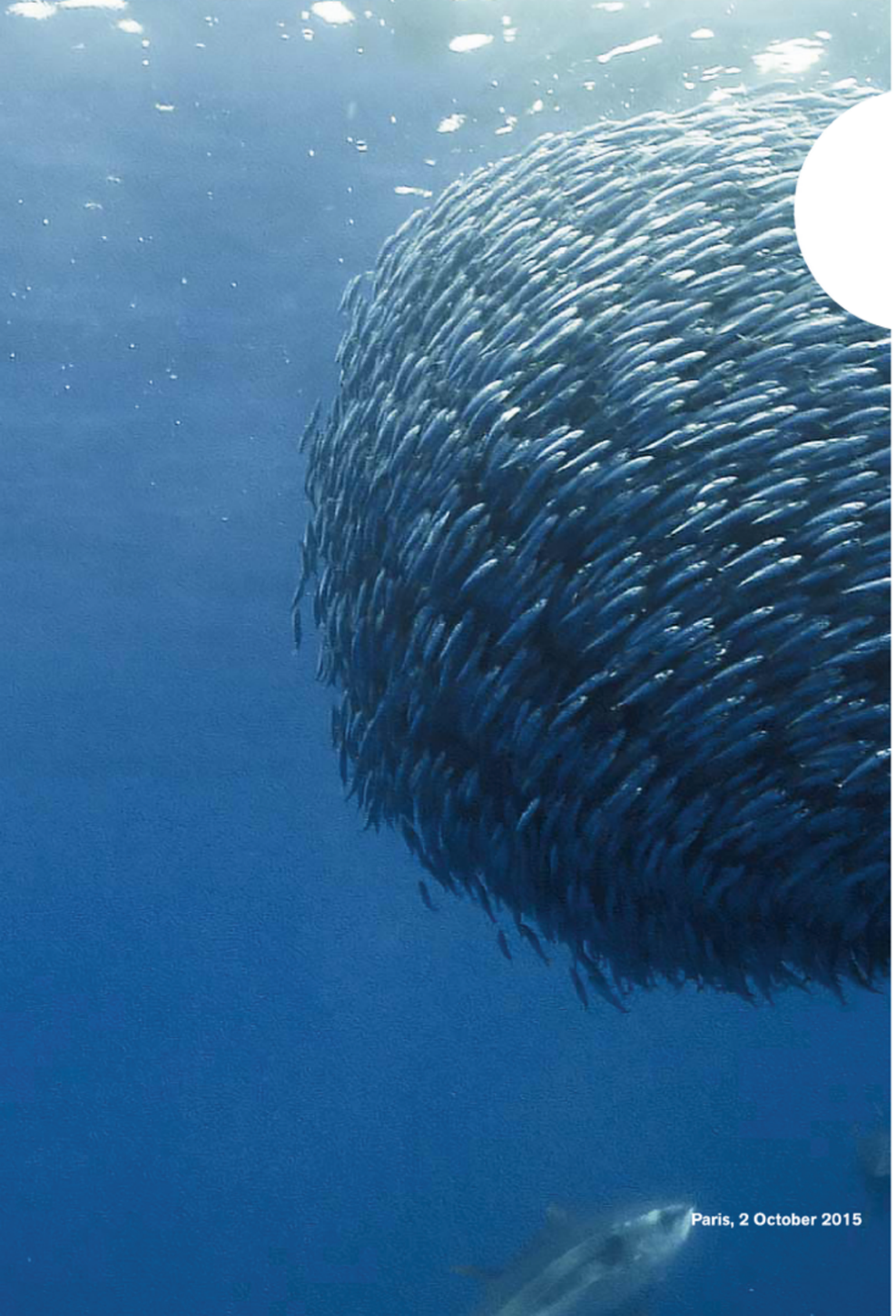


Impacts of climate change and ocean acidification on marine ecosystems

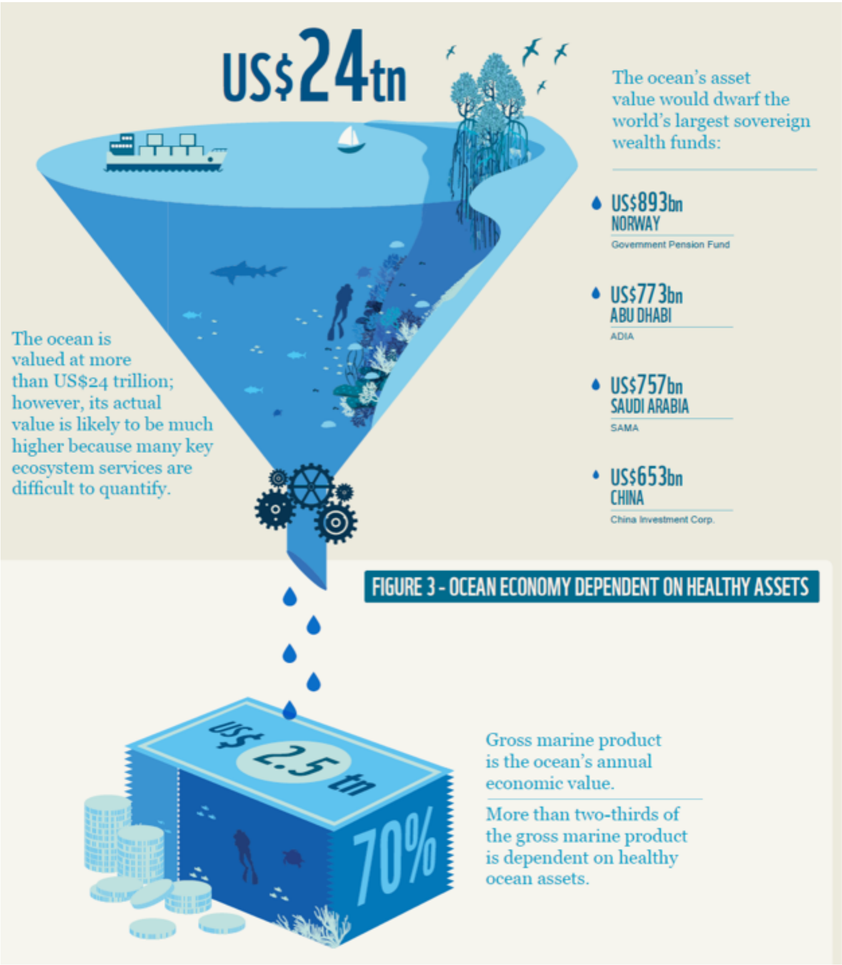
Jean-Pierre Gattuso
CNRS-Université Pierre et Marie Curie-IDDRI

Paris, 2 October 2015

Implementing the Ocean SDG: from knowledge to action

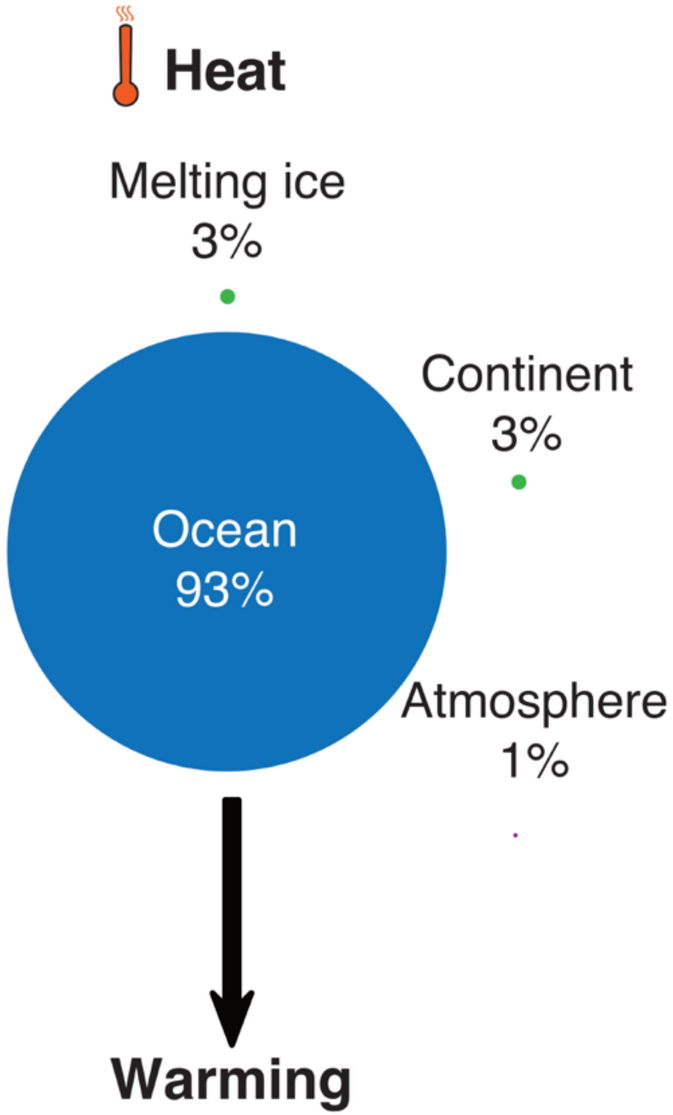
Ocean: considerable value

- **Moderates** climate change
- **Represents** more than 90% of Earth's habitable space
- **Hosts** 25% of eukaryotic species
- **Provides** 11% of global animal protein consumed by humans
- **Protects** coastlines
- …

