

## ANTARCTIC CLIMATE EXPEDITION 2023



# LEVERAGING BLUE

NEWSLETTER CONTRIBUTION BY  
THE PRINCIPAL EXPEDITION TEAM

## THE ANTARCTIC CLIMATE EXPEDITION 2023 (ACE 2023)

Aims to bring about public and government awareness of the importance and the splendor of the Antarctic, to address the warming climate and loss of ice in the southern polar region as a direct threat to the future of human life on this planet.

The purpose of this Expedition is to confront the consequences and develop creative strategies for everyone to radically reduce carbon emissions, with the goal that each one of us will take more active ownership of our carbon footprint, then find ways to reduce and offset their emissions.

Hence the primary mission is for the ACE 2023 Team to propose and champion 23 Resolutions to reduce and offset emissions within our lives, communities, and countries to pace up in reaching Net Zero. The principal expedition team for this important climate summit will comprise conservationists, celebrities, and ocean luminaries. 100 people will be selected to be part of ACE 2023. You can be one of them. Find out more [here](#).

#ACE2023, #AntarcticClimateEpic, #AntarcticClimate, #OceanGeographic, #ACETEAM

## ACCELERATING CLIMATE ACTION THROUGH OCEAN CONSERVATION

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### INTRODUCTION

The ocean plays an instrumental role in influencing weather and climate given its tight linkage with the atmosphere. Most notably, 90% of the heat trapped on earth by greenhouse gas is stored by the ocean, only 2.3% of the extra heat warms the atmosphere directly. Hence, our planet would be a lot warmer without the presence of the ocean. Under the effects of climate change, the health of the ocean is deteriorating, weakening in function to moderate the climate. This then aggravates climate change, forming a negative feedback loop. To stop the vicious cycle, urgent action must be taken to protect our ocean. We will discuss ways that the ocean is affected by climate change, and how the ocean's role in climate action can be enhanced through leveraging Blue.



Image: Michael AW

## IMPACT OF CLIMATE CHANGE ON THE OCEAN

### Ocean Warming

Warming is the most apparent impact of climate change on the ocean. The global mean surface temperature has risen by 1.1°C above pre-industrial levels, leading to warming of the ocean by 0.76°C. Increase in ocean heat content is one of the primary drivers for global mean sea level rise, along with mass loss of Greenland and Antarctic ice sheets. According to IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), sea level will rise by 0.84m by 2100 compared with 1986-2005 under high greenhouse gas emissions scenario (RCP8.5). Even under low emissions scenario (RCP2.6), sea level will rise by 0.43m. It is forecasted that 200 million people will be threatened by sea level rise by the end of the Century with the inundation of low-lying and coastal areas.

Thwaites Glacier, the widest glacier in the world, is found to have doubled its melting rate in the past 30 years as observed in ariel films of Antarctica, which is faster than scientists forecasted in the past. This massive glacier comparable to the size of Florida has already contributed to 4% of global sea level rise. Warming of seawater continues to melt the ice shelf protecting the Thwaites Glacier, increasing the risk of cracking and disintegration in the coming decade. This would lead to substantial sea level rise and irreversible damage to the cryosphere.

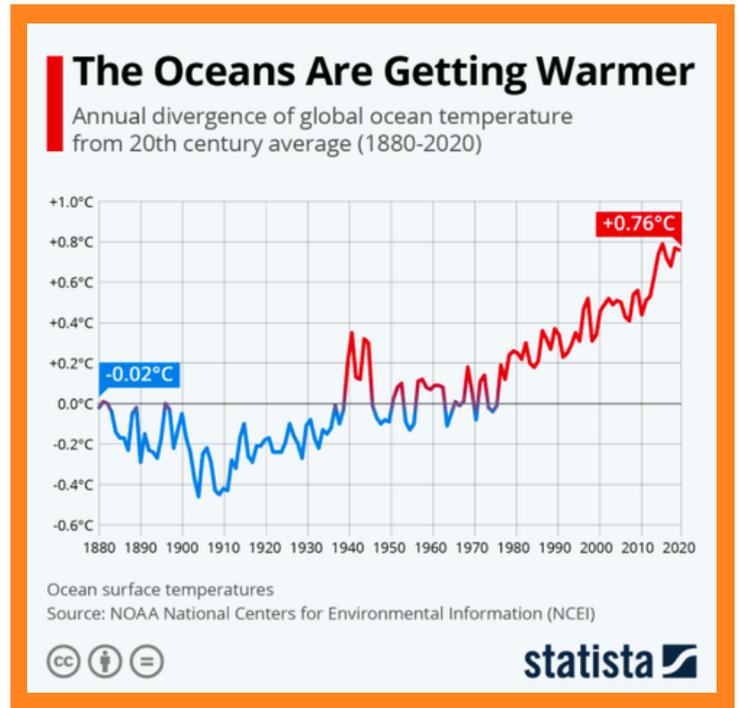


Figure 1. Annual divergence of global ocean temperature from 1880 to 2020 (Source: Statista, 2021)

### Ocean Acidification

Acidification is another major impact of climate change on the ocean. A quarter of carbon dioxide from anthropogenic activities is absorbed by the ocean. At present, the ocean absorbs 22 million tons of carbon dioxide per day. Gaseous carbon dioxide dissolves in water to form carbonic acid, reducing ocean pH from 8.2 to 8.1 since the Industrial Revolution. 0.1 difference in pH may seem insignificant, but it is, in fact, equivalent to a 30% increase in ocean acidity on the logarithmic pH scale. This rate of acidification is more rapid than known changes in ocean chemistry over the past 50 million years. Ocean acidification reduces the availability of carbonate ion, which is fundamental to forming calcium carbonate for skeletons and shells of marine species. This not only disrupts the marine food chain, but also the fisheries industry and people who depend on it for their livelihoods. Acidic seawater corrodes existing corals and limits the growth of new reefs, subsequently threatening species that rely on coral reefs as habitats. Dramatic effects were observed on a coral reