European Environment Agency

Joint EEA Scientific Committee – EEA Seminar

Ecosystems and their services: building the knowledge base for European assessments

European Environment Agency, Copenhagen, 01 October 2014, 09.00 to 17.00

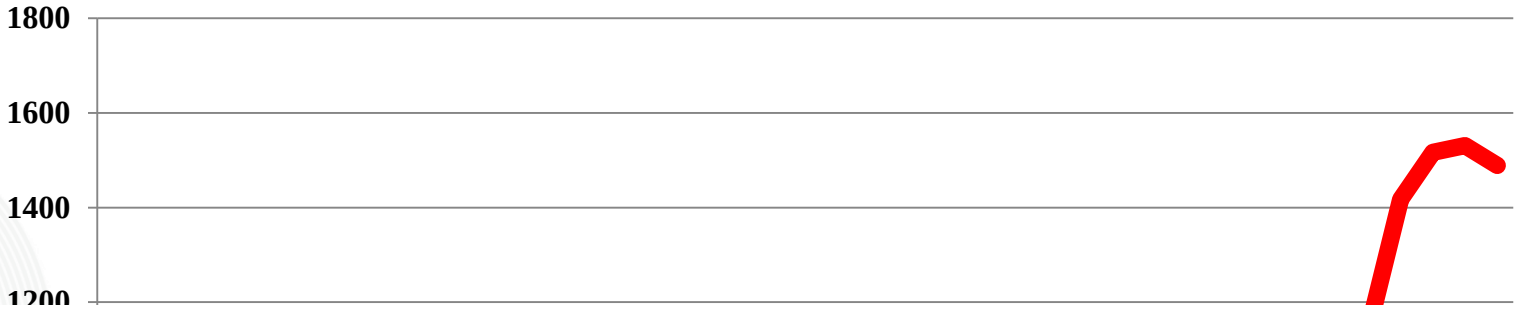
Grand challenges in marine ecosystem ecology

ANGEL BORJA

aborja@azti.es

Introduction

Marine ecosystems: hot research topic



frontiers in MARINE SCIENCE

SPECIALTY GRAND CHALLENGE ARTICLE
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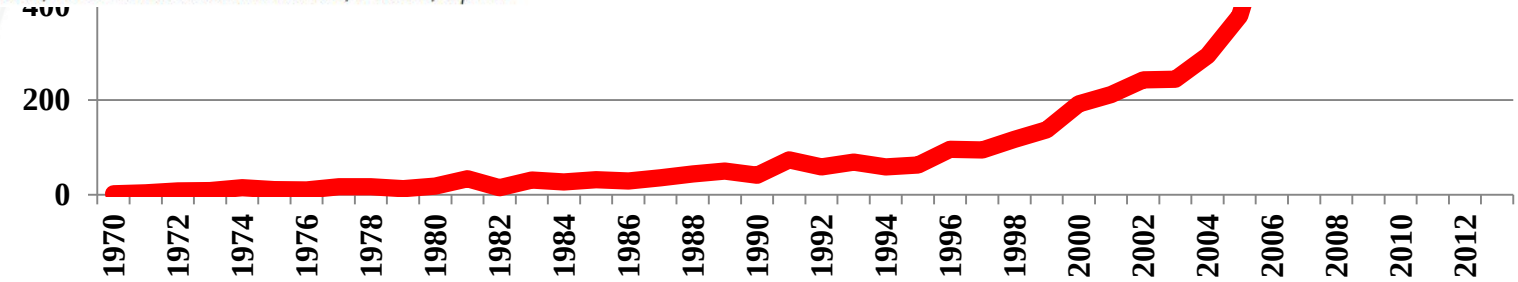
Grand challenges in marine ecosystems ecology