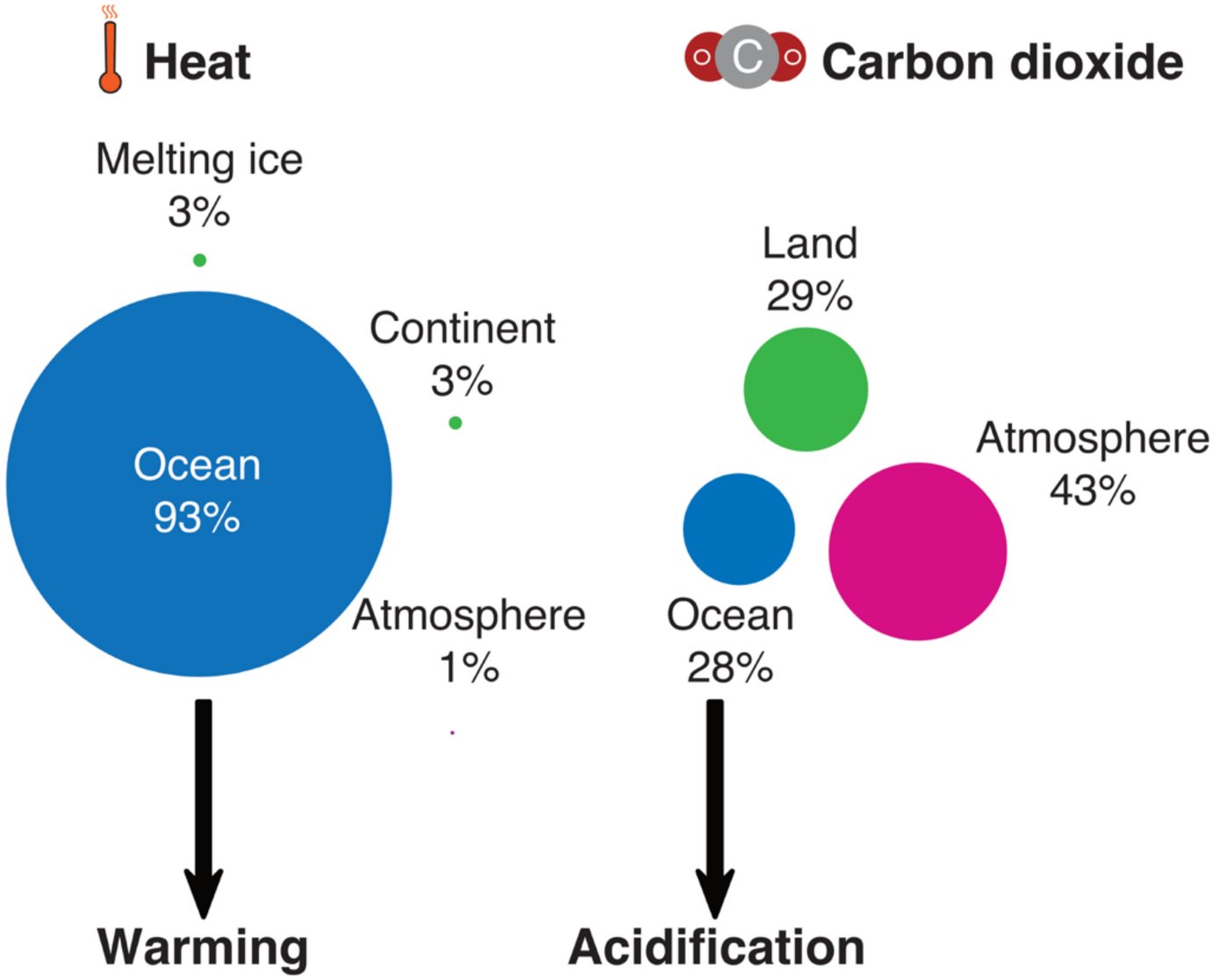


Hoegh-Guldberg et al. (2015)

