

Integrated Ecosystem Assessment for Ecosystem-based Fisheries Management



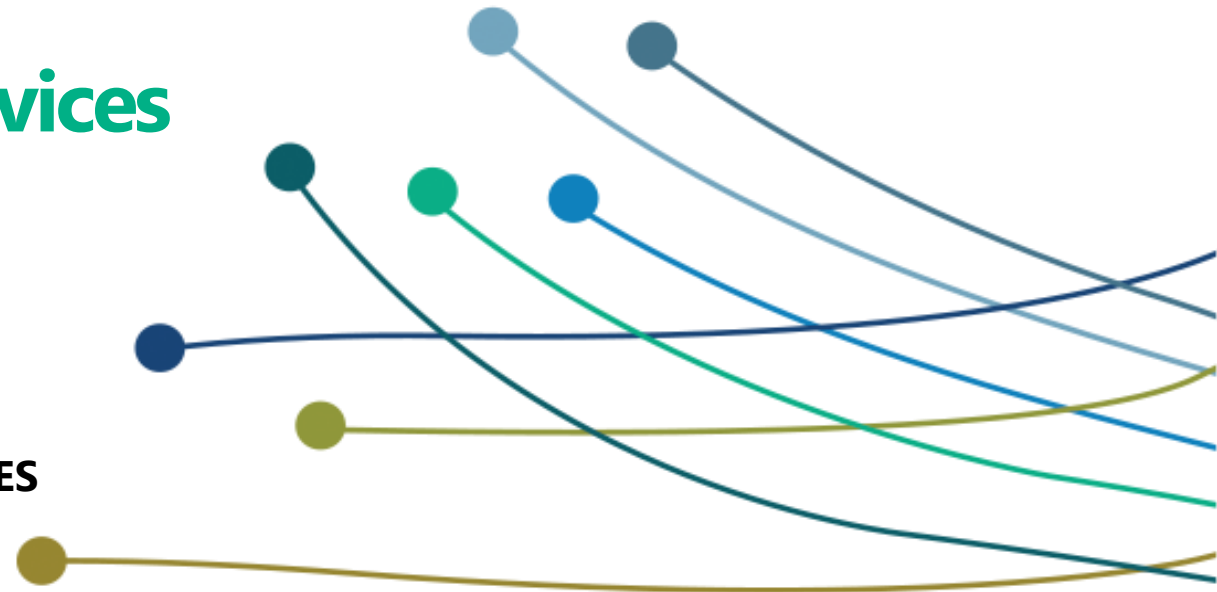
Fisheries Ecosystem Advisory Services

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Post-doctoral Researcher, Marine Institute.

Integrated Ecosystem Assessment Steering Group Chair, ICES

With contributions from Dave Reid (MI) & Jacob Bentley (Natural England)



Ecosystem Based Management

No universally agreed definition.

Chat GPT tells us:



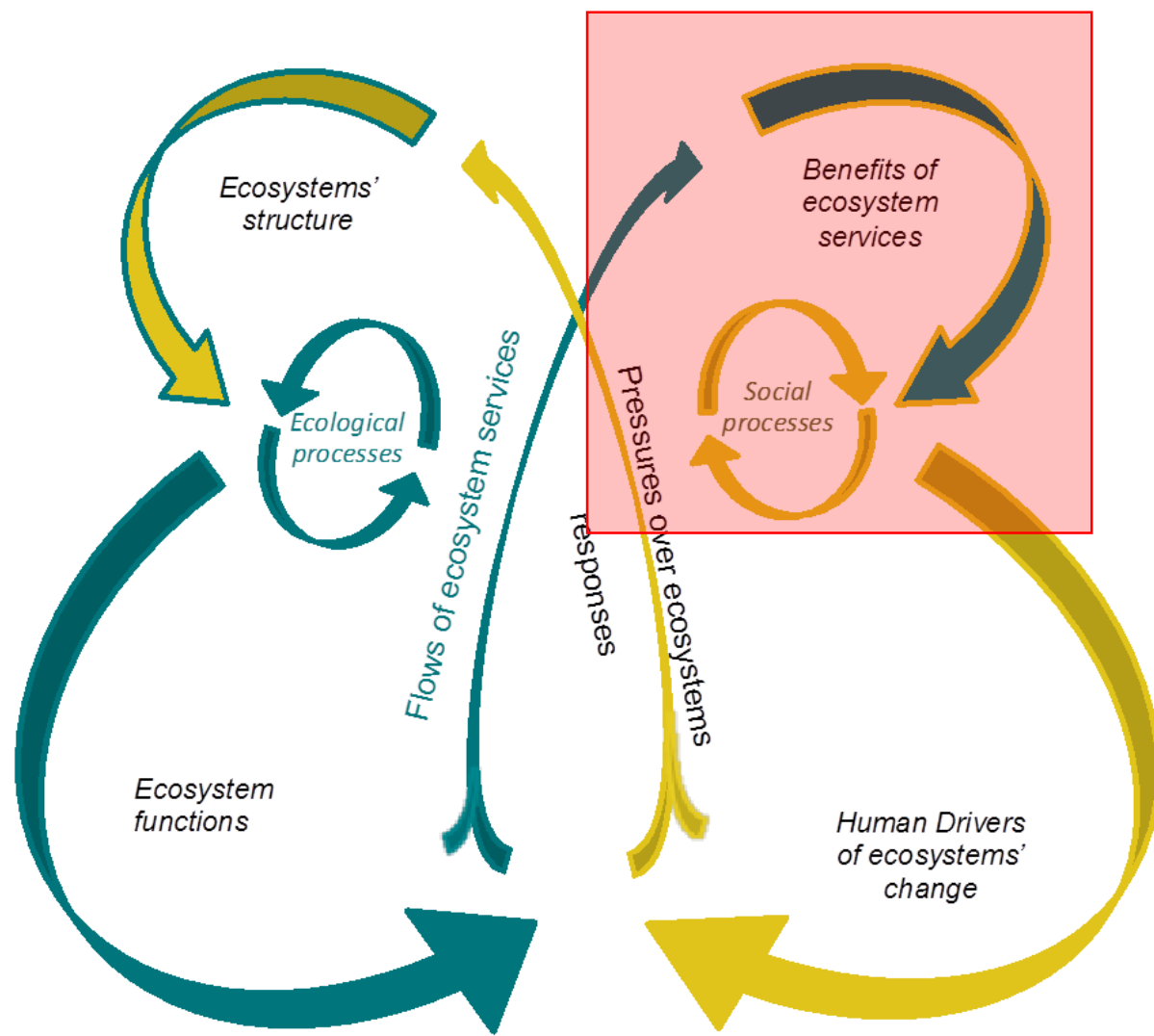
- EBM mandate**
- European Union (EU) Marine Strategy Framework Directive (MSFD)
 - Australia's Oceans Policy
 - Canadian Oceans Act
 - Oceans Act of 2000
 - Norwegian Cross Sector Management Plans
 - South African National Water Act
 - More....