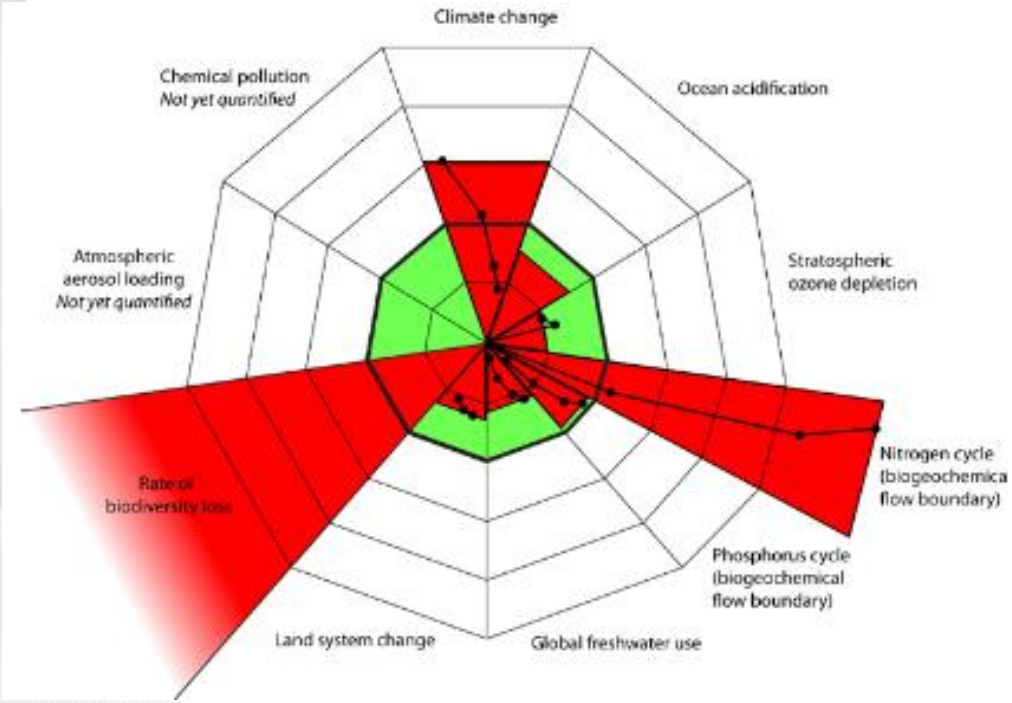
***Angel Borja** **

AZTI-Tecnalia, Marine Research Division, Pasaia, Spain



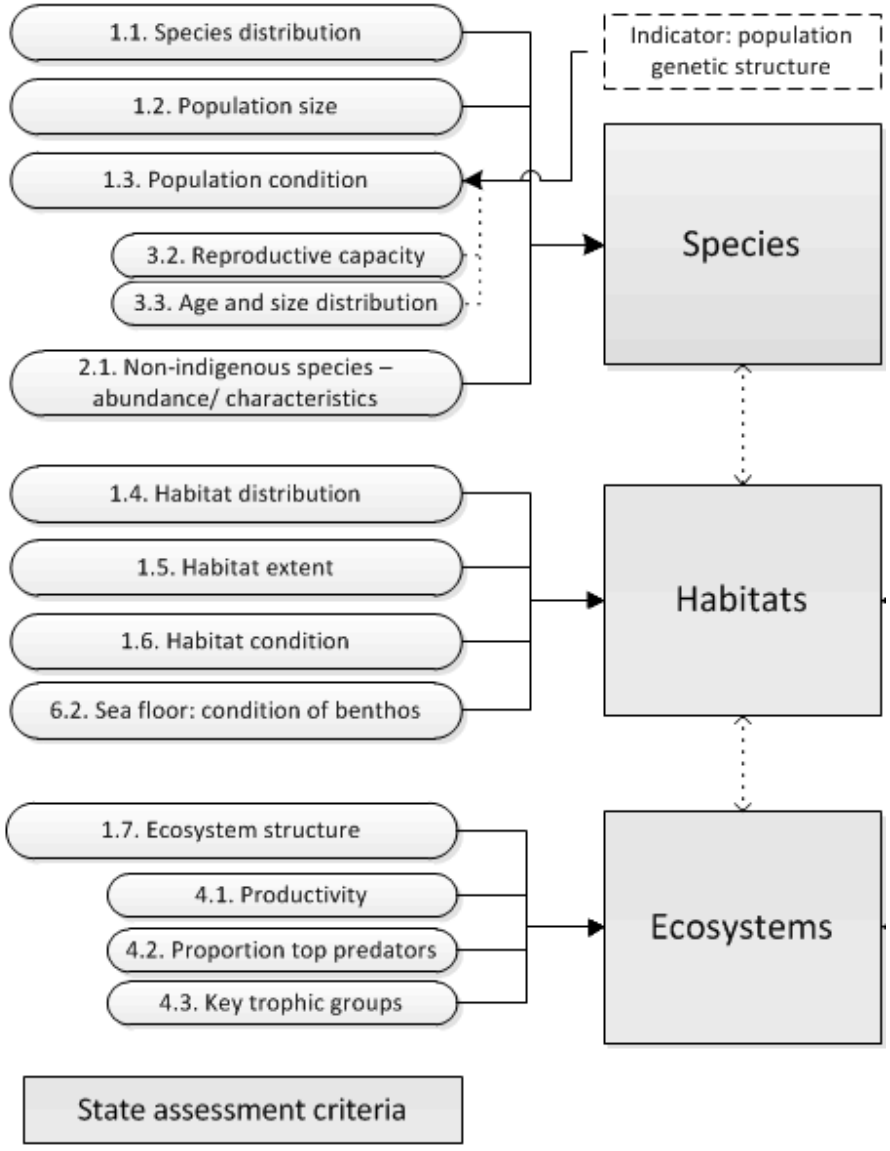
