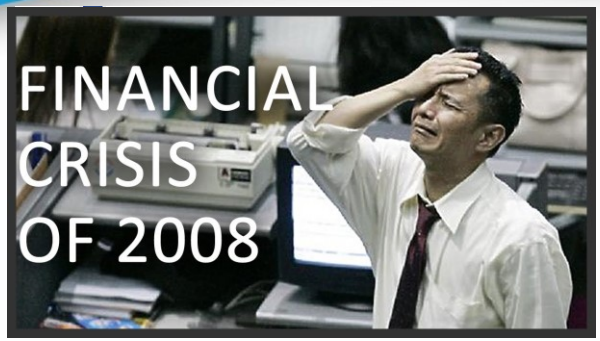
2020 and Beyond
Can Europe sustain marine ecosystems and drive Blue Growth at a North Atlantic scale?

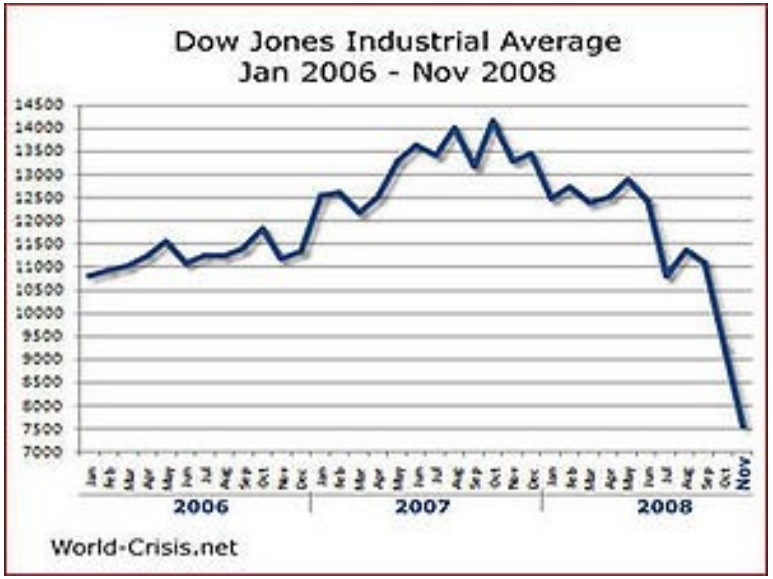
J Murray Roberts

MASTS Annual Science Conference

19th October 2016

@jmurrayroberts





Weekend Journal: Dancing on Gehry's Rooftops

THE WALL STREET JOURNAL.

FRIDAY, SEPTEMBER 19, 2008 - VOL. CCLII NO. 68

U.S. Drafts Sweeping Plan to Fight Crisis As Turmoil Worsens in Credit Markets

Paulson Briefs Congress on Idea to Buy Bad Assets From Banks, Insure Money-Market Funds; Stocks Rebound Sharply

Bailout Brigade

SEC Is Set To Issue Temporary Ban Against Short Selling

What's News –

Street Scenes: The Players Remaking Financial World

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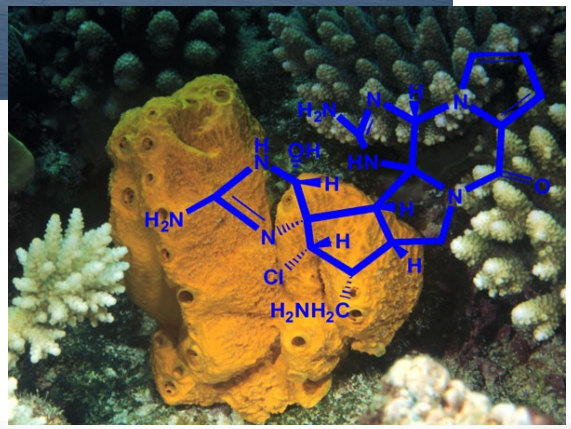

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Ocean Warming

Ocean Acidification

Reduced oxygen

Harmful Fishing Practices

Invasive species

Deep-sea Mining

Plastics & Pollution

Hydrocarbon Exploitation

Bioprospecting

Blue Growth

- “Blue Growth is the long term strategy to support sustainable growth in the marine and maritime sectors as a whole.
- The ‘blue’ economy represents roughly 5.4 million jobs and generates a gross added value of almost €500 billion a year. However, further growth is possible in a number of areas which are highlighted within the strategy.”

Source: EC Maritime Affairs
http://ec.europa.eu/maritimeaffairs/policy/blue_growth/index_en.htm

Blue Growth Strategy

1. Develop sectors that have a high potential for sustainable jobs and growth (such as aquaculture, coastal tourism, marine biotech, ocean energy, seabed mining)
2. Develop sea basin strategies to ensure tailor-made measures and to foster cooperation between countries

European Commission

BLUE GROWTH

71% of the Earth surface is WATER

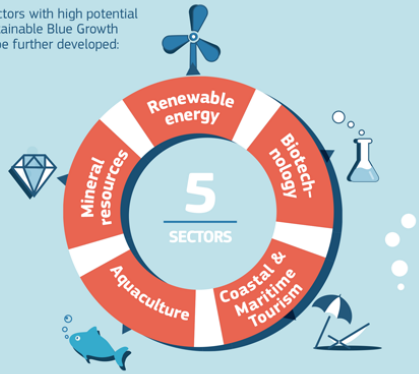
Why?