*Ecosystem-based management (EBM) is an approach to natural resource management that focuses on the **conservation and sustainable use of entire ecosystems**, rather than just individual species or specific resources. It takes into account the **complex interactions and interdependencies** between different **species, habitats, and human activities** within an ecosystem. The primary goal of ecosystem-based management is to maintain the **health, resilience, and functionality of ecosystems while also meeting the needs of society**.*

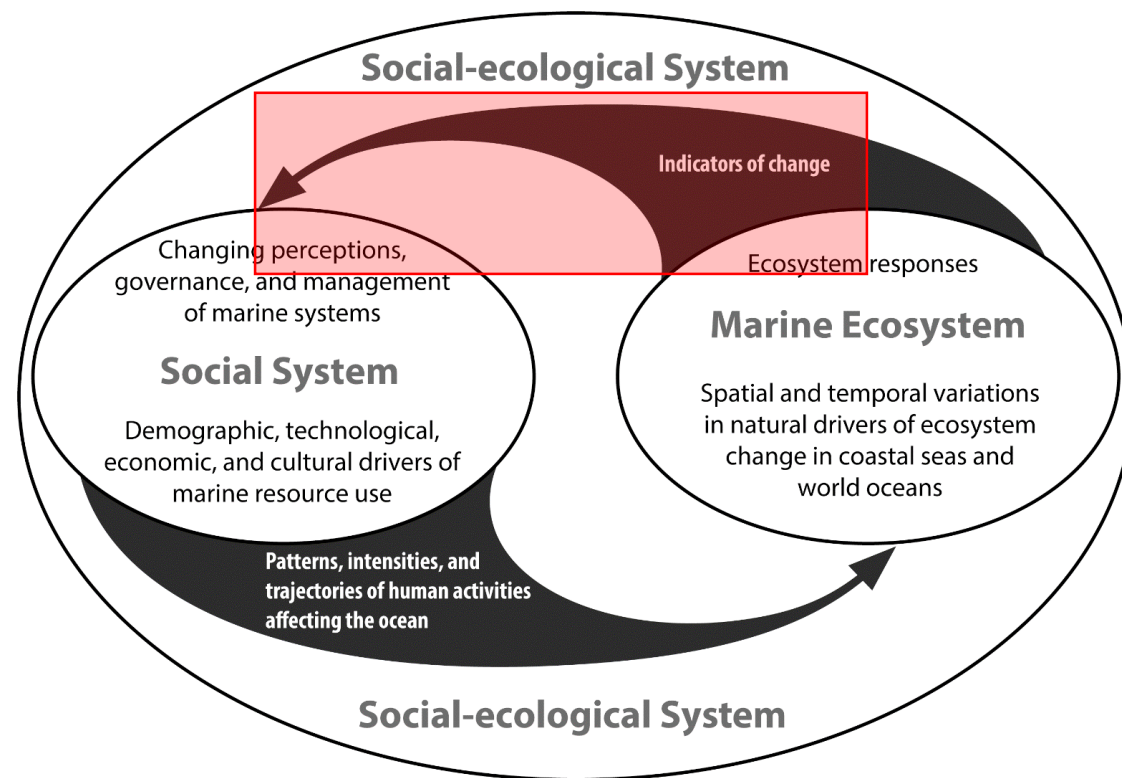


Holistic Perspective
Sustainability
Adaptive Management
Cross-Sector Integration
Precautionary Principle
Conservation Targets
Multi-disciplinarity
Stakeholder Engagement
Useful/ Applied
Trade-offs
Resilience
Objectives

But it is also supposed to be a **WHOLE** systems approach...

