

ATLANTIC STAKEHOLDER PLATFORM CONFERENCE

1st & 2nd December, 2022
Cadiz, Spain

REGISTER NOW

ATLANTIC STRATEGY
Support Team for the Atlantic Action Plan





Blue-Cloud

Piloting innovative services for Marine Research & the Blue Economy

Blue-Cloud: Your Open Science Platform for Collaborative Marine Research

Contribution to the Workshop “Connecting Atlantic policy efforts through
co-implementation”

9th Atlantic Stakeholder Platform Conference

1st December 2022

Sara Pittonet Gaiarin, Trust-IT & Blue-Cloud Coordinator





Blue-Cloud develops a European federation of marine and ocean water data management infrastructures and services with increased FAIR, advanced analytical capabilities and high quality data provision, interacting with EOSC developments, in support of the EU Green Deal, UN SDG, EU Destination Earth, and the EU Mission Starfish on healthy oceans, seas, coastal and inland waters.

Funding: H2020: The 'Future of Seas and Oceans Flagship Initiative'
(BG-07-2019-2020) topic: [A] 2019 - Blue Cloud services
October 2019- September 2022
20 partners + 13 Blue federated Infrastructures



Blue-Cloud key products and services



- **Blue-Cloud Data Discovery & Access service**, federating key European data management infrastructures, to facilitate users in finding and retrieving multi-disciplinary datasets from multiple repositories
- **Blue-Cloud Virtual Research Environment infrastructure** to provide a range of services and to facilitate orchestration of computing and analytical services for constructing, hosting and operating Virtual Labs for specific applications

- **Blue-Cloud Virtual Labs**, configured with specific analytical workflows to serve five **Demonstrators**, developed to showcase the potential of the European Open Science Cloud, which can be adopted and adapted to support other thematic communities.



Zoo & Phytoplankton
EOV products



Plankton
Genomics



Fish a matter
of scales



Marine Environmental
Indicators



Aquaculture
Monitor

<https://blue-cloud.d4science.org/>





A zooplankton and phytoplankton abundances

B high resolution precision microscopy gene images

C genomics data

D high resolution precision microscopy gene images

E environmental climatologies

F inorganic carbon data

G chlorophyll a concentration

H satellite-derived reflectance's

I temperature, salinity, currents, density, sea level anomaly

J wind

K fisheries data

L aquaculture farm information

M fisheries data

N fisheries data

O radar and optical images

P temperature and salinity

Q bathymetry

R biodiversity data

S zooplankton and phytoplankton abundances

T environmental data

U salinity and temperature

A G H I
P S U



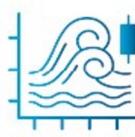
**Zoo- and Phytoplankton
EOV products**

B C D
E R T



**Plankton
Genomics**

F I J



**Marine Environmental
Indicators**

K M N Q



**Fish, a matter
of scales**

L O Q



**Aquaculture
Monitor**



What can Blue-Cloud contribute to the marine value chain? Some examples

From the Fishnet to the Internet



The “Fish, A Matter of Scales” demonstrator²⁴ has evolved innovative ways of delivering knowledge on fisheries to improve their **management** and **monitor trends** in fisheries indicators. Its **Global Tuna Fisheries Atlas VLab** provides an overview of **FAO statistics**, further allowing their visualisation in combination with other maps of environmental data, feeding from Copernicus Marine satellite data products and from EMODnet. It offers global thematic maps showing the **Earth’s fisheries**, their **production and trade**, as well as **fish distribution maps** and **ecological zones**. Added maps, measurements and accurate analytical techniques allow users to place and analyse fisheries in a wider environmental context, potentially informing and supporting decision making across different **EU policies** -including the **Common Fisheries Policy**, the **EU “Farm-To-Fork” Strategy** and the **EU Biodiversity Strategy**- as well as at a regional level, further enabling **capacity building** to monitor progress towards the **UN SDGs**, more specifically **SDG 2 (Zero Hunger)**, **SDG 13 (Climate Action)** and **SDG 14 (Life Under Water)**.

