Challenges for sustainable monitoring and evaluation of the EU Marine Strategy Framework Directive in the Atlantic offshore waters: the iFADO project.

F. Campuzano (1), T. Dabrowski (2), S. Groom (3), M. Ruiz-Villarreal (4), V. Brotas (5), M. Kaufmann (6), S. Hartman (7), P. Oliveira (8), A. Martins (9), M. Juliano (9), F. Vieira (9), M. Lux (10), C. Barreda (11), X. Rebour (12), A.P. Simão (13), M García (1) and R. Neves (1)
campuzanofj.maretec@tecnico.ulisboa.pt

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Introduction

The **iFADO project** (Innovation in the Framework of the Atlantic Deep Ocean) is a European project funded from ERDF funds of the INTERREG Atlantic Area Programme that will develop its activities during the period November 2018-2021. The project aims to create marine services at regional and subregional scale using the EU Atlantic Waters as case study. By filling current technical gaps, the iFADO project will use the European Marine Strategy Framework Directive (**MSFD**, 2008/56/EC), including the recent MSFD Commission Decision (EU 2017/848), and its implementation to **demonstrate the application of innovative products**. The project will combine **traditional monitoring** with cost-effective, **state-of-the-art technologies**: **remote sensing**, **numerical modelling** and emerging observation platforms such as gliders and new sensors.

Overall objective and Common Challenge

The **Atlantic Action Plan** aims to revitalize the Marine and Maritime Economy, recommending closer collaboration among member states such as to set up sustainable strategies for natural resources exploitation while promoting innovation and regional strategies that secure and enhance the marine and coastal environments. The **European Atlantic Region** (EAR) has the largest potential for "**blue growth**" due to, among others, its size, maritime tradition, and vast deep-sea areas available for exploitation. The Copernicus Marine Environment Monitoring Service (**CMEMS**) set up tools to monitor and forecast marine systems at the oceanic scale, foreseeing the subsequent development of innovative services by regional/local actors, oriented to the development of **solutions at regional/local scales able to support authorities and investors**.

This project aims to downscale CMEMS products and to combine the conventional monitoring programmes with ocean buoys, satellite data and emerging technologies to develop tailor-made and innovative products. The latter will:

- assist the **MSFD competent authorities**;
- provide services at regional/local scales to **enhance blue economy**;
- contribute to the challenges posed by **climate change**;
- provide tools to **optimize** the observing strategies allowing better forecasts;
- **capitalise** on individual initiatives and historical data on an EAR perspective.

The European Atlantic Area is specific for its extent and especially for having a narrow continental shelf and extensive deep areas. Hence, the influence of large-scale ocean circulation/dynamics extends almost up to the shore-line. Furthermore, its great surface area hinders detailed in situ characterization/monitoring due to its extremely high costs involved (**24% of total EU waters for 12% of total population**). The iFADO project aims to demonstrate that similar strategies are valid at the regional scale and that **downscalling** is the most suitable mechanism to generate the required solutions and that new technologies are able to provide data in higher quantity, with wider spatial coverage and for **remote marine areas**.

Consortium

Table. I. List of iFADO partners, acronym and country. The institution number and role, Leader (L), Full (F) or Associated (A) partner, is indicated within brackets.

Partner	Acronym	Country
Instituto Superior Técnico (1, F, L)	IST	Portugal
Foras na Mara - Marine Institute (2, F)	MI	Ireland
Plymouth Marine Laboratory (3, F)	PML	UK
Direção Geral de Recursos Naturais, Segurança e Serviços Marítimos (13,A)	DGRM	Portugal
Instituto Español de Oceanografía (4,F)	IEO	Spain
Faculdade Ciências da Universidade de Lisboa (5, F)	FCUL	Portugal
Universidade da Madeira (6, F)	UMa	Portugal
Natural Environment Research Council (7, F)	NERC	UK
Instituto Português do Mar e da Atmosfera (8, F)	IPMA	Portugal
Fundo Regional para a Ciência e a Tecnologia dos Açores (9, F)	FCRT	Portugal
Direção Regional dos Assuntos do Mar (A)	DRAM	Portugal
NOVELTIS (10, F)	NOVELTIS	France
Secretaria Regional do Ambiente e dos Recursos Naturais (A)	DROTA	Portugal
Mercator Océan (A)	MERCATOR	France
Plataforma Oceánica de Canarias (11, F)	PLOCAN	Spain
Ministerio de Agricultura, Alimentación y Medio Ambiente (A)	MAGRAMA	Spain
Pole Mer Bretagne Atlantique (12, F)	PMBA	France
Agence Française pour la Biodiversité (A)	AFB	France
Department of Housing Planning Community and Local Government (A)	DHPCLG	Ireland
Department of Environment Food and Rural Affairs (A)	DEFRA	UK