Blue Growth is the European Commission's initiative to further harness the potential of Europe's oceans, seas and coasts for:

- Jobs
- Value
- Sustainability

Focus Area

Five sectors with high potential for sustainable Blue Growth are to be further developed:



other **sectors of the blue economy** crucial for value & jobs

- Shipbuilding & Ship repair
- Transport (cargo & ferry)
- Fisheries
- Offshore oil & gas

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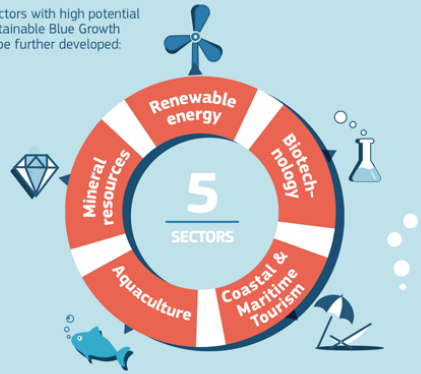
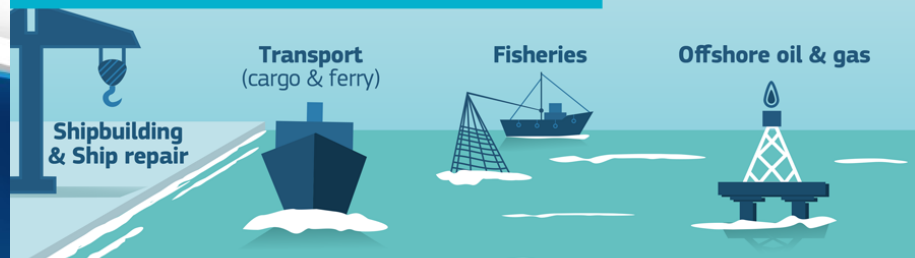
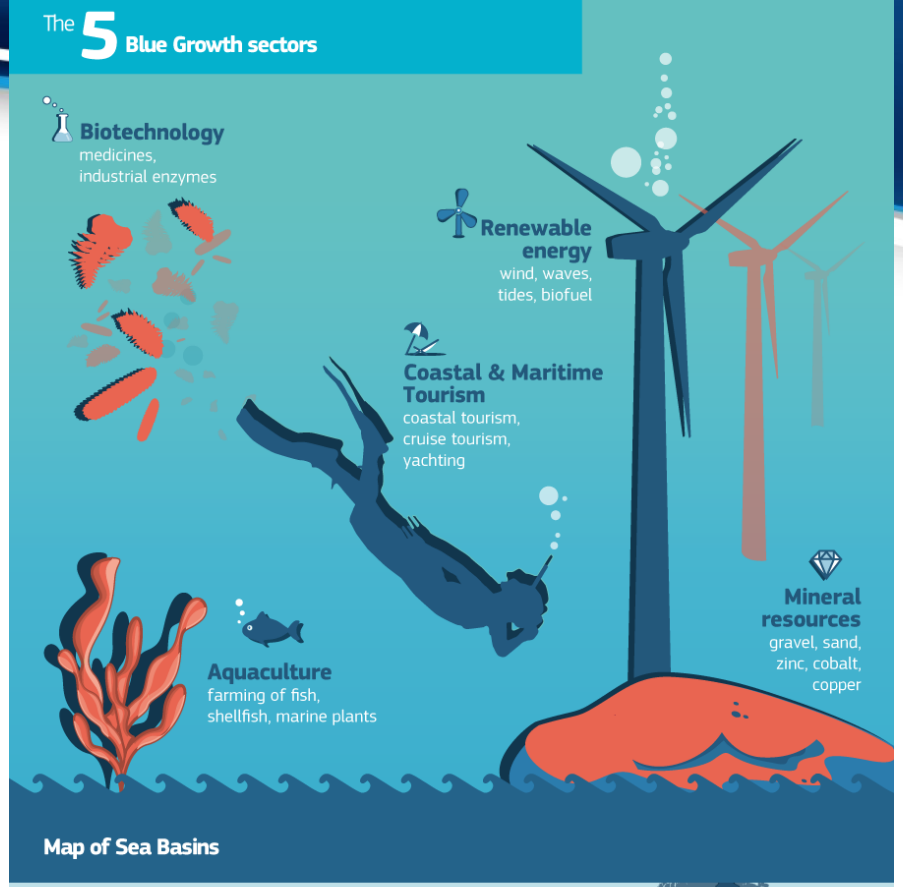


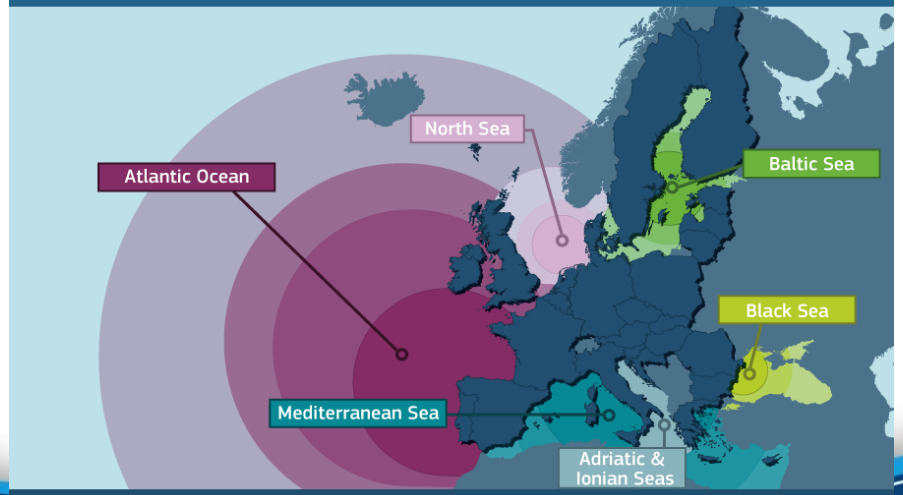
other **sectors of the blue economy** crucial for value & jobs



The 5 Blue Growth sectors



Map of Sea Basins



The Blue Economy by sea basin and by country
shown in jobs and value

Blue Growth Challenge: Topic BG-01

"The Commission considers that proposals requesting a contribution from the EU in the range of EUR 8–12 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts."

