SCIENCE COMUNICATION & ADAPTATION TO CLIMATE CHANGE

Disciplina de Avaliação Ambiental e Ordenamento do Espaço Marítimo
Mestrado em Ecologia Marinha

09 DEZEMBRO 2020 | T4

CATARINA FRAZÃO SANTOS

Ciências ULisboa

Ciências ULisboa

4 classes:

18/11 – MSP around the world & Sustainability issues

25/11 – Global climate change & effects on ocean uses

02/12 – 

09/12 – MSP adaptation to (climate) change &
Science Communication

Ciências ULisboa

Evaluation:

18/11. Written exercise ✓

25/11. Written exercise ✓

02/12. 🚫

09/12. Written exercise + Oral communications

Written exercises can be **delivered** by the **end of the class** OR until the **following class** (to cfsantos@fc.ul.pt)

Key rule:

If you have questions, ask

Ciências ULisboa

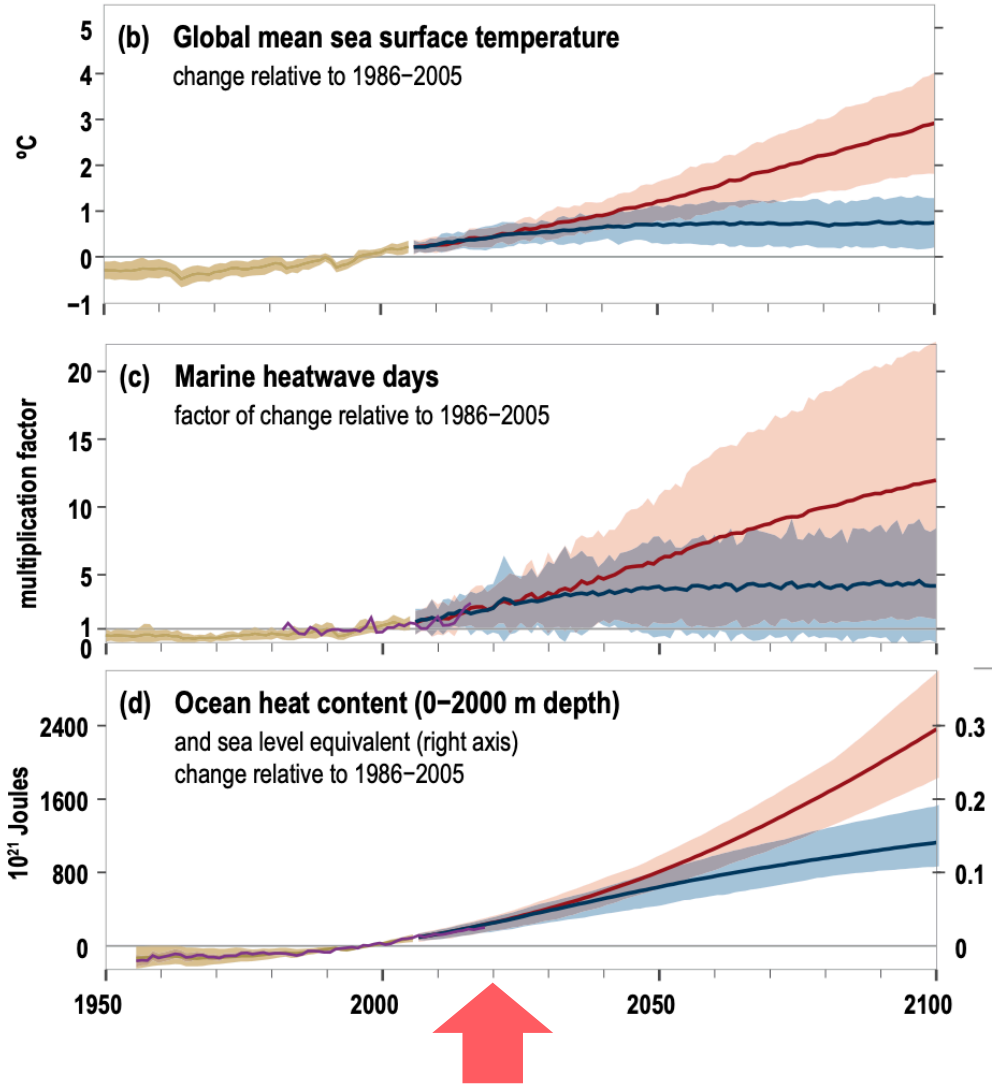
Today's class:

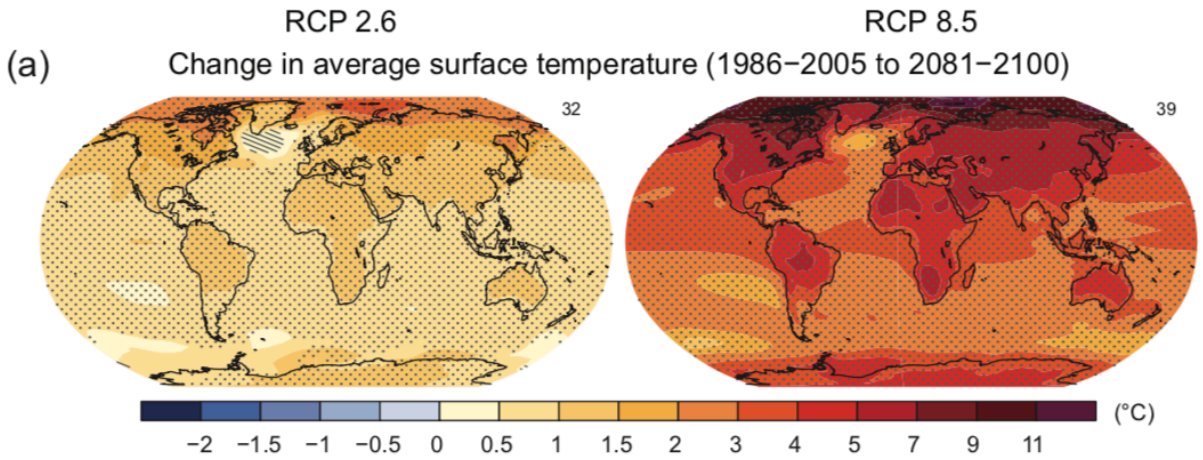
PART 1.
MSP Adaptation to climate change

PART 2.
Science communication

PART 1

GLOBAL CLIMATE CHANGE



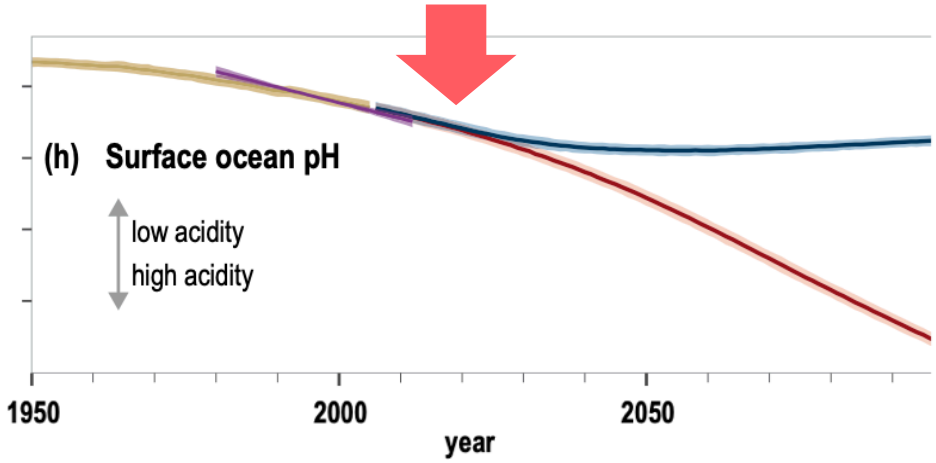


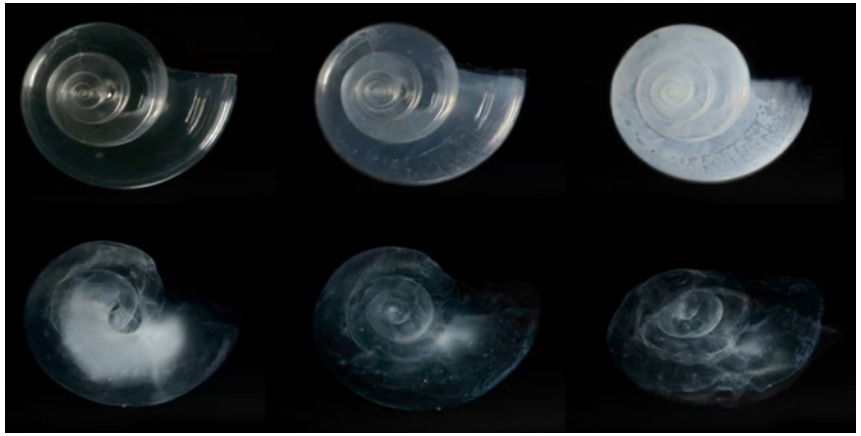
Ocean Warming

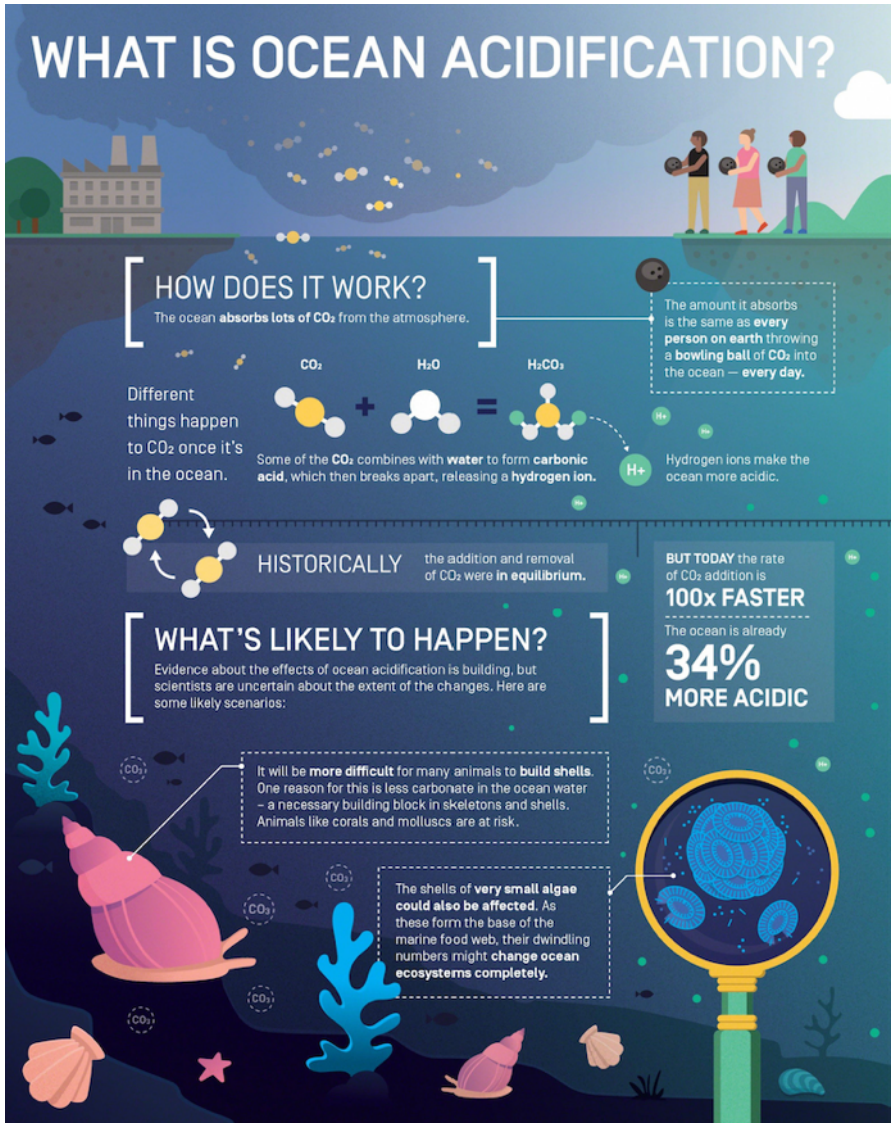
IPCC (2019)

Ciências ULisboa

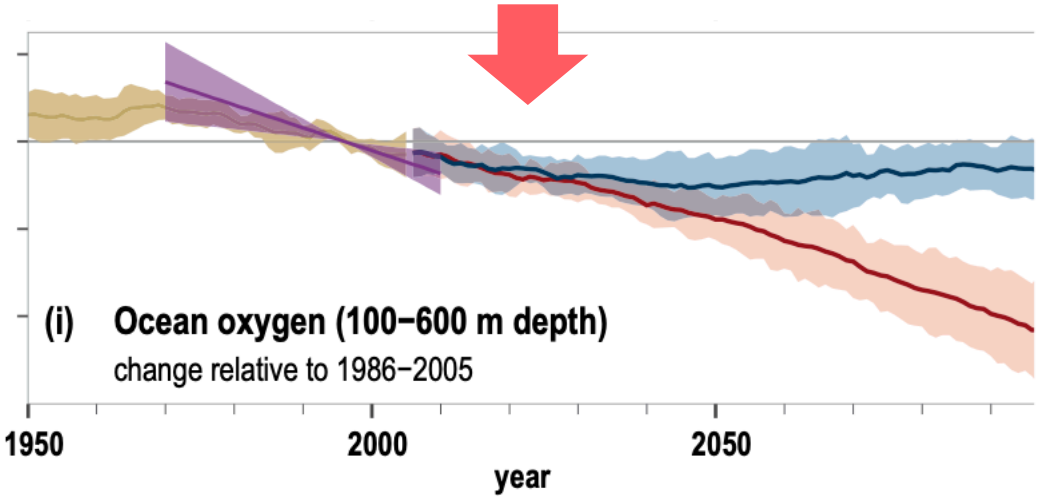
Acidification

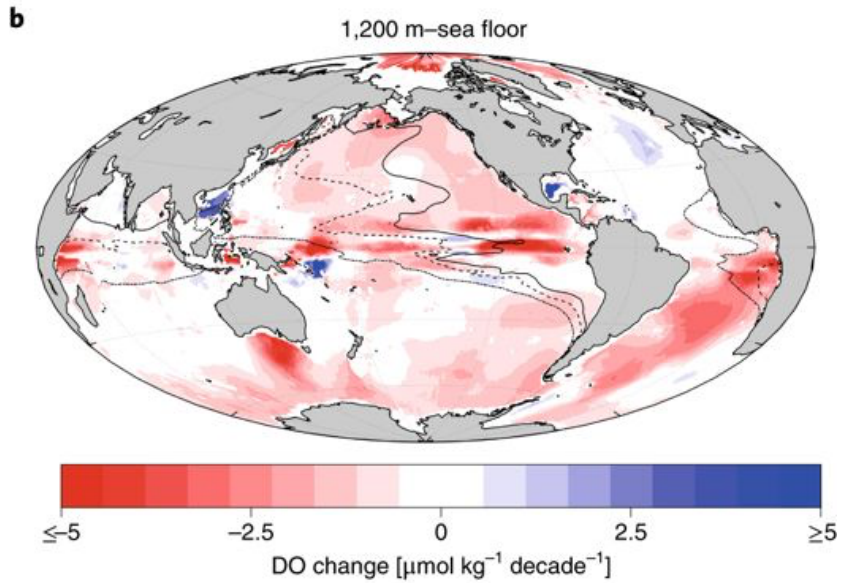


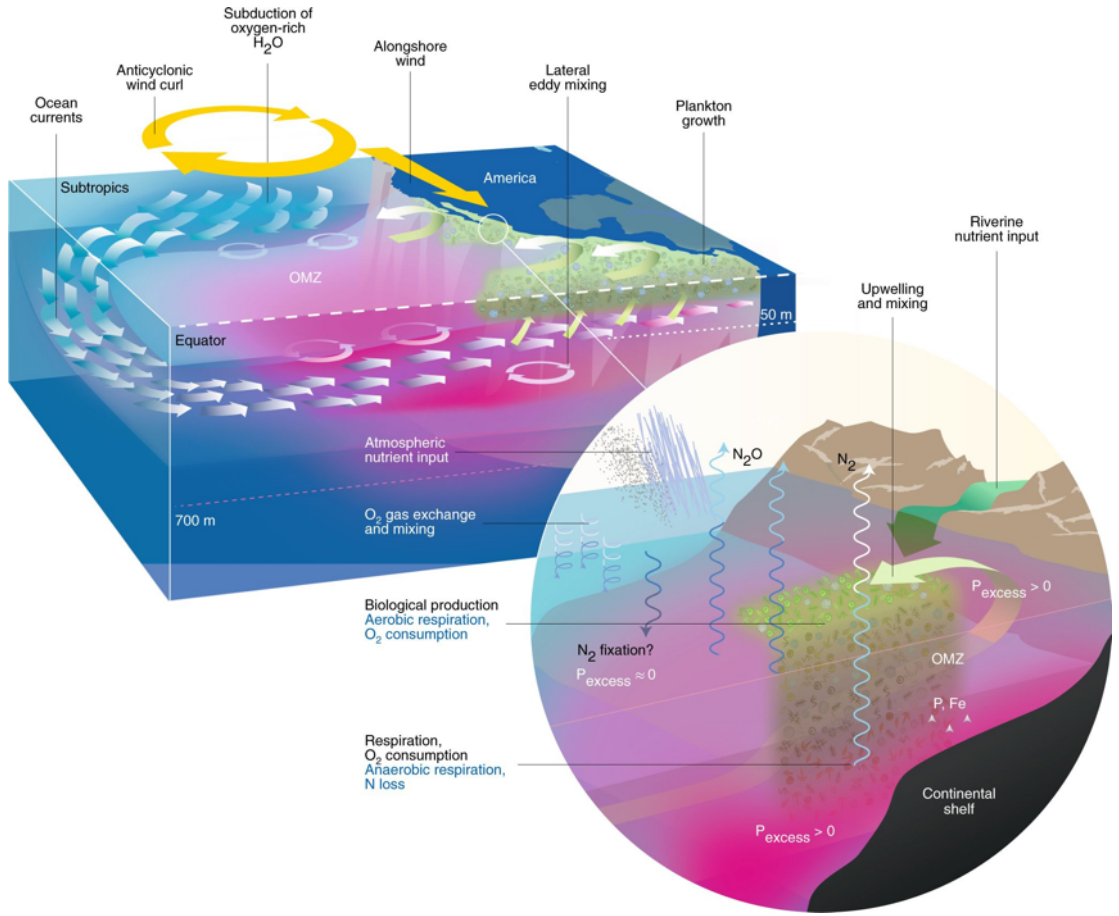




GLOBAL CLIMATE CHANGE



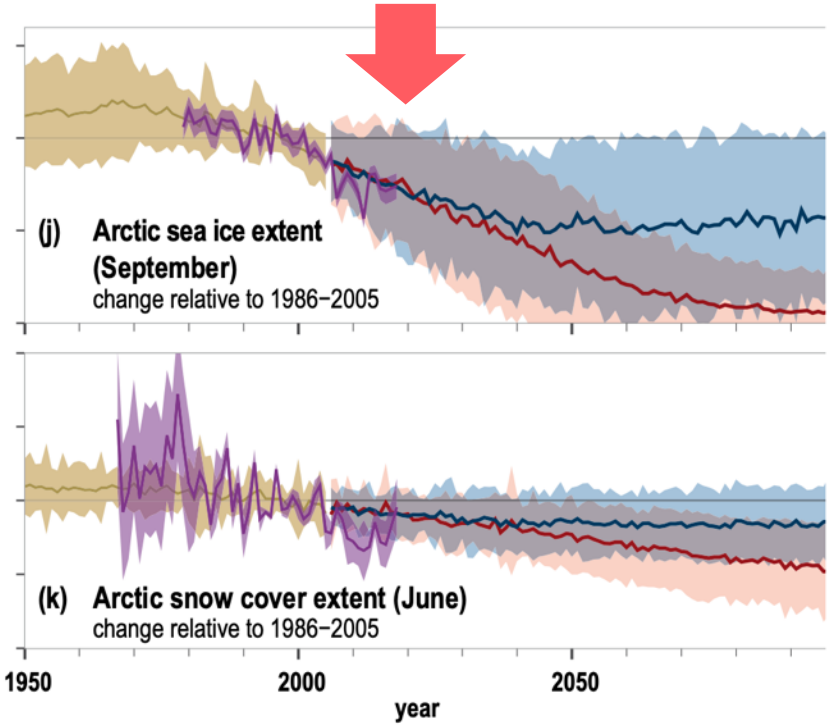


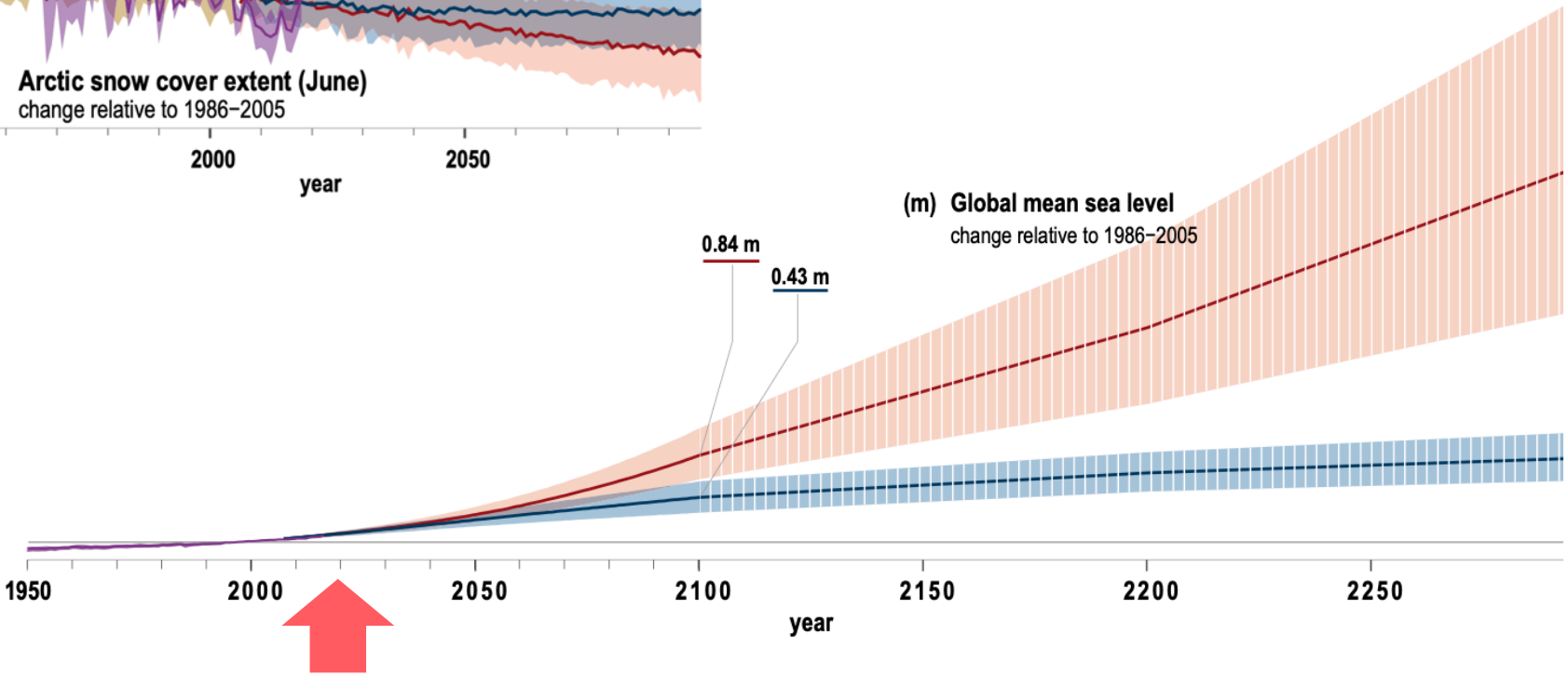


Deoxygenation

OSCHLIES ET AL. (2018)
NATURE GEOSCIENCE

GLOBAL CLIMATE CHANGE





Ice loss & SLR

Extreme events

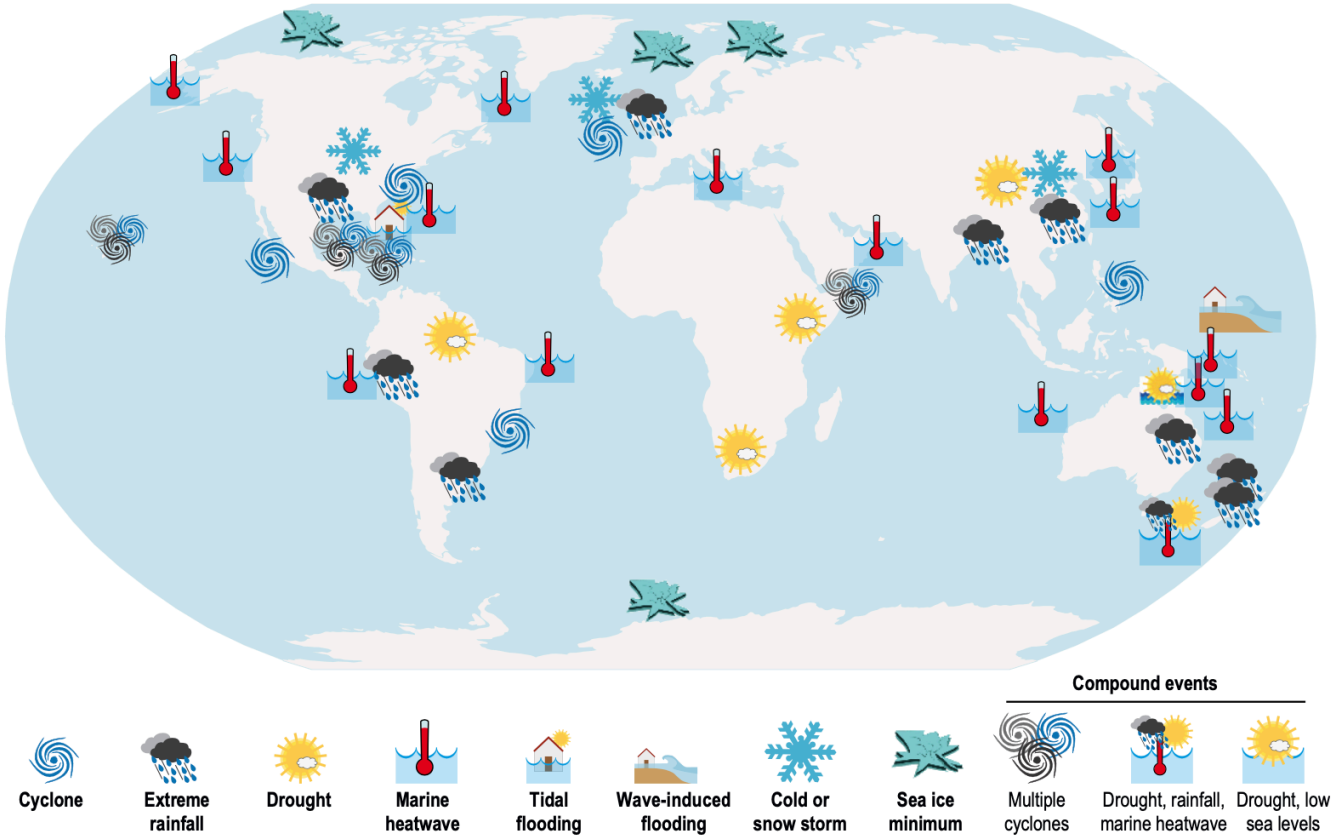
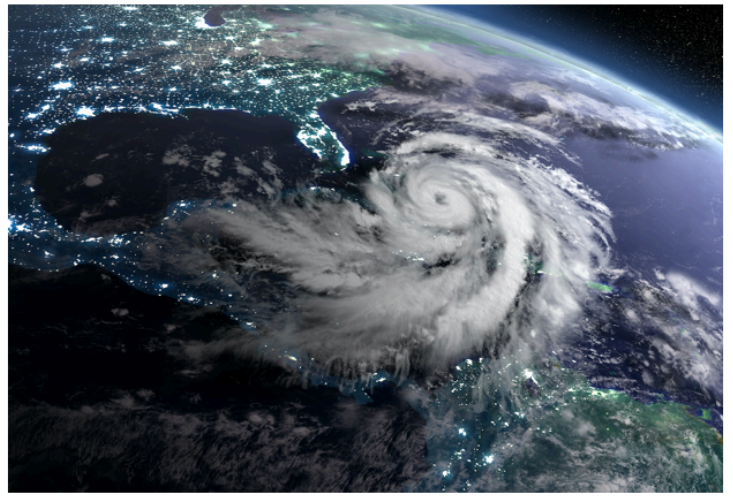
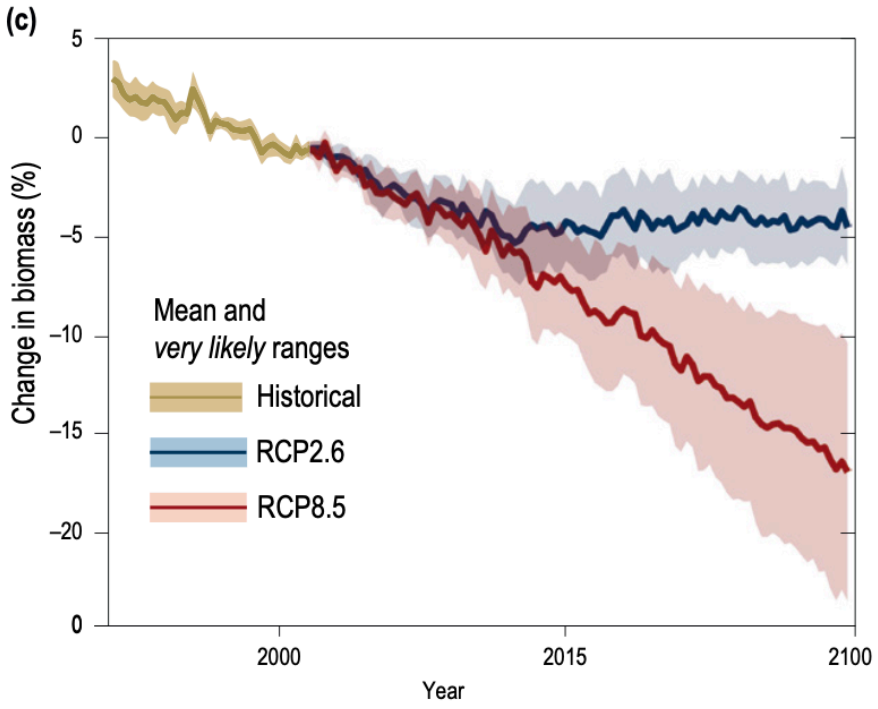


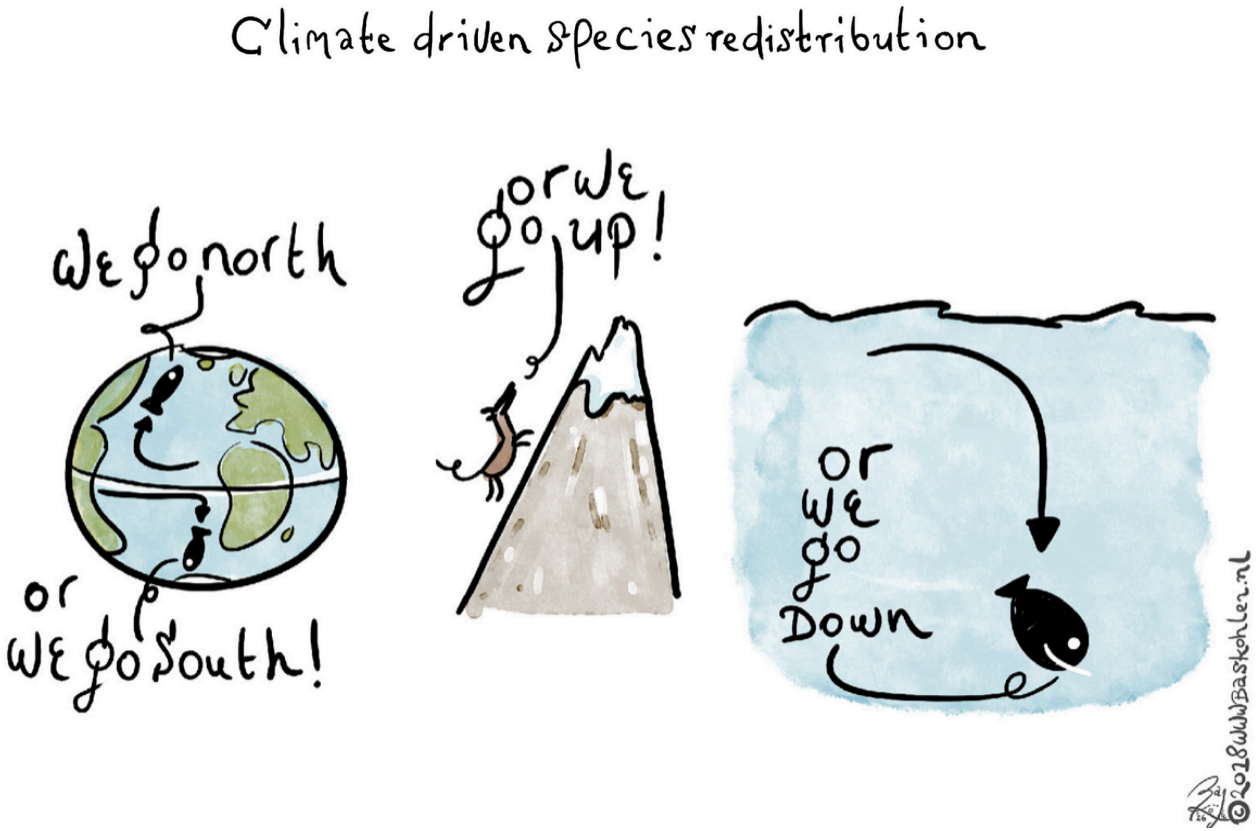
Figure 6.2 | Locations where extreme events with an identified link to ocean changes have been discussed in Table 6.2.



Changes in marine ecosystems

STRUCTURE AND FUNCTIONING





Changes in marine ecosystems

STRUCTURE
AND FUNCTIONING







Changes in ocean conditions

EXTREME EVENTS,
LOSS OF SEA ICE, ETC.

Ciências ULisboa

USE-USE CONFLICTS

USE-ENVIRONMENT

LEGAL ISSUES

!! Marine Spatial Planning !!

Very few MSP plans address this key challenge

GLOBAL CLIMATE CHANGE & MSP

Ecological Applications, 0(0), 2019, e02009

A fast-moving target: achieving marine conservation goals under shifting climate and policies

Gil Rilov,[1,16] Simonetta Fraschetti,[2,3,4] Elena Gissi,[5] Carlo Pipitone,[6] Fabio Badalamenti,[4,6] Laura Tamburello,[3,4] Elisabetta Menini,[7] Paul Goriup,[8] Antonios D. Mazaris,[9] Joaquim Garrabou,[10,11] Lisandro Benedetti-Cecchi,[3,4,12] Roberto Danovaro,[4,7] Charles Loiseau,[13] Joachim Claudet,[13,14] and Stelios Katsanevakis[15]

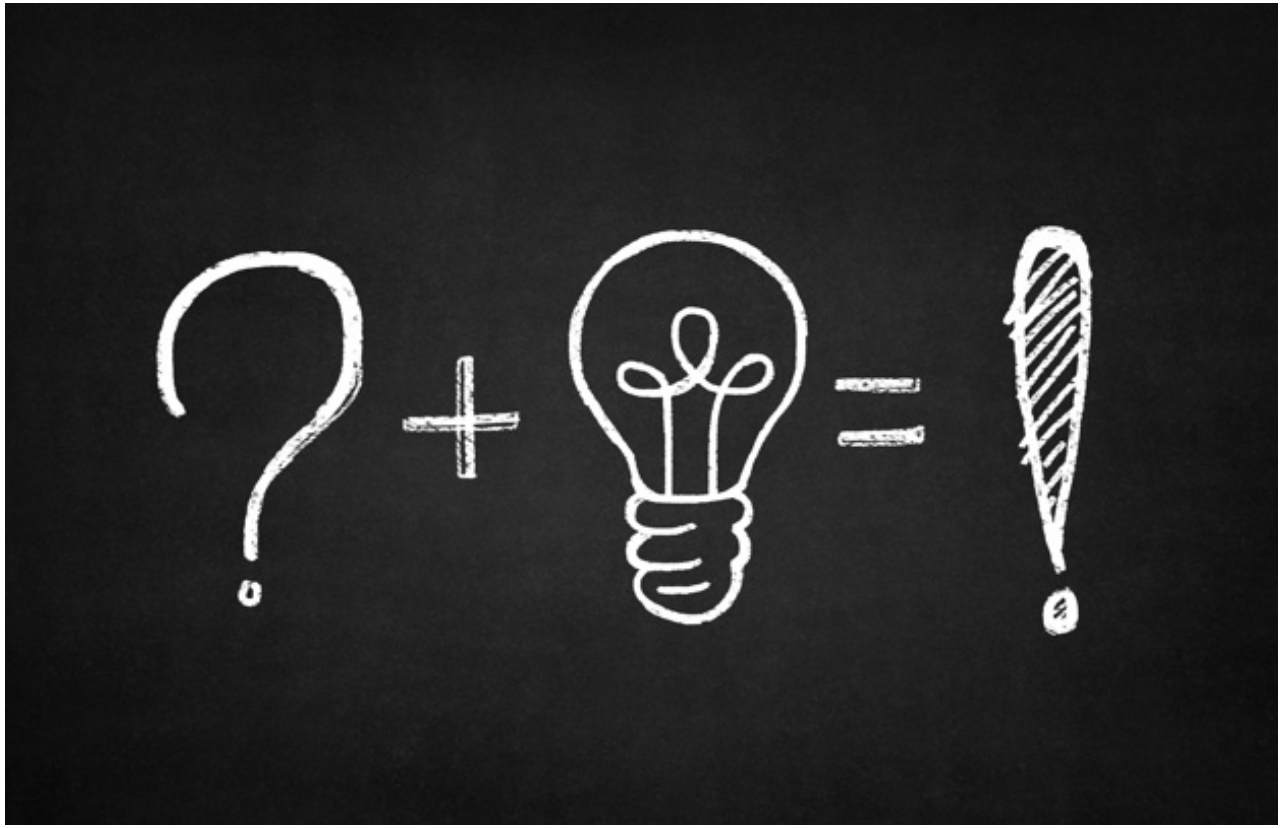
[1]*Israel Oceanographic and Limnological Research, National Institute of Oceanography, P.O. Box 8030, Haifa 31080 Israel*
[2]*Department of Biology, University of Naples Federico II, Naples 80926 Italy*
[3]*CoNISMa, Piazzale Flaminio 9, Roma 00196 Italy*
[4]*Stazione Zoologica Anton Dohrn, Naples 80121 Italy*
[5]*University Iuav of Venice, Tolentini 191, Venice 30135 Italy*
[6]*CNR-IAS, via Giovanni da Verrazzano 17, Castellammare del Golfo 91014 Italy*
[7]*Department of Life & Environmental Science, Polytechnic University of Marche, Ancona 60131 Italy*
[8]*NatureBureau, Votec House, Hambridge Road, Newbury RG14 5TN United Kingdom*
[9]*Department of Ecology, School of Biology, Aristotle University of Thessaloniki, Thessaloniki 54124 Greece*
[10]*Institute of Marine Sciences, CSIC, Passeig Marítim de la Barceloneta, Barcelona 37-49 08003 Spain*
[11]*Aix Marseille Université, Université de Toulon, CNRS, IRD, MIO, Marseille, France*
[12]*Department of Biology, University of Pisa, Pisa, Italy*
[13]*National Center for Scientific Research, PSL Université Paris, CRIOBE, USR 3278 CNRS-EPHE-UPVD, Maison des Océans, 195 rue Saint-Jacques, Paris 75005 France*
[14]*Laboratoire d'Excellence CORAIL, Moorea, French Polynesia*
[15]*Department of Marine Sciences, University of the Aegean, 81100 Mytilene, Greece*

Citation: Rilov, G., S. Fraschetti, E. Gissi, C. Pipitone, F. Badalamenti, L. Tamburello, E. Menini, P. Goriup, A. D. Mazaris, J. Garrabou, L. Benedetti-Cecchi, R. Danovaro, C. Loiseau, J. Claudet, and S. Katsanevakis. 2019. A fast-moving target: achieving marine conservation goals under shifting climate and policies. Ecological Applications 00(00):e02009. 10.1002/eap.2009

"Only three [EU] countries (…) considered **adaptation and mitigation to climate change** (…) as an objective of their **[marine spatial] plan**, for which **specific actions** are put in place.

All other (…) **ignore this threat entirely in their plans**"

GLOBAL CLIMATE CHANGE & MSP



nature sustainability

REVIEW ARTICLE

https://doi.org/10.1038/s41893-020-0513-x

Check for updates

Integrating climate change in ocean planning

Catarina Frazão Santos[1,2]✉, Tundi Agardy[3], Francisco Andrade[1], Helena Calado[4], Larry B. Crowder[5], Charles N. Ehler[6], Sara García-Morales[1], Elena Gissi[7], Benjamin S. Halpern[8,9], Michael K. Orbach[10], Hans-Otto Pörtner[11,12] and Rui Rosa[1]

The acceleration of global warming and increased vulnerability of marine social-ecological systems affect the benefits provided by the ocean. Spatial planning of marine areas is vital to balance multiple human demands and ensure a healthy ocean, while supporting global ocean goals. To thrive in a changing ocean though, marine spatial planning (MSP) must effectively integrate climate change. By reviewing existing literature on MSP and climate change, we explore the links between them and with ocean sustainability, highlight management challenges, and identify potential pathways to guide action towards the effective integration of climate impacts in MSP.

The sustainable use and conservation of the world ocean and its resources represent one of the 17 global goals set to 'transform our world' in the context of the United Nations (UN) 2030 Agenda for Sustainable Development[1]. Although such global agreement on promoting sustainability in the ocean is relatively recent, protecting marine ecosystems has been in the international agenda for decades[2,3], with numerous actions, approaches, frameworks and plans being developed and implemented to support it. These include the ecosystem approach, with its origins in the UN Convention on Biological Diversity[4], ecosystem-based management (EBM) that grew out of the ecosystem approach[5], the integrated management concept that stemmed from Chapter 17 of the Agenda 21[6], or international treaties such as the UN Convention on the Law of the Sea (UNCLOS)[2].

Concomitant to these developments, and incorporating many of these concepts (for example, the ecosystem approach and integrated management; Box 1), in the 1990s a management process commonly known as marine spatial planning (MSP) emerged and has spread widely in the last 15 years[7]. No single definition exists for MSP; it takes many forms and names depending on context (Box 1). However, it can be generally outlined as the analysis and allocation of the spatial and temporal distribution of human uses

most of them are in early stages of development (only 25 countries have marine spatial plans that are already implemented or at least government approved; Fig. 1)[7].

