

# **Climate Change and Sustainable Development: Ocean as a Victim or a Hero?**

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**Ocean as a victim**

**The world's ocean and cryosphere have been  
'taking the heat' from climate change for decades.**

**Consequences for nature and humanity are  
sweeping and severe.**

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## Changes in the ocean

- To date, the ocean has taken up **more than 90%** of the excess heat in the climate system. By 2100, the ocean will take up **2 to 4 times** more heat if global warming is limited to 2°C and **up to 5 to 7 times** at higher emissions.
- Ocean warming reduces mixing between water layers and therefore the supply of **oxygen and nutrients for marine life**.
- **Marine heatwaves** are becoming more frequent and severe, especially harming warm-water corals, kelp forests and the distribution of marine life.
- The **ocean takes up** human-induced **carbon emissions**. This **increases ocean acidity**. It has taken up 20 to 30% of these emissions and continued uptake will exacerbate this.

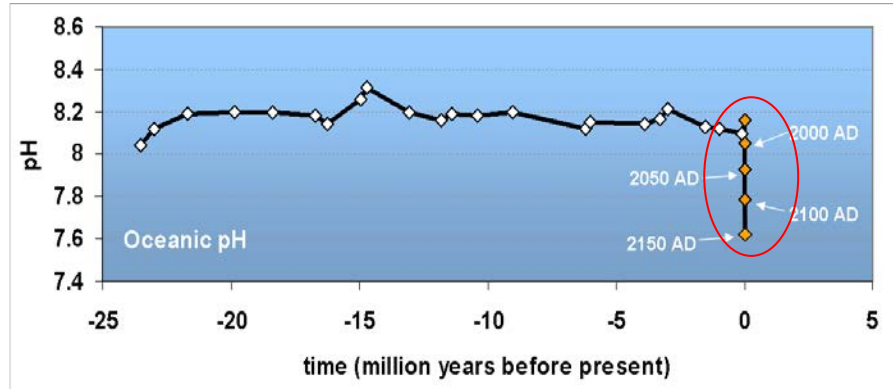
# Coral reefs are dying



American Samoa (from [www.globalcoralbleaching.org](http://www.globalcoralbleaching.org))

# Oceans are Acidifying Fast .....

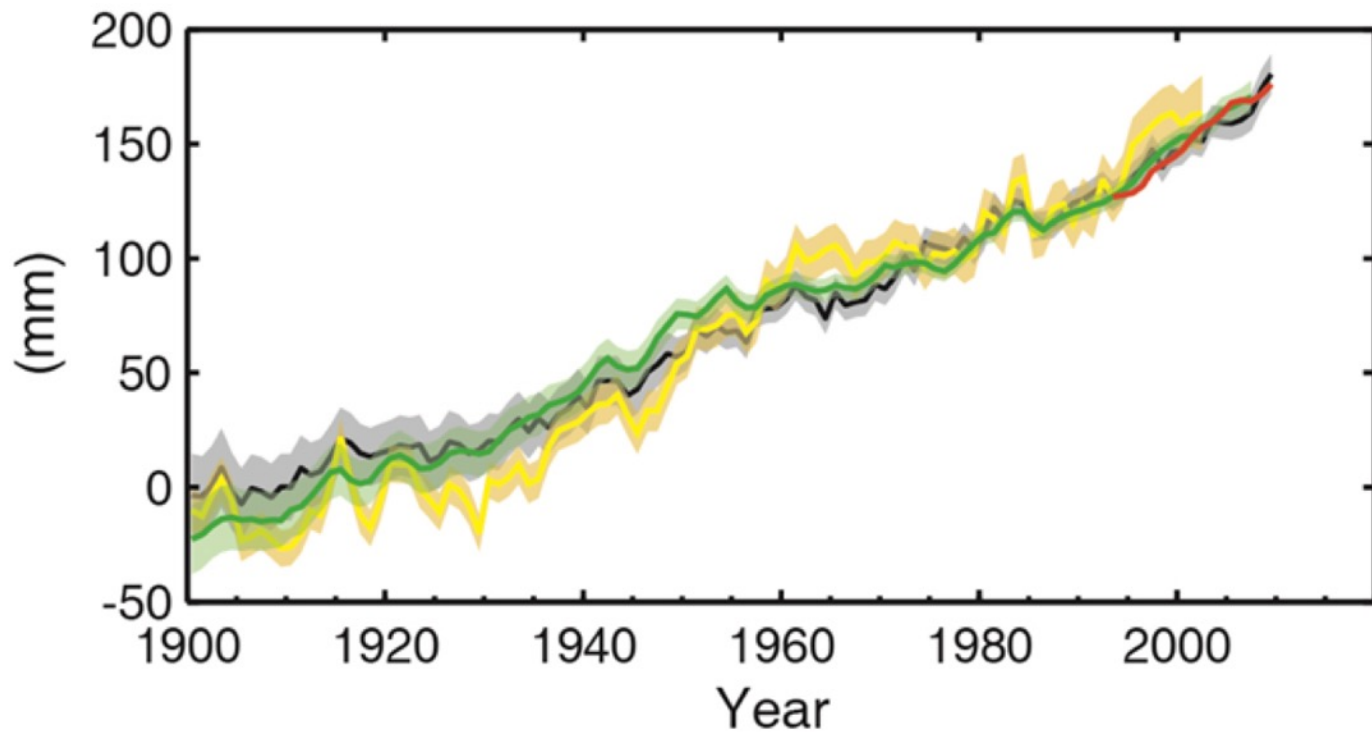
Changes in pH over the last 25 million years