Blue Growth Challenge: Topic BG-01

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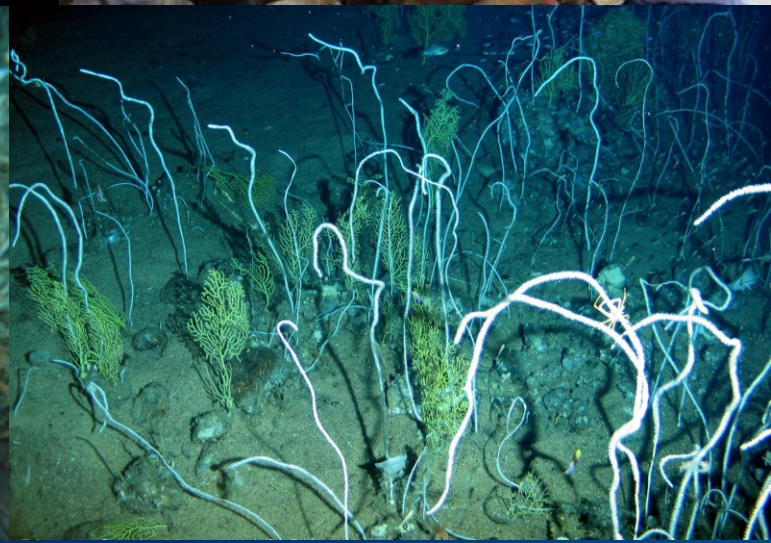

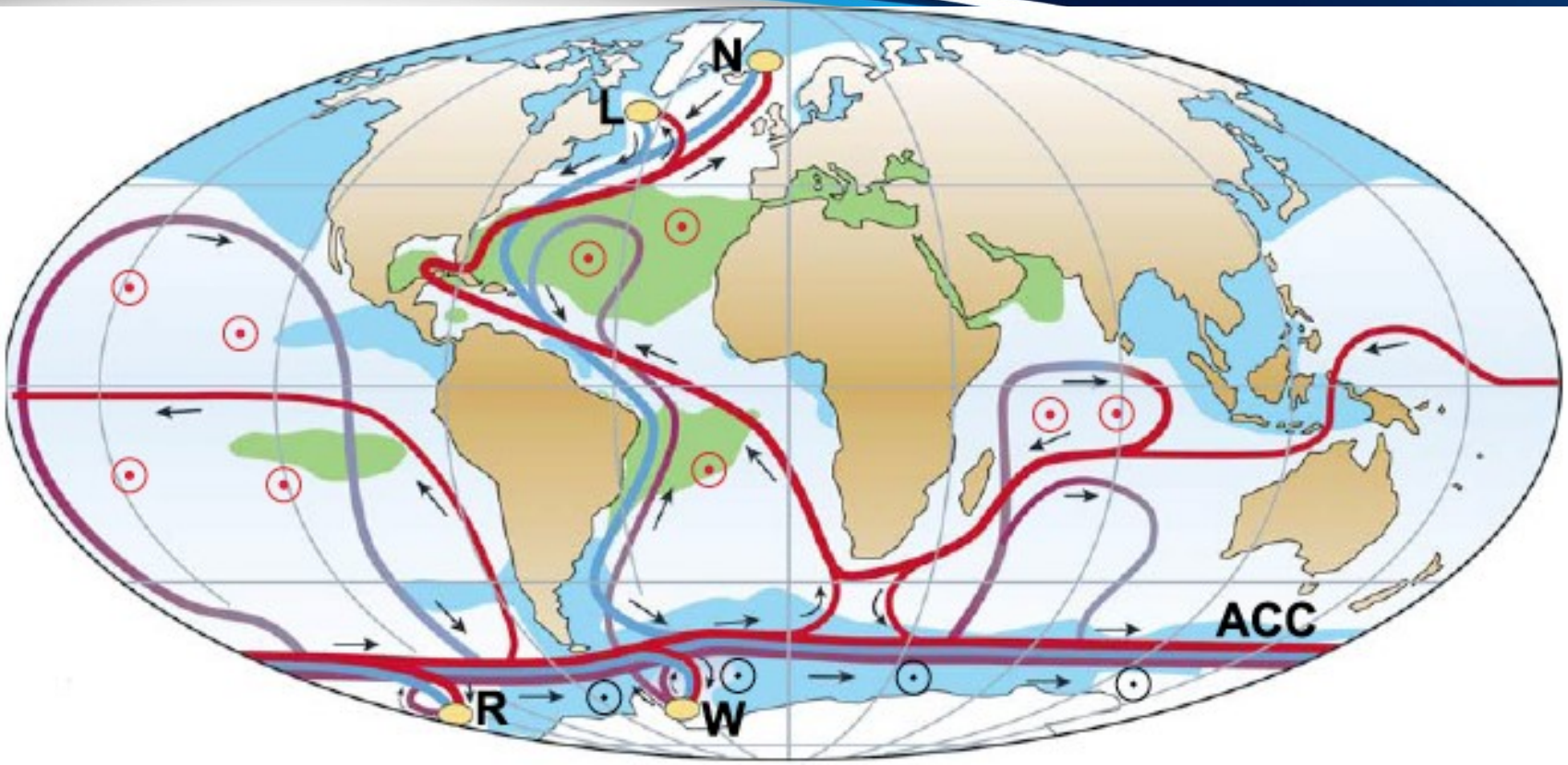
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Surface flow
Deep flow
Bottom flow
Deep Water Formation
Wind-driven upwelling
Mixing-driven upwelling
Salinity > 36 ‰
Salinity < 34 ‰
L Labrador Sea
N Nordic Seas
W Weddell Sea
R Ross Sea

atlas

UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

A trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 678760 (ATLAS). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

At a Glance

A trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe

Call: EU Horizon 2020: BG-2015-2 (Unlocking the potential of seas and oceans)

Duration: May 2016 – April 2020 (48m)

Consortium: 24 partners +1 linked 3rd party, from 12 countries

Budget: €9.3M

Coordinator: University of Edinburgh (UK)

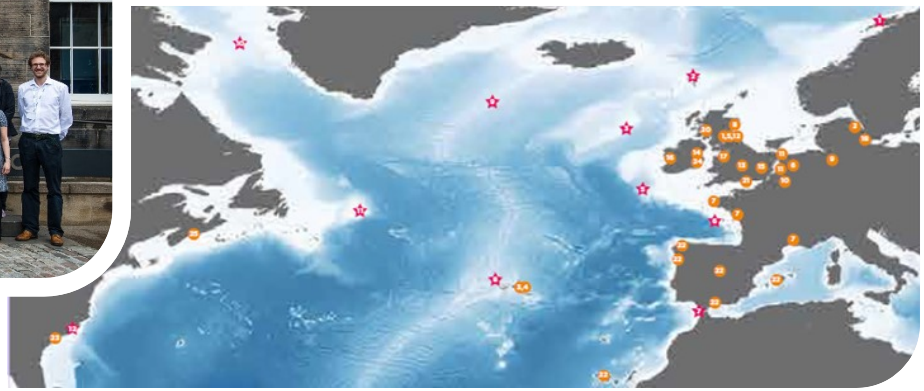
Focus: Providing essential new knowledge of North Atlantic ecosystems through data gathering and synthesis