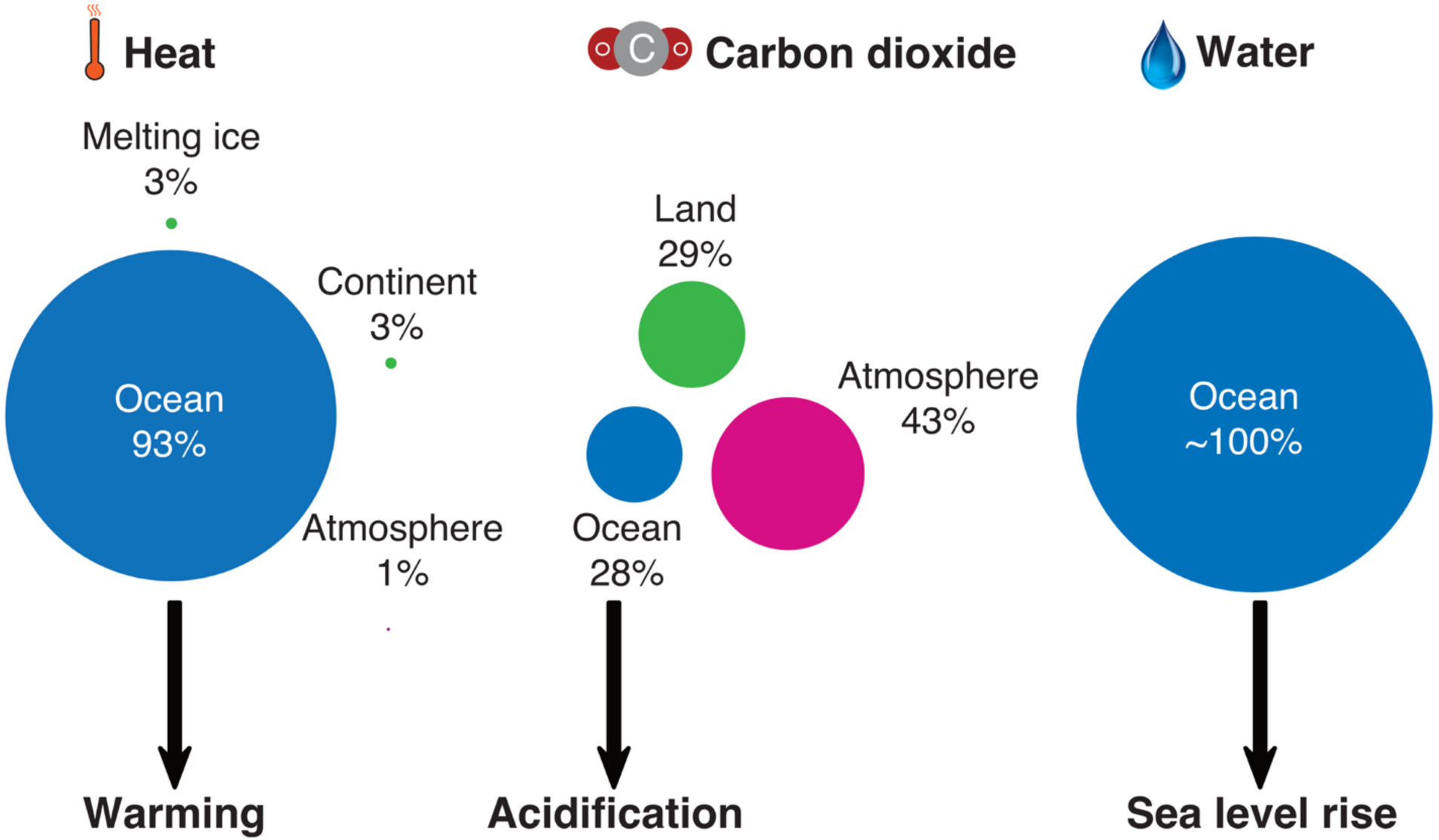
Ocean: actor and victim



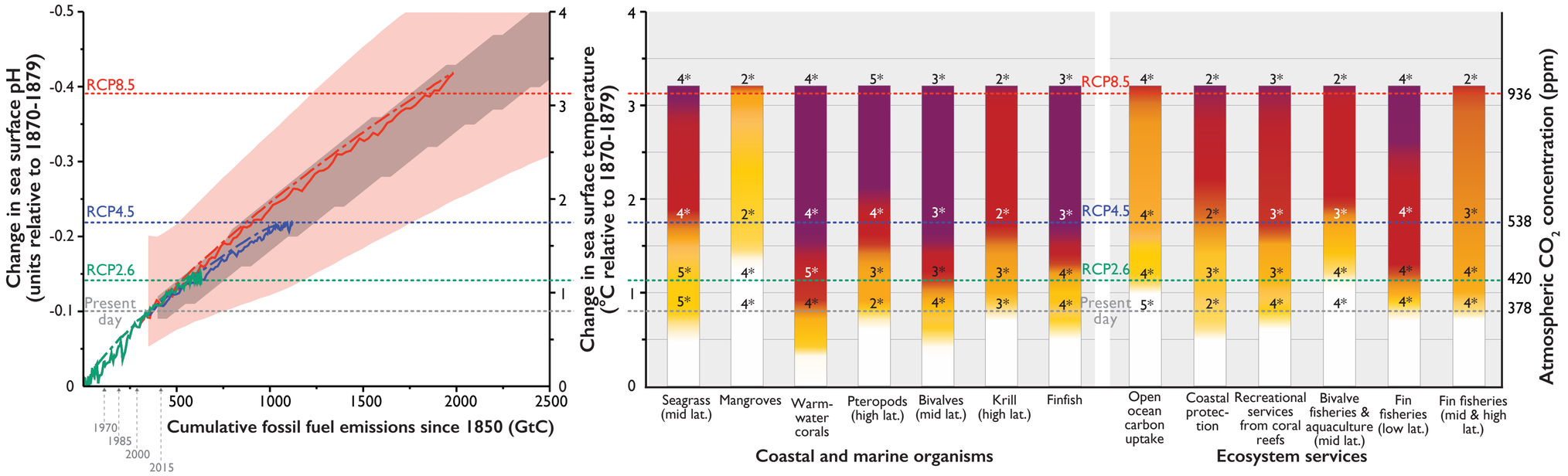
Ocean: actor and victim



Ocean: actor and victim



Risks of impacts



Changes in the global average of

sea surface pH

RCP8.5
RCP4.5
RCP2.6

68% confidence interval

sea surface temperature

RCP8.5
RCP4.5
RCP2.6

Global average sea surface temperature and pH at present and in 2100 according to the 3 RCPs.

RCP8.5
RCP4.5
RCP2.6
Present day (2005-2014)

Risk of impact

Undetectable — Moderate — High — Very high

Confidence levels for present-day and the 3 RCPs

1*	2*	3*	4*	5*
very low	low	medium	high	very high

Gattuso et al. (2015)

4 key messages

1. The ocean strongly influences the climate system and is an important provider of key services
2. Impacts are already detectable, high risk of impacts are expected well before 2100, even with RCP2.6
3. Immediate and substantial reduction of CO_2 emissions are crucially needed to prevent massive and mostly irreversible impacts
4. As CO_2 increases, the protection, adaptation, and repair options become fewer and less effective

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IAEA Ocean Acidification International Coordination Centre OA-ICC

FONDATION BNP PARIBAS

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SciencesPo

POLICY BRIEF

N°04/15 SEPTEMBER 2015 | CLIMATE - OCEANS AND COASTAL ZONES

Intertwined ocean and climate: implications for international climate negotiations

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INTRODUCTION

The atmosphere and ocean are two components of the Earth system that are essential for life, yet humankind is altering both. Contemporary climate change is now a well-identified problem: anthropogenic causes, disturbance in extreme events patterns, gradual environmental changes, widespread impacts on life and natural resources, and multiple threats to human societies all around the world. But part of the problem remains largely unknown outside the scientific community: significant changes are also occurring in the ocean, threatening life and its sustainability on Earth.