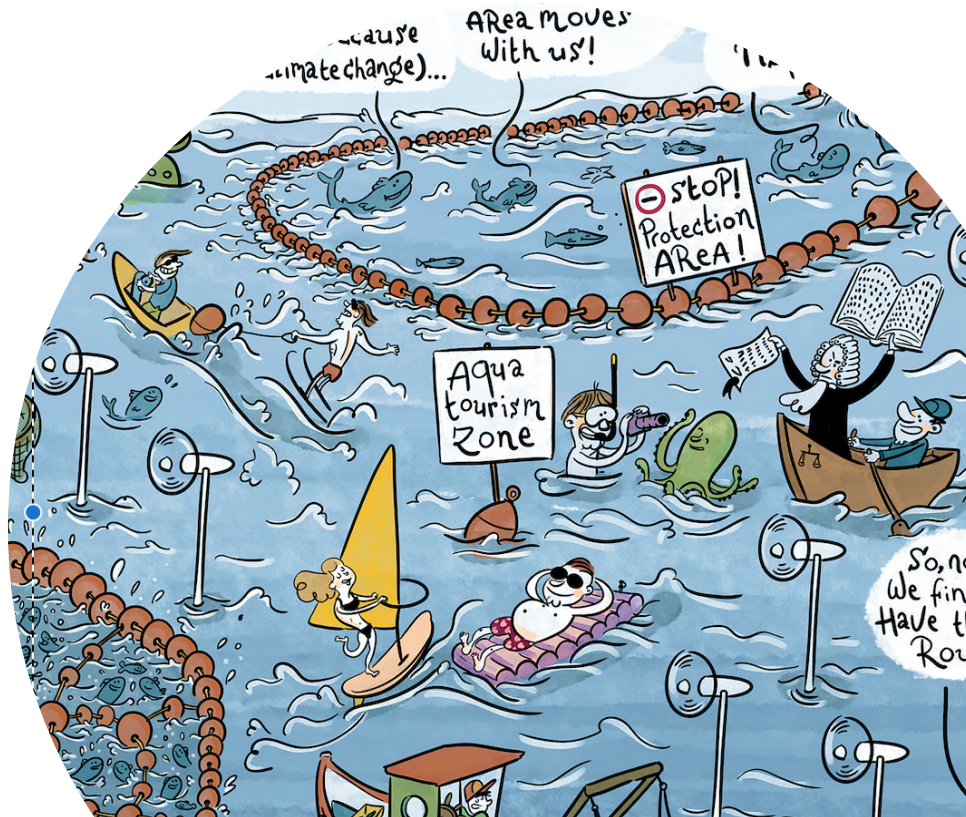
MSP will likely keep expanding in the coming decade as new countries start to discuss the development of ocean planning initiatives, especially in Africa and South America. For example, the European Union (EU) funded Paddle project ('Planning in a liquid world with tropical stakes'; www-iuem.univ-brest.fr/paddle) explores opportunities and limits of MSP in Brazil, Senegal and Cabo Verde, although government-led initiatives are not yet in place. MSP in international waters is also being increasingly discussed[12,13], and in early 2019, the European Commission and UNESCO's Intergovernmental Oceanographic Commission (IOC) jointly launched the MSPglobal program (www.mspglobal2030.org) with the intention to support the effective implementation of marine spatial plans worldwide.

Several conceptual and practical challenges limit the efficacy of MSP development and implementation[14]. For example, ensuring ecosystem conservation through MSP is rarely straightforward because the importance of protecting marine ecosystems is often overlooked by economic and/or political short-term goals and objectives, often insensitive to environmental impacts[15,16]. In addi-

OceanPlan

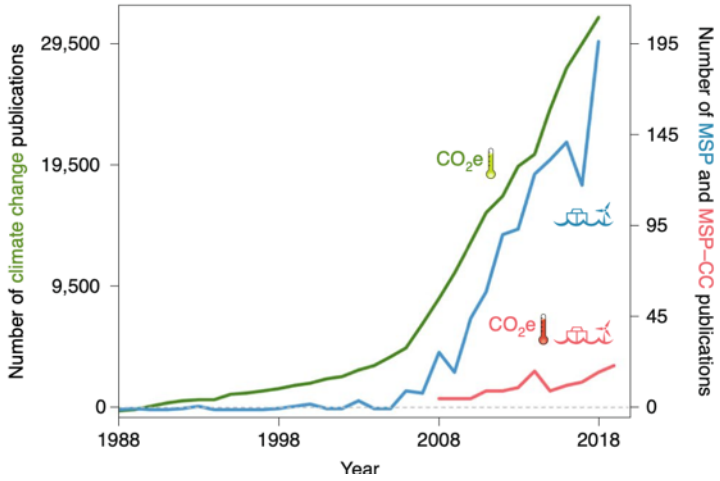
marine spatial planning under a changing climate

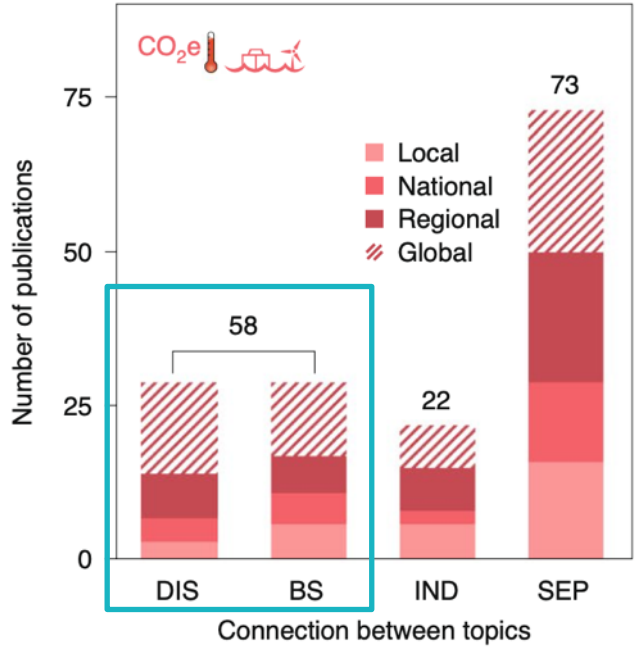
FCT PTDC/CTA-AMB/30226/2017

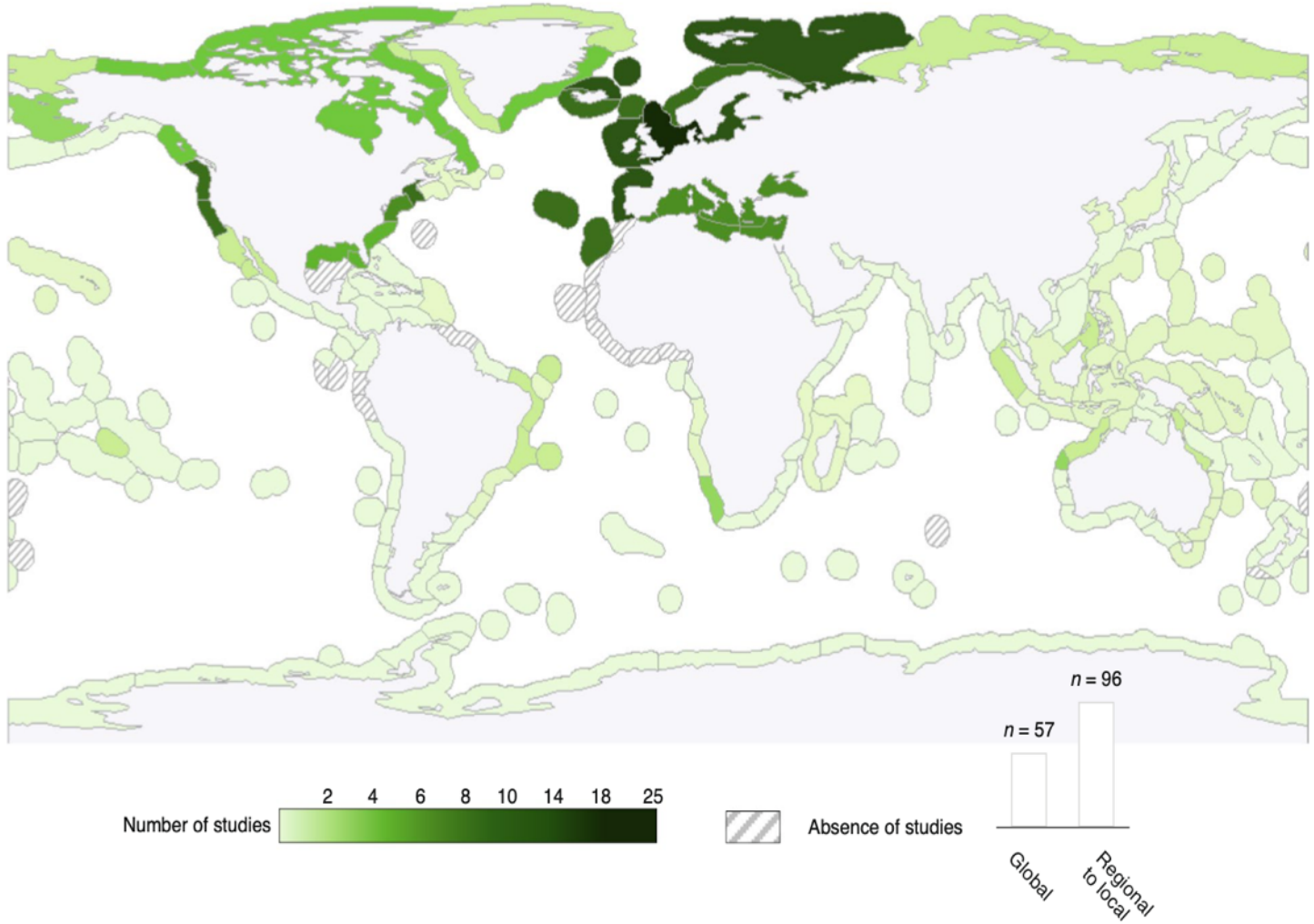


GLOBAL CLIMATE CHANGE & MSP

153 studies







FRAZÃO SANTOS ET AL. (2020)

Ciências ULisboa

I. Raise awareness on the topic importance

II. Integrate climate change in MSP

III. Explore adaptation mechanisms to respond to change

ADAPTIVE GOVERNANCE,
DYNAMIC OCEAN MANAGEMENT, ETC.

13 CLIMATE ACTION

14 LIFE BELOW WATER

Recognizing the need for climate-smart MSP

Ciências ULisboa

Recognizing climate change as a threat or challenge

Ciências ULisboa

Recognizing climate change as a real threat or challenge

Marine Spatial Planning Programme

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Contact | Sitemap | Change language Spanish

With the financial support of GORDON AND BETTY MOORE FOUNDATION

About | MSP Guides | World Applications | MSP Good Practices | References

OVERVIEW

MSP Around th

"An invas
–Victor Hu

Over the past 15
considerable imp

Ecological Applications, 30(1), 2020, e02009

A fast-moving target: achieving marine conservation goals under shifting climate and policies

Gil Rilov,[1,16] Simonetta Fraschetti,[2,3,4] Elena Gissi,[5] Carlo Pipitone,[6] Fabio Badalamenti,[4,6] Laura Tamburello,[3,4] Elisabetta Menini,[7] Paul Goriup,[8] Antonios D. Mazaris,[9] Joaquim Garrabou,[10,11] Lisandro Benedetti-Cecchi,[3,4,12] Roberto Danovaro,[4,7] Charles Loiseau,[13] Joachim Claudet,[13,14] and Stelios Katsanevakis[15]

[1]*Israel Oceanographic and Limnological Research, National Institute of Oceanography, P.O. Box 8030, Haifa 31080 Israel*
[2]*Department of Biology, University of Naples Federico II, Naples 80926 Italy*
[3]*CoNISMa, Piazzale Flaminio 9, Roma 00196 Italy*
[4]*Stazione Zoologica Anton Dohrn, Naples 80121 Italy*
[5]*University Iuav of Venice, Tolentini 191, Venice 30135 Italy*
[6]*CNR-IAS, via Giovanni da Verrazzano 17, Castellammare del Golfo 91014 Italy*
[7]*Department of Life & Environmental Science, Polytechnic University of Marche, Ancona 60131 Italy*
[8]*NatureBureau, Votec House, Hambridge Road, Newbury RG14 5TN United Kingdom*
[9]*Department of Ecology, School of Biology, Aristotle University of Thessaloniki, Thessaloniki 54124 Greece*
[10]*Institute of Marine Sciences, CSIC, Passeig Marítim de la Barceloneta, Barcelona 37-49 08003 Spain*
[11]*Aix Marseille Université, Université de Toulon, CNRS, IRD, MIO, Marseille, France*
[12]*Department of Biology, University of Pisa, Pisa, Italy*
[13]*National Center for Scientific Research, PSL Université Paris, CRIOBE, USR 3278 CNRS-EPHE-UPVD, Maison des Océans, 195 rue Saint-Jacques, Paris 75005 France*
[14]*Laboratoire d'Excellence CORAIL, Moorea, French Polynesia*
[15]*Department of Marine Sciences, University of the Aegean, 81100 Mytilene, Greece*

Citation: Rilov, G., S. Fraschetti, E. Gissi, C. Pipitone, F. Badalamenti, L. Tamburello, E. Menini, P. Goriup, A. D. Mazaris, J. Garrabou, L. Benedetti-Cecchi, R. Danovaro, C. Loiseau, J. Claudet, and S. Katsanevakis. 2020. A fast-moving target: achieving marine conservation goals under shifting climate and policies. Ecological Applications 30(1):e02009. 10.1002/eap.2009

Integrating climate change

Spatial-use scenarios and visioning processes

STEP 6 DEFINING AND ANALYZING FUTURE CONDITIONS

"Before we can create a desirable future, we first need to imagine it"

What outputs should be delivered from this step?

- A **trend scenario** illustrating how the MSP area will look if present conditions continue without new management interventions;
- Alternative **spatial sea use scenarios** illustrating how the management area might look when human activities are redistributed based on new goals and objectives; and
- A **preferred scenario** that provides the basis for identifying and selecting management measures in the spatial management plan (Step 7).

Introduction

The previous step concentrated on analyzing existing conditions within the marine management area. Its main purpose was to gain understanding of the existing distribution of important ecological and economic areas in the marine environment and the nature and scope of its human uses. Essentially, it provides an inventory of what exists today in the management area.

The purpose of this phase of the planning process is to answer another seemingly simple question: **Where do we want to be?** The answer takes the form of alternative spatial sea use scenarios and the selection of a preferred scenario.

A spatial sea use scenario provides a vision that projects the future use of marine space based on a core set of goals, objectives, and assumptions about the future.

MSP is a future-oriented activity. Its purpose is to help envision and create a desirable future and enable proactive decision-making in the short run to move toward what is desired. Consequently, planning should not be limited to defining and analyzing only existing conditions and maintaining the status quo, but should reveal possible alternative futures of how the area could look like in another 10, 15, or 20 years. Box 26 lists a number of other reasons why the development of alternative spatial sea use scenarios is important.

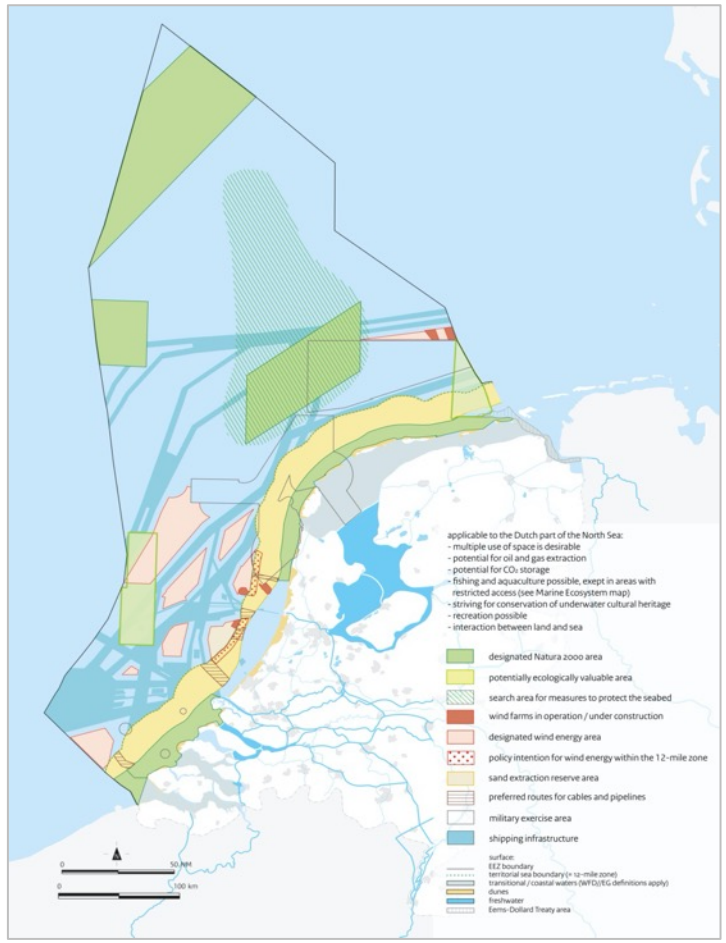
Defining and analyzing future conditions involves the following tasks:

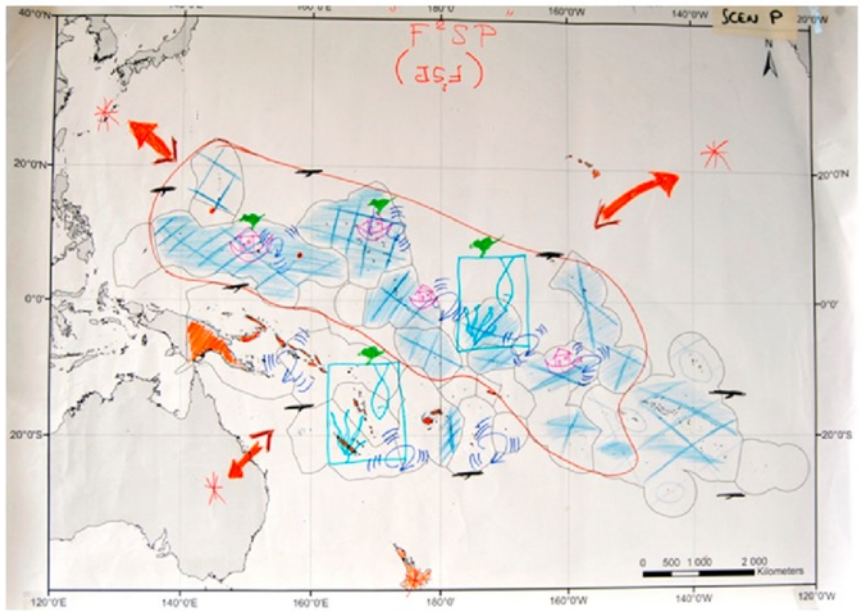
(1) Projecting current trends in the spatial and temporal needs of existing human uses;
(2) Estimating spatial and temporal requirements for new demands of ocean space;
(3) Identifying possible alternative future scenarios for the planning area; and
(4) Selecting the preferred spatial sea use scenario

Each of these steps are discussed in more detail in the following sections.

Ciências ULisboa

Spatial-use scenarios and visioning processes





Group n° :

PACIOCEA Workshop n°2
18-21 August 2014 - Nouméa
Territory Game

Legend Scenario

« F²SP : Federated floating states of the Pacific »

N°	Symbol	Description
1		Disapearance of land with sea level rise
2		Migration fluxes and welcoming lands
3		Exploitation of resources in exchange of population welcoming
4		High tech floating houses
5		Integrated multi-trophic aquaculture and fisheries
6		Conflicts in welcoming land because of difficulties of integration of immigrants from the Pacific
7		Gliders for safety and monitoring
8		Renewable energy production (based on marine biomass and wave dynamics)
9		Artificial structure for preservation of iconic species

