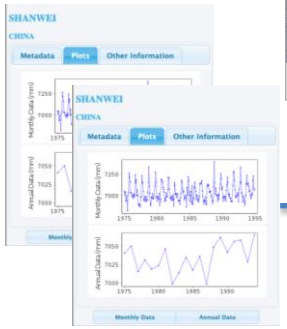
Area of Interest [lat 7 °S - 45°N; lon 30°E -130°E]

To provide data/information products (i.e. digital maps) covering the sea route between China and Europe on:

- Relative and absolute sea level changes
- Coastal erosion
- Wetland degradation
- Vessel traffic density

All products available on Project Central Portal

WP5 products - Relative and absolute sea level changes

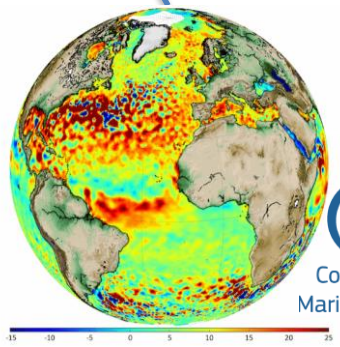


In-situ tide gauges observations

EMODnet Physics

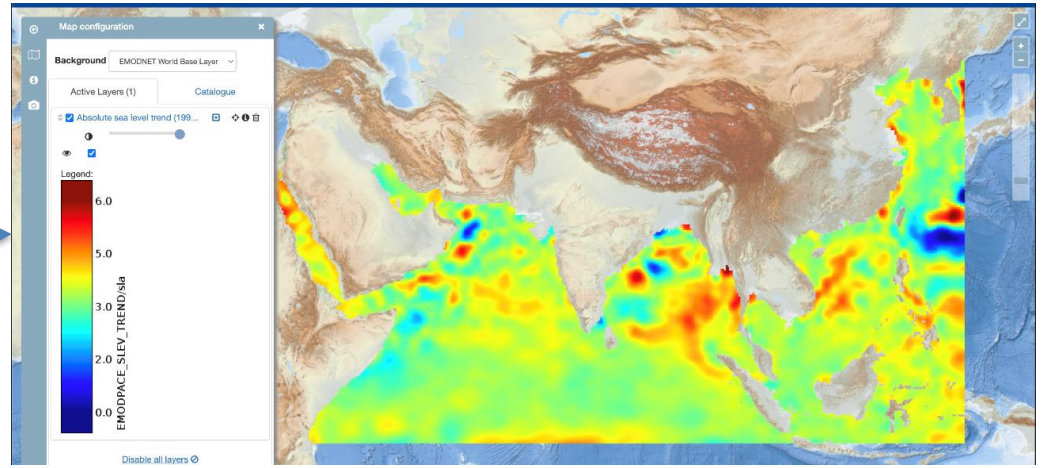
Numerical model estimates (reanalysis)

In-situ tide gauges observations and numerical model estimates (reanalysis)