Using Artificial Intelligence to Classify Coastal Areas and Monitor Aquaculture



Blue-Cloud’s “**Aquaculture**” demonstrator²⁵ has evolved a series of **algorithms** and a repeatable **data workflow** that enables the use of satellite images to support the **detection and tracking** of **aquaculture cages**, anytime, anywhere. This can evolve into a service that would enable the production of national aquaculture sector overviews, allowing countries to make use of **OGC-compliant data services** to monitor its aquaculture sector, built on interoperable services where teams can compute and publish reproducible experiments. This demonstrator provides a powerful example of how **Artificial Intelligence** could be harnessed to enhance monitoring capabilities and analytical services across different domains, in support of policy objectives.

Modelling & assessing the socioeconomic impact of MSP on coastal communities



In the last years, different initiatives have developed models to quantify the socio-economic effects of **MSP** on coastal communities²⁷. Evolving and fine-tuning these models could further contribute to using existing data on human activities in coastal areas and at sea to develop different use scenarios of available marine space, providing policy makers with tools to test different planning options in real time. Besides gaining insight into uses that contribute higher social and economic value with a lower environmental footprint, collaborating in an **EU platform** would allow them to factor in how neighbouring countries are planning their Ocean space, enabling for example cost-efficient, collaborative investment decisions (e.g., on deployment of shared Ocean energy grid infrastructures).

**Ref. Atlantic Action Plan 2.0:
Pillar IV: Health Ocean and Resilient Coasts**

Source: Blue-Cloud Strategic Roadmap to 2030



Blue-Cloud

Blue-Cloud Hackathon pilots



Sea Clearly

Sea Clearly focuses on providing an environmental impact assessment tool to determine locations for lowest probability of plastic pollution from two perspectives: 1) Plastic pollution reaching aquaculture cages and 2) Plastic pollution from cages reaching Marine Protected Areas (MPAs)



Data sources through Blue-Cloud: Copernicus Marine Service and EMODnet

Main target users: Policy-makers, aquaculture industry, general public.

Services Introduction: Sea Clearly is a Jupyter Notebook for analysis of plastic pollution in aquaculture. The main service is openly available on Github and also accessible on the Blue-Cloud VLab. A second service is an interactive web-application www.seaclearly.io where visualisations are accessible without any installation required.



SERVICES

Jupyter notebook
The Jupyter notebook consists of forward and backward in time simulations of marine plastic visualising the impact of plastic from aquaculture cages on MPAs, and the most likely sources of plastic pollution affecting aquaculture cages in the Mediterranean Sea. CMEMS data is used to advect the simulated plastic particles and the aquaculture cages and MPAs locations are obtained from EMODnet

Online simulation
The website seaclearly.io is a service with the aim of showing interested members of the public the impact of plastic to and from aquaculture cages. It shows stakeholders the potential of the Sea Clearly tool without having to install it first. This service uses ParticleViz software. It uses pre-loaded simulations to and from a number of selected farms. It works on mobile devices making it accessible for any user with a connection to the internet.

"Sea Clearly joint forces between early career researchers of different expertise, career levels, backgrounds and nationalities. This diverse team allowed us to apply our knowledge to a growing environmental problem, and provide an open source tool to contribute to its future management and understanding"



Test the VLab now!



The Wildlife Tracker for Oceans

The "Wildlife Tracker" is a cloud geo-framework dedicated to Marine Protected Areas (MPAs) management based on biogeochemical and ocean satellite data. The platform offers a unique opportunity to overlay and enrich the movement tracks of wildlife over ecogeographical data layers such as Phytoplankton hot spots to observe in near real-time what may be influencing the animal activities and to spatially assess their meaningful habitats as MPAs.



Data sources through Blue-Cloud: The Global ocean three-dimensional (3D) key phytoplankton product of chlorophyll-a (Chl) concentration, as a proxy for total phytoplankton biomass from Vials.

Main target users: Marine scientists dedicated to MPAs and conservation efforts

Services Introduction: The Wildlife Tracker has diversified its activities and it can offer real-time wildlife monitoring based on alert system, web map gallery creation, and biogeochemical data enrichment with satellite data. As a cloud-based platform the service is done by monthly/yearly subscription and we offer cooperation to non-profit foundations based on blue economy model.