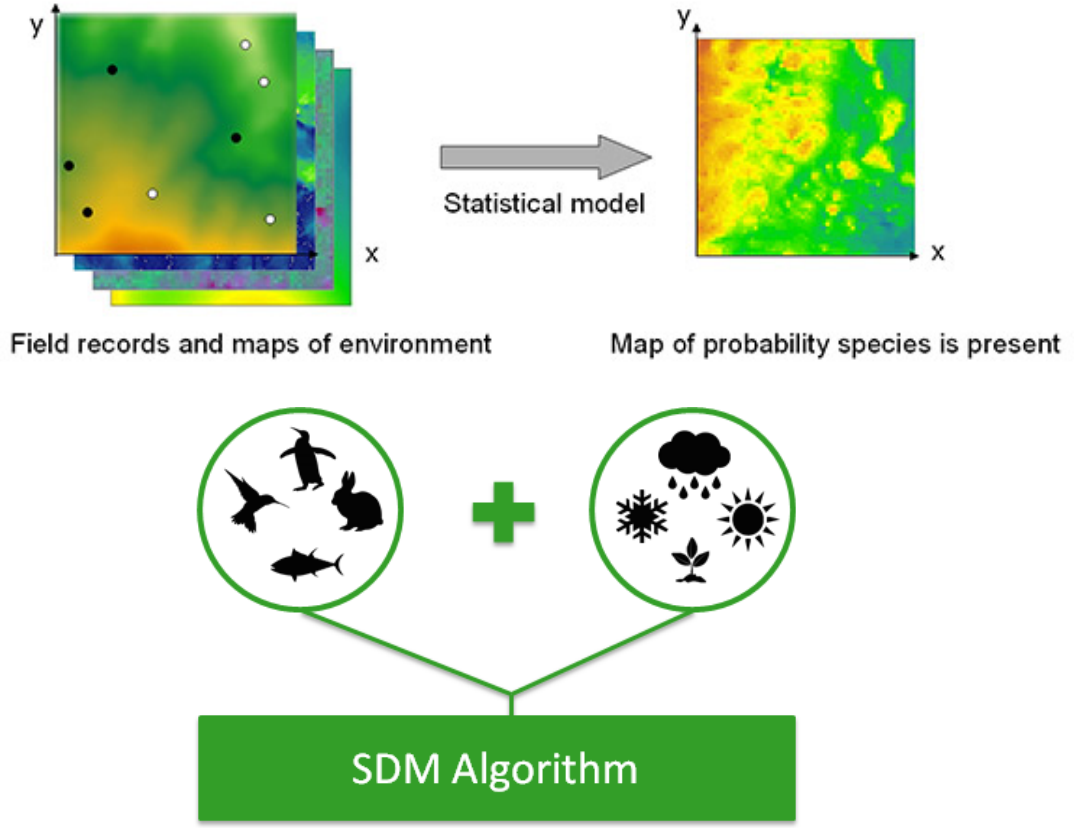
Western Tropical Pacific Ocean

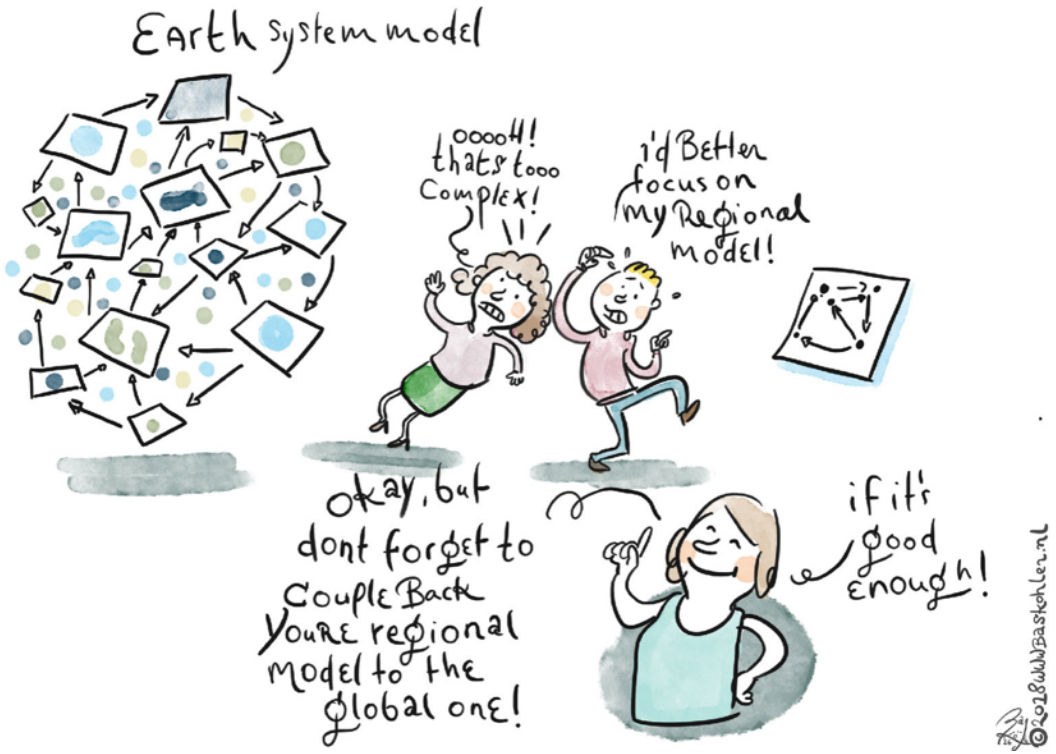
Netherlands

Ciências ULisboa

Modelling and mapping tools

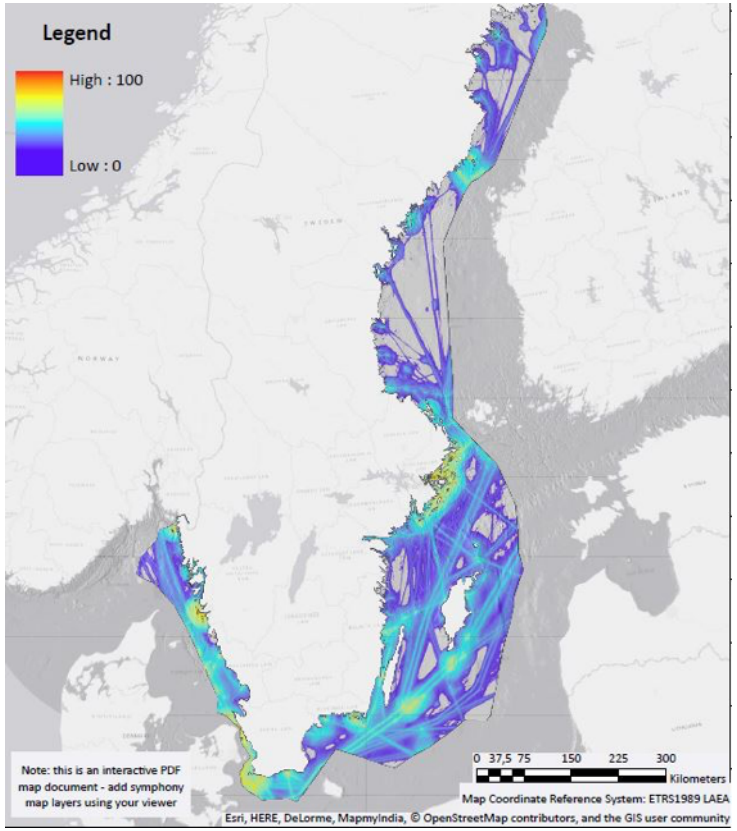
changes in ecosystem goods and services and related human activities





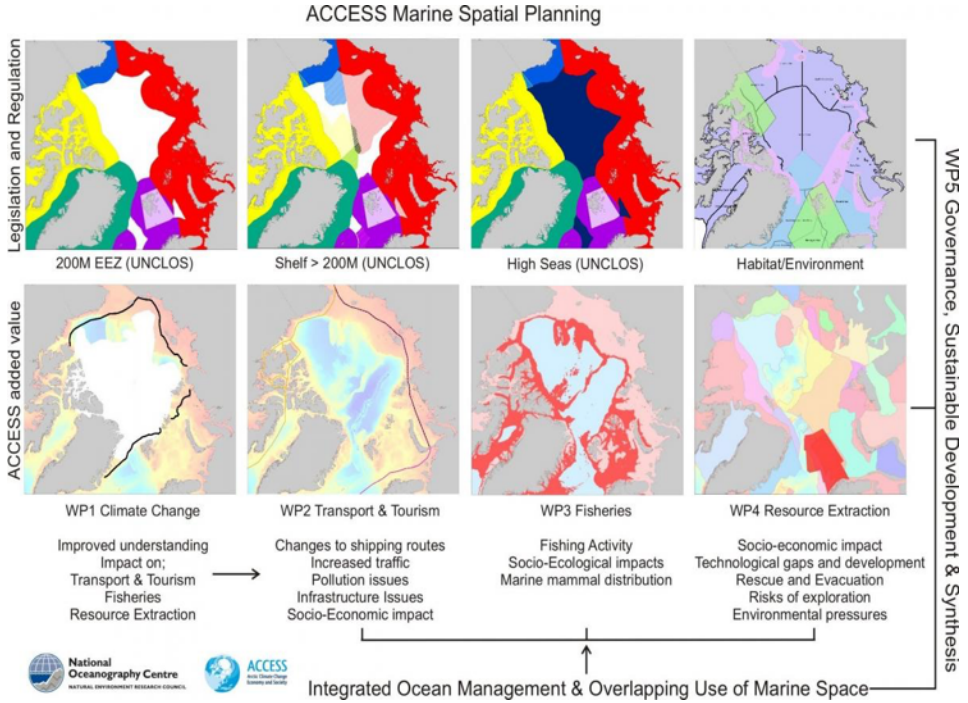
Modelling and mapping tools

changes in ecosystem services and related human activities



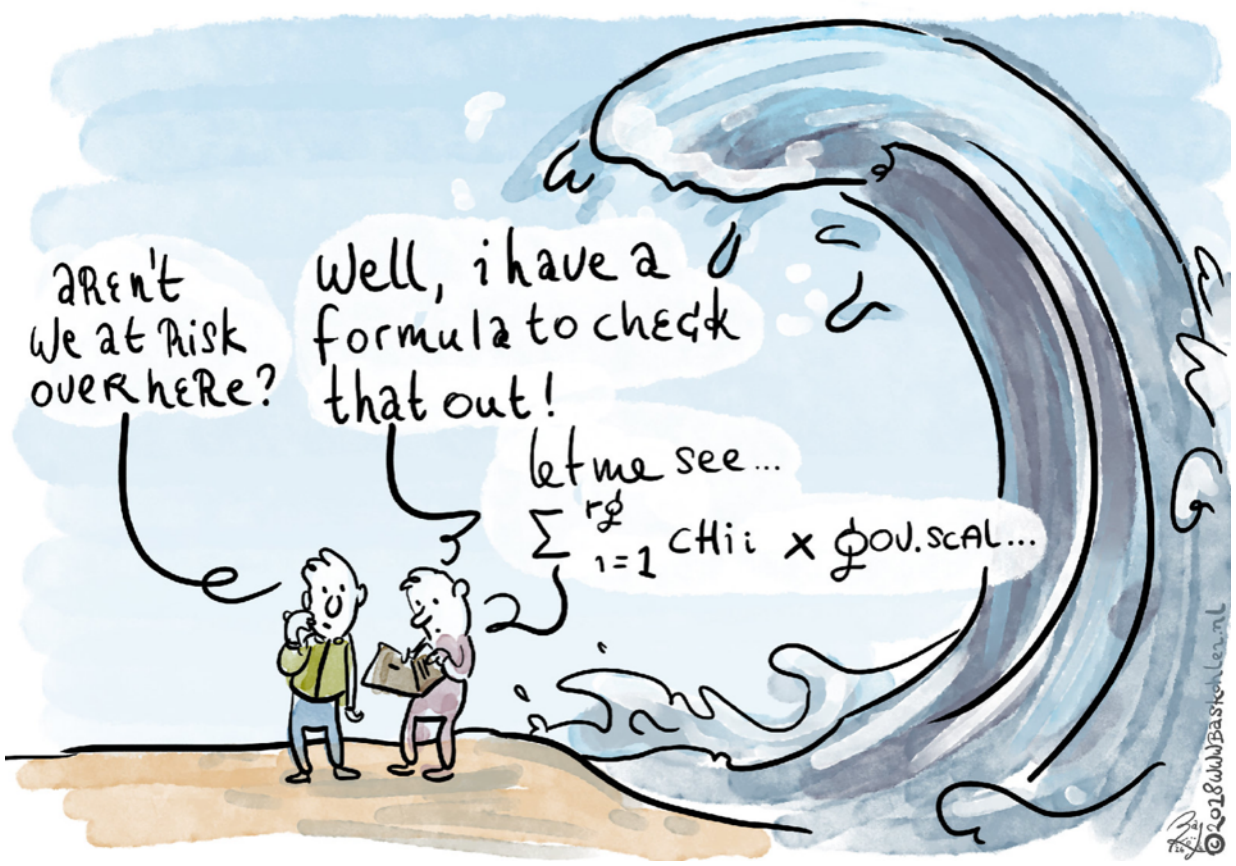
Symphony tool (Sweden)

ACCESS tool (Arctic)



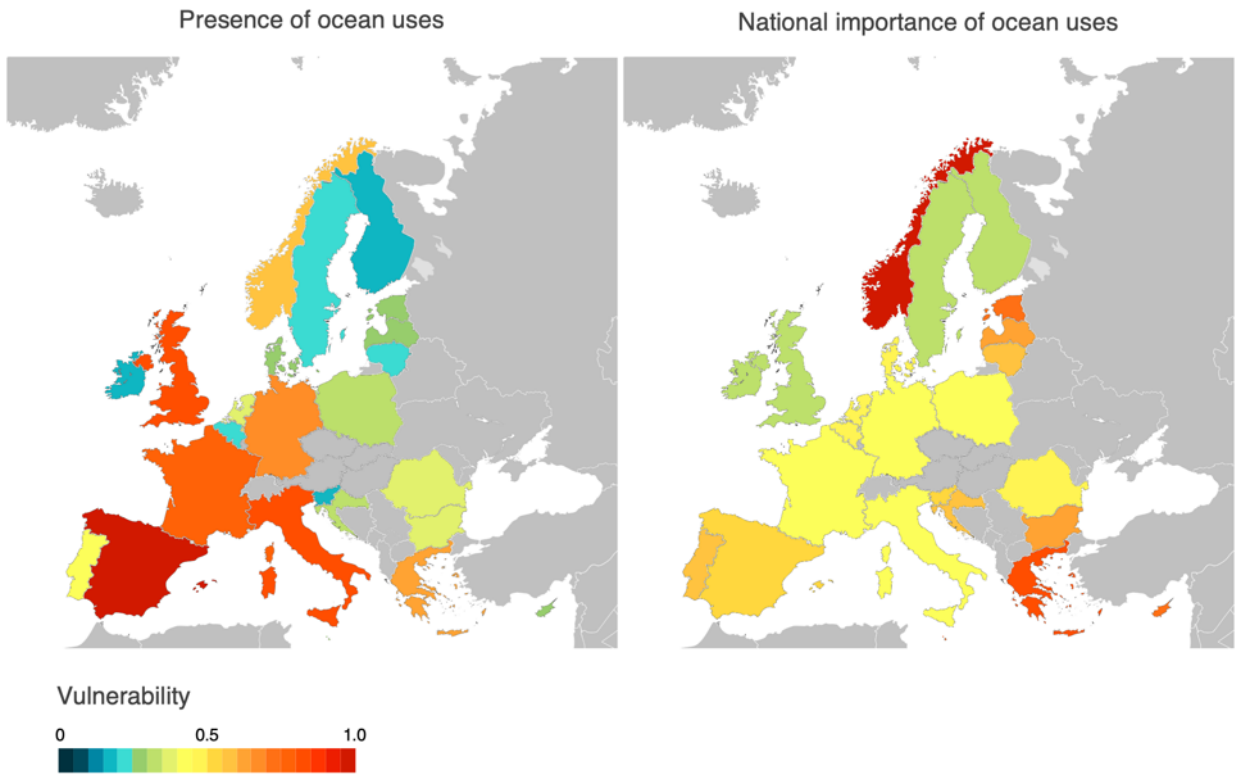
Ciências ULisboa

Climate-related vulnerability and risk analyses



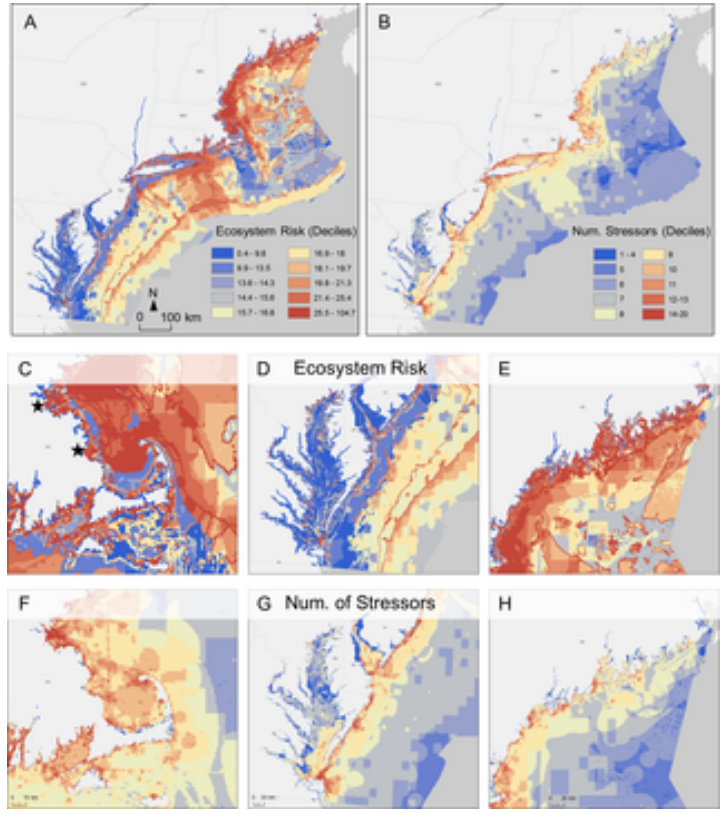
Ciências ULisboa

Climate-related vulnerability and risk analyses



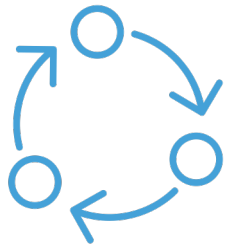
Socio-ecological vulnerability (Europe)

Socio-economic vulnerability (Moorea)



Habitat risk assessment (US)

Promoting adaptation



Ciências ULisboa

Adaptação

Qualquer ***ajuste*** **nos sistemas naturais e humanos** em resposta aos **efeitos** positivos ou negativos, actuais ou esperados, das **alterações climáticas**

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Ciências ULisboa

Adaptação

Envolve a **tomada de acção** (medidas)

Medidas de adaptação são aquelas que **aumentam** a nossa **resiliência**, e a capacidade de nos adaptarmos ou tiramos **vantagem** das consequências das alterações climáticas.

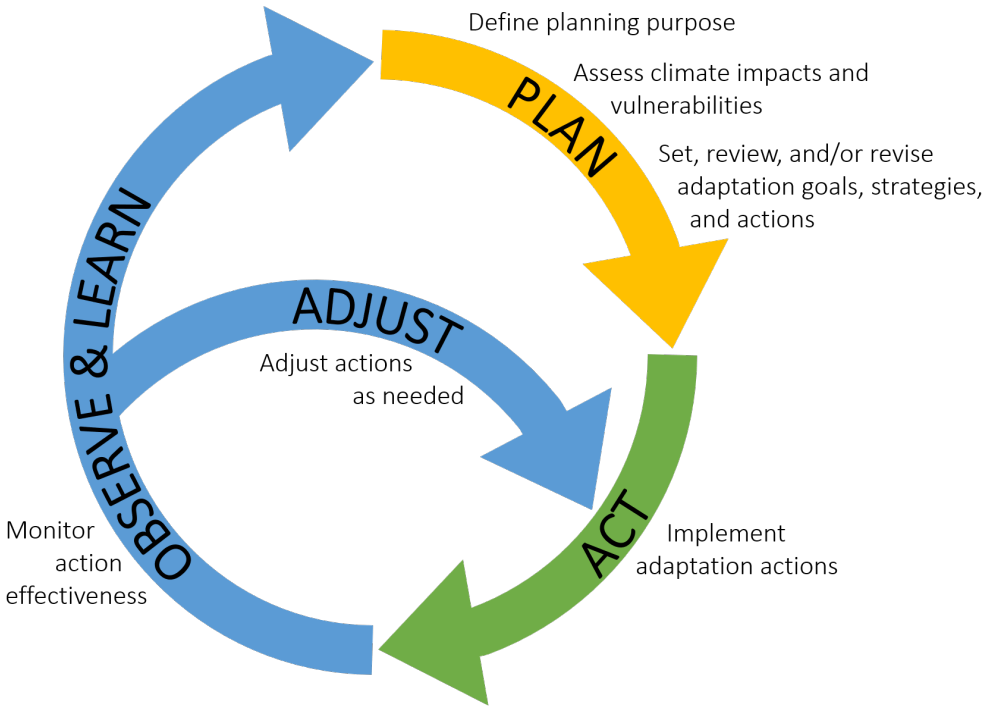
Podem ser **nacionais, regionais e locais**

A **adaptação** e a **mitigação** (limitar/minimizar as causas antropogénicas das AC) **são essenciais** para lidar com os **desafios e oportunidades** associadas às AC

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Climate Change Adaptation Cycle

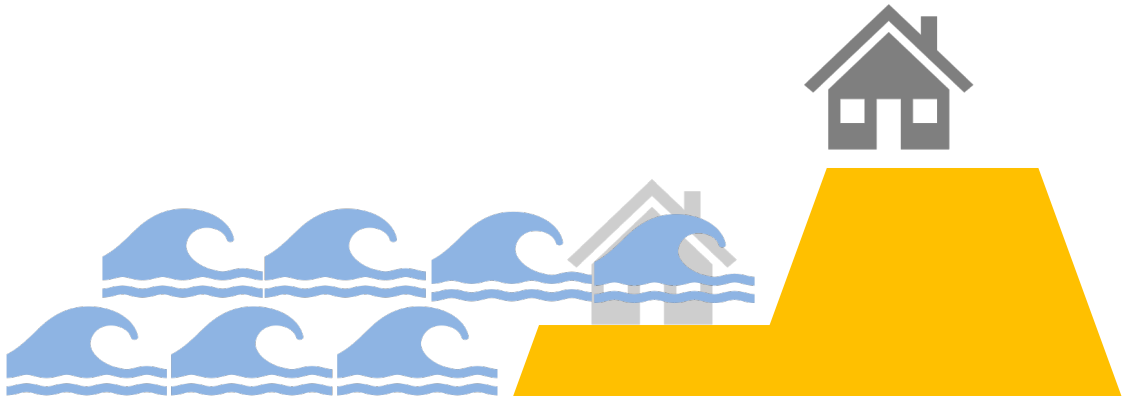


Ciências ULisboa

Mitigation

actions to **prevent**
sea level rise
(e.g. decrease emissions)

Adaptation



actions to **minimize**
sea level rise **impacts**
(e.g. relocation)

EU recognizes the challenge

The EU Adaptation Strategy has three objectives.

1. Promoting action by Member States:

The Commission encourages all Member States to adopt comprehensive adaptation strategies (15 had strategies as of mid-2013) and will provide guidance and funding to help them build up their adaptation capacities and take action. The Commission will also support adaptation in cities by launching a voluntary commitment based on the Covenant of Mayors initiative.

2. Promoting better informed decision-making by addressing gaps in knowledge about adaptation and further developing the European Climate Adaptation Platform (Climate-ADAPT) as the 'one-stop shop' for adaptation information in Europe.

3. Promoting adaptation in key vulnerable sectors through agriculture, fisheries and cohesion policy, ensuring that Europe's infrastructure is made more resilient, and encouraging the use of insurance against natural and man-made disasters.