Grand Challenge 1

UNDERSTANDING THE ROLE OF BIODIVERSITY IN MAINTAINING ECOSYSTEMS FUNCTIONALITY



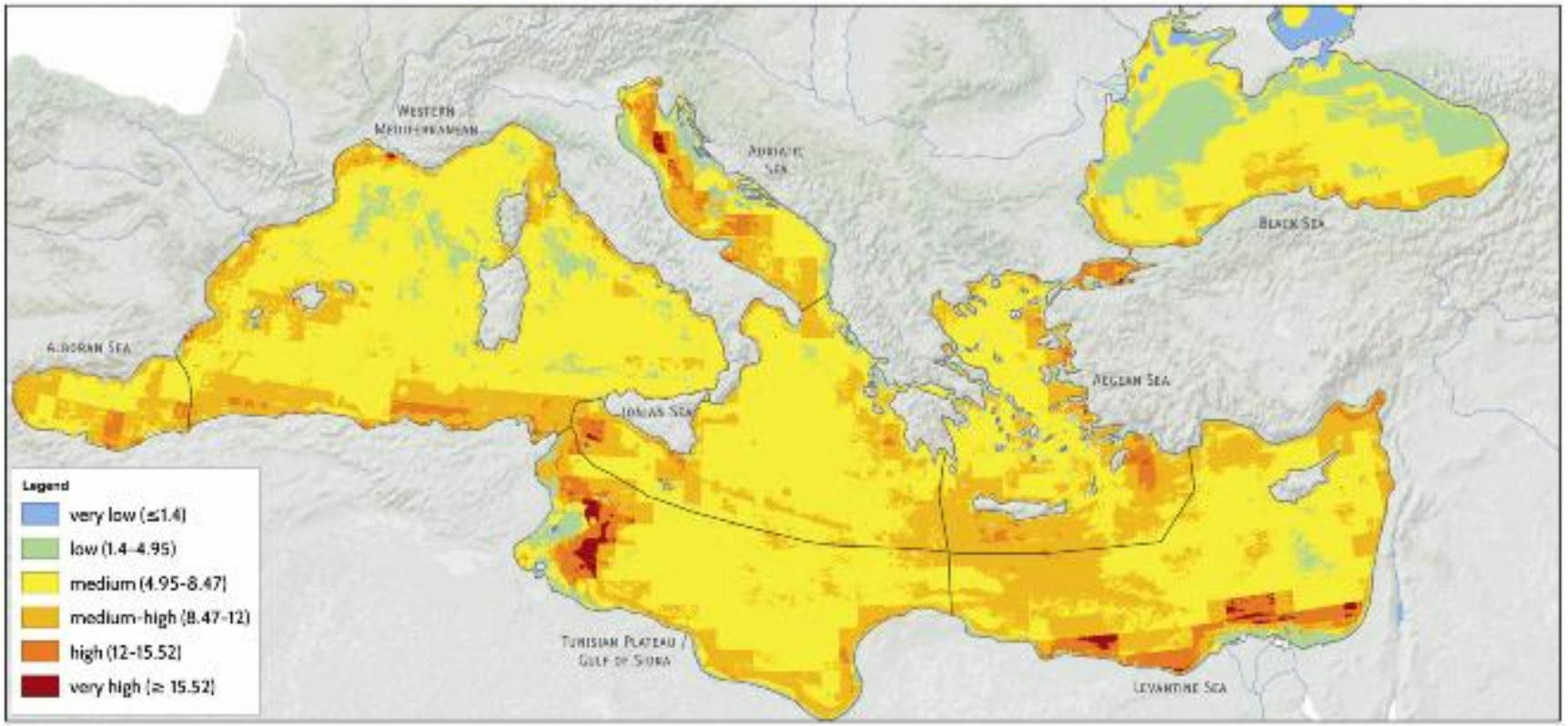
Rockström, et al. 2009. Planetary boundaries:exploring the safe operating space for humanity. Ecology and Society, 14: 32 pp.

