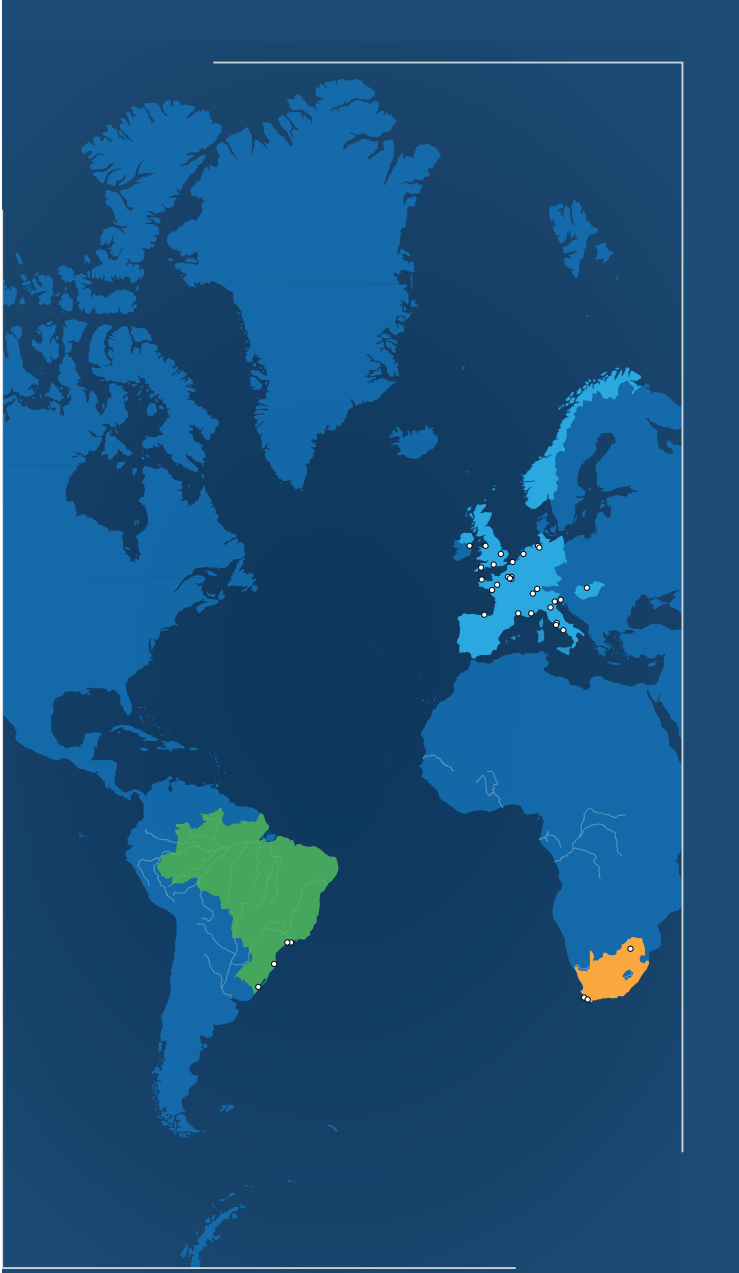
AtlantECO

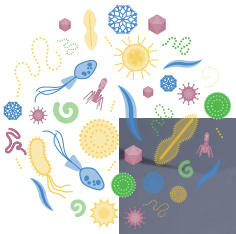
Atlantic Ecosystems Assessment, Forecasting & Sustainability



36 PARTNERS FROM 13 COUNTRIES

France, Belgium, Switzerland,United Kingdom, Italy, Spain, Portugal, Norway, Hungary, Netherlands, Germany, South Africa & Brazil

Content



Research field: the Atlantic Ocean

The Atlantic Ocean is a key component of the Earth system. With a surface of **106,5 million square kilometres**, it is the second largest ocean basin on Earth. The Atlantic Ocean powers the overturning circulation, a fundamental component of the climate system. It also comprises regions of contrasting nutrient concentrations, which sustain a diversity of food webs that impact ocean productivity and fish stocks.

Biogeochemical processes drive **more than 30% of the global ocean absorption of atmospheric CO_2**, with a possible decrease in the incoming decades. The Atlantic Ocean is also a pillar of the global maritime economy. Marine ecosystems are increasingly affected by climate change and other environmental threats, yet the ocean-based economy is expected to double in the next 20 years.

Marine ecosystems are largely driven by the ocean microbiome, the ensemble of microscopic organisms that inhabit the ocean, classically known as plankton, which process most of the fluxes of energy and matter, including pollutants, through the system.