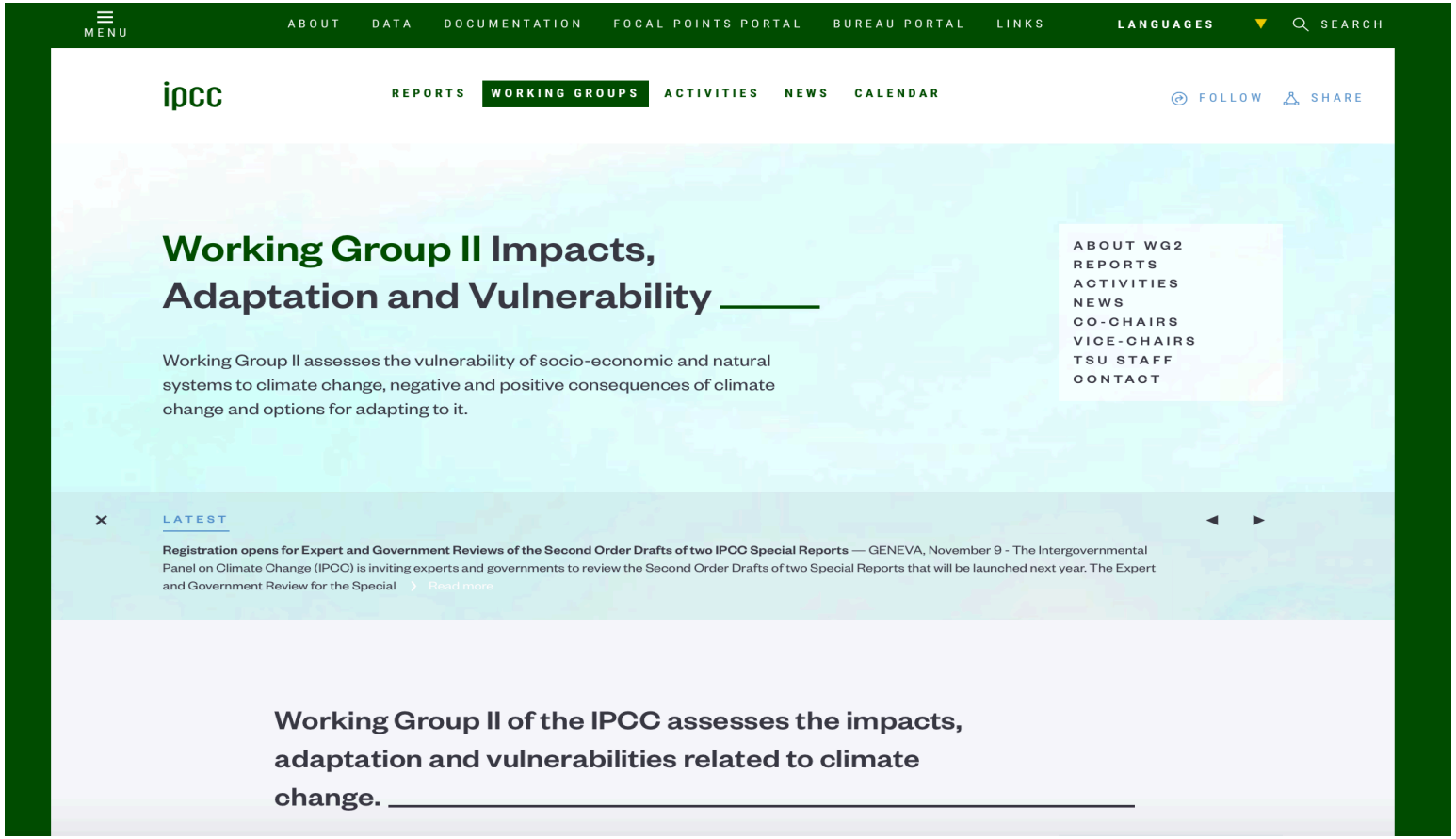
Ciências ULisboa

Climate-ADAPT (Europe)

https://climate-adapt.eea.europa.eu

Ciências ULisboa

IPCC – Working Group II (worldwide)



https://www.ipcc.ch/working-group/wg2/

United Nations

Home About Us Login

Search

UNITED NATIONS DEVELOPMENT PROGRAMME

Climate Change Adaptation

Signature Programmes Resources Media Centre Impact

National Adaptation Programmes of Action (NAPAs)

National Adaptation Programmes of Action (NAPAs) provide a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change – those for which further delay would increase vulnerability and/or costs at a later stage.

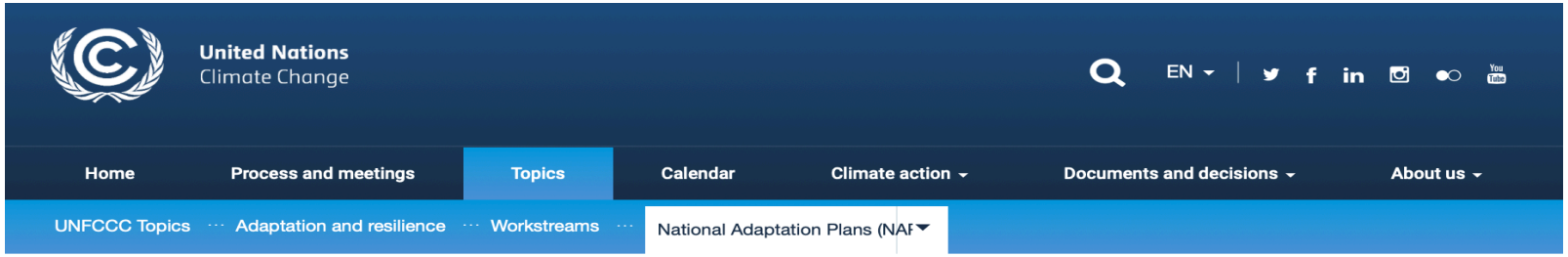
To date, UNDP has supported 31 countries in preparing and submitting their National Adaptation Programme of Action (NAPA) to the UNFCCC, with financing from the LDCF.

The UNDP publication, *Water Adaptation in National Adaptation Programmes for Action*, published January 2009, details some of the work in the NAPA process on integrating climate adaptation in freshwater planning.

https://www.adaptation-undp.org/national-adaptation-programmes-action-napas

Ciências ULisboa

United Nations



National Adaptation Plans

https://unfccc.int/topics/adaptation-and-resilience/workstreams/national-adaptation-plans

ADAPTATION TO CLIMATE CHANGE

Ciências ULisboa

OECD (worldwide)

OECD

BETTER POLICIES FOR BETTER LIVES

A to Z

Google Custom search

OECD Home | About | Countries | Topics | Français

OECD Home › Environment Directorate › Climate change › Adaptation to climate change

- Biodiversity, water and natural resource management
- Chemical safety and biosafety
- Climate change
- Consumption, innovation and the environment
- Environment and trade
- Environment in emerging and transition economies
- Environmental country reviews
- Environmental indicators, modelling and outlooks
- Environmental policy tools and evaluation
- Greening transport

Adaptation to climate change

Publications | Events | Blogs | Contact

Climate change poses serious, wide-ranging risks to economies, societies and ecosystems. These risks include: damage to coastal infrastructure, shifting patterns of infectious diseases and loss of food security.

Reducing these risks requires action to sharply reduce greenhouse gas emissions (mitigation), combined with measures to increase resilience to the impacts that occur (adaptation).

The OECD supports countries' efforts to prepare for the effects of a changing climate by providing impartial analysis, policy advice and supporting the sharing of experiences between the public and private sectors.

LATEST REPORTS

- Climate-resilient Infrastructure I Environment Policy Paper, December 2018
- Innovative Approaches to Building Resilient Coastal Infrastructure I Environment Policy Paper, September 2018

http://www.oecd.org/env/cc/adaptation.htm#Publications

Back to MSP !

Several approaches can foster adaptation:

Adaptive management

Anticipatory Zoning

Dynamic Zoning

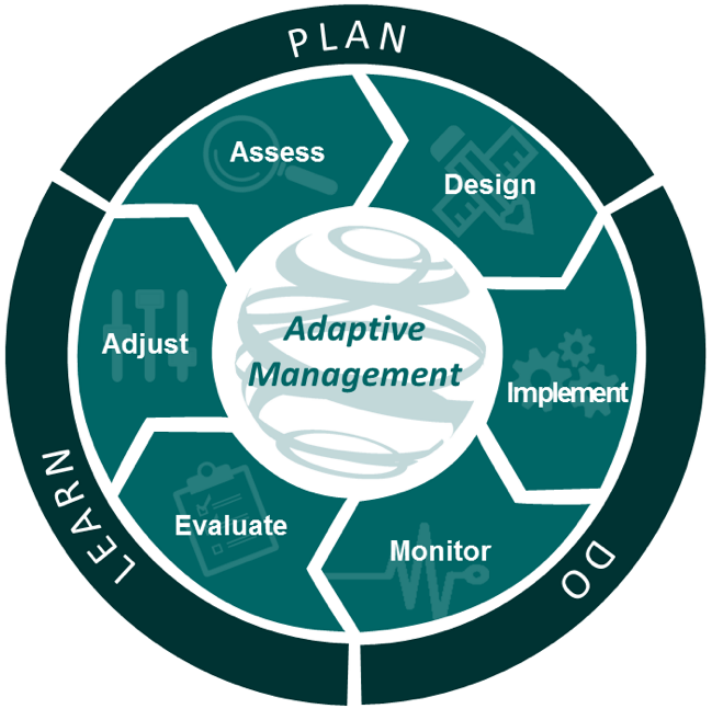
Dynamic Ocean Management

Planning Just-in-time

Adaptive management

Ciências ULisboa

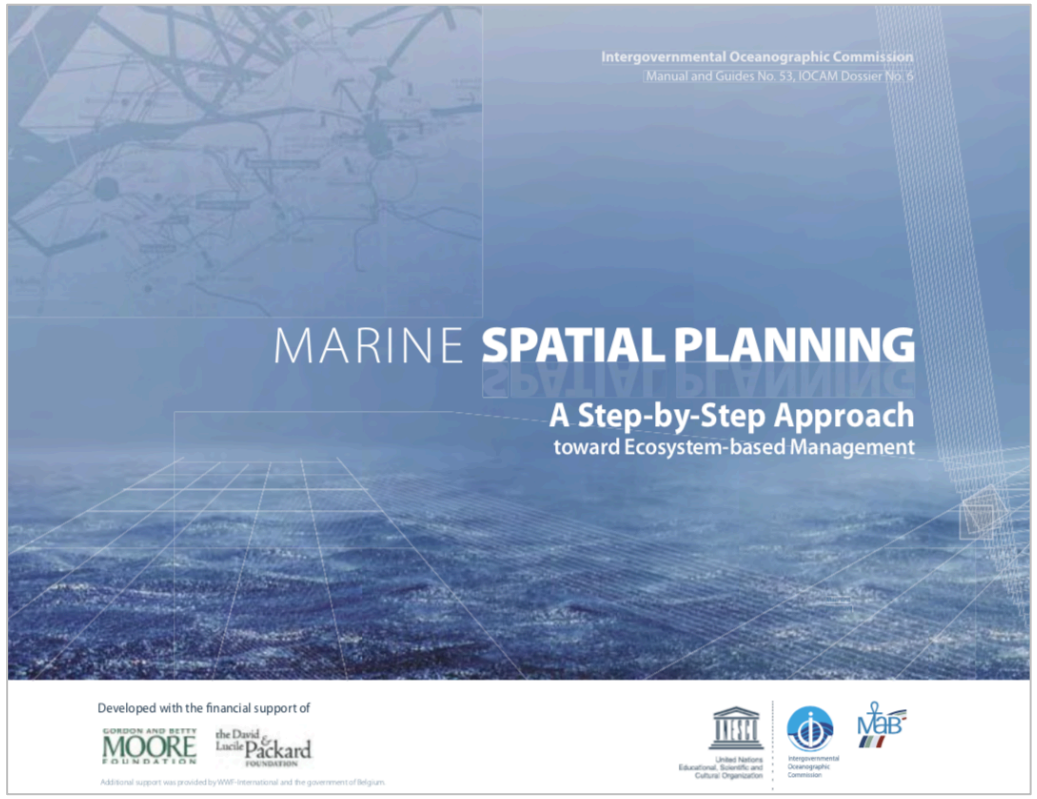
Management approach focused on the systematic learning through experimentation, monitoring and evaluation, and the subsequent adaptation of policy and management options according to obtained results



Actions are adjusted based on obtained results

Adaptive management

Conceptually, adaptive management is embedded in MSP…



http://unesdoc.unesco.org/images/0018/001865/186559e.pdf

A **10-step guide** to understanding what MSP is and how it can be **put into practice** toward achieving ecosystem-based management

Adaptive management

Developed between **November 2007** and **May 2009**

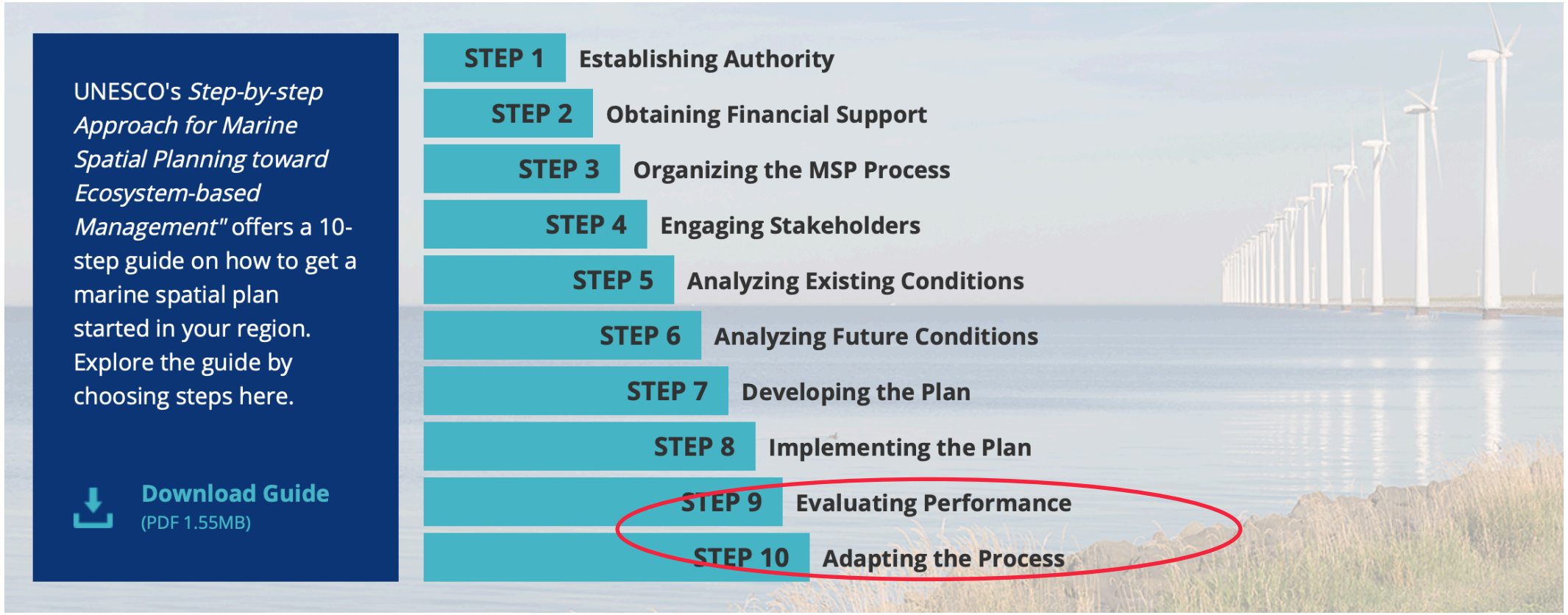
Steps were based on **real world MSP practices** around the globe

The guide was **refined and revised** during expert meetings and "fine-tuning" events with resource managers and decision makers (Massachusetts and Viet Nam)

Adaptive management

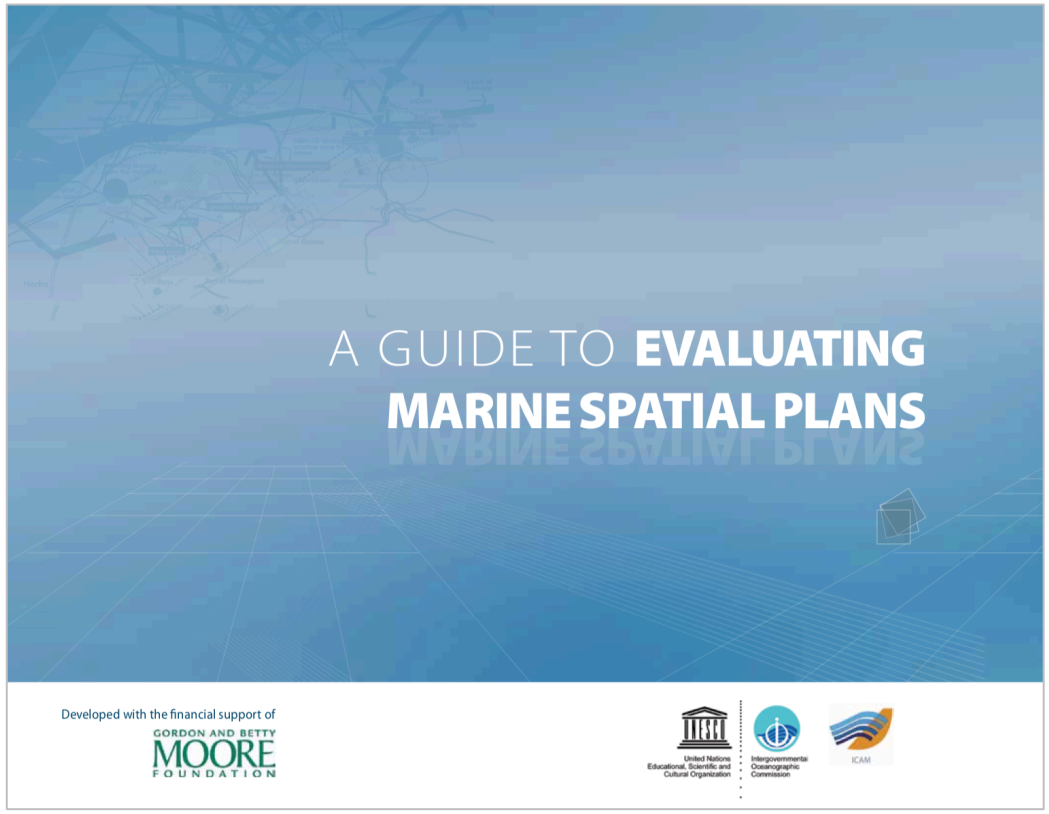
The 10 Steps

http://msp.ioc-unesco.org/msp-guides/msp-step-by-step-approach/



Adaptive management

Step 9. Monitoring and evaluating performance



2014

http://unesdoc.unesco.org/images/0022/002277/227779e.pdf

Adaptive management

Step 9. Monitoring and evaluating performance

TASK 1. DEVELOPING A **PERFORMANCE MONITORING & EVALUATION** PLAN

Performance monitoring and **evaluation** is key to adaptive management (**STEP 10**)

! If we do not measure results, we cannot tell success from failure

If performance monitoring and evaluation **results** are **not used to modify** revisions to **future plans**, then the process has **not been successful**

! Selection of relevant and measurable indicators is one of the most important components of performance monitoring and evaluation

Adaptive management

Step 9. Monitoring and evaluating performance

TASK 2. **EVALUATE** PERFORMANCE MONITORING DATA

Evaluation is the element of management in which the **greatest learning** is to occur – it allows information concerning the **past** to feed back into, and improve the way management is conducted in the **future**

Evaluation consists of **reviewing the results** of actions taken and **assessing** whether these actions have **produced the desired results**

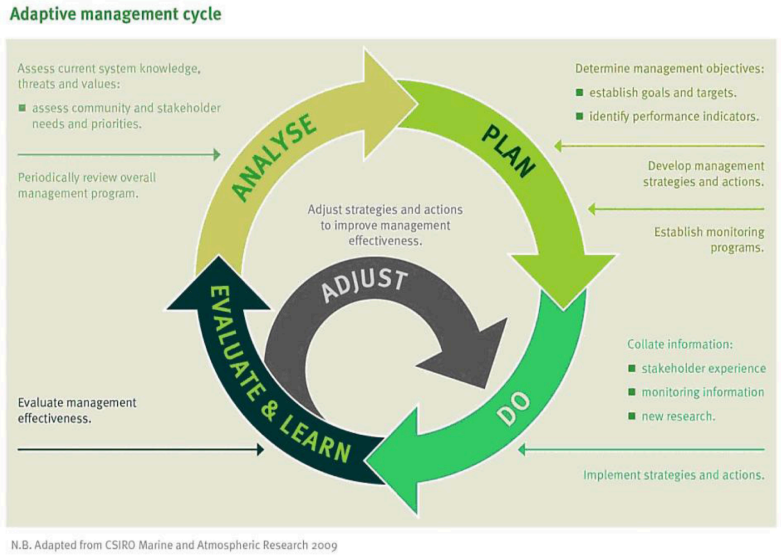
! **Ideally, evaluation should be undertaken periodically during the lifetime of the MSP process**

Adaptive management

Step 10. Adapting the spatial management process

Adaptive management is **needed** for MSP is to be **sustained** over time

! However adaptive management is rarely implemented



Adaptive management

Step 10. Adapting the spatial management process

TASK 1. PROPOSE **CHANGES** IN OBJECTIVES AND MANAGEMENT ACTIONS

This step must address two broad **questions**:

? What has been accomplished through the MSP process and learned from its successes and failures?

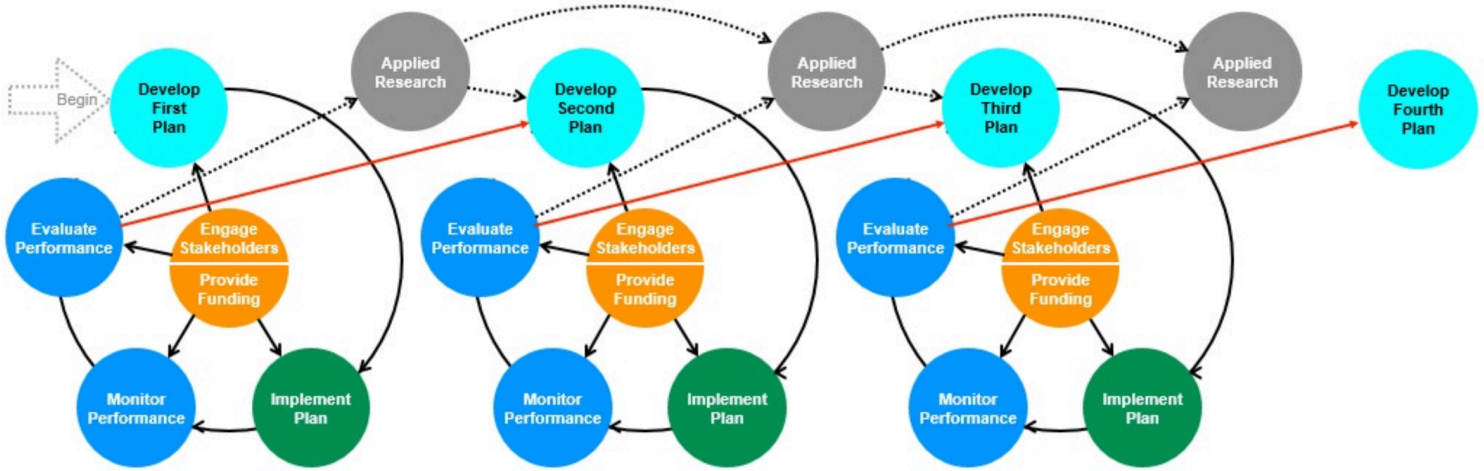
? How has the context (e.g. environment, governance, technology, economy) changed since the programme was initiated?