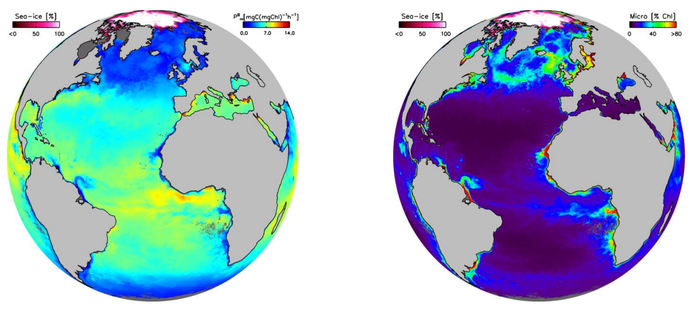
iFADO Technologies

The iFADO project will:

- evaluate the capacities for **enhancing** and improving the **traditional monitoring** surveys focusing in the offshore areas;
- explore the **cost-effectiveness of novel technologies** and sensors for completing the monitoring data in the Atlantic waters;

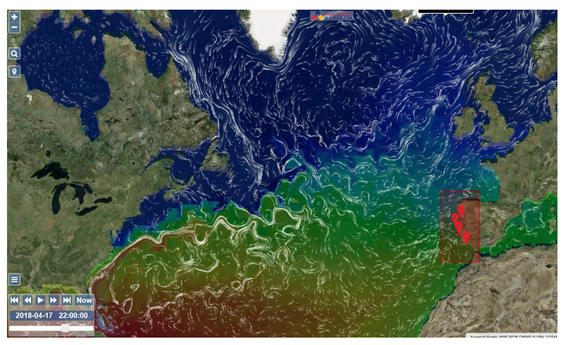
PML Atlantic Meridional Transect – Glider – Phytoplankton fom Flow Cam (IEO)

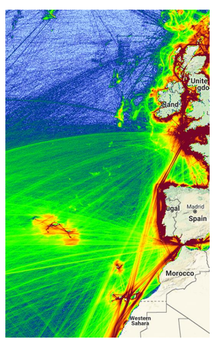
- evaluate **satellite products** to provide assistance for the MSFD descriptors i.e. marine litter (D10) and biodiversity (D1);



Marine primary production and Phytoplankton size classes Brewin *et al.* (2017) FiMS

- explore **numerical models** capacities to calculate **indicators** and complete information in areas where traditional observations and remote sensing do not reach;





CMEMS and PCOMS Surface Currents and SST– Marine Traffic density in the Atlantic (Bentley Systems & IST) http://actionforecast.com/ (www.marinetraffic.com)

- **integrate information** from all the different sources to provide indicators that integrate the different data sources easing the **link between science and policy making** and providing state-of-the-art products to the **responsible authorities.**

Collaboration

The iFADO consortium, involving 20 partners, will foster the regional **quadruple helix cooperation** including public sector, university/research centres, enterprise and end-users to ensure that the designed products meet the market needs and are sustainable after the project lifetime.

The iFADO project is **looking for companies** interested in testing their developments on open waters conditions (i.e. cruises or the consortium platforms) and that will gain visibility to the monitoring institutions and policy-making organisations. This visibility will be reinforced through the project webpage (http://www.ifado.eu/) and social media (twitter: @AAiFADO, Facebook: @AAiFADO; LinkedIn: iFADO; vimeo: iFADO). The collaboration will be formalised by a common simplified **Memorandum of Understanding** (MoU) .

The project is **open for collaboration** with other institutions/projects that are currently performing monitoring activities in the Atlantic waters in order to provide visibility to their activities and to share methodologies for indicators calculation.

The project is trying to **involve citizens** to obtain more effective ways to collect data in offshore waters by promoting the use of existing mobile apps for ocean data collection with special focus in the **sailing for pleasure community**. Citizens will also be approached by ocean literacy events in the five participant countries.