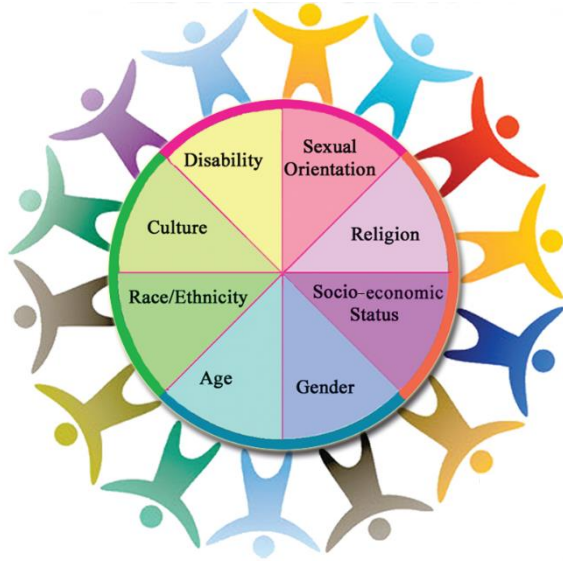


From AQUACROSS



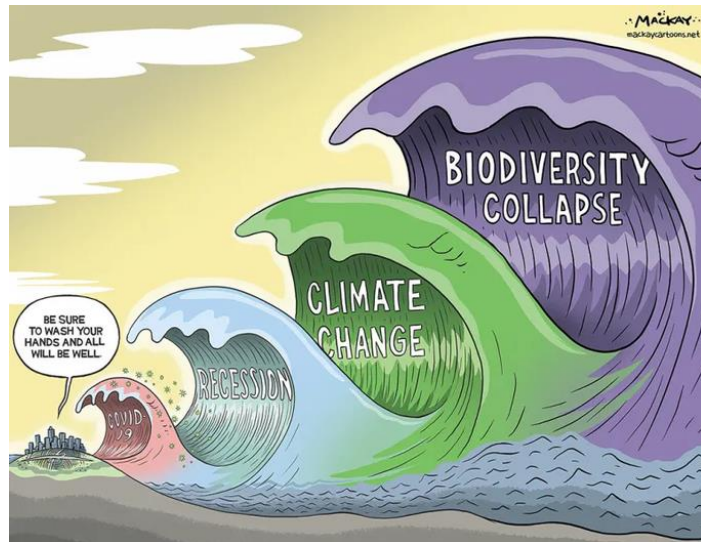
Máñez et al. 2014 <https://doi.org/10.1371/journal.pone.0101466>

And society is diverse....



...with diverse perspectives

And nothing is static....

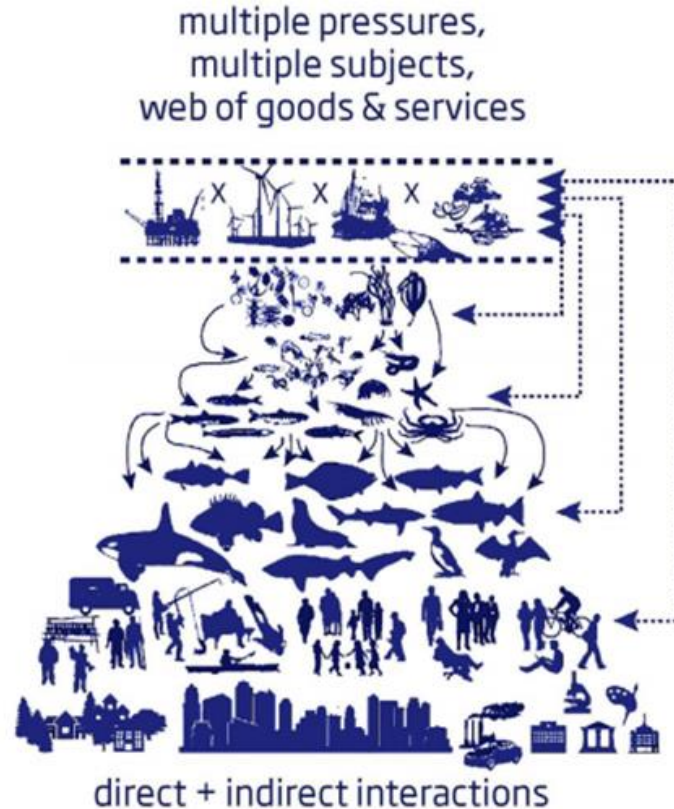


And everything is urgent....

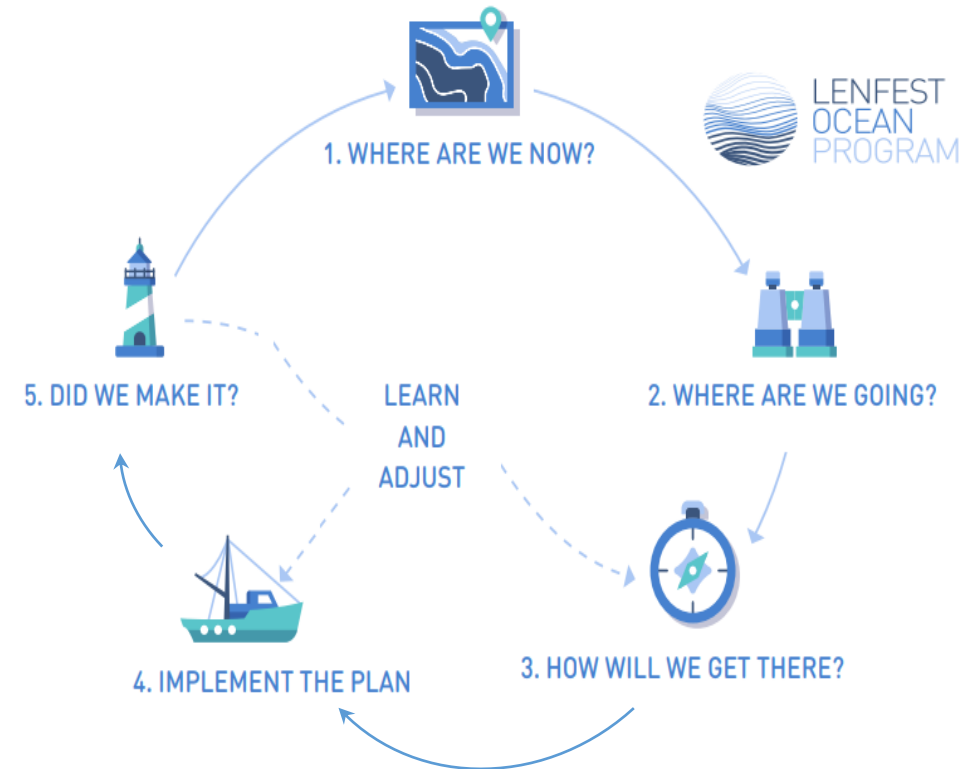
How can we account for everything?