This Policy Brief explains the significance of these changes in the ocean. It is based on a scientific paper recently published in *Science* (Gattuso *et al.*, 2015), which synthesizes recent and future changes to the ocean and its ecosystems, as well as to the goods and services they provide to humans. Two contrasting CO_2 emission scenarios are considered: the high emissions scenario (also known as "business-as-usual" and as the Representative Concentration Pathway 8.5, RCP8.5) and a stringent emissions scenario (RCP2.6) consistent with the Copenhagen Accord[1] of keeping mean global temperature increase below 2°C in 2100.

1. Copenhagen Accord, *Decision 2/CP.15: Copenhagen accord* (United Nations Framework Convention on Climate Change, Geneva, 2009).

KEY MESSAGES

- Climate and ocean are inseparable: the ocean moderates anthropogenic climate change by absorbing significant proportions of the heat and CO_2 that accumulate in the atmosphere, as well as by receiving all water from melting ice.
- This climate-regulating function happens at the cost of profound alterations of the ocean's physics and chemistry, leading to ocean warming and acidification, as well as to sea level rise. These changes significantly affect the ocean's ecology (organisms and ecosystems) and eventually marine and coastal human activities (fisheries, aquaculture, tourism, health…).
- As atmospheric CO_2 increases, possible human responses become fewer and less effective.
- This scientific statement provides further compelling arguments for immediate and ambitious CO_2 emissions reduction at the international level. This conclusion applies to COP21 as well as to the post-2015 climate regime at large.

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United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

OCEANS 2015 INITIATIVE

Paris, 2 October 2015

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