Impact: Discoveries and outputs will inform and facilitate stakeholder agreement on marine policy and regulation and spur Blue Growth

Core activities: 25+ research cruises investigating 12 case studies across the Atlantic

Trans-Atlantic Collaboration

ATLAS kick-off meeting Edinburgh (June 2016)



★ Case studies ● Project Partners

1 University of Edinburgh (UEDIN)
2 Aarhus Universitet (AU)
3 IMAR - Instituto do Mar (IMAR -Uaz)
4 Secretária Regional do Mar, Ciência e Tecnologia (DRAM)
5 British Geological Survey (BGS/NERC)
6 Gianni Consultancy (GC)
7 Institut Francais de Recherche pour L'Exploitation de la Mer (Ifremer)
8 Marine Scotland (MSS)
9 Universitaet Bremen (UniHB)
10 Iodine (Iodine)
11 NIOZ Koninklijk Nederlands Instituut voor Onderzoek der Zee (NIOZ)
12 Dynamic Earth (DE)
13 University of Oxford (UOX)
14 University College Dublin (UCD)
15 University College London (UCL)
16 National University of Ireland, Galway (NUIG)
17 University of Liverpool (ULIV)
18 Syddansk Universitet (USD)
19 UiT The Arctic University of Norway (UiT)
20 Scottish Association for Marine Science (SAMS)
21 Seascape Consultants (SC)
22 Instituto Español de Oceanografía (IEO)
23 University of North Carolina at Wilmington (UNCW)
24 AquaTT UETP Ltd (AquaTT)
25 Fisheries and Oceans Canada (DFO)

Designed by AquaTT

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Objectives

- **Advance** our understanding of deep Atlantic marine ecosystems and populations
- **Improve** our capacity to monitor, model and predict shifts in deep-water ecosystems and populations
- **Transform** new data, tools and understanding into effective ocean governance
- **Scenario-test** and develop science-led, cost-effective adaptive management strategies that stimulate Blue Growth

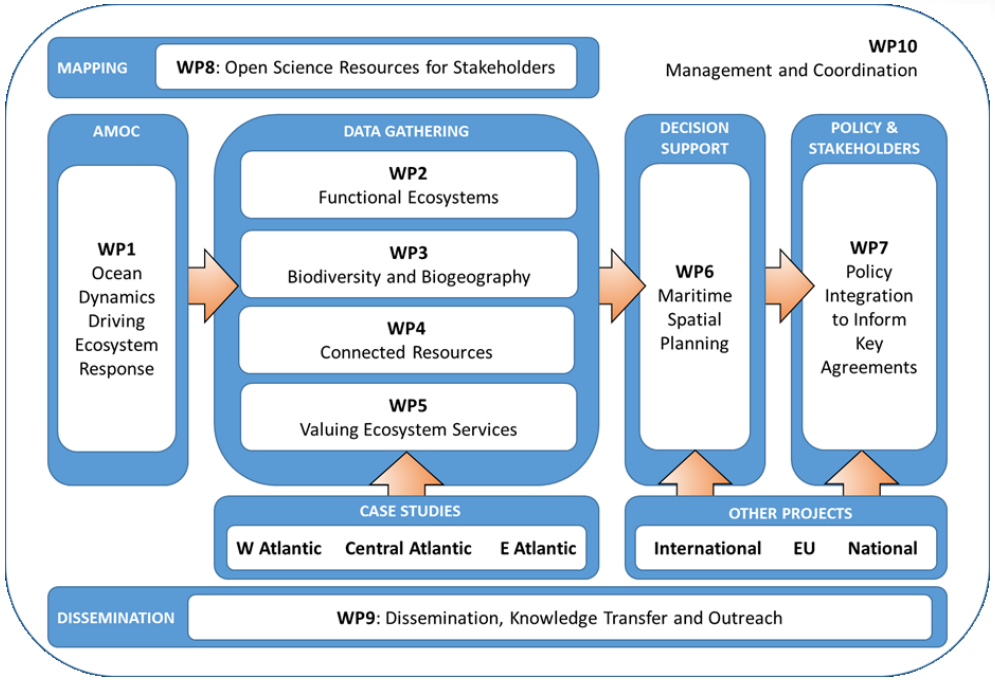
Multidisciplinary Approach

Designed by AquaTT

Workpackages

WP Leaders:

WP1: Scottish Association for Marine Science
WP2: Royal Netherlands Institute for Sea Research
WP3: IMAR-University of the Azores
WP4: French Research Institute for Exploration of the Sea
WP5: UIT The Arctic University of Norway
WP6: National University of Ireland, Galway
WP7: Seascape Consultants
WP8: University of Bremen
WP9: AquaTT
WP10: University of Edinburgh