SERVICES

Real-time alerts
Once the biogeochemical data is connected to our database and the Wildlife Tracker is retrieving real-time data the alert system is connected. Alerts are customisable e.g. individuals out of MPAs, on land, or in high fishing pressure zone. Alerts are received via mobile.

Customisable visualisation
Wildlife Tracker enables users to customise the visualisation based on selected individuals and selected satellite data. The map animation can be downloaded as a web map that can be uploaded to our website and a web map gallery is created for specific purposes.

Environmental eco-annotation
The new enrichment algorithm annotates each location and date with historic spatio-temporal data generated from remote sensors. This product help scientists to understand wildlife behavior and support ecosystem modelling for MPAs management.



BRYAN R VALLEJO
CEO at GISA Wildlife Movement Analytics

"Thanks to the development of geospatial technologies the 'Wildlife Tracker' has discovered innovative ways for wildlife monitoring and MPAs assessment. Our vision is to cover extensively species in MPAs and understand via satellites how marine wildlife inhabits closely with human activities. The main goal is to provide protection to marine wildlife that might be undiscovered and affected by industrial activities and support the MPAs creation and management in nearly real-time."

Test the VLab now!



PerfeCt - Performance of Aquaculture under Climate change

PerfeCt is an innovative geospatial web application built to forecast the effects of climate change on key aquaculture performance factors and help stakeholders determine future conditions for aquaculture at a given site.



Data sources through Blue-Cloud: Copernicus Marine Service, Copernicus Climate Service, EMODnet

Main target users: Risk assessors, Aquaculture managers, Investors, Policy makers

Services Introduction: PerfeCt is a modular Jupyter notebook that hindcasts and forecasts the effects of IPCC climate change scenarios on three simple aquaculture performance factors - time-to-market, food conversion ratio, and risk of disease - using open-source data and services.



SERVICES

User-friendly GIS framework
The application integrates a process-based modelling of fish growth built upon Dynamic Energy Budget theory, as well as an innovative index to identify the risk of vibriosis disease based on a Vibrio growth model, into a user-friendly GIS framework.

Models fed by open-source data
Three groups of open-source data feed the models to create predictions: (i) basic data layers (bathymetry, maps of aquaculture sites, marine protected areas), (ii) IPCC climate change scenarios, and (iii) model parameters for DEB fish growth model.

Easily accessible information
The application transforms science-based results to easily accessible and understandable information (graphical and colour-coded outputs) useful for target users, thus creating a valuable link between R&D and industry.



INES HABERLE
Research assistant at IRB

"PerfeCt is an innovative approach to answer the 'what if?' question when establishing and/or adapting aquaculture facilities in light of climate change. Our goal is to provide information necessary to strengthen investor confidence and support development of smart policies."

Test the VLab now!