The **answers** to these questions can then be **used to re-focus planning** and management in the future

Adaptive management

Step 10. Adapting the spatial management process

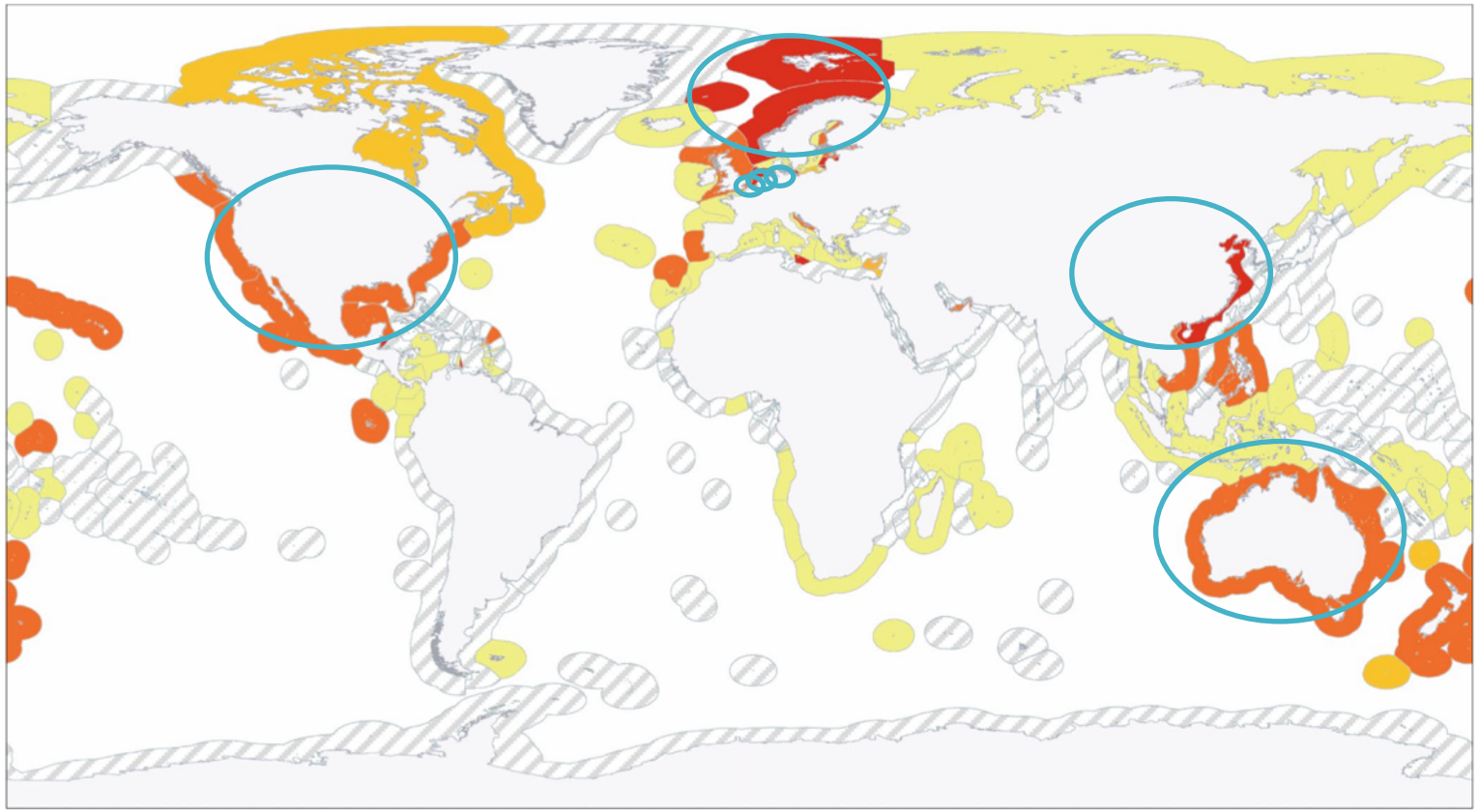
TASK 3. START THE **NEXT ROUND** OF MSP

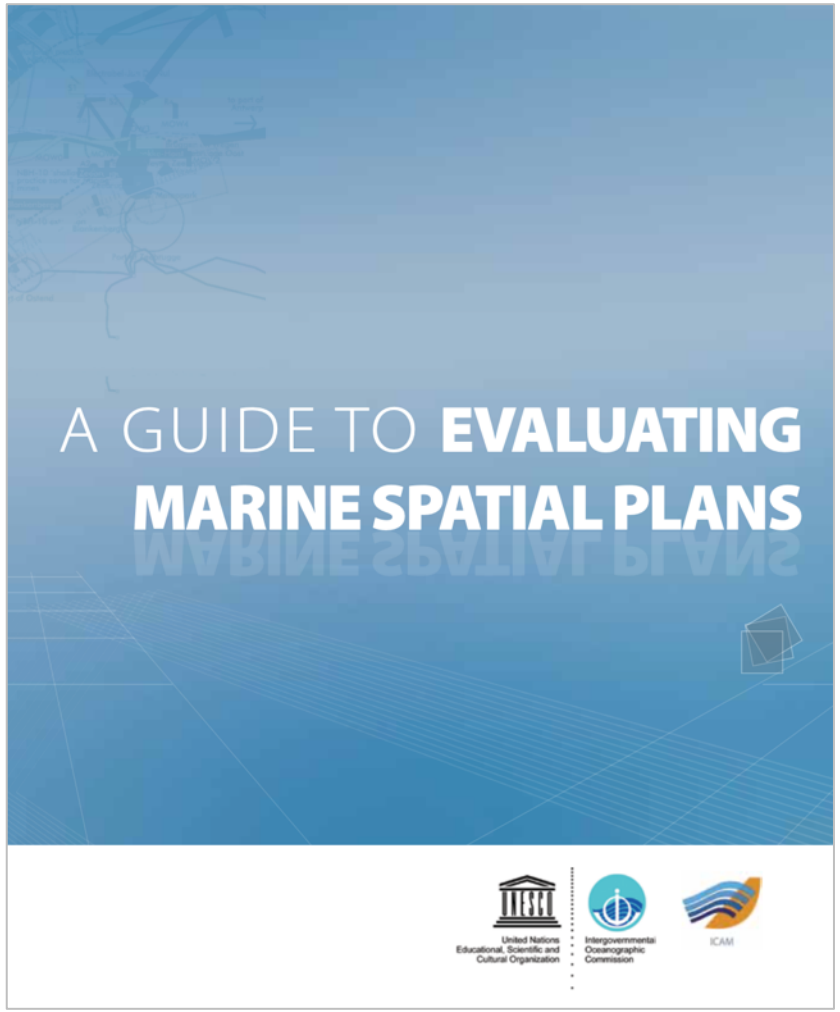


http://msp.ioc-unesco.org/msp-good-practices/adapting-the-process/

Adaptive management

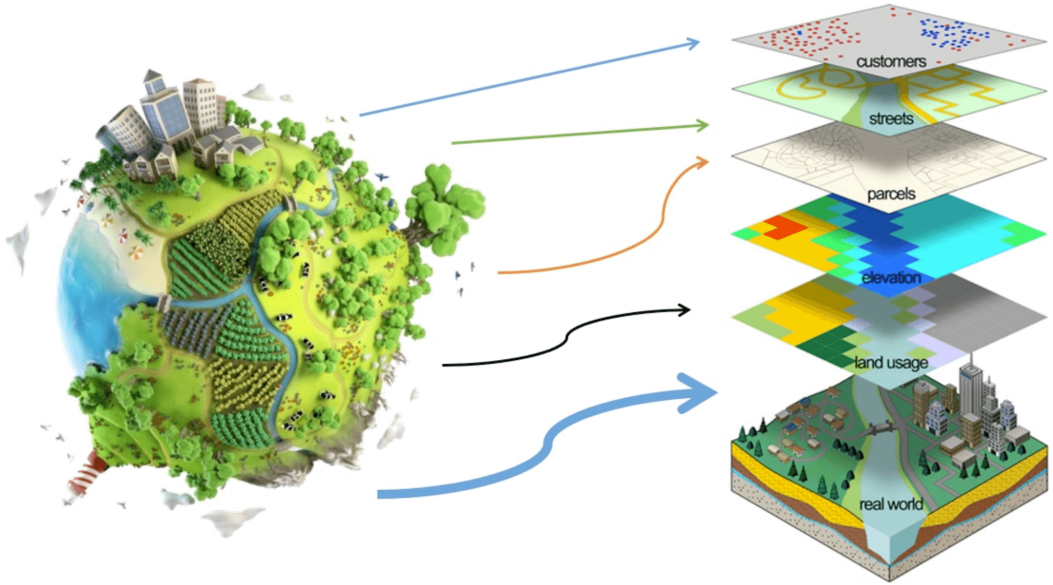
Only 7 nations…





Adaptive management

Many challenges



Anticipatory Zoning

Consiste na **alocação de áreas** para o desenvolvimento **futuro** de certos usos, ou para a ausência dos mesmos, em antecipação aos impactos das alterações climáticas

Promove uma gestão mais flexível ao permitir que as entidades responsáveis **ajustem** os **regimes de gestão antes** dos usos estarem **instalados** no espaço marítimo (o que permite evitar problemas políticos e legais)

Permite **antecipar conflitos** futuros e **priorizar usos** do oceano, e.g. **antes** de se fazerem **investimentos** dispendiosos em infraestruturas

Craig (2012) **Harvard Environmental Law Review**

Anticipatory Zoning

Arctic

Anticipatory Zoning

Arctic

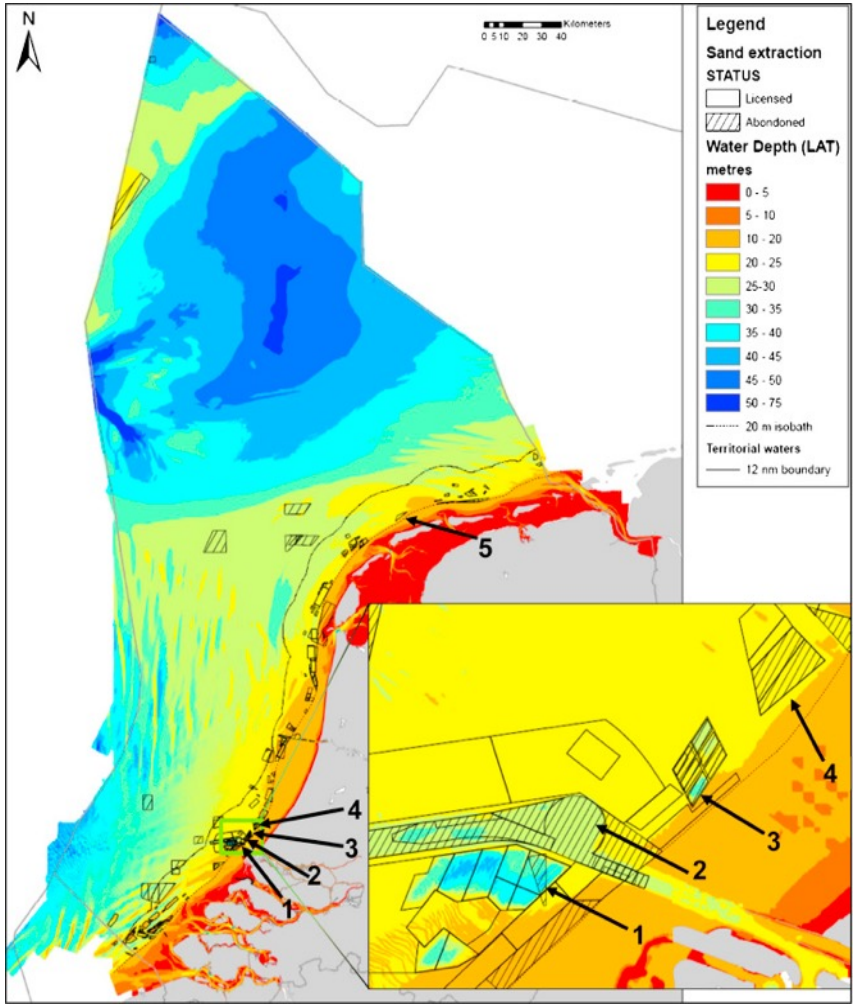
Redução na cobertura de gelo marinho está abrir **novas áreas** com potencial de **exploração económica** (e.g. new **shipping** routes, **hydrocarbon** exploitation, commercial **fishing**, **aquaculture**)

Competição pelo uso dessas novas áreas pode levar a **conflitos** entre **sectores da economia azul**, bem como a **impactos** significativos em **espécies e habitats chave**, e nas **comunidades humanas** locais que dependem dessas espécies/habitats

Anticipatory Zoning

Netherlands

Preferred **sand extraction zones** in the Netherlands to support climate adaptation, namely protection coastal areas against sea level rise



DE JONG ET AL. (2016)

Dynamic Ocean Management – DOM

"Management that changes rapidly in space and time in response to the shifting nature of the ocean and its users based on the integration of new biological, oceanographic, social and/or economic data in near real-time"

Maxwell et al. (2015) Marine Policy

Recognizes that…

Ocean and ocean uses are highly dynamic

but that…

MPAs

MSP

TAC

Management approaches are relatively static

Recognizes that…

but that…

MPAs

MSP

TAC

! Mismatches in rate and scale at which ocean/ocean users change, and management responds, result in decreased efficiency and effectiveness

Ciências ULisboa

what to do ?

Management must become as fluid in space and time as both the ocean and ocean users

?

! Shift to

near real-time management ?

! By integrating…

1. **Existing datasets** (e.g. remote sensing, animal tracking, fisheries observer data)

2. **Advanced techniques** (analytical processing and modelling) that allow for **predictions** about key species distributions, user behaviour or oceanographic habitats, etc., in space and time

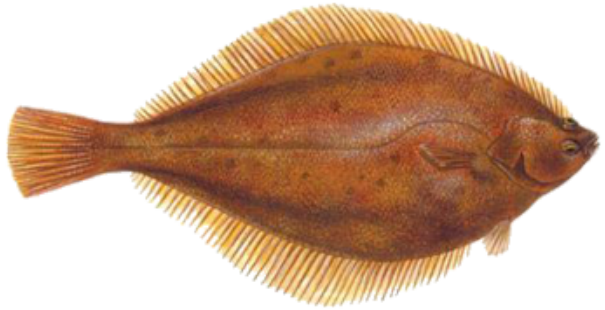
! By integrating…

3. Technology that allows rapid data-sharing (e.g. portable/handheld devices) to be used in dynamic tools that respond at finer, more detailed scales

Pesca de vieiras na Nova Inglaterra (USA)

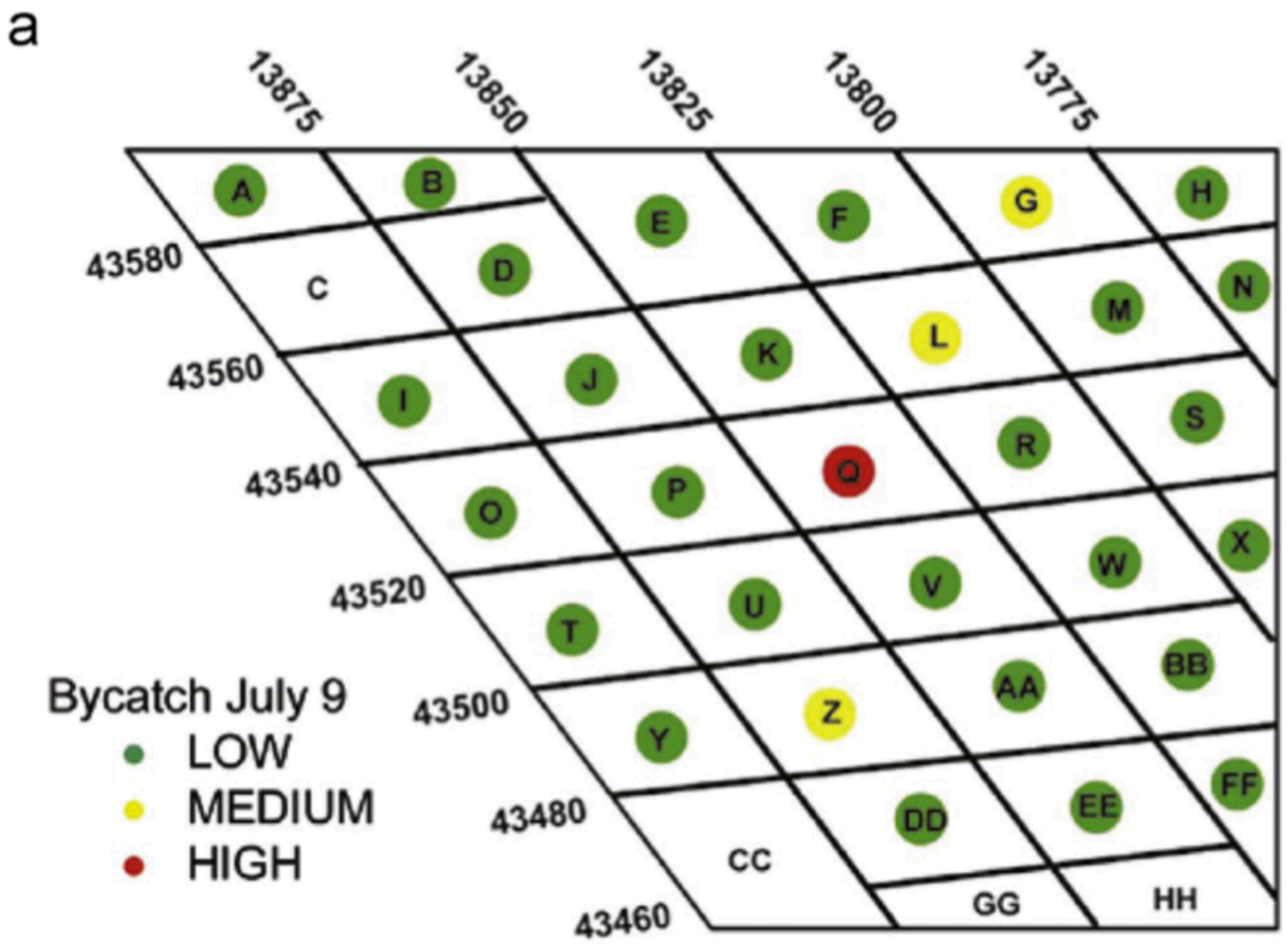
Pescadores de vieiras reportam voluntariamente as **capturas acessórias** (*by-catch*) de solha dos mares do norte (espécie vulnerável, IUCN) à Universidade de Massachusetts numa base diária

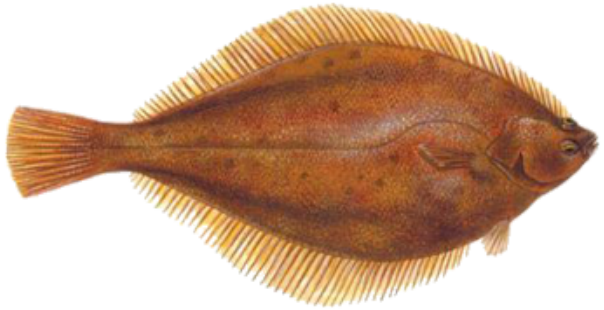
Essa informação é compilada por área e redistribuída no dia seguinte aos pescadores para estes **evitarem certas áreas** (de maior *by-catch*)



Limanda ferruginea

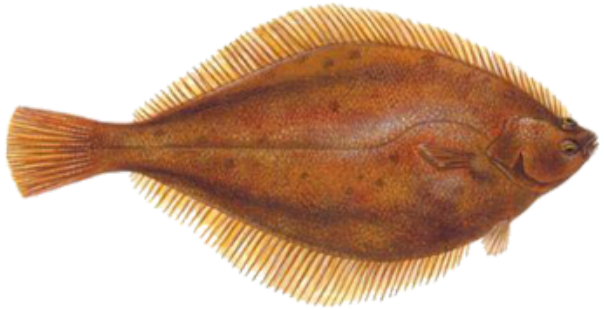
DOM


a
13875
13850
13825
13800
13775
43580
43560
43540
43520
43500
43480
43460
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
AA
BB
CC
DD
EE
FF
GG
HH
Bycatch July 9
LOW
MEDIUM
HIGH



Result:

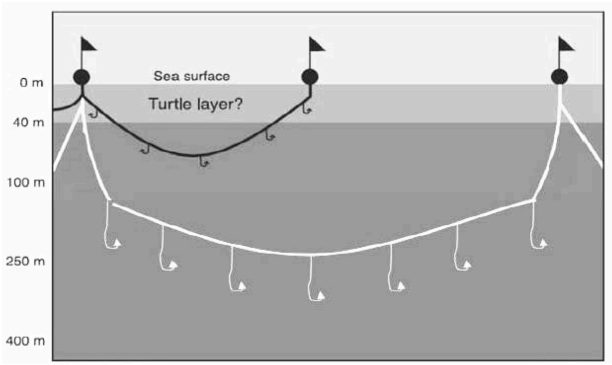
Since the program started (2010) fishermen have been able to fish the entire duration of the scallop season, resulting in economic gains upwards of $10 million/year over previous years



TurtleWatch (NOAA Pacific Islands Fisheries Center)