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Steering Committee

Stuart Cunningham
WP1, SAMS

Dick van Oevelen
WP2, NIOZ

Telmo Morato
WP3, IMAR-UAz

Sophie Arnaud-Haond
WP4, Ifremer

Claire Armstrong
WP5, UiT

Anthony Grehan
WP6, NUIG

David Johnson
WP7, SC

Stéphane Pesant
WP8, UniHB

David Murphy
WP9, AquaTT

J Murray Roberts
WP10, UEDIN

Advisory Board

Jake Rice, DFO
Scientist Emeritus

bp

Statoil

woodside

CHONe
CANADIAN HEALTHY OCEANS NETWORK

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Pharma Mar

Science Policy Panel

NAFO
Northwest Atlantic Fisheries Organization

NEAFC

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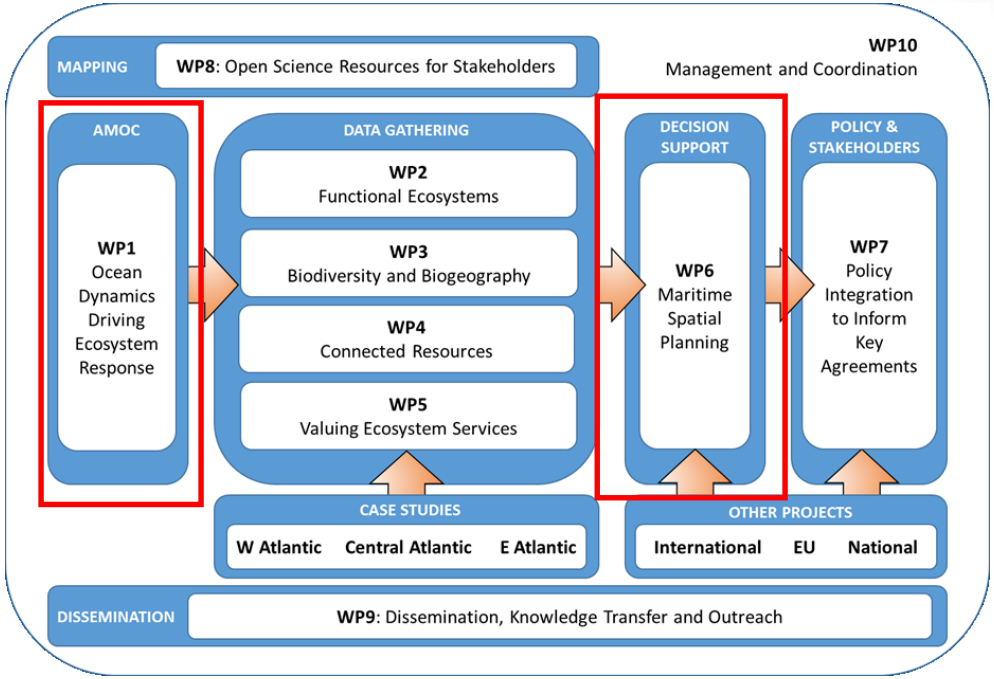

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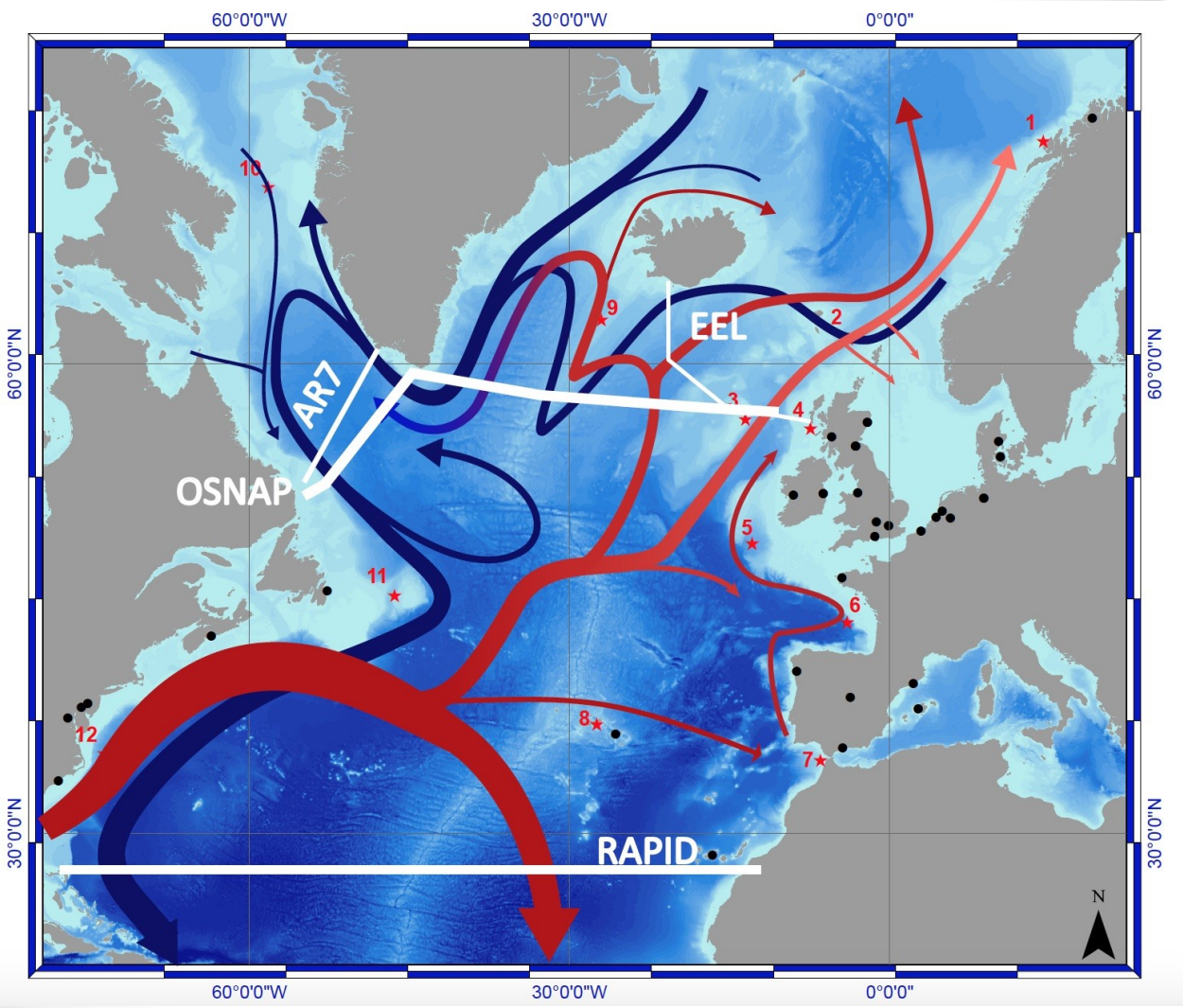
WP1 : Ocean Dynamics
Driving Ecosystem Response

"The capacity to monitor and understand living resources in the North Atlantic and unlock their Blue Growth potential must start with synchronised trans-Atlantic measurements of energy and element transport by the AMOC."