Biodiversity provide evidence of its importance in sustaining ecosystem functioning and services and preventing ecosystems from tipping into undesired states



Grand Challenge 2

UNDERSTANDING RELATIONSHIPS BETWEEN HUMAN PRESSURES AND ECOSYSTEMS

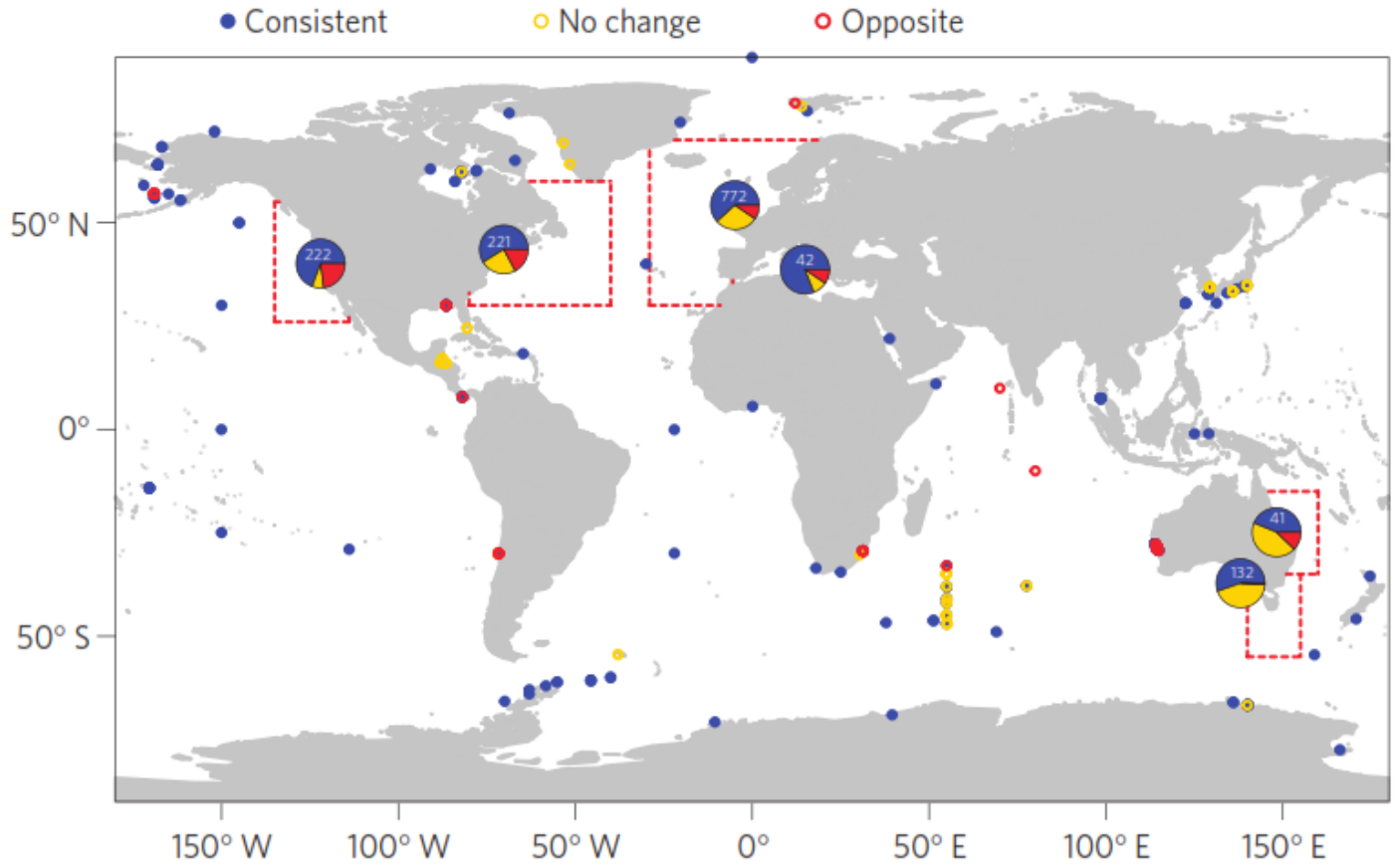


Micheli et al. 2013. Cumulative Human Impacts on Mediterranean and Black Sea Marine Ecosystems: Assessing Current Pressures and Opportunities. PLoS ONE, 8: e79889.

Humans are considered part of the marine ecosystem

Grand Challenge 3

UNDERSTANDING THE IMPACT OF GLOBAL CHANGE ON MARINE ECOSYSTEMS