106.5

MILLION SQUARE KM

The 2nd largest ocean basin on Earth

30%

MORE THAN 30%

of the global ocean absorption of atmospheric CO_2

x2

OCEAN-BASED ECONOMY

The ocean-based economy is expected to double in the next 20 years

The study of the Atlantic Ocean: a crucial issue for tomorrow's challenges

The Atlantic ocean is largely unexplored and therefore unknown. In the context of rapid demographic growth and climate change, one of the greatest challenges of our times is to identify and preserve existing ecosystem services and good environmental status. Changes in temperature, ocean circulation, and the supply of essential or harmful chemical substances are among the stressors that cumulatively impact marine ecosystems and hamper their ability to provide key services.

While increased incidences of harmful algal blooms, invasive species, parasites and jellyfish are more frequently observed, the consequences of increasing human activities on marine ecosystems and their services are still poorly quantified, especially in the South Atlantic. Consequently, there is a need to develop a framework to better understand these marine ecosystems, linking observations, numerical models, policy design, and their implementation. Furthermore, current analyses focus on specific elements of pelagic and benthic systems, oversimplying the complexity of the system.

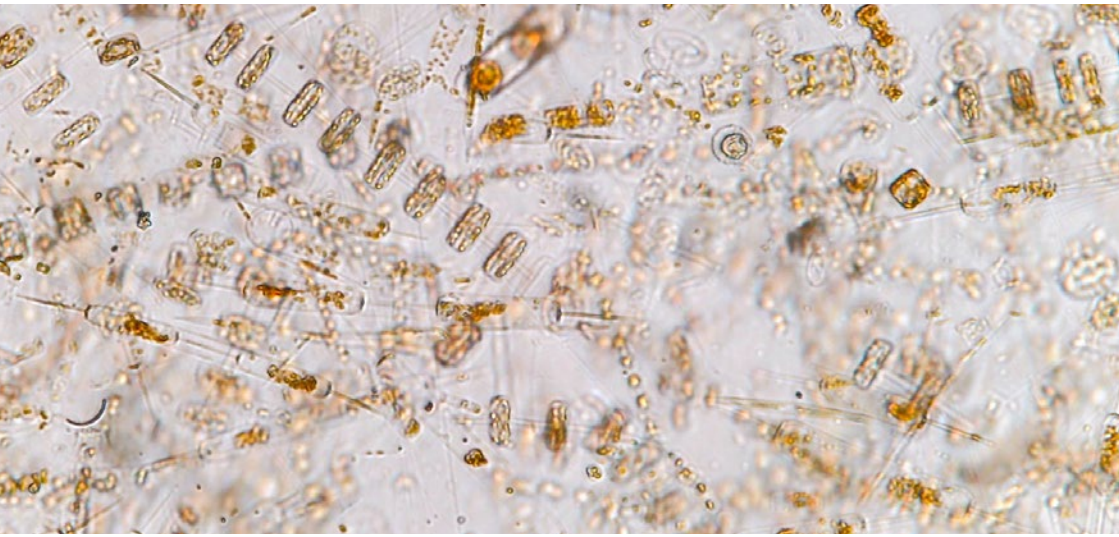
The AtlantECO project

AtlantECO is a Research and Innovation project which is funded under the Horizon 2020 programme.

It brings together 36 partners from 13 countries in Europe, Brazil and South Africa as well as many collaborators from around the Atlantic basin.

Throughout the project, AtlantECO will engage with a range of stakeholders from citizens to scientists, and actors from the policy and the industry sectors, in order to increase awareness, develop capacity, promote responsible behaviour and stimulate Blue Growth.

AtlantECO aims to develop knowledge-based resources to assess and forecast the sustainability of the Atlantic Ocean and its ecosystem services. These resources are based on novel observations and models describing marine microbiomes, plastics & the plastisphere, and the connectivity of ecosystems at regional, basin and global scales. Knowledge will be shared among scientists, industry, policy-makers and citizens in order to help sustain a Blue Growth strategy for an All-Atlantic community.



Objectives of the project

AtlantECO has four objectives:

1. ECOSYSTEMS

Assess dynamics of Atlantic marine ecosystems, their ecosystem services provision and the interplay of both with socio-economic activities.

2. KNOWLEDGE

Increase data and knowledge and data on microbiomes, plastics, the plastisphere and carbon fluxes that support ecosystems at basin scale using best practices and integrative sampling strategies, novel genomics, imaging and biogeochemical methods, bioinformatics and modelling approaches.