Integrated Ecosystem Assessment...



From Holsman et al. 2017



...is a tool for Ecosystem-Based Management

...is a process



MISSION ATLANTIC

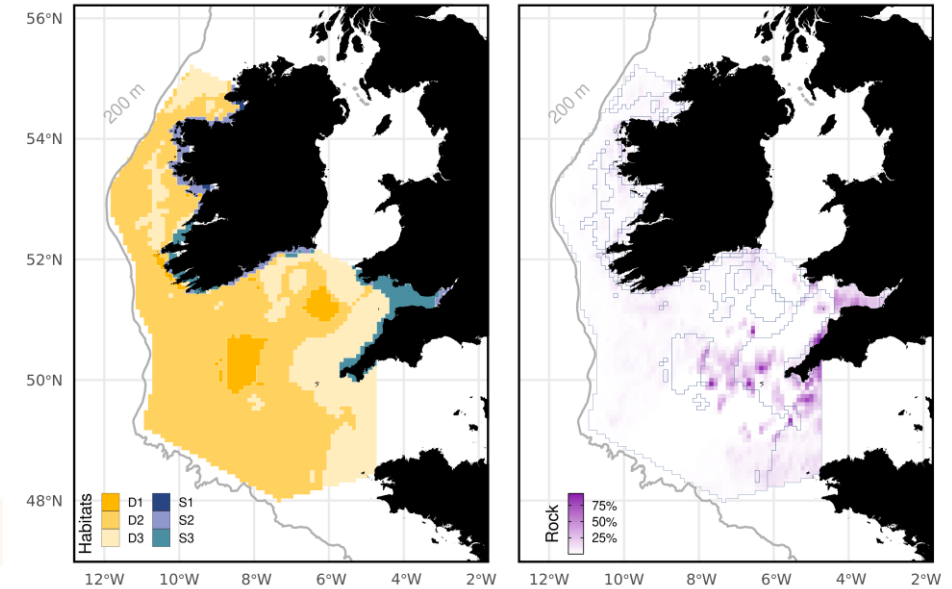
Using ecosystem-based management approaches and an **Integrated Ecosystem Assessment (IEA)** Framework, MISSION ATLANTIC will synthesise the necessary knowledge and provide tools to support marine resource managers and policy makers to move towards a positive future for the Atlantic Ocean.

Case Studies

1. Norwegian Sea
2. North Mid Atlantic Ridge
3. Celtic Sea
4. Canary Current
5. South Mid Atlantic Ridge
6. South Brazilian Shelf
7. Benguela Current



The Celtic Sea example



*Debbi Pedreschi *, Dave Reid (Marine Institute)
Jed Kempf (University College Cork)
Jack Laverick, Douglas Speirs, Mike Heath
(University of Strathclyde)*



Marine Institute
Foras na Mara



University College Cork, Ireland
Colaiste na hOllscoile Corcaigh



University of
Strathclyde
Glasgow



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 @MISSIONATLANTIC

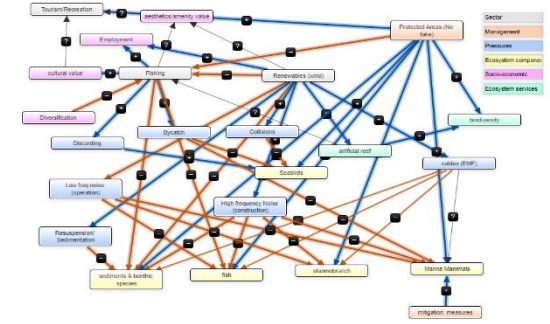
www.missionatlantic.eu





17 Sectors, 20 pressures, 26 ecological components

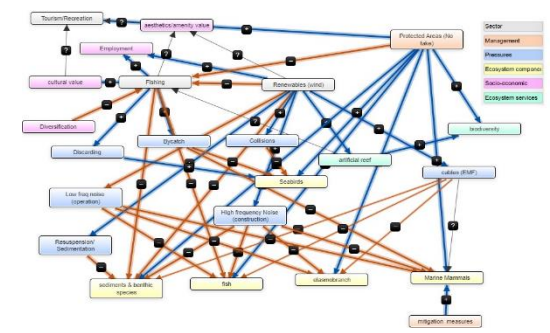
3 stakeholder meetings





17 Sectors, 20 pressures, 26 ecological components

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Integrated Trend Analysis
 Early Warning Analysis
 Breakpoints Analysis

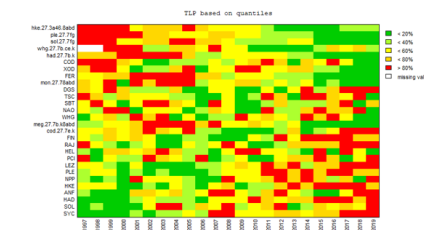


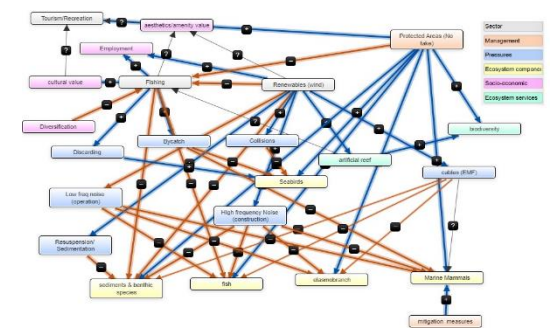
Figure 5: Traffic light plot of pressures and CPUE series in the Celtic Sea from 1997 to 2019.