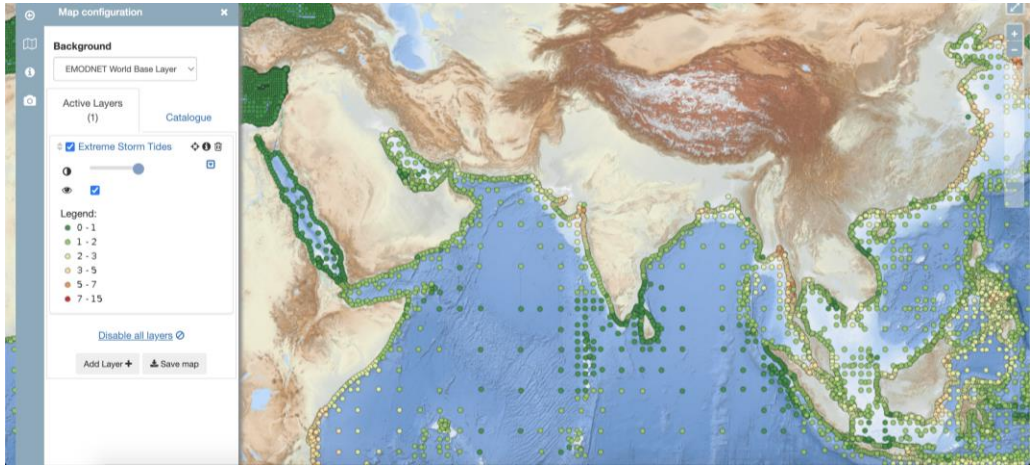


Satellite altimetry observations and numerical model estimates (reanalysis)

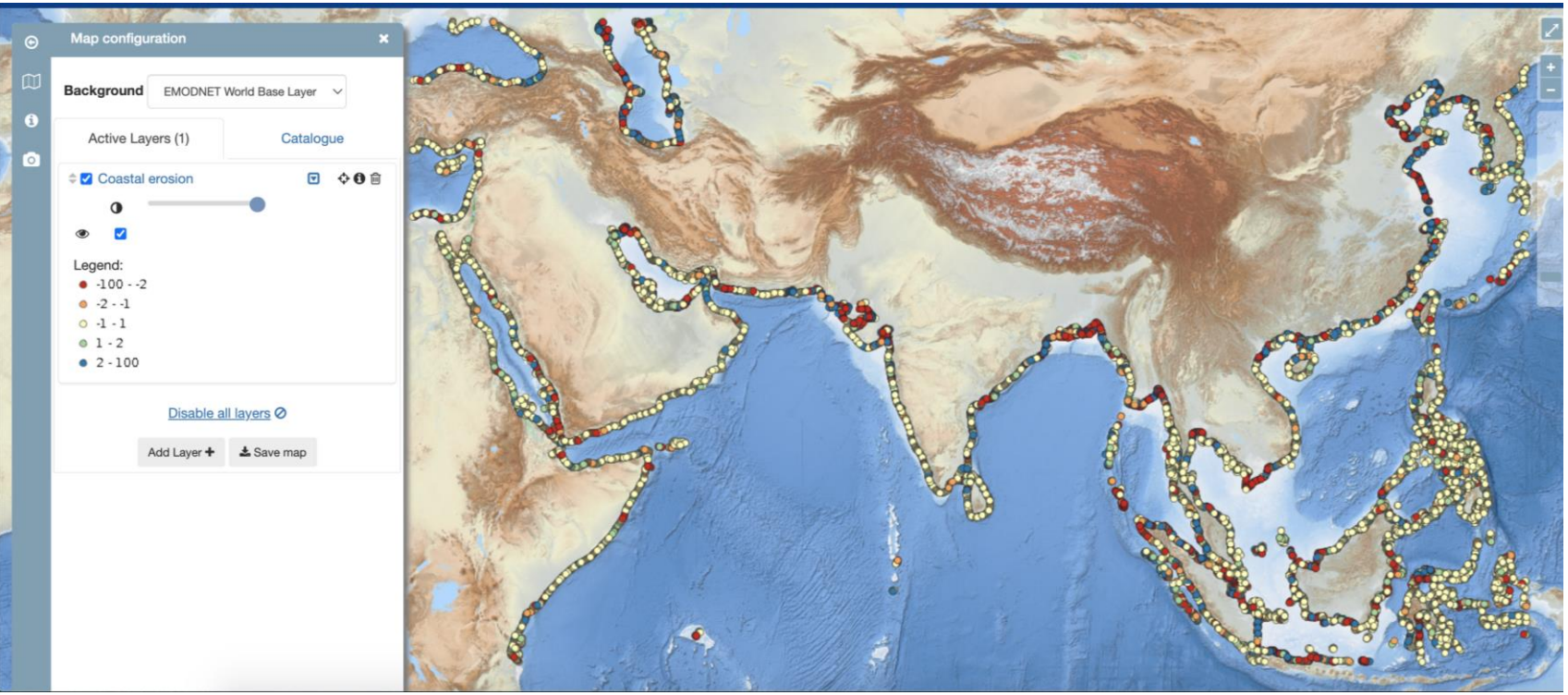
Absolute and relative sea level trend (1993-2019)