Poloczanska et al. 2013. Global imprint of climate change on marine life. Nature Climate Change, 3: 919-925.

Understanding:

- Capacity of adaptation
- Cascading implications
- Effects combined with human pressures
- Adaptive strategies

From 1735 marine biological responses to global change 81–83% are consistent with the expected impacts of climate change on marine life

Grand Challenge 4

ASSESSING MARINE ECOSYSTEMS HEALTH IN AN INTEGRATIVE WAY

Marine Pollution Bulletin 76 (2013) 16–27

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

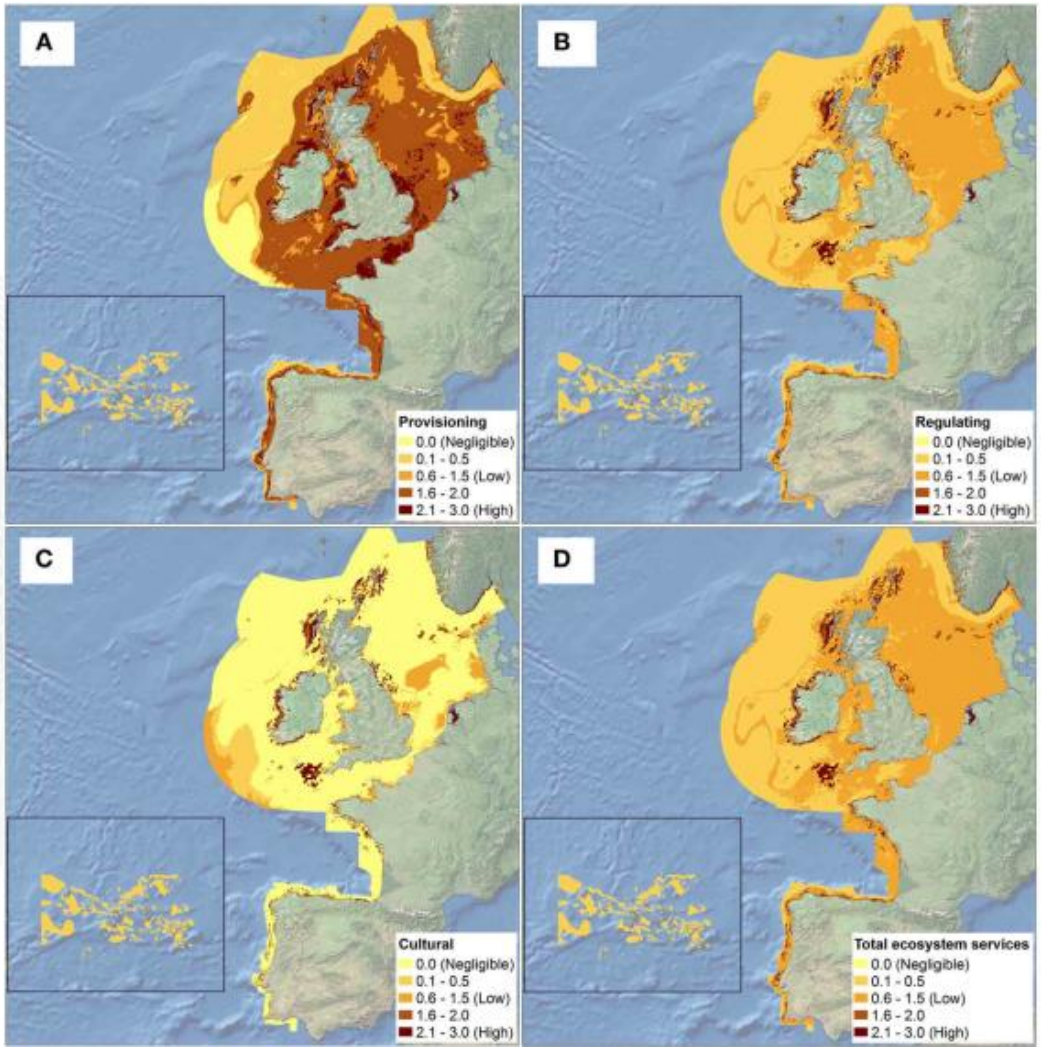
Good Environmental Status of marine ecosystems: What is it and how do we know when we have attained it?