Primary driver = fishing, not environment
 Temperature and Primary production have remained relatively stable



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Integrated Trend Analysis
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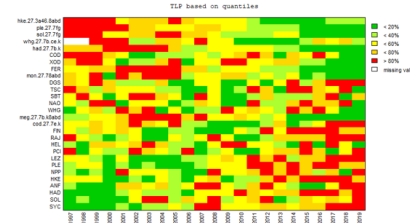
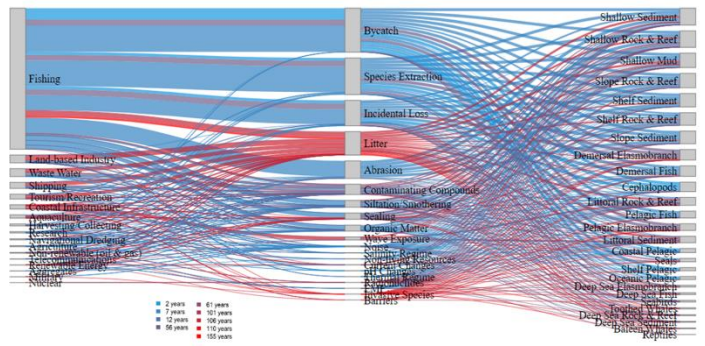


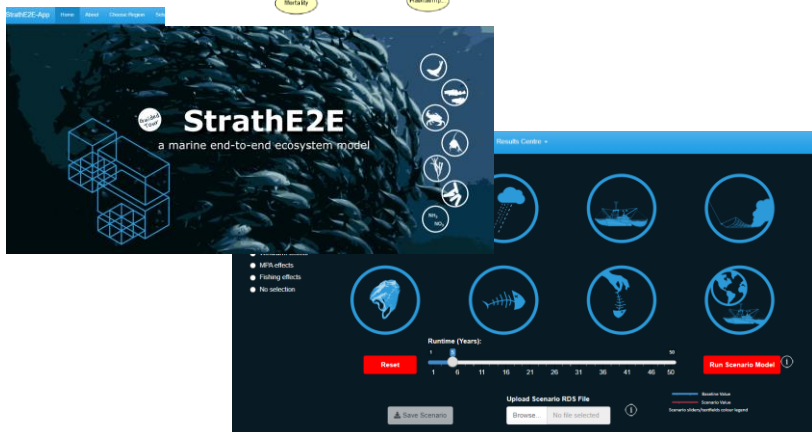
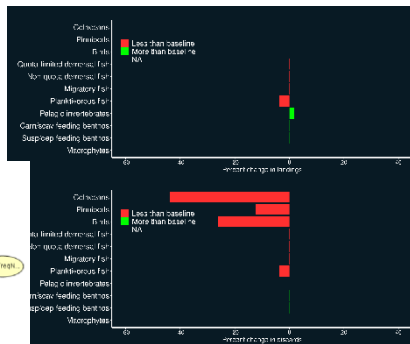
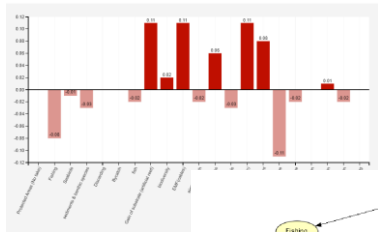
Figure 5: Traffic light plot of pressures and CPUE series in the Celtic Sea from 1997 to 2019.

| Sector | Pressure |
|---------------------------|--------------------------|
| Fishing (78%) | Bycatch (25%) |
| Land-based Industry (4%) | Species Extraction (21%) |
| Waste Water (4%) | Incidental Loss (13.6%) |
| Shipping (3.2%) | Litter (12.4%) |
| Tourism/Recreation (2.5%) | Abrasion (9.4%) |
| TOTAL: 91.7% | TOTAL: 81.4% |



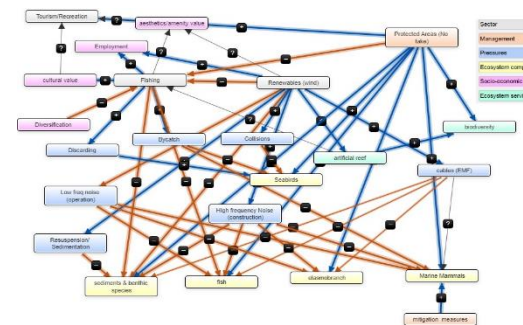
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Integrated Trend Analysis
Early Warning Analysis
Breakpoints Analysis

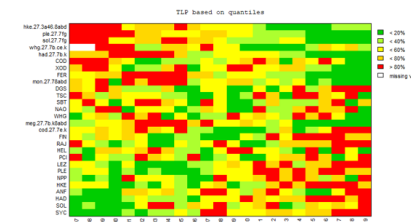
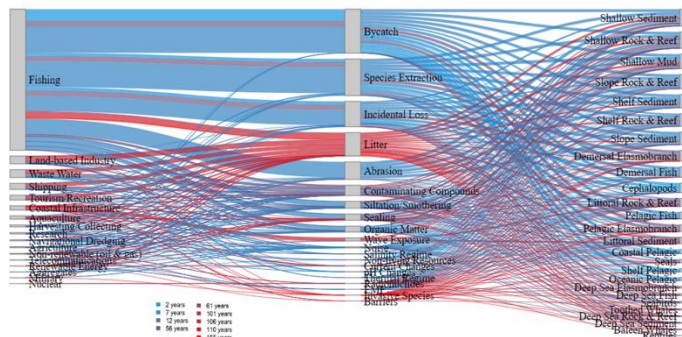