Extreme sea level



WP5 products - Coastal erosion

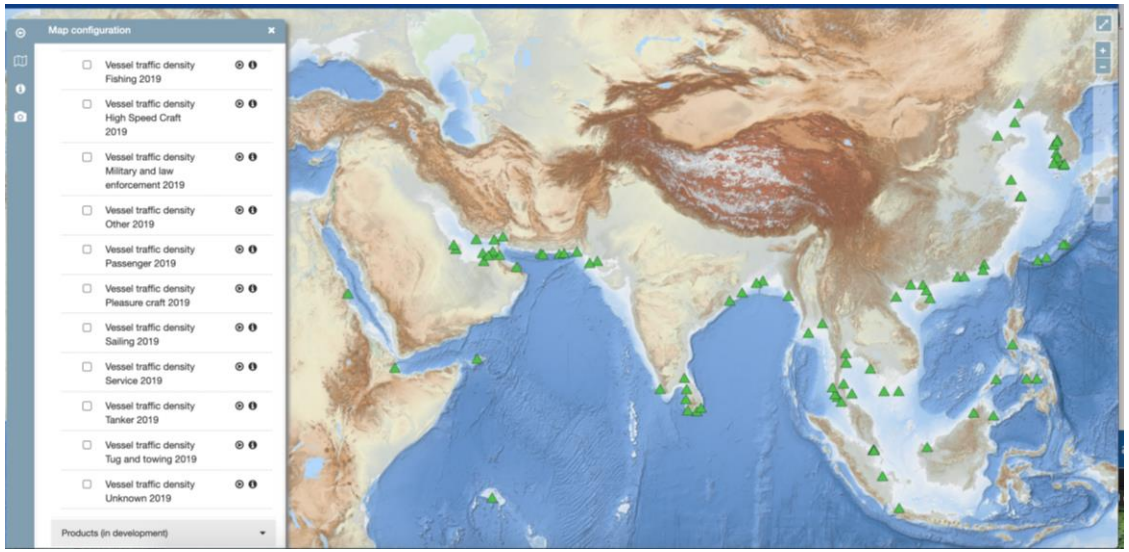


- Erosion
- Stable
- Accumulation
- Erosion + accumulation

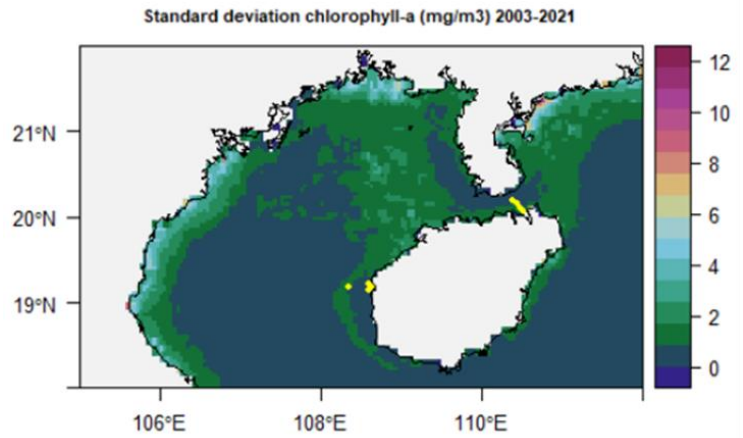
Satellite-derived coastline.
Computed coastline dynamics in terms of change rate in [m/yr] in 1984-2021

WP5 products - Wetland degradation

Classification of coastal wetlands on the base of Ramsar Wetland Classification System



Satellite's chlorophyll-a indicators (MODIS-AQUA, 2002-2021)