“Today is a rare event in the history of the World”

- It is happening now, at a **speed and to a level** not experienced by marine organisms **for about 60 million years**
- Mass extinctions were linked to previous ocean acidification events
- It took 10,000’ s of years to recover

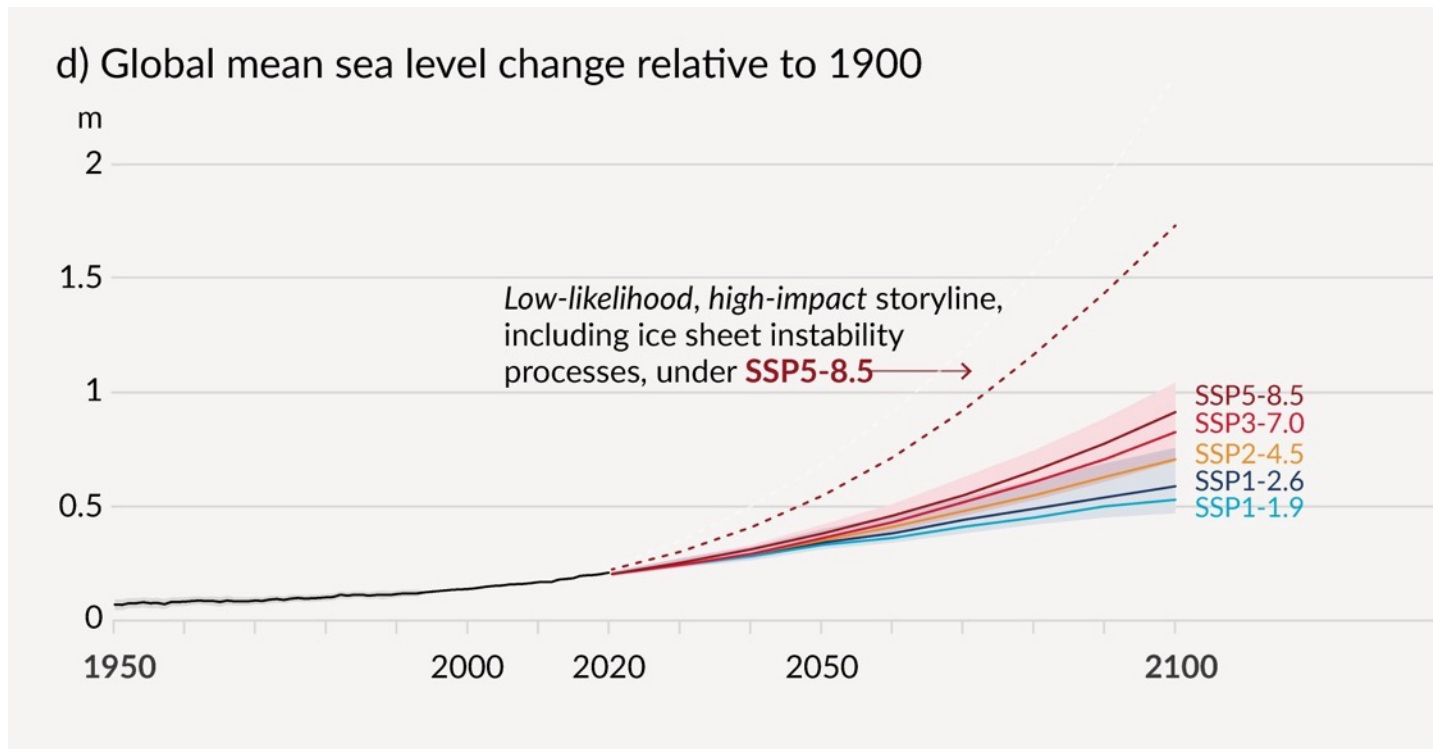
# Change in average sea-level change



# SIXTH ASSESSMENT REPORT

Working Group I – The Physical Science Basis

Human activities affect all the major climate system components, with some responding over decades and others over centuries *Figure SPM.8*





# SIXTH ASSESSMENT REPORT

Working Group I – The Physical Science Basis

« Sea level rise **greater than 15 m** cannot be ruled out with high emissions »