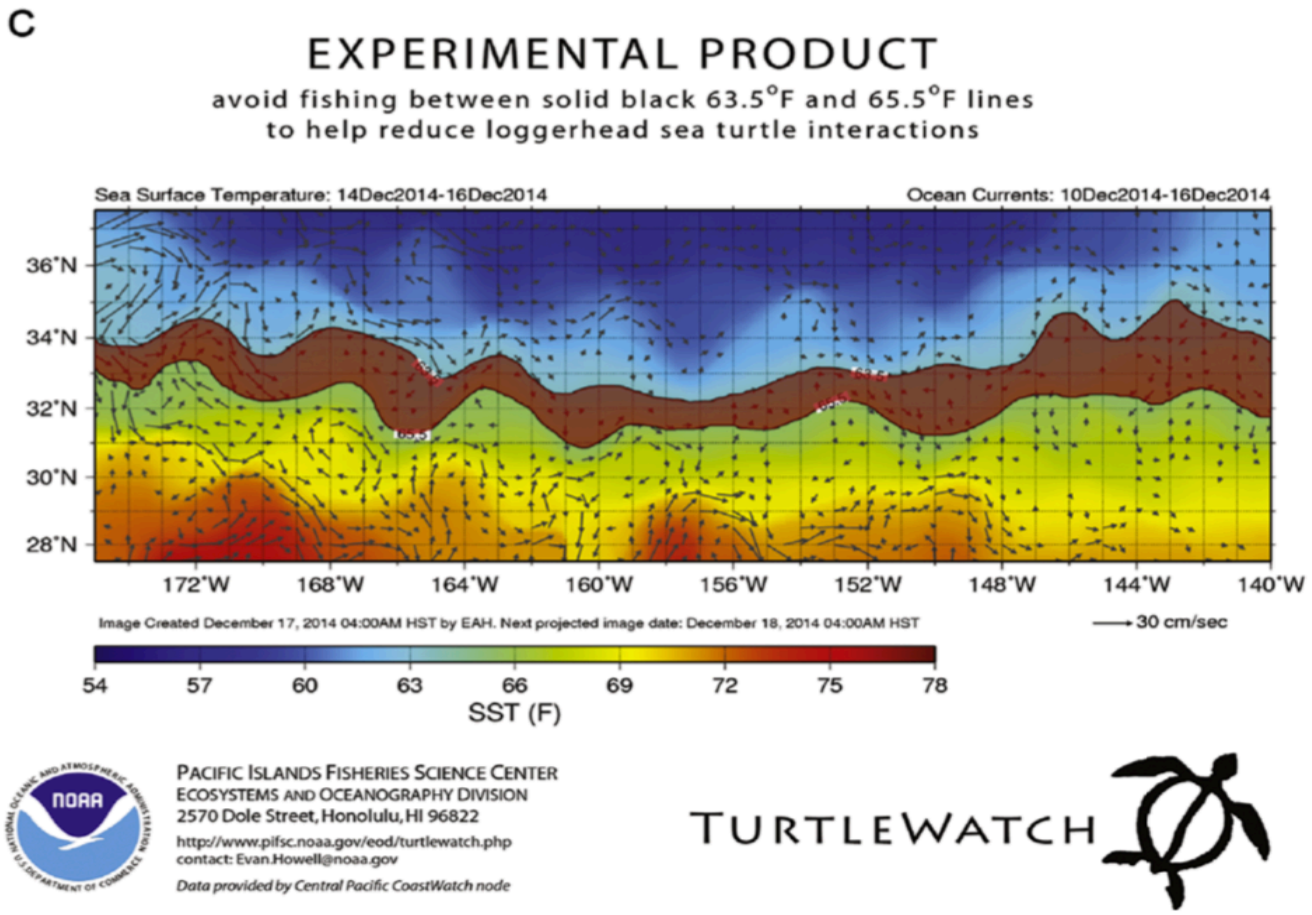
Programa desenvolvido para reduzir *by-catch* de tartarugas marinhas comuns (vulnerável) em pesca de palangre no Hawaii

Com base em dados de **satélite** (rastreamento), os cientistas determinaram as **temperaturas preferenciais** das tartarugas, e identificaram áreas que os pescadores deviam evitar



TurtleWatch (NOAA Pacific Islands Fisheries Center)

A informação é colocada online (every few days) de acordo com as **flutuações de temperatura** do Pacífico Norte Central

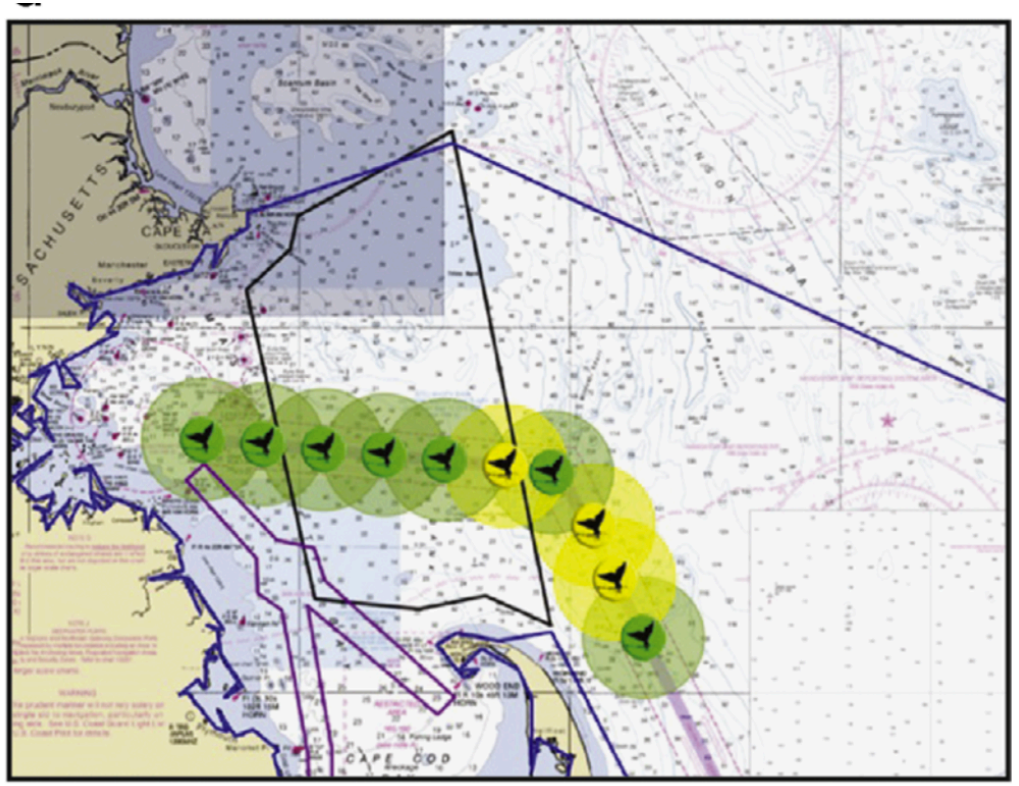


WhaleAlert (EUA, costa Este)

Boias acústicas e deteção remota são utilizadas para detectar a localização em tempo real de **Baleias francas do Atlântico Norte** (criticamente em perigo, IUCN) por forma a evitar colisões letais com navios

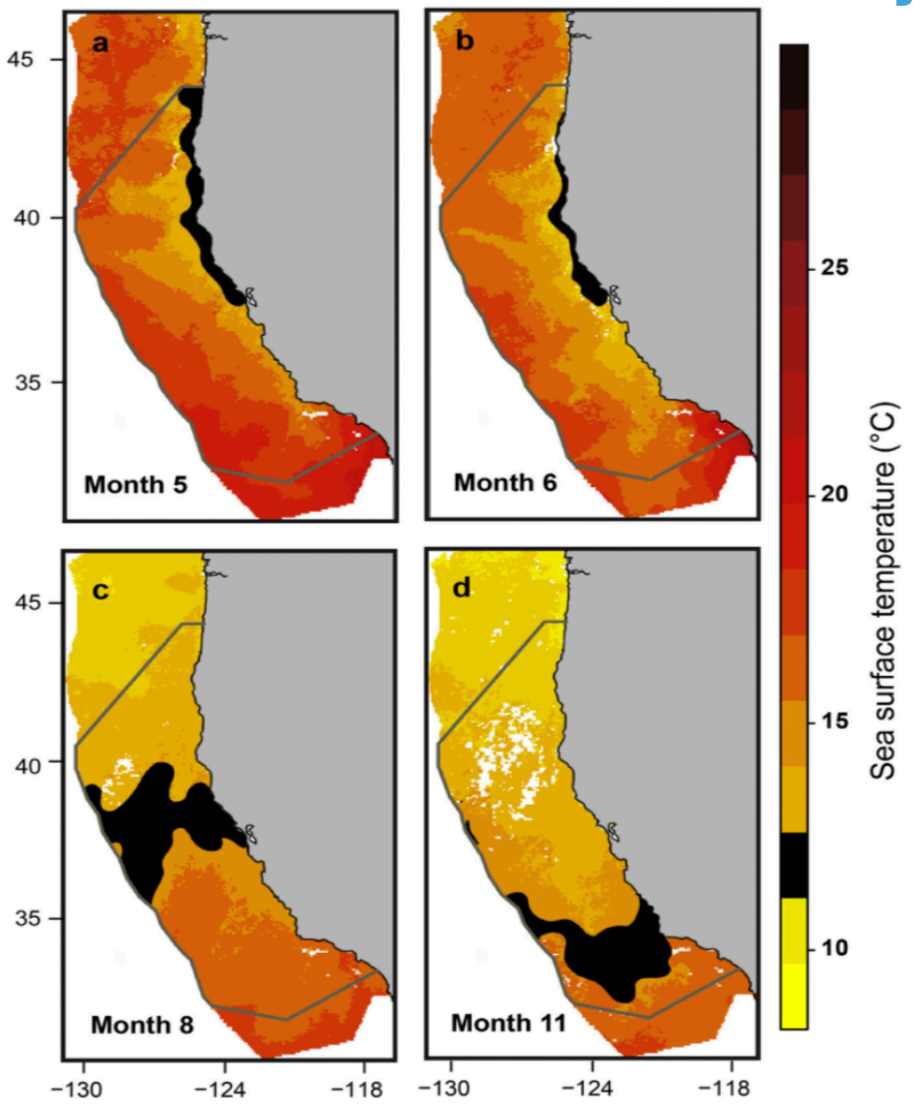
WhaleAlert (EUA, costa Este)

A informação é fornecida aos **capitães dos navios** (aplicações móveis) para alertar para a presença das baleias, e recomendar a **redução da velocidade** ou mesmo o **evitar** dessas áreas



DOM

Hypothetical Scenario (west coast, US)



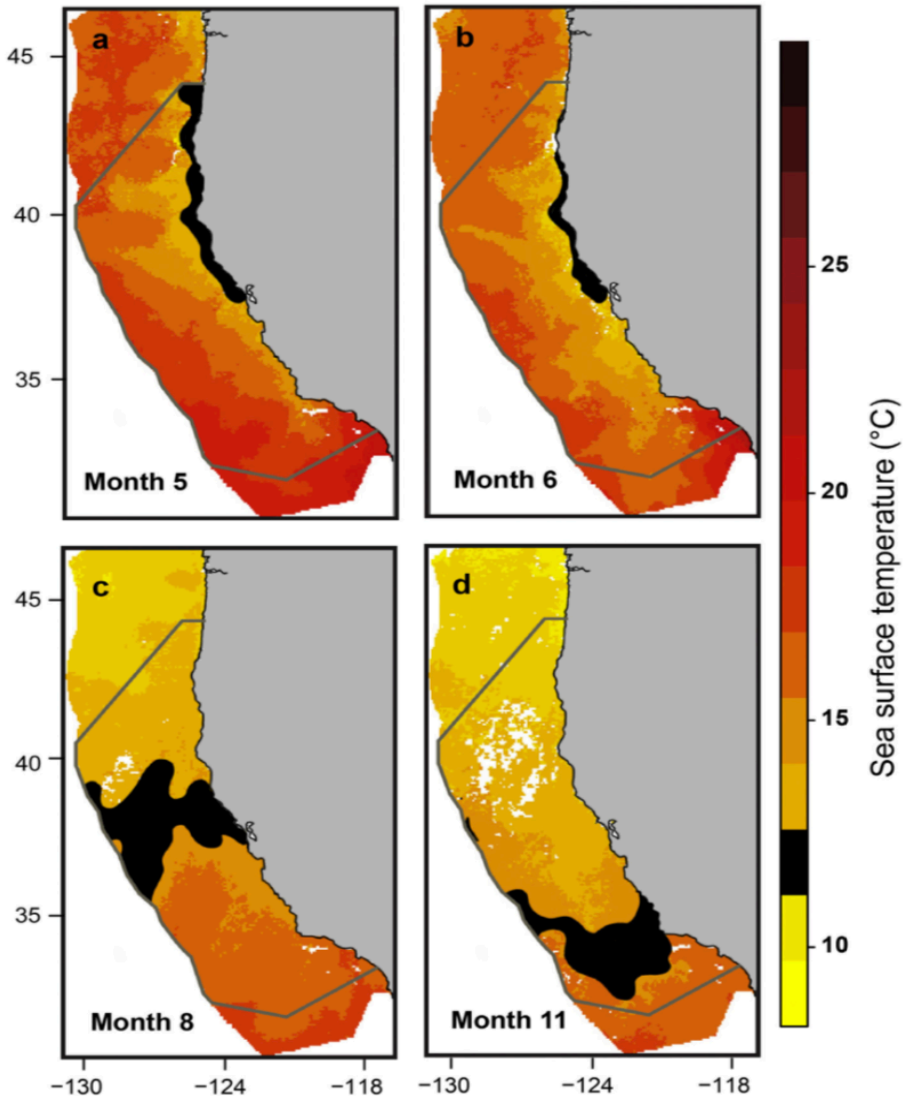
Área de **gestão estática**

vs.

Áreas de **gestão dinâmica**

DOM

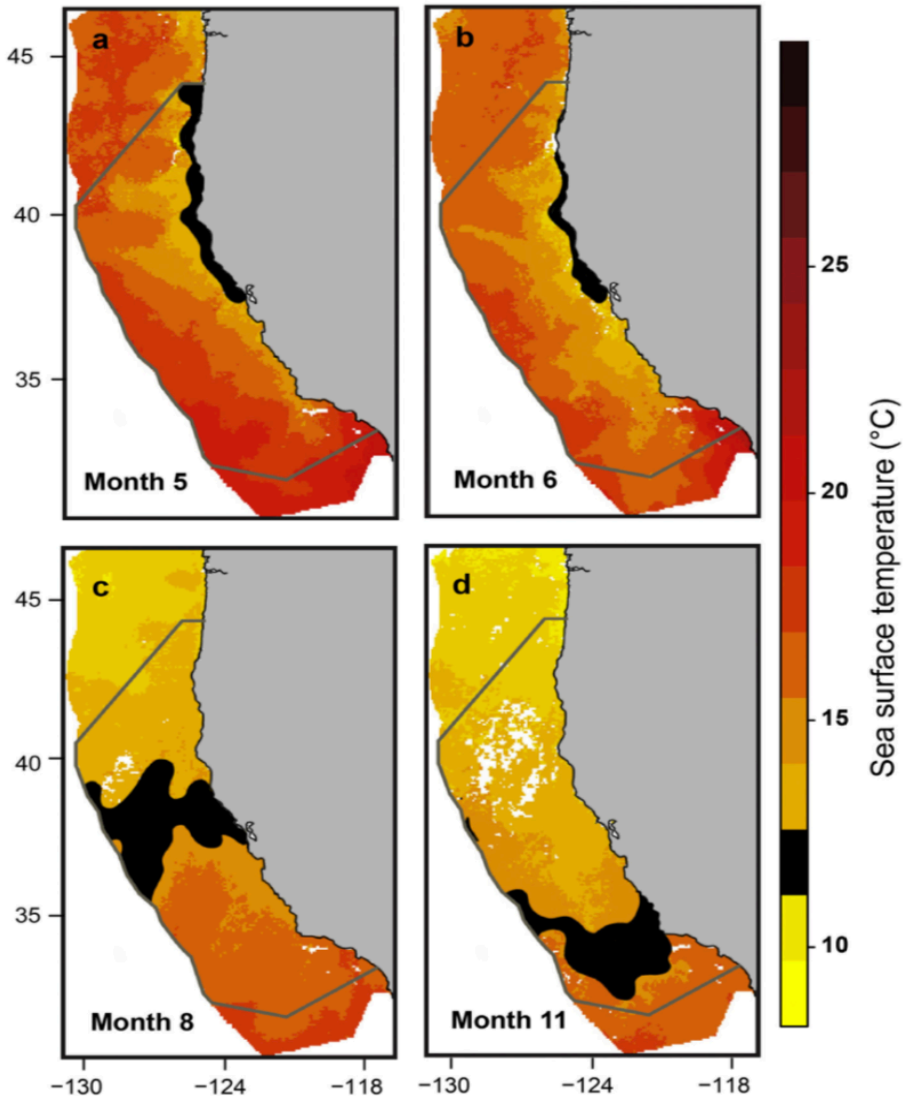
Hypothetical Scenario (west coast, US)



Área de **gestão estática** (**linha cinzenta**) necessitaria de uma área maior por forma a incluir todos os habitats animais dependentes de variações na temperatura ao longo do ano

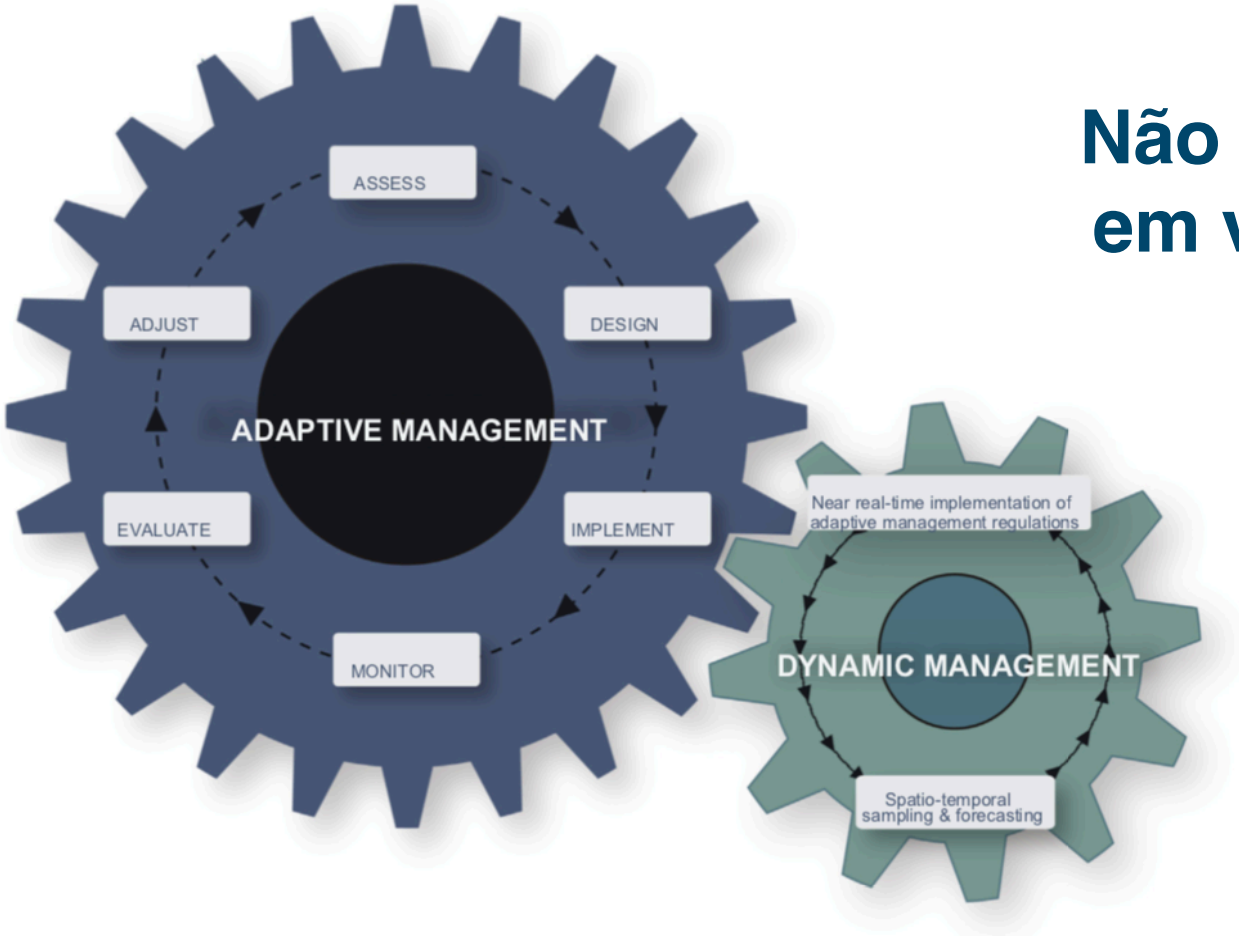
DOM

Hypothetical Scenario (west coast, US)



Áreas de **gestão dinâmica** (**polígonos pretos**) delimitadas com base na localização provável dos habitats animais, permitem a utilização de áreas mais pequenas e que variam ao longo do ano, permitindo uma **maior utilização** por actividades humanas

DOM



Não substitui a gestão adaptativa, em vez disso contribui para a sua implementação

(implementa alterações em regimes de gestão com rapidez)

Conclusion...


b
No solution fits all
Pre-planning
Analysis for planning
Plan development
Plan completion
Plan approval
Plan implementation
Plan revision
Country
Overseas territory
Sub-national area in a different phase of MSP

Ciências ULisboa

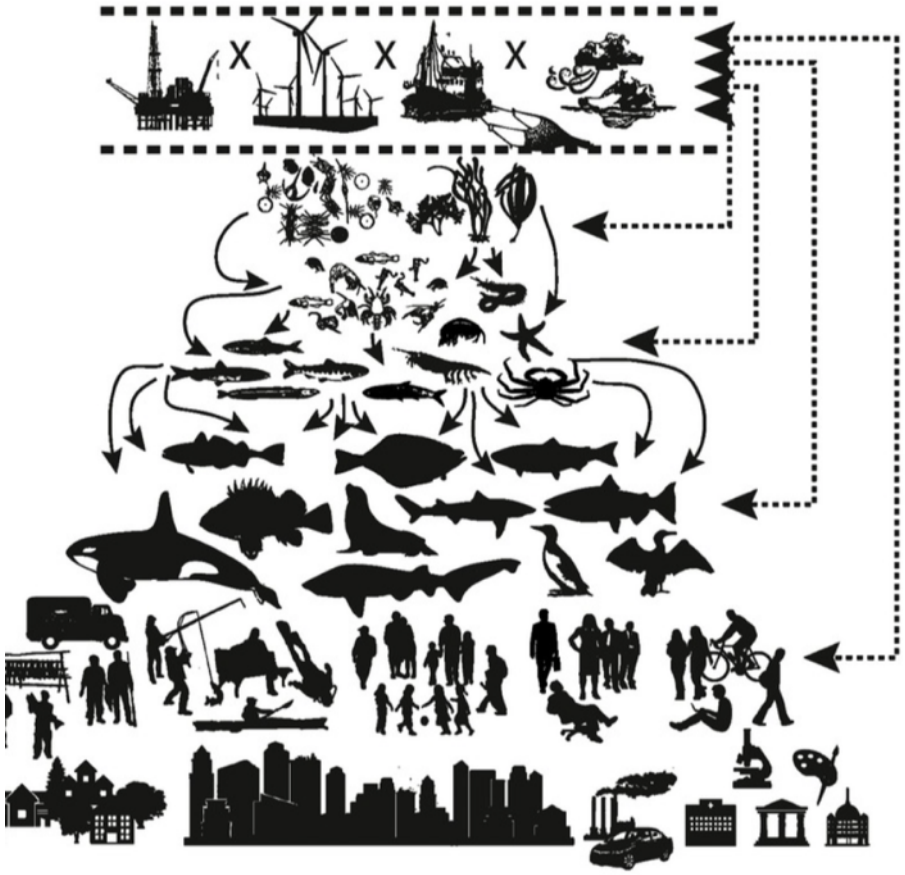
Why is it so important to develop adaptive, climate-smart MSP?