3. IMPACTS

Assess and predict the cumulative impacts of multiple stressors on ecosystem status and dynamics and Ecosystem Services provision, identifying their drivers and role on tipping points, assessing their changes in recovery of ecosystem structures, functions and services, and developing eco-socio-economic models to predict future trajectories.

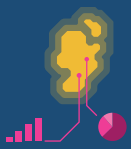
4. CAPACITY BUILDING

Deploy a systemic strategy to build capacity and transfer knowledge for a seamless engagement between science, industry, policy, and society. To achieve these objectives AtlantECO brings together experts and pioneers from Europe, South America and South Africa with the relevant resources, knowledge and experience.

Activity streams

The ambition of AtlantECO is to develop and apply a novel, unifying framework for providing knowledge-based resources to design policies, support decision making and engage with citizens to encourage responsible behaviour to manage the Atlantic system and protect its Ecosystem Services provision.

'To realise this vision, AtlantECO will implement four Activity Streams to reach its four objectives'.

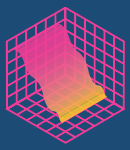


MAP THE CURRENT STATE

Map the current state of marine ecosystem composition, functioning, health and services using high quality data at globalscale.

GENERATE NEW DIGITAL KNOWLEDGE

Generate new digital knowledge from scientific expeditions and citizen science, using innovative numerical models.



FORECAST CHANGES

Forecast the impacts of human and climatic pressures on complex ecosystems using eco-socio-economic models.

SHARE AND USE KNOWLEDGE

Share and use knowledge among scientists, industry, policy-makers and citizens. Make all data available via open databases.

Scientific pillars

MICROBIOMES

The Ocean microbiomes includes all the microscopic life in the Ocean. Every litre of seawater contains billions of microorganisms, the composition and activity of this group of microorganisms indicate the health of the marine ecosystem in which they live. This invisible majority, which makes up the Ocean microbiomes, has received far less attention than large charismatic species despite its essential role for the health of the Planet:

- Marine microbiomes are responsible for half of the oxygen produced on earth every day and capture 25% of the carbon, generated by human activities.
- It regulates the temperature on earth.
- It plays a key part in nourishing ecosystems.

PLASTICS & THE PLASTISPHERE

One of the most pressing environmental challenges is the growing amount of plastic in our oceans, it is so large that plastic is regarded as a marker of the Anthropocene. Most of this plastic quickly fragments into micro- and nano-plastics. Less than 250,000 tons of plastic is accounted for as floating on the surface of the ocean, which means that more than 99% of the plastic that ever entered the ocean is 'missing'. Microplastic is equivalent to around 0.1% of global plankton biomass and it is increasing.

A growing body of research has investigated plastic distribution and toxicity for marine fauna. Organisms can get entangled in larger pieces of plastic or ingest smaller pieces. The plastic is transported by ocean currents and waves. Some of it passes through regions of high biodiversity where it can particularly impact marine life. Accurate maps of the transport and distribution of marine plastics are therefore crucial to assess its impact and to inform mitigation strategies, including removal.

AtlantECO will map plastic distribution in the Atlantic basin, identify or infer the putative sources, analyse the interaction between the plastics and the microbiome (e.g. aggregation, scavenging, ingestion, weathering, biofouling) and quantify their transfer 'up' in the pelagic food web and their transfer 'down', toward the deeper oceanic layers and sea floor.