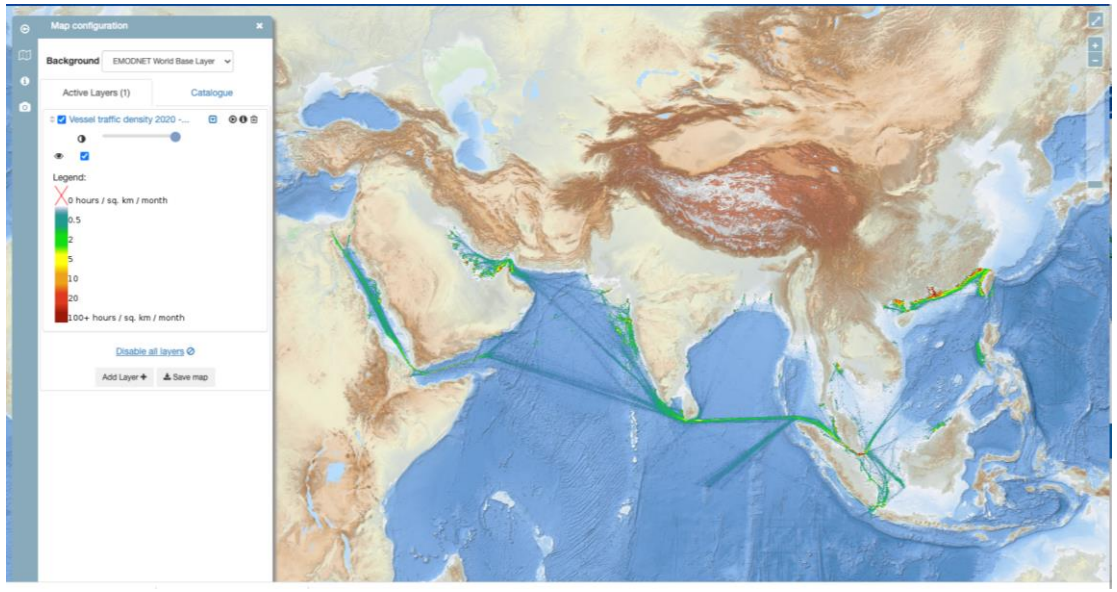
Sea level change, **coastal erosion** and **wetland degradation** products are important to monitor for **coastal zone management**.

They can be useful to many different stakeholders ranging from **government** (planning and management) to **local** (residents, coastal tourism industries, ecosystem health and functioning, biodiversity etc..).

Monitoring also helps understand long-term drivers of change and inform decision-making for future coastal adaptation under **climate change impacts**.