Angel Borja [a,*], Mike Elliott [b], Jesper H. Andersen [c], Ana C. Cardoso [g], Jacob Carstensen [c], João G. Ferreira [d], Anna-Stiina Heiskanen [e], João C. Marques [f], João M. Neto [f], Heliana Teixeira [g], Laura Uusitalo [e], María C. Uyarra [a], Nikolaos Zampoukas [g]

Halpern et al. 2012. An index to assess the health and benefits of the global ocean. Nature, 488: 615-620.

Grand Challenge 5

DELIVERING ECOSYSTEM SERVICES BY CONSERVING AND PROTECTING OUR SEAS



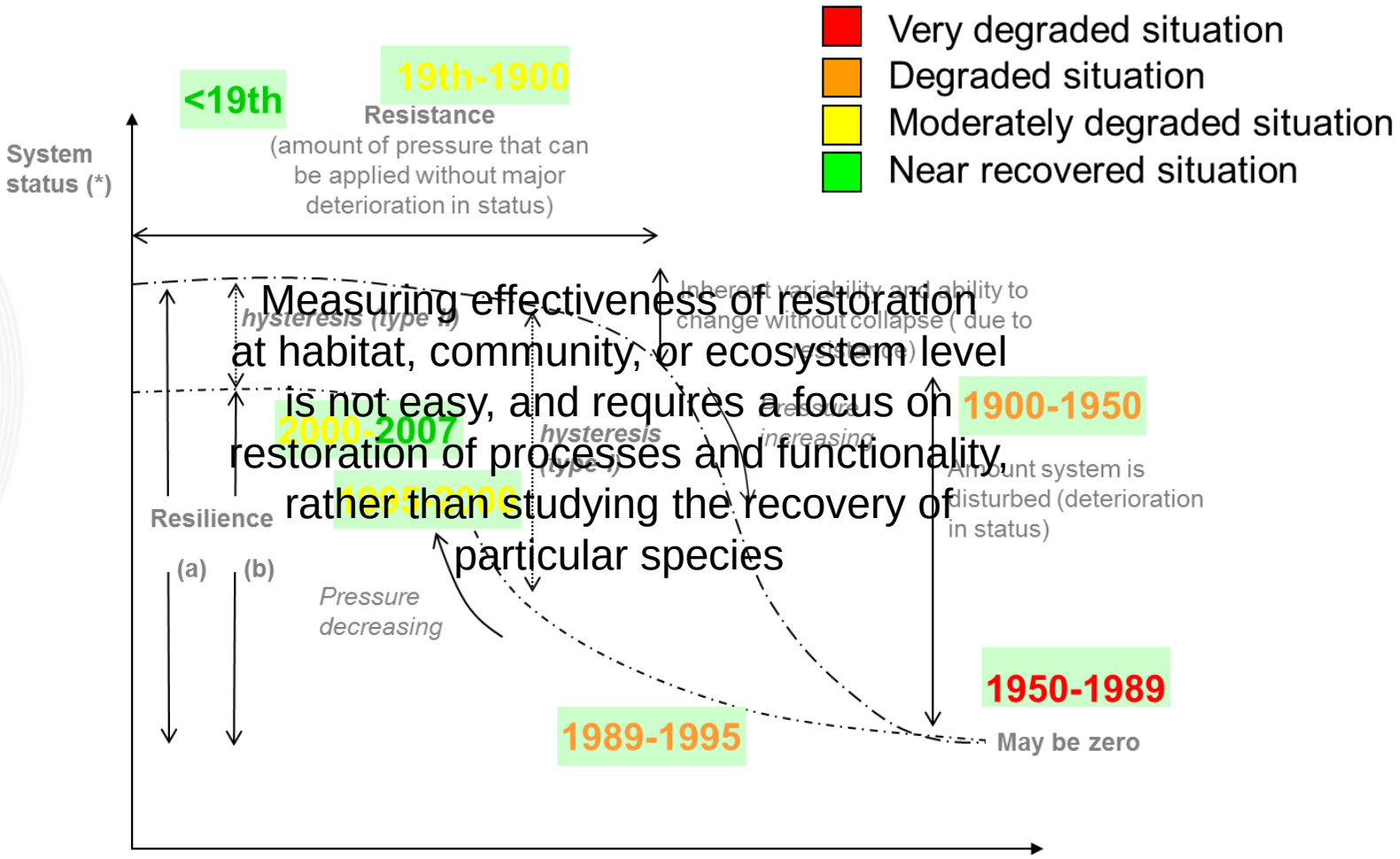
Galparsoro et al. 2014. Mapping ecosystem services provided by benthic habitats in the European North Atlantic Ocean. Frontiers in Marine Science, 1.

Need of:

- Marine protected areas and near-natural systems
- Reducing habitat fragmentation
- Determining vulnerability of species and habitats
- Enhance connectivity to maintain habitat quality

Grand Challenge 6

RECOVERING ECOSYSTEM STRUCTURE AND FUNCTIONING THROUGH RESTORATION



Measuring effectiveness of restoration at habitat, community, or ecosystem level is not easy, and requires a focus on restoration of processes and functionality, rather than studying the recovery of particular species

Borja et al. 2010. Medium- and Long-term Recovery of Estuarine and Coastal Ecosystems: Patterns, Rates and Restoration Effectiveness. Estuaries and Coasts, 33: 1249-1260.