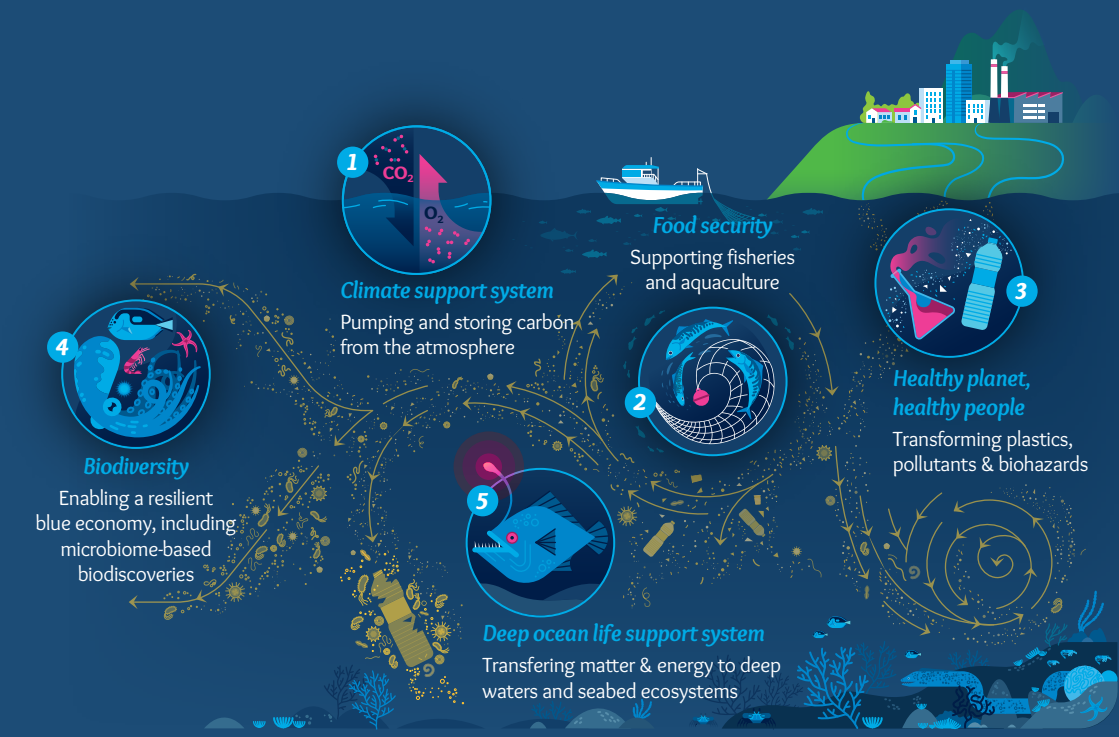
SEASCAPE AND CONNECTIVITY

Seascape is the mapping of the pathway and timescales on which ocean flows transport material between different regions. It's a useful framework to characterize the interactions between physics, chemistry and biology in the ocean. Like the atmosphere, the ocean has the equivalent of high and low pressure areas, fronts, trade winds and cyclones. The ocean is in constant motion, full of small-scale features that play a crucial role in transporting heat, nutrients, organisms, and microplastics between regions.

Ecosystem services

Ecosystem service frameworks have mostly been developed and implemented in terrestrial ecosystems. Their application has lagged behind in the marine environment, mainly due to a lack of data both on the supply side of the ecosystem service framework and on the demand side (monetary and non-monetary valuation data for benefits), which has arisen partly because there is little standard methodology to collect these data in marine systems.

The project will focus on five Ecosystem Services :



Case studies

To demonstrate the exploitation potential of AtlantECO knowledge towards a range of applications, five case studies have been defined in AtlantECO, the aim of the case studies is to ensure and demonstrate the applicability of methods, technologies, results and outputs for real applications.

CS1 MOLECULAR BIOPROSPECTING
Discover new bioproducts & chemicals for industrial applications with high socio-economic value, for example new ways to produce pharmaceutical products or enzymes able to digest plastics.

CS2 IMPACT OF DRILLING IN BRAZIL AND INFLUENCING POLICIES
Study the impact of oil and gas extraction platforms on marine microbiomes, and engage with the industry and policy makers about future regulations and practice in the gas and oil industry.

CS3 EARLY HAZARD DETECTION IN AQUACULTURE
Monitor aquaculture sites using imaging and genetic sensors to detect potential harmful microorganisms.

CS4 ENVIRONMENTAL REGULATION OF COASTAL AREAS IN THE CONTEXT OF SHALLOW SEA DIAMOND MINING
Study the impact of shallow diamond mining on marine microbiomes, and engage with the industry and policy makers about future regulations and practice in mining areas.

CS5 VALUE CHAIN FOR FOOD PRODUCTION: ADAPTING TO CLIMATE CHANGE
Explore molecular databases from the marine microbiome; look for genetic adaptation to “salty” environments; and transfer this knowledge to industries working on the adaptation of crops (tomatoes, potatoes) in response to sea level rise and reduced precipitations.

AUGMENTED OBSERVATIONS MICROBIOMES, PLASTICS AND PLASTISPHERE

Atlanteco flagship cruises

- RSS Discovery (UK AMT line)
- Eugen Seibold (Germany)
- Tara (France)
- Veleiro ECO (Brazil)
- RV SA Agulhas II (South Africa)
- Alpha crucis (Brazil)

All-Atlantic OSD sites (2021,2022)

- All Atlantic Ocean Sampling Day

Continuous Planton Recorder

- CPR line (RIO - Cape Town)

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