WP5 products - Vessel traffic density

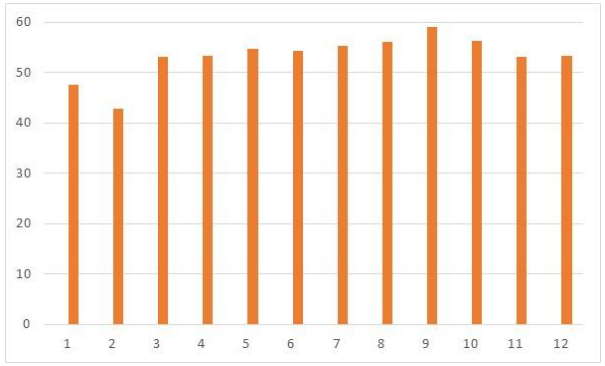
Vessel density map

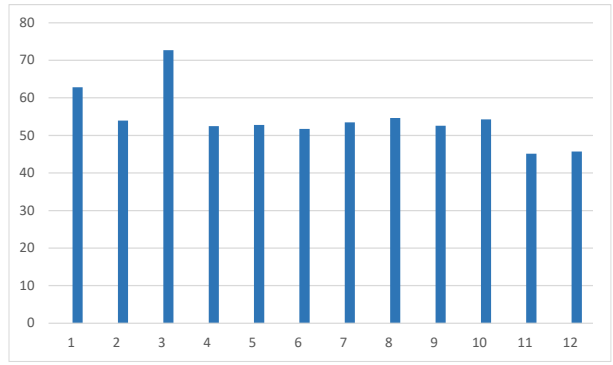


2019

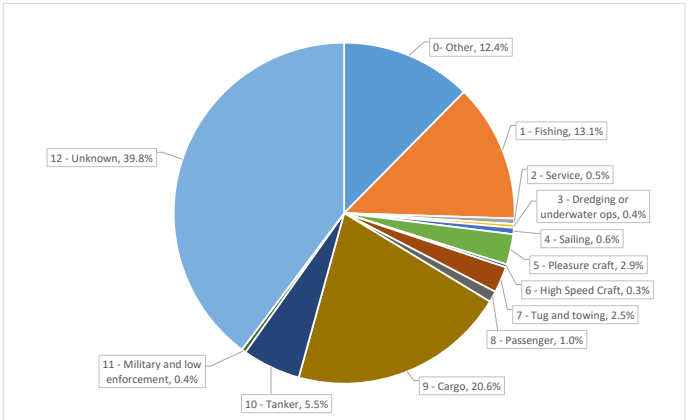
Number (millions) of acquired AIS records (positions) per month

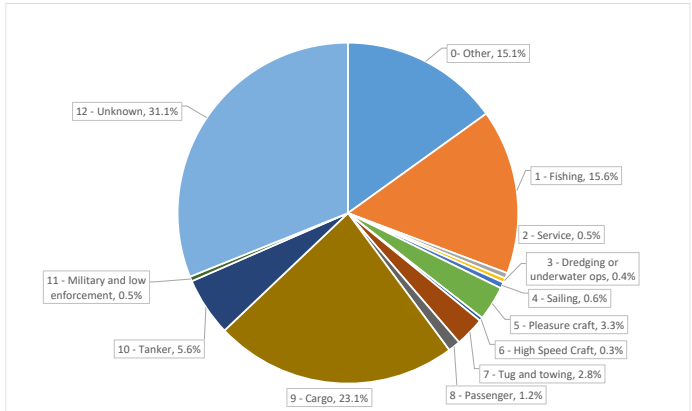
2020





Distribution of unique MMSI by EMODnet ship type

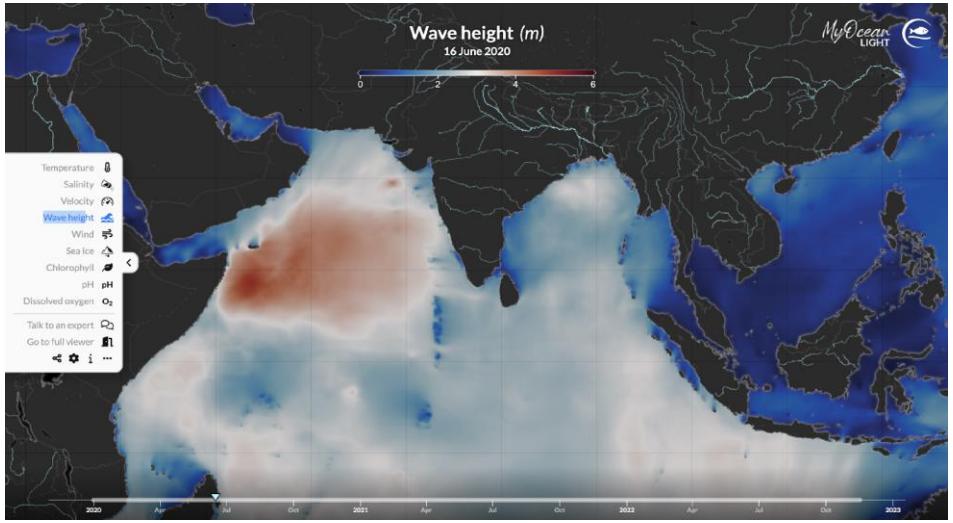




WP5 products - Low carbon routes

Optimal ship routes for EMOD-PACE were computed via the VISIR-2 ship routing model [1].