Image credit: SA

Atlantic Meridional Overturning Circulation

- Transports warm, salty water from equator to sub-polar
- Mediates 25% global heat transport
- Intense air-sea interaction liberates heat to Europe and lead to high ocean C concentration in sub-polar N Atlantic
- Climate models forecast a 25% AMOC slowing by end 21st century BUT natural variability (Atlantic Multi-decadal Oscillation, AMO) produces larger variability signals
- AMO influences ecosystems & fisheries
- *What are implications of AMO and long-term AMOC change to deep-water Atlantic ecosystems?*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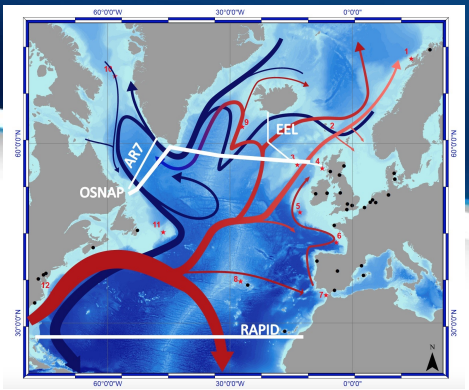
WP1 Summary



1. Derive co-variability circulation & biogeochemical fluxes on monthly to inter-annual timescales by adding biogeochemical sensors to OSNAP array
2. Assess environmental tipping points driving deep coral extinction events by aligning with palaeo-proxies for past circulation strength, bottom water ventilation & food supply
3. Map ocean transport pathways using basin-scale eddy-resolving VIKING20 model with water-mass and larval tracking

Fox et al. Thursday 20th Oct 1015
Deep coral connectivity

WP6: Maritime Spatial Planning

"Fully integrated spatial planning products built on basin and regional scales are needed to allow stakeholders to explore, and respond to, alternate scenarios of ocean dynamics and cross-sectoral Blue Growth.

The MESMA (Monitoring and Evaluation of Spatially Managed Areas) framework will be used to develop first adaptive Atlantic MSP approach, and applied in Case Studies spanning the Atlantic against the backdrop of potential climate change."

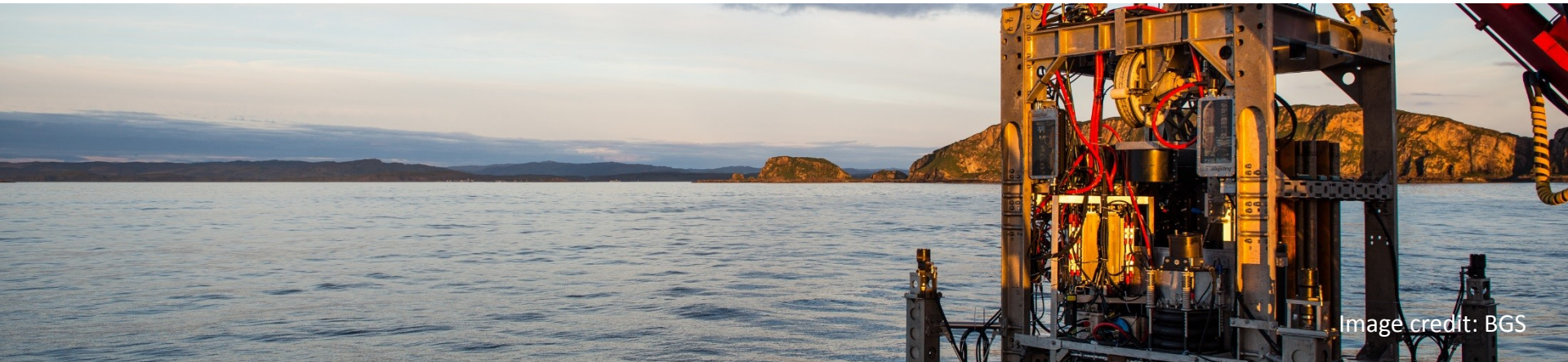


Image credit: BGS

ATLAS Case Studies

12 Case Studies that follow the major Atlantic current patterns.

- Selected on basis of: proximity to Blue Growth activities, presence of focal ecosystems, availability of existing data/samples and opportunities for offshore cruises during the ATLAS project.
- Case Studies cross-cut the project and give the biogeographic, regulatory and jurisdictional range needed to meet ATLAS's objectives.

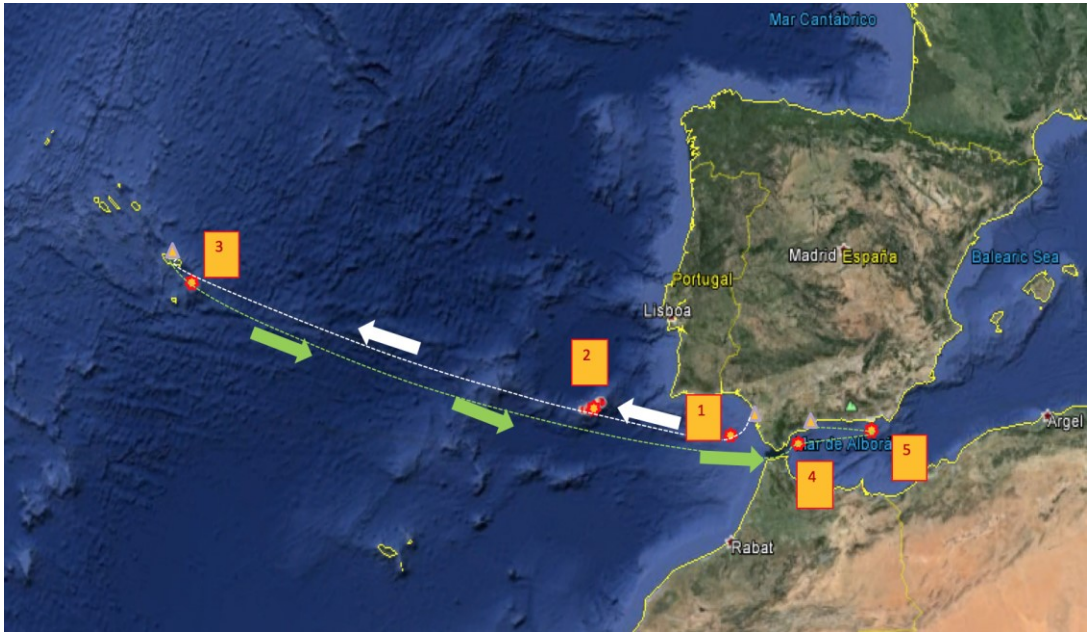
Case Study	Focus Ecosystems (CWC, cold-water coral)	Current and BG Sectors*	Lead & collaborators
1. LoVe Observatory (Norway)	CWC reefs, sponges	F, OG, T	Statoil, NIOZ, UEDIN
2. West of Shetland and W Scotland slope (UK)	Sponge grounds	B, F, OG	UEDIN, BP, OGUK, MSS
3. Rockall Bank (UK & Ireland)**	CWC reefs, coral gardens, carbonate mounds, sponge grounds, cold seeps	B, F, OG	MSS, IEO, OXU
4. Mingulay Reef Complex (UK)	CWC reefs	F, T	UEDIN, MSS
5. Porcupine Seabight (Ireland)	CWC reefs, coral gardens, carbonate mounds, sponge grounds	B, F, OG	NUIG, Woodside
6. Bay of Biscay (France)	CWC on slope and in canyon settings	B, F	IFREMER
7. Gulf of Cádiz/Strait of Gibraltar/Alborán Sea (Spain & Portugal)	CWC reefs, coral gardens, sponge grounds	B, F, OG	IEO, IFREMER, IMAR-UAz
8. Azores (Portugal)**	Hydrothermal vents, seamounts, coral gardens, sponge grounds	B, F, M	IMAR-UAz, IEO
9. Reykjanes Ridge (Iceland)**	Hydrothermal vents, CWC reefs, coral gardens, sponge grounds	B, F, M	UCD
10. S Davis Strait/Western Greenland/Labrador Sea (Canada)	CWC reefs, coral gardens, sponge grounds	B, F	DFO
11. Flemish Cap (Canada)**	Coral gardens, sponge grounds	B, F, OG	IEO, DFO, OXU, NAFO
12. SE USA (Bermuda transect)**	CWC reefs on slope and in canyon settings	B, F, M, OG	UNCW, AP-TU, NOAA