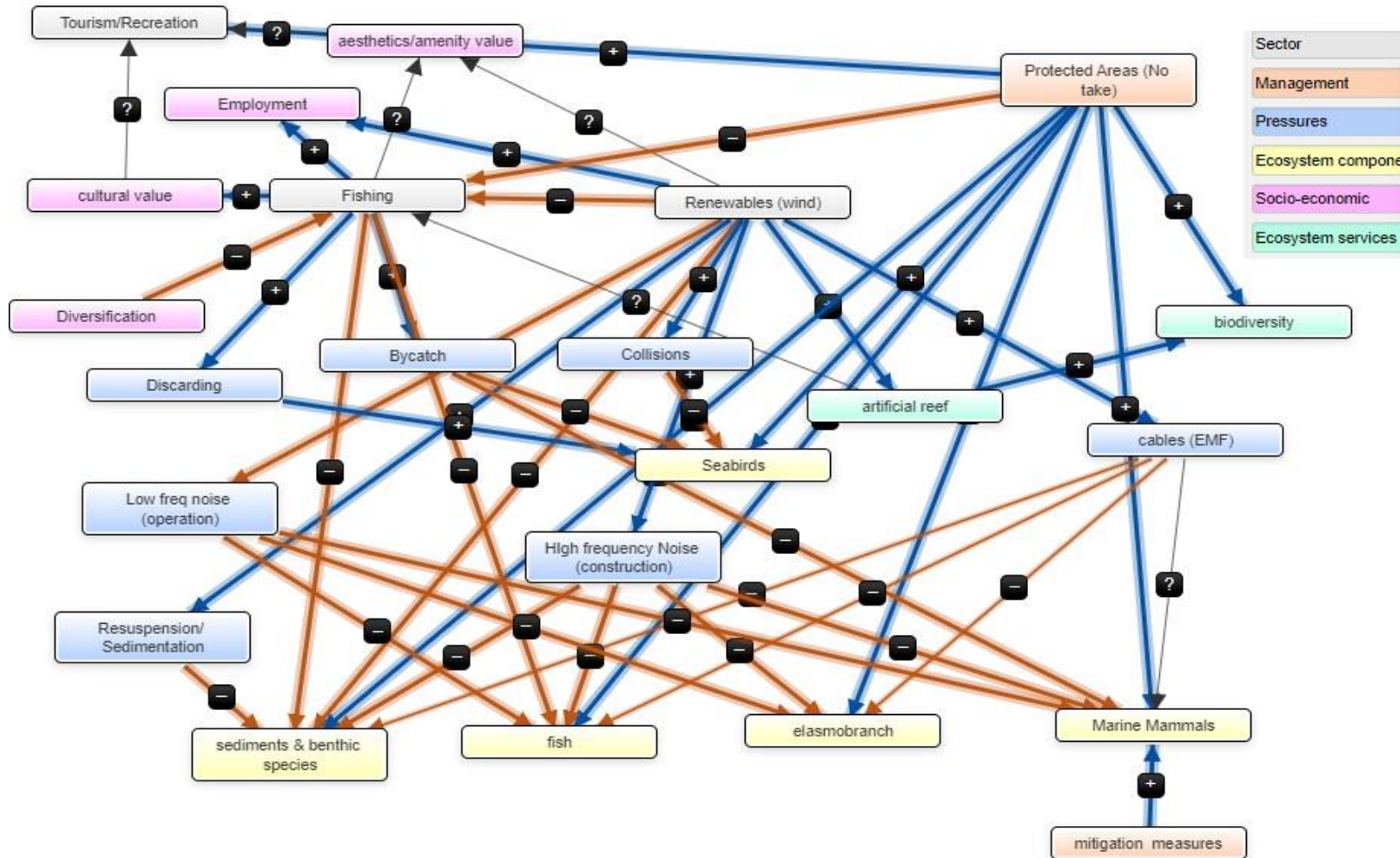
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Identification of emerging issues



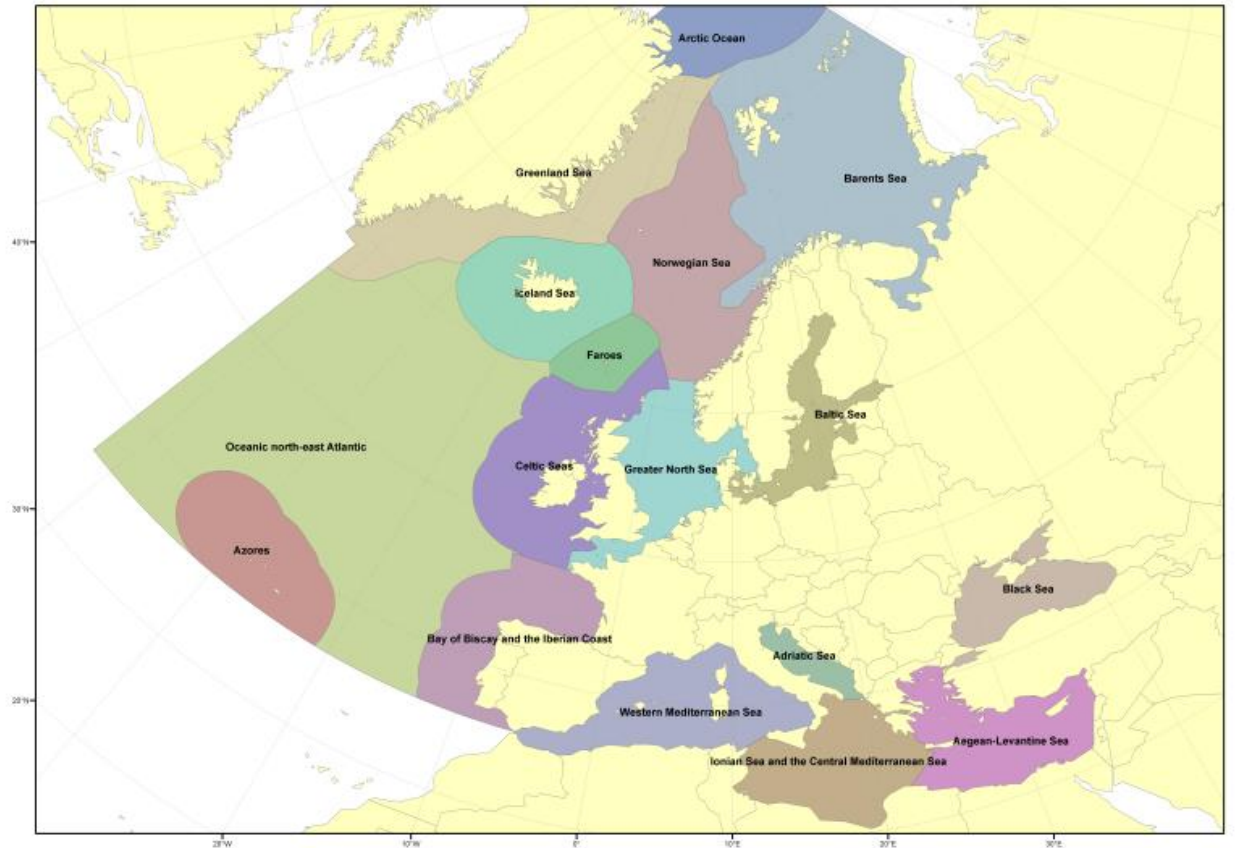
Scenarios:

1. Ecosystem impacts of increase of ORE
2. Fisheries impacts of increase in ORE; displacement
3. ORE + conservation measures (MPAs)

Great, but how do we use it?

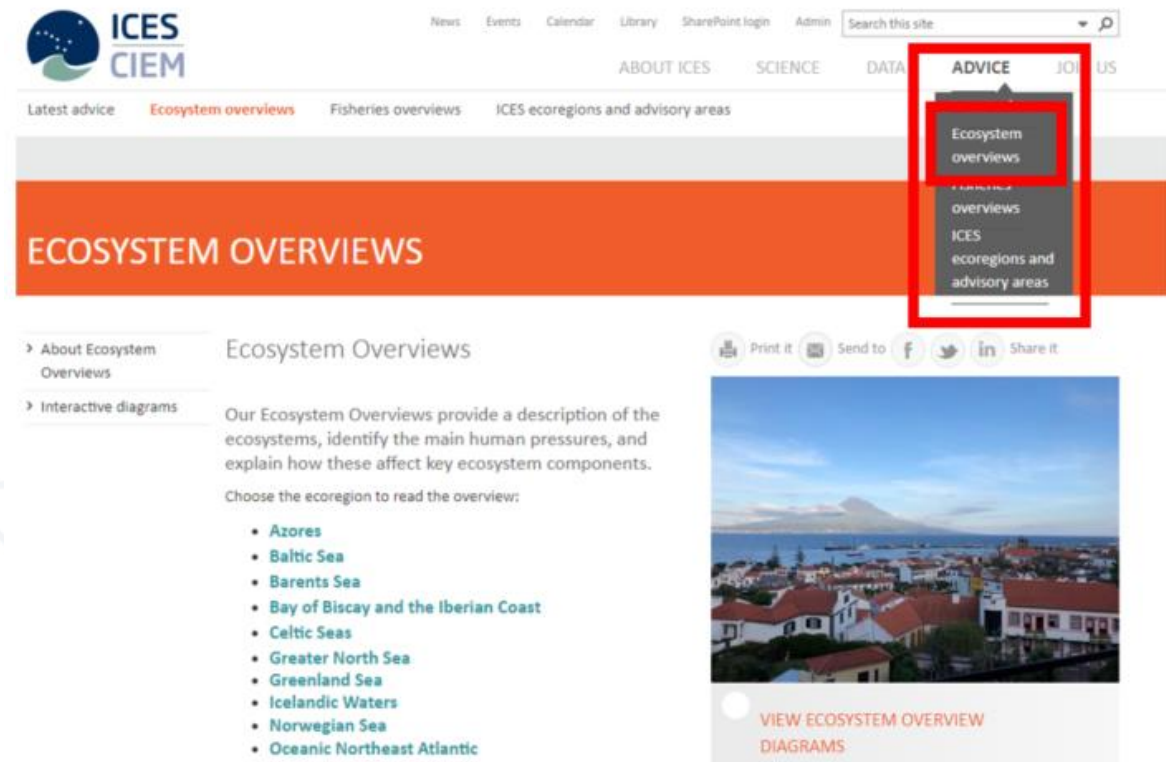
International Council for the Exploration of the sea (ICES)

- Integrated Ecosystem Assessment (IEA) Steering Group
 - Regional IEA groups
- Currently developing and harmonizing methods
- Responsible for the Ecosystem Overviews