The sea state was represented by wave analysis fields from the Copernicus Marine Service [2]



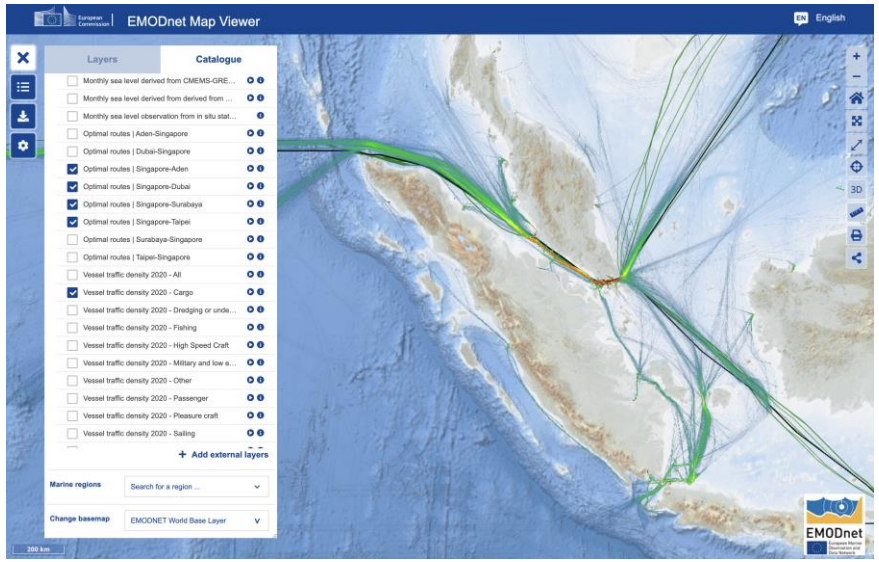
[1] G. Mannarini and L. Carelli. VISIR-1.b: ocean surface gravity waves and currents for energy-efficient navigation. Geoscientific Model Development, 12(8):3449–3480, 2019. https://gmd.copernicus.org/articles/12/3449/2019/gmd-12-3449-2019.html

[2] https://marine.copernicus.eu/

WP5 products - Low carbon routes

AIS data inform on actually sailed ship routes. They are not always optimized with respect to the best forecasts of the marine state.

VISIR CO_2-optimal routes can be overlaid on maps of AIS data [3] for showing potentially smarter navigational decisions



- ***black****: shortest-distance routes (from VISIR)*
- ***dark green****: least-CO2 routes (from VISIR)*
- ***(blue-green-yellow-red)****: AIS vessel density map*

Optimal routes | Dubai-Singapore

Bundle of least-CO2 emission routes (green) between Dubai and Singapore compared to the least-distance route (black). Departures were computed for every fifth day of January, April, July, and October 2020.

Mean relative savings with respect to the least-distance route:

	Jan	Apr	Jul	Oct
CO2 relative savings [%]	0.4	0.5	8.4	0.7
CII relative saving [%]	0.7	0.8	13.9	1.4
CO2 absolute savings [tons]	1.1	1.4	28.0	1.9
Voyage duration absolute savings [hours]	0.9	1.2	23.3	1.6
Fuel consumption absolute savings [tons]	0.4	0.4	9.0	0.6

The expertise developed by the EMOD-PACE partners can be deployed to assess the role of ship routing for decarbonisation of shipping also in other regions.

In particular, the contribution to the Carbon Intensity Indicator (CII) reduction goals mandated by International Maritime Organization [4] can be quantified via VISIR .

[3] https://emodnet.development.ec.europa.eu/geoviewer-new/
[4] https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC76meetingsummary.aspx

Thank you!

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