MSP AS A SOLUTION?

As MSP operates in a changing ocean, properly addressing and integrating climate effects is vital to keep plans viable, relevant and useful in the long term

HOEL & OLSEN (2012), CRAIG (2012), OKEY ET AL. (2014), FRAZÃO SANTOS ET AL. (2016), MCHENRY ET AL (2017), ETC.

MSP AS A SOLUTION?



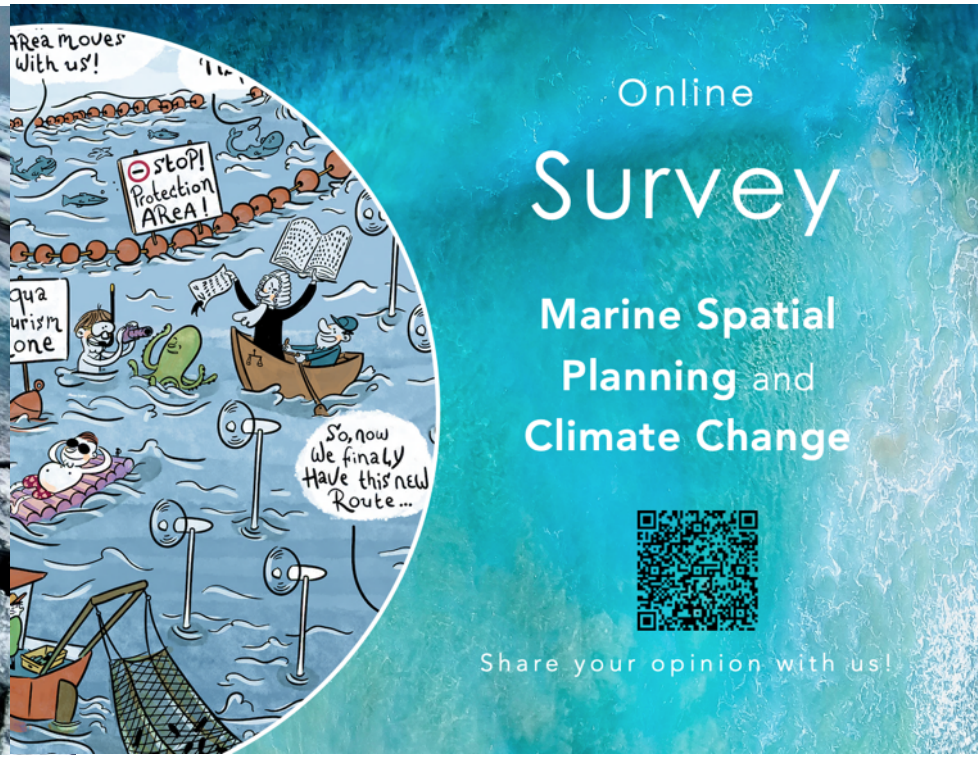
Plan holistically (not sector-by-sector)

Protection of critical marine areas and climate refugia

Reduction of greenhouse gases emissions

(areas to renewable energy developments
and blue carbon capture and storage)

PERCEPTIONS OF PEOPLE KNOWLEDGEABLE ON MSP



www.oceanplan-project.com/survey

OCEANPLAN
WEBSITE

English . Español . Português

@OCEANPLAN_MSP

MORE INFORMATION

Ciências ULisboa

nature sustainability

REVIEW ARTICLE

https://doi.org/10.1038/s41893-020-0513-x

Check for updates

Integrating climate change in ocean planning

Catarina Frazão Santos[1,2]✉, Tundi Agardy[3], Francisco Andrade[1], Helena Calado[4], Larry B. Crowder[5], Charles N. Ehler[6], Sara García-Morales[1], Elena Gissi[7], Benjamin S. Halpern[8,9], Michael K. Orbach[10], Hans-Otto Pörtner[11,12] and Rui Ro

The acceleration of global warming and increased vulnerability of marine social-ecological systems aff by the ocean. Spatial planning of marine areas is vital to balance multiple human demands and ensu supporting global ocean goals. To thrive in a changing ocean though, marine spatial planning (MSP) n climate change. By reviewing existing literature on MSP and climate change, we explore the links betw sustainability, highlight management challenges, and identify potential pathways to guide action towa tion of climate impacts in MSP.

The sustainable use and conservation of the world ocean and its resources represent one of the 17 global goals set to 'transform our world' in the context of the United Nations (UN) 2030 Agenda for Sustainable Development[1]. Although such global agreement on promoting sustainability in the ocean is relatively recent, protecting marine ecosystems has been in the international agenda for decades[2,3], with numerous actions, approaches, frameworks and plans being developed and implemented to support it. These include the ecosystem approach, with its origins in the UN Convention on Biological Diversity[4], ecosystem-based management (EBM) that grew out of the ecosystem approach[5], the integrated management concept that stemmed from Chapter 17 of the Agenda 21[6], or international treaties such as the UN Convention on the Law of the Sea (UNCLOS)[2].

Concomitant to these developments, and incorporating many of these concepts (for example, the ecosystem approach and integrated management; Box 1), in the 1990s a management process commonly known as marine spatial planning (MSP) emerged and has spread widely in the last 15 years[7]. No single definition exists for MSP; it takes many forms and names depending on context (Box 1). However, it can be generally outlined as the analysis and allocation of the spatial and temporal distribution of human uses

most of them are in early stages of deve
have marine spatial plans that are alrea
government approved; Fig. 1)[7].

MSP will likely keep expanding in t
countries start to discuss the developm
tiatives, especially in Africa and South
European Union (EU) funded Paddle
uid world with tropical stakes'; www
explores opportunities and limits of M
Cabo Verde, although government-led
place. MSP in international waters is a
cussed[12,13], and in early 2019, the Eu
UNESCO's Intergovernmental Oceanog
jointly launched the MSPglobal program
with the intention to support the effectiv
spatial plans worldwide.

Several conceptual and practical ch
of MSP development and implementat
ing ecosystem conservation through MS
because the importance of protecting marine ecosystems is often overlooked by economic and/or political short-term goals and objectives, often insensitive to environmental impacts[15,16]. In addi-

OPEN CHANNELS

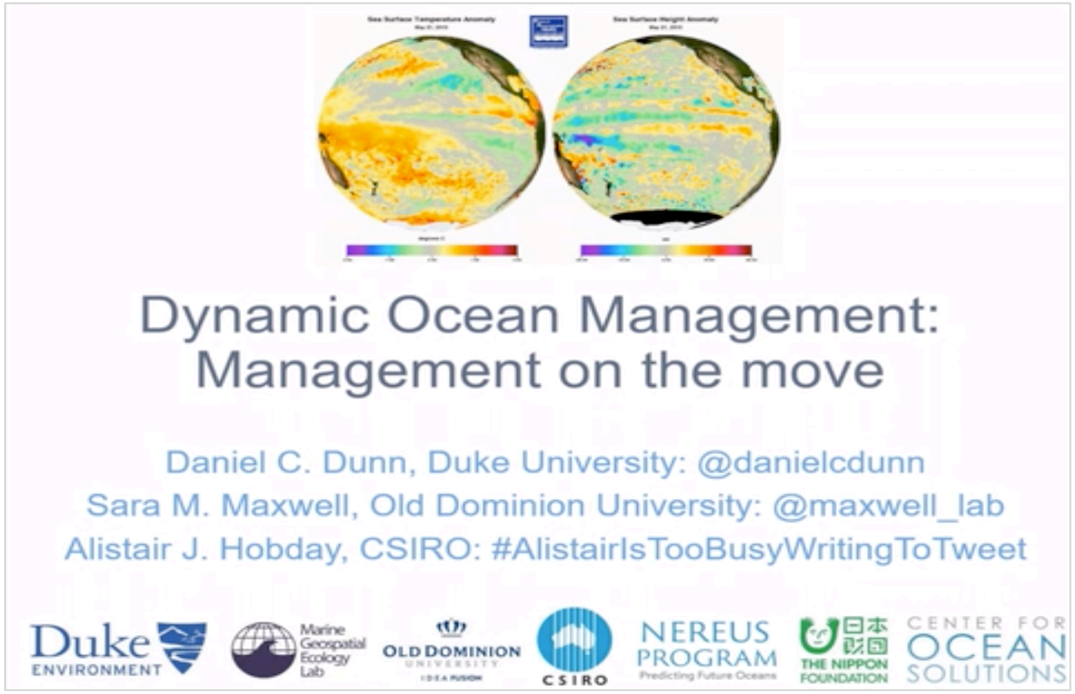
OCTO OPEN COMMUNICATIONS FOR THE OCEAN

PRODUCED BY OCTO

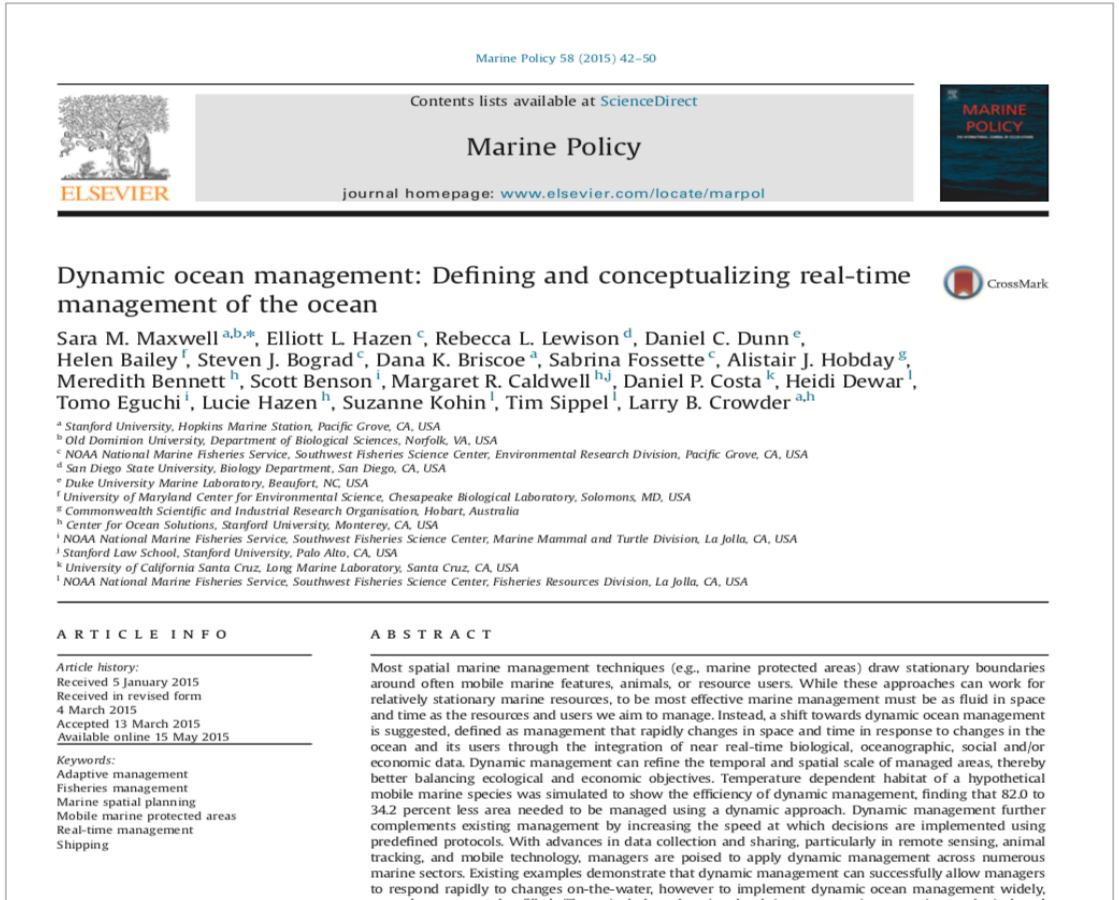
Exercise

EXERCISE

Identify the benefits and limitations of Dynamic Ocean Management



www.openchannels.org/webinars/2016/management-move-making-ebm-and-msp-more-dynamic



Marine Policy 58 (2015) 42–50

Contents lists available at ScienceDirect

Marine Policy

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

Dynamic ocean management: Defining and conceptualizing real-time management of the ocean

Sara M. Maxwell [a,b,*], Elliott L. Hazen [c], Rebecca L. Lewison [d], Daniel C. Dunn [e], Helen Bailey [f], Steven J. Bograd [c], Dana K. Briscoe [a], Sabrina Fossette [c], Alistair J. Hobday [g], Meredith Bennett [h], Scott Benson [i], Margaret R. Caldwell [h,j], Daniel P. Costa [k], Heidi Dewar [l], Tomo Eguchi [i], Lucie Hazen [h], Suzanne Kohin [i], Tim Sippel [i], Larry B. Crowder [a,h]

[a] Stanford University, Hopkins Marine Station, Pacific Grove, CA, USA
[b] Old Dominion University, Department of Biological Sciences, Norfolk, VA, USA
[c] NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Environmental Research Division, Pacific Grove, CA, USA
[d] San Diego State University, Biology Department, San Diego, CA, USA
[e] Duke University Marine Laboratory, Beaufort, NC, USA
[f] University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, Solomons, MD, USA
[g] Commonwealth Scientific and Industrial Research Organisation, Hobart, Australia
[h] Center for Ocean Solutions, Stanford University, Monterey, CA, USA
[i] NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Marine Mammal and Turtle Division, La Jolla, CA, USA
[j] Stanford Law School, Stanford University, Palo Alto, CA, USA
[k] University of California Santa Cruz, Long Marine Laboratory, Santa Cruz, CA, USA
[l] NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Fisheries Resources Division, La Jolla, CA, USA

ARTICLE INFO

Article history:
Received 5 January 2015
Received in revised form
4 March 2015
Accepted 13 March 2015
Available online 15 May 2015

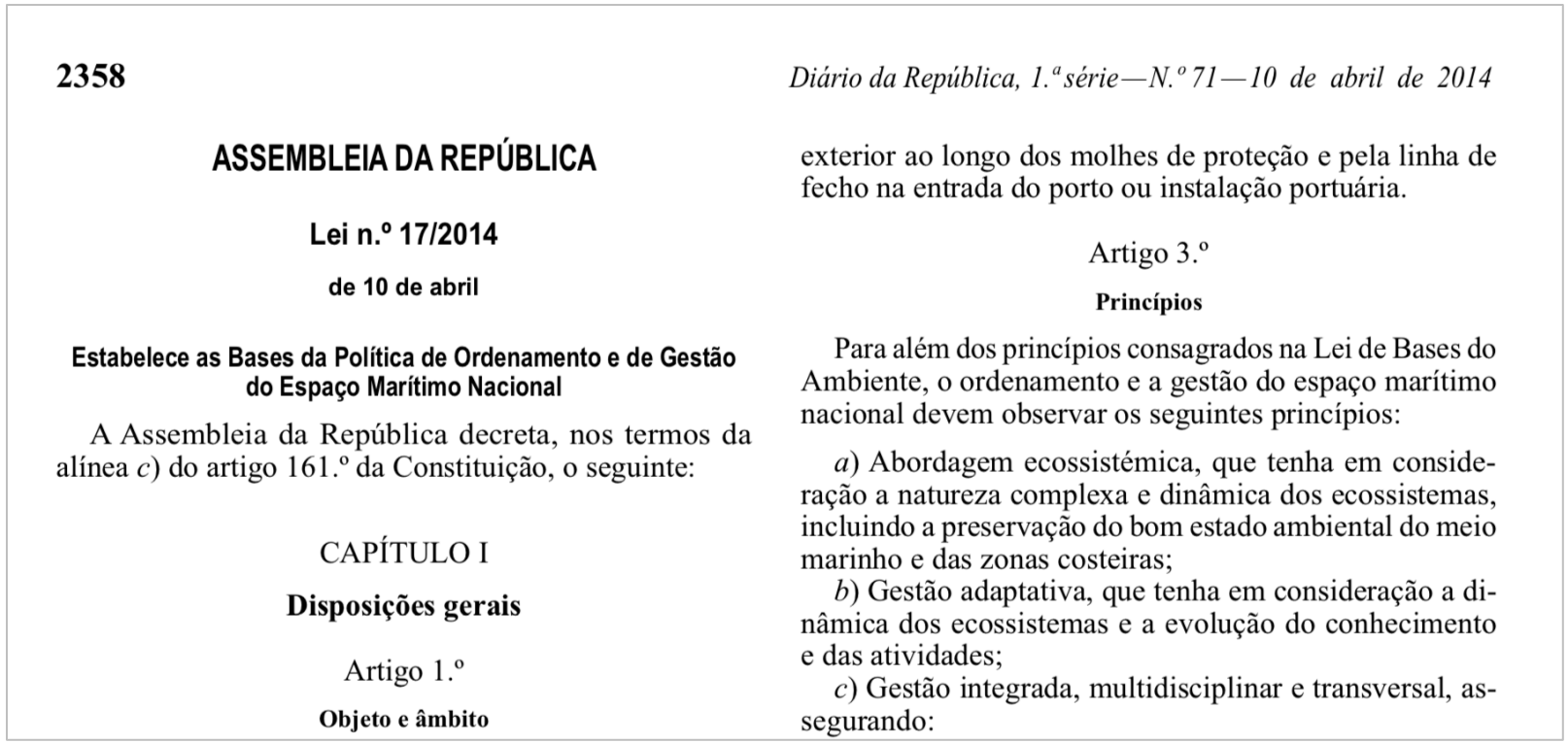
Keywords:
Adaptive management
Fisheries management
Marine spatial planning
Mobile marine protected areas
Real-time management
Shipping

ABSTRACT

Most spatial marine management techniques (e.g., marine protected areas) draw stationary boundaries around often mobile marine features, animals, or resource users. While these approaches can work for relatively stationary marine resources, to be most effective marine management must be as fluid in space and time as the resources and users we aim to manage. Instead, a shift towards dynamic ocean management is suggested, defined as management that rapidly changes in space and time in response to changes in the ocean and its users through the integration of near real-time biological, oceanographic, social and/or economic data. Dynamic management can refine the temporal and spatial scale of managed areas, thereby better balancing ecological and economic objectives. Temperature dependent habitat of a hypothetical mobile marine species was simulated to show the efficiency of dynamic management, finding that 82.0 to 34.2 percent less area needed to be managed using a dynamic approach. Dynamic management further complements existing management by increasing the speed at which decisions are implemented using predefined protocols. With advances in data collection and sharing, particularly in remote sensing, animal tracking, and mobile technology, managers are poised to apply dynamic management across numerous marine sectors. Existing examples demonstrate that dynamic management can successfully allow managers to respond rapidly to changes on-the-water, however to implement dynamic ocean management widely,

EXERCISE

Analyse how well the Portuguese legislation on MSP addresses climate change



2358 *Diário da República, 1.ª série — N.º 71 — 10 de abril de 2014*

ASSEMBLEIA DA REPÚBLICA

Lei n.º 17/2014

de 10 de abril

Estabelece as Bases da Política de Ordenamento e de Gestão do Espaço Marítimo Nacional

A Assembleia da República decreta, nos termos da alínea *c*) do artigo 161.º da Constituição, o seguinte:

CAPÍTULO I

Disposições gerais

Artigo 1.º

Objeto e âmbito

exterior ao longo dos molhes de proteção e pela linha de fecho na entrada do porto ou instalação portuária.

Artigo 3.º

Princípios

Para além dos princípios consagrados na Lei de Bases do Ambiente, o ordenamento e a gestão do espaço marítimo nacional devem observar os seguintes princípios:

a) Abordagem ecossistémica, que tenha em consideração a natureza complexa e dinâmica dos ecossistemas, incluindo a preservação do bom estado ambiental do meio marinho e das zonas costeiras;

b) Gestão adaptativa, que tenha em consideração a dinâmica dos ecossistemas e a evolução do conhecimento e das atividades;

c) Gestão integrada, multidisciplinar e transversal, assegurando:

Lei 17/2014

DL 38/2015

Supporting documents:

www.oceanplan-project.com/aaoem2020