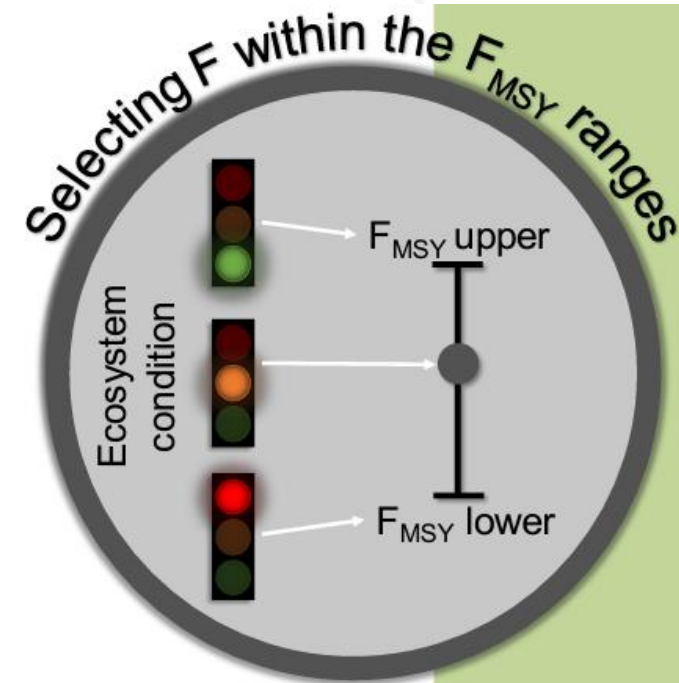
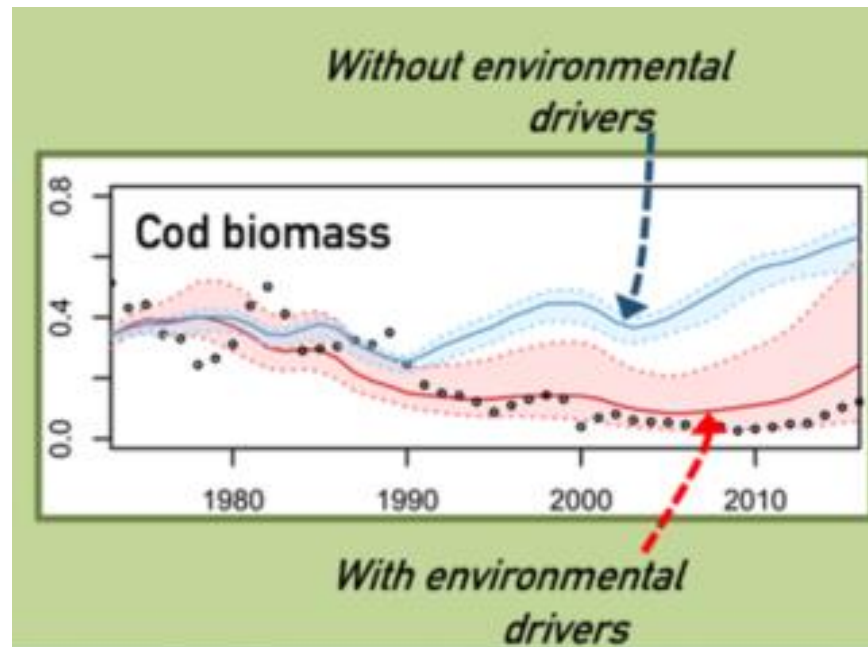
Ecosystem Overviews

- **Ecosystem Overviews contain:**
 - Key Signals
 - Ecoregion Description
 - Management frameworks and legislative instruments
 - Pressures (impacts)
 - Climate Change impacts
 - Social and economic context
 - Ecosystem State (current status of system and species)



The screenshot shows the ICES CIEM website interface. At the top, there is a navigation bar with the ICES CIEM logo, a search bar, and links for News, Events, Calendar, Library, SharePoint login, and Admin. Below this, there are tabs for ABOUT ICES, SCIENCE, DATA, and ADVICE. The ADVICE tab is selected, and a dropdown menu is open, showing options for Ecosystem overviews, Fisheries overviews, and ICES ecoregions and advisory areas. The Ecosystem overviews option is highlighted with a red box. Below the navigation, there is a large orange banner with the text 'ECOSYSTEM OVERVIEWS'. To the right of the banner, there are social media sharing icons (Print it, Send to, Facebook, Twitter, LinkedIn, Share it) and a large image of a coastal town. Below the image, there is a button that says 'VIEW ECOSYSTEM OVERVIEW DIAGRAMS'.

In Single Species Fisheries Advice...



WKIrish: <https://ices-library.figshare.com/search?q=WKIRISH>

Bentley et al. 2019: <https://www.doi.org/10.1093/icesjms/fsz003>

Bentley et al. 2020: <https://www.doi.org/10.1111/fog.12486>

Bentley et al. 2021: <https://doi.org/10.3389/fmars.2021.602072>

In the single species fisheries Advice....



*ICES Advice on fishing opportunities and conservation
Ecoregions in the Northeast Atlantic
Published 3 November 2022*



European eel (*Anguilla anguilla*) throughout its natural range

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catches in all habitats in 2023. This applies to both recreational and commercial catches and includes catches of glass eels for restocking and aquaculture.

ICES advice on conservation aspects

ICES advises based on ecosystem based management considerations that:

- all non-fisheries related anthropogenic mortalities should be zero.
- the quantity and quality of eel habitats should be restored; this includes restoring connectivity and the physical, chemical, and biological properties of the habitats.

https://ices-library.figshare.com/articles/report/European_eel_Anguilla_anguilla_throughout_its_natural_range/19772374

Operational IEA – where could it lead?

- IEA is made up of a series of analyses and living documents
- These are updated as knowledge is updated
- Organising it into an IEA framework can allow rapid responses to specific EBM questions
- National example: **D3 Commercial Fish Assessment:**
are there non-fisheries pressures acting upon the fish resource?
 - 325 pressures (excluding fishing)
 - 40 are classified as ‘chronic’
 - 285 are low impact
 - 256 local or site scale
 - 29 are widespread and persistent



**ANSWERED
WITHIN 24
HOURS**

Operational IEA – where could it lead?

- IEA is made up of a series of analyses and living documents
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- Organising it into EBM question

Future iterations will allow rapid response maps, and insights related to cumulative impacts, ecosystem services and potential socio-economic effects....

- National exam
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Future Outlook

- Increasing demands for EBM/ ecosystem-informed science and advice....
- Mandate for EBM, adoption of IEA (NOAA, ICES)
- Project-based funding limits applicability, and adaptability (EU)
- **REQUIRES STRATEGIC INVESTMENT THAT CAN:**
 - Support dedicated multi-disciplinary assessment teams
 - Facilitate stakeholder engagement
 - Provide EBM advice
 - Consistency in application



The benefits, for society and the ecosystem, will far outweigh the costs...



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