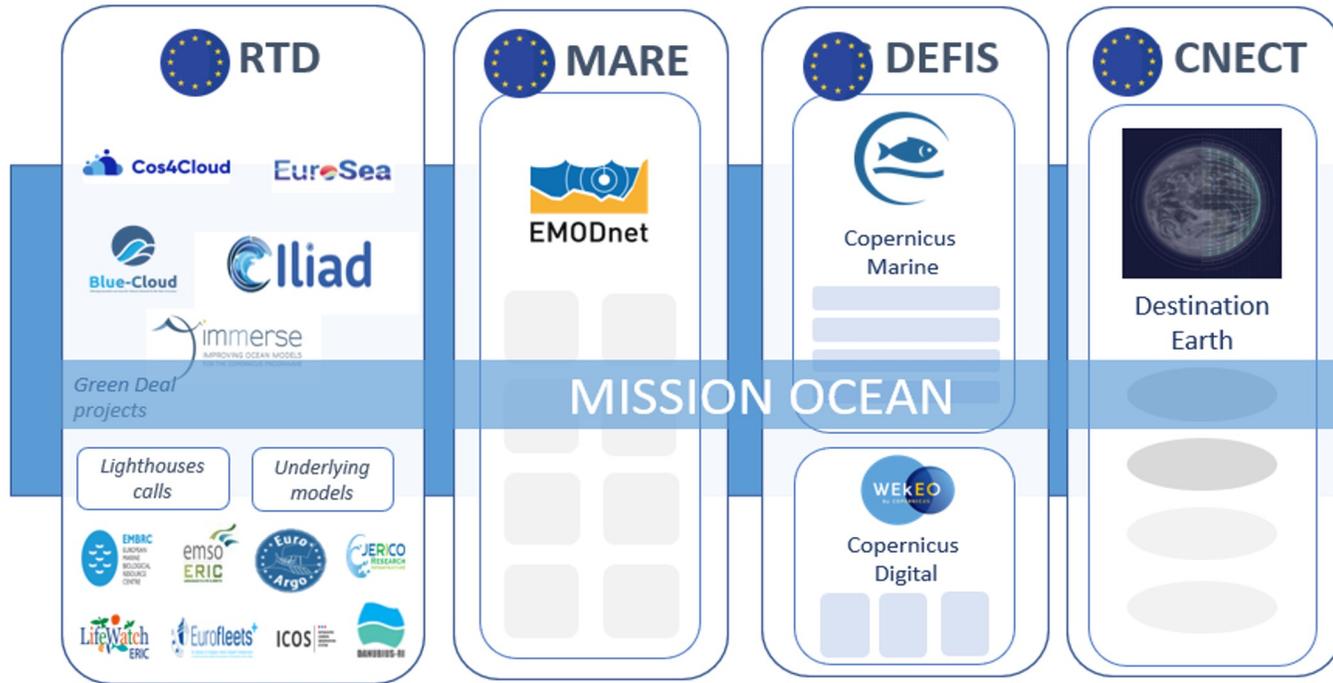
Ref. Atlantic Action Plan 2.0.
Pillar IV: Health Ocean and Resilient Coasts