Grand Challenge 7

MANAGING THE SEAS USING THE ECOSYSTEM APPROACH AND SPATIAL PLANNING

Developed with the financial support of

GORDON AND BETTY MOORE FOUNDATION

the David & Lucile Packard FOUNDATION

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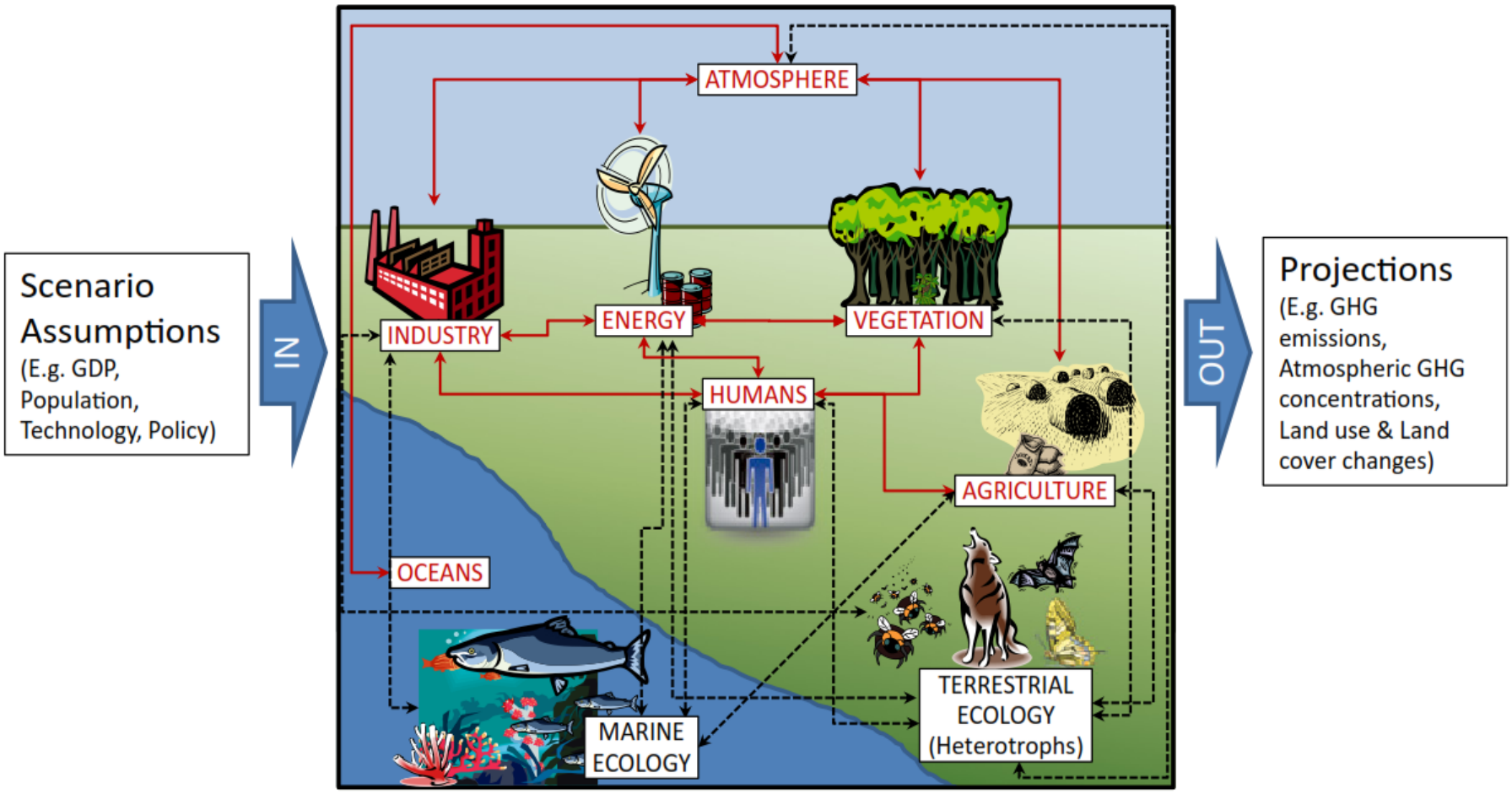
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

MaB

Grand Challenge 8

MODELING ECOSYSTEMS FOR BETTER MANAGEMENT



Harfoot et al. 2014. Integrated assessment models for ecologists: the present and the future. *Global Ecology and Biogeography,* **23**: 124-143.

Schematic representation of a typical full-scale integrated assessment model composition, including scenario assumptions as input and projection outputs

Conclusions

To achieve these challenges we need:

- Effective long-term monitoring of populations and communities
- Develop new ways to get reliable, verifiable, efficient and cost-effective monitoring methods
- To understand marine ecosystem functioning and its responses to environmental and anthropogenic pressures
- Data integration of the different ecosystem components in order to understand large-scale patterns and long-term changes
- Open access to scientific data and publications (science-based knowledge)

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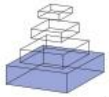

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Angel Borja*

AZTI-Tecnalia, Marine Research Division, Pasaia, Spain

Dr Ángel Borja (aborja@azti.es)
Twitter: @AngelBorjaYerro
ResearchGate Profile: https://www.researchgate.net/profile/Angel_Borja/
Linkedin: www.linkedin.com/profile/view?id=245091062&trk=tab_pro