* Blue Growth sectors: **B**iotechnology; **F**isheries; **M**ining; **O**il & **G**as; **T**ourism; ** indicates data include ABNJ

21th September 2016 – 26th October 2016 (36 days; one scale in Azores)
Research Vessel "Sarmiento de Gamboa" (CSIC)

RV Sarmiento de Gamboa (image: Joan Costa, CSIC)

- ROV "Liropus" Super Mohawk
- 2 CDT rosettes
- ADCP and EK-60
- Multibeam echosounder
- Sidescan sonar
- Box corer, Multicorer, van Veen grab



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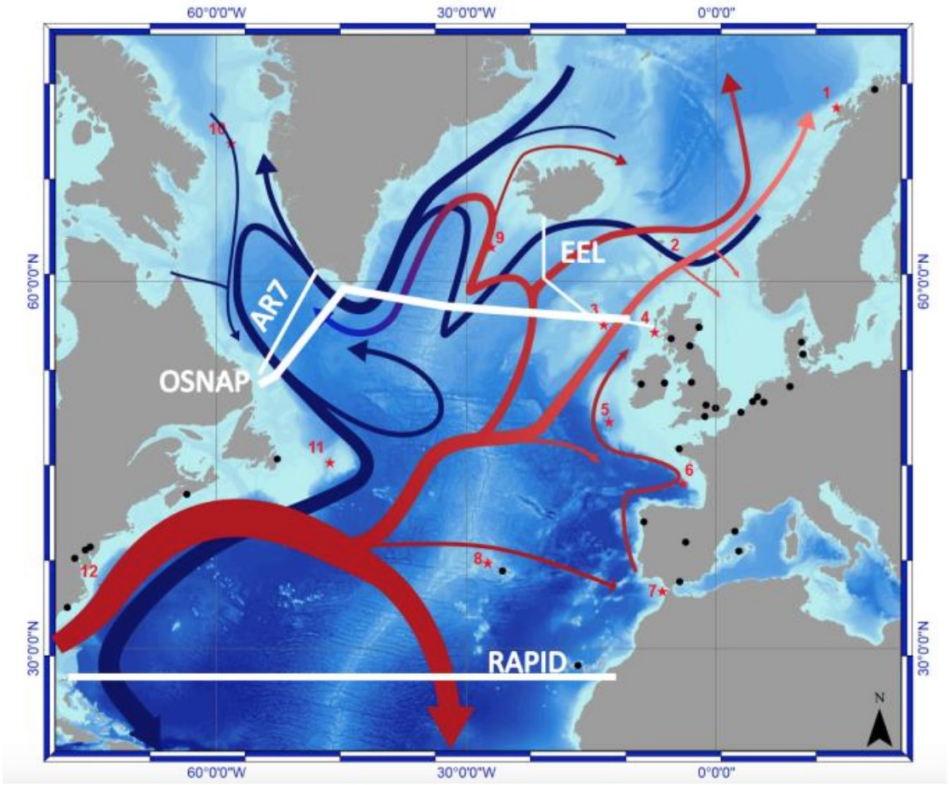
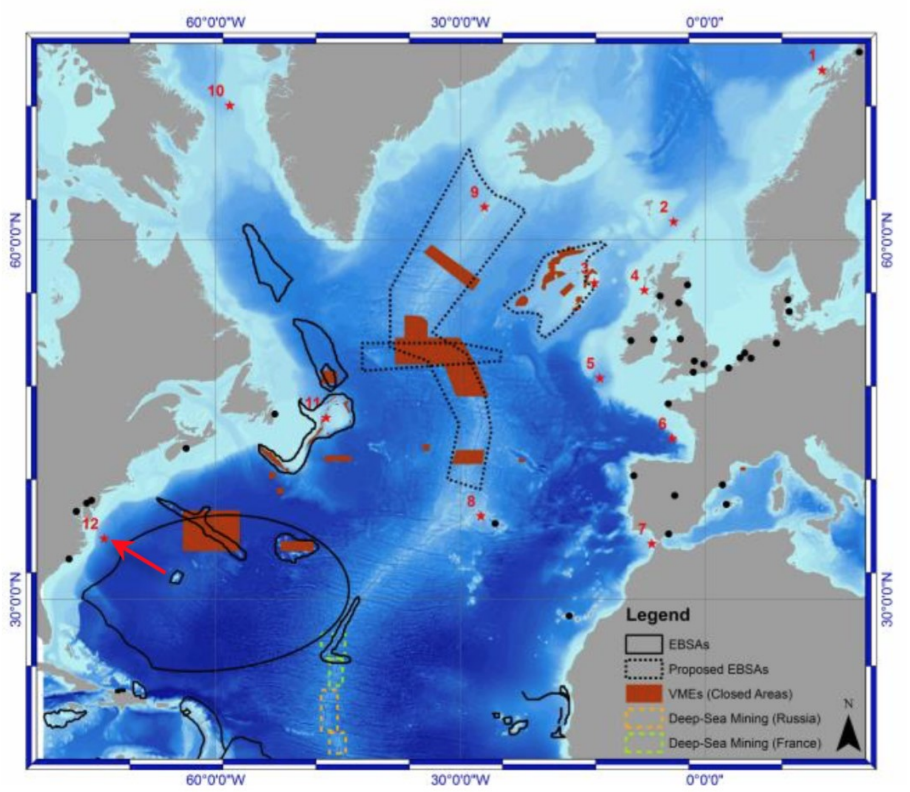
Lea-Anne Henry