Blue-Cloud

Blue-Cloud contribution to the Digital Twin of the Oceans

Accessing Ocean Data & New Sensors



An **inclusive** community of European experts, ready to commit

Image courtesy of Mercator Ocean International

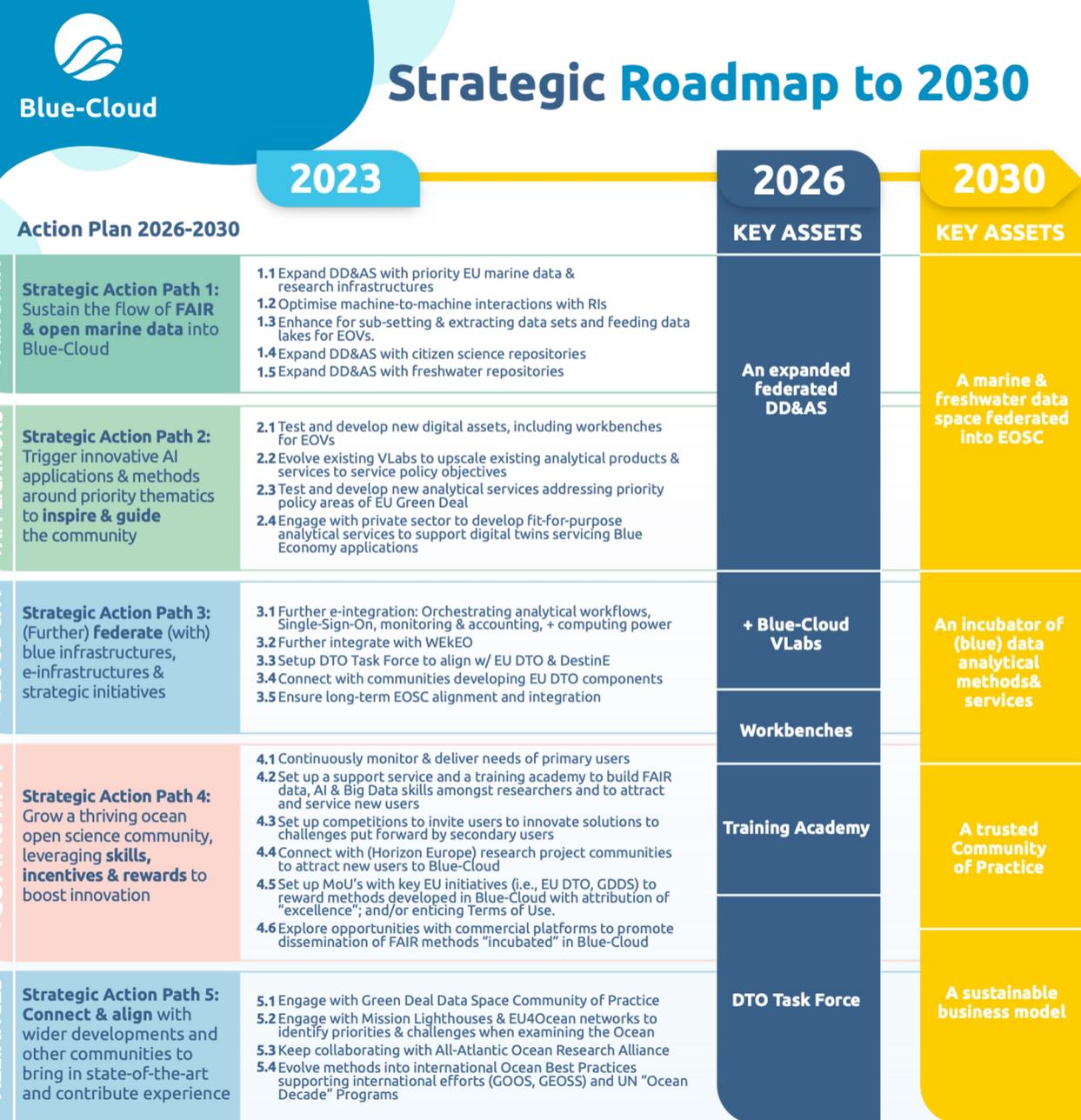


Blue-Cloud

Blue-Cloud Mission 2030

“Accelerating marine and freshwater data interoperability, modelling and Big Data analytics through Artificial Intelligence, Machine Learning and cloud-based Open Science to catalyse innovation in support of the EU Green Deal & UN Agenda 2030”.

Source: Blue-Cloud Strategic Roadmap to 2030



Blue-Cloud 2026

MISSION: To develop further the European federation of marine and inland water data management infrastructures & high quality services



A1. DD&AS

A FAIR compliant Data Discovery & Access Services > access to 10+ million open data sets & products by 13 major BDIs



A2. VRE

An Open Science Virtual Research Environment (VRE) federating multiple e-infrastructures > supporting Analytical Big Data Workbenches & VLabs



A3. EOVs

3 EOVS Workbenches for highly qualified data collections

3,000 DATA ANALYTICS SESSIONS PER MONTH - 5,000 HTC DATA ANALYTICS JOBS PER MONTH

A4. VLabs - FIVE DOMAIN-BASED VIRTUAL LABS



Coastal Ocean observations along Europe



Coastal currents from observations



Carbon-Plankton Dynamics



Marine Environmental Indicators



Global Fisheries Atlas



A7. COMMUNITY

- All EU countries engaged
- 3k+ engaged Blue-Cloud community users
- 5k+ followers across all the platforms
- 10+ External Stakeholders



OUTREACH

- 1 Blue-Cloud Hackathon
- 1 Blue-Cloud TV
- 18 Newsletter issues
- 11 Webinars on Blue-Cloud VRE, DDAS & EOVS Workbenches
- 3 Blue-Cloud Annual Impact Events
- 3 Ocean Literacy Webinars
- Videos & Interviews



A6. TRAINING ACADEMY & CATALOGUE

- 3 Online training course on Best Practices for FAIR data principles
- 3 Info session & course on the EOVS Workbenches
- 2 online webinars dedicated to the BlueCloud VRE
- 2 dedicated to the DDAS and the innovations introduced
- A series of training sessions on how to use the VLabs



POLICY

- Scientific papers & articles
- Restoring healthy oceans, seas, coastal & inland waters in Europe
- Strategic Roadmap 2030 **A5. ROADMAP**
- Cross-domain expansion factsheets
- Sustainability Business model



DTO Task Force

Unlocking
Open Science
in support of the
EU Green Deal



Blue-Cloud

8 Dec 2022

Brussels, Belgium

SAVE THE DATE

FINAL CONFERENCE



Thank You!

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