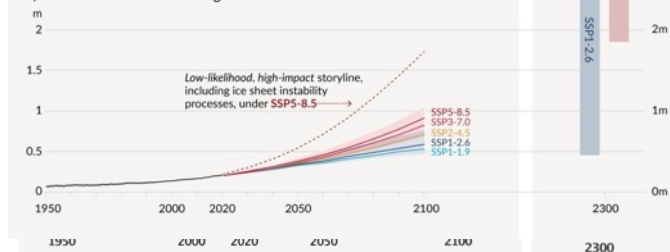
**2300**  
e) Global mean sea level change in 2300 relative to 1900

Sea level rise greater than 15m cannot be ruled out with high emissions

7 m

2 m

d) Global mean sea level change relative to 1900



**NB: The altitude of Mechelen (2020 BBNJ Workshop) is 10 m**



Photo: Glenn R. Specht

Sea Level  
Rise



# Effects on the Nile Delta, where more than 10 million people live less than 1 m above sea level



NB: + 1 m is possible  
in the next 100 years...

(Time 2001)

**Risk = Hazard x Vulnerability x Exposure**  
**(Katrina flood victim, New Orleans, 2005)**



AP Photo - Lisa Krantz (<http://lisakrantz.com/hurricane-katrina/zspbn1k4cn17phidupe4f9x5t1mzdr>)

**Ocean as a hero**

# Ocean as a hero and an ally

- Ocean **delays warming** by hiding much heat trapped by greenhouse gases (and pays the price through coral death)
- Ocean **provides oxygen** and **absorbs 25% of human CO<sub>2</sub> emissions** (and pays the price through acidification)
- Marine life, fisheries, and **biodiversity support hundreds of millions** of people
- Ocean-based **renewable energy**: offshore wind, tidal energy...
- **Algae, kelp, and other carbon-storing ecosystems** can help reduce net CO<sub>2</sub> emissions
- **Mangroves help protect coasts, store carbon, promote biodiversity**

A group of people, including children and adults, are wading in shallow, clear water in a lagoon, planting mangrove saplings. The water is light green and reflects the sky. In the background, there is a line of trees and a distant island. The sky is filled with large, white and grey clouds. A white rope is stretched across the water, marking a planting area. A man in a red shirt and a straw hat is in the foreground, holding a sapling and a long pole. A child in a yellow shirt is bent over, planting a sapling. Other people are visible further back, some holding saplings. The overall scene depicts a community activity focused on environmental restoration.

**ADAPTATION IS**

ALREADY  
OCCURRING





RAINBOW WARRIOR







# SUSTAINABLE DEVELOPMENT GOALS



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# The Ocean and Cryosphere in a Changing Climate

This Summary for Policymakers was formally approved at the Second Joint Session of Working Groups I and II of the IPCC and accepted by the 51st Session of the IPCC, Principality of Monaco, 24th September 2019

Summary for Policymakers



WG I WG II



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WG I WG II



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**Our ocean and cryosphere –**

**They sustain us.**

**They are under pressure.**

**Their changes affect all our lives.**

**The time for action is now.**

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**Only  
together...**



Source: UNICEF

**Please ratify BBNJ!**

## Océans et cryosphère

**L**e rapport spécial sur l'Océan et la cryosphère dans le contexte des changements climatiques a été adopté par l'Assemblée plénière du GIEC le 25 septembre 2019 à Monaco.

Dans cette Lettre, nous présentons d'abord un aperçu des principaux éléments de l'évaluation du GIEC, sous une forme accessible et illustrée d'éléments concrets.

Ensuite, trois scientifiques belges nous font bénéficier de leur expertise en présentant chacun un sujet important lié au rapport - la fonte des glaces du Groenland et de l'Antarctique, leurs mécanismes et leur impact sur le niveau des mers, et la perte d'oxygène des océans, perturbation anthropique moins souvent abordée mais à laquelle les changements climatiques contribuent également.

Nous vous souhaitons une agréable lecture de cette Lettre !

Philippe Marbaix, Bruna Gaino et Jean-Pascal van Ypersele

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# Lettre N°15: Océan et Cryosphère

Novembre 2019

## *Aperçu du Rapport spécial du GIEC sur l'Océan et la Cryosphère*

- Les changements physiques relatifs à l'océan et à la cryosphère
- Leurs conséquences sur les écosystèmes
- Leurs conséquences pour les populations et les services écosystémiques
- Les possibilités de réactions humaines à ces changements.



# To go further :

- [www.climate.be/vanyp](http://www.climate.be/vanyp) : my slides (under « conferences »)
- [www.ipcc.ch](http://www.ipcc.ch) : IPCC
- [www.pplateforme-wallonne-giec.be](http://www.pplateforme-wallonne-giec.be) : IPCC-related in French, Newsletter
- **Twitter: @JPvanYpersele & @IPCC\_CH**