Case Study co-ordinator

Chancellor's Fellow, University of Edinburgh





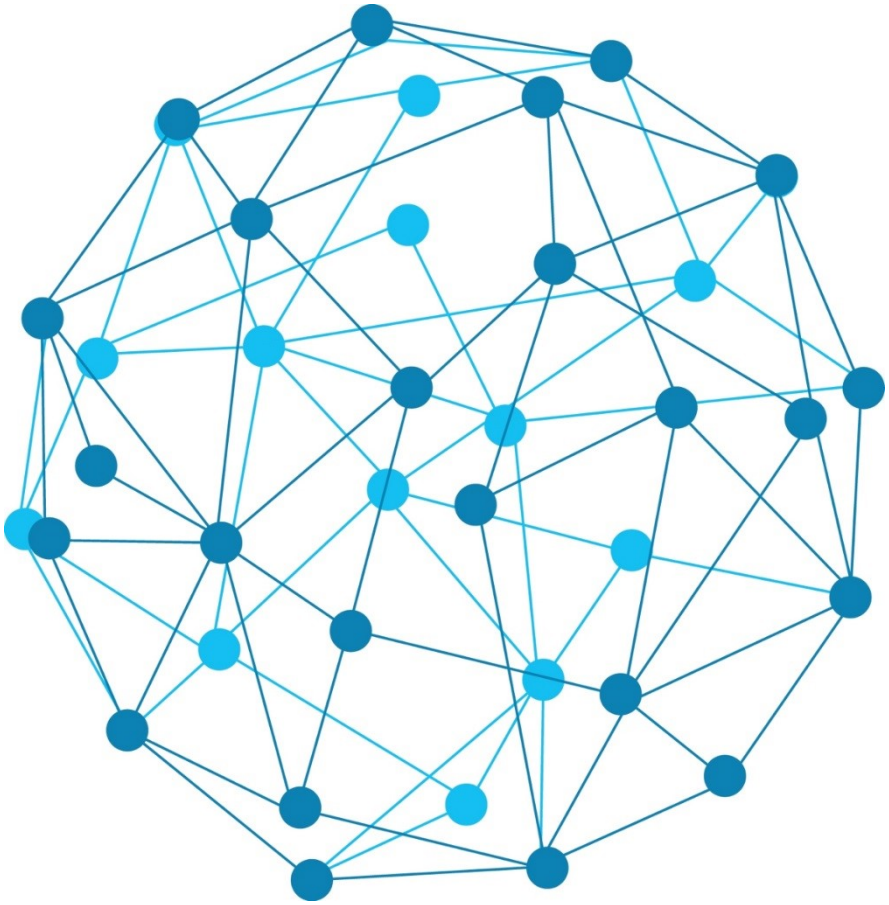
WP6: Maritime Spatial Planning Summary

Ten case studies will be used as a basis for delineating areas that might typically require marine spatial plans:

1) Set MSP goals and operational objectives.
2) Collate maps of VMEs, fish habitat and ecosystem goods and services.
3) Carry out Strategic Environmental Assessments.
4) Test new Blue Growth scenarios and propose appropriate adaptive management measures against a background of potential climate change.

Investigating interconnections between:

- Ocean circulation
- Surface production
- Ecosystem functioning
- Biological richness
- Socio-economic importance



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Expected Impacts

Blue Growth: Opportunities for marine and maritime sustainable growth

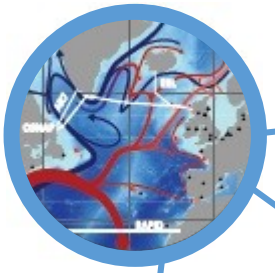
- Improve **resource management** (ecosystem approach) and governance
- Improve **cooperation** within EU and trans-Atlantic
- Contribute to the **EU Integrated Maritime Policy**
  - The Marine Strategy Framework Directive (MSFD),
  - The Common Fisheries Policy (CFP),
  - The EU 'Maritime Strategy for the Atlantic Ocean Area'
  - The Galway Statement on Atlantic Cooperation
- Strengthen international **agreements to conserve** Vulnerable Marine Ecosystems and Ecologically & Biologically Significant Areas

Vital Statistics

- Partnership Industry, SMEs, Govt & Academia
- 24 Partners, One 3rd Party; 15 Associate Partners
- Denmark, Belgium, Canada, France, Germany, Ireland, Netherlands, Norway, Portugal (incl. Azores), Spain, the UK and USA
- EU contribution €9.1M
- 25 deep-sea cruises planned
- 12 Case Studies
- Project dates May 2016 – April 2020

Can Europe sustain marine ecosystems and drive Blue Growth at a North Atlantic scale?

New basin models



Better predictions

Dynamic communication

Cost-effective robust monitoring

Stronger policy implementation

Can Europe sustain marine ecosystems and drive Blue Growth at a North Atlantic scale?




our dynamic earth

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Many thanks!

- MASTS PEER award
- ATLAS consortium
- Changing Oceans research group at University of Edinburgh

PhD and Post-doc positions available

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 678760 (ATLAS). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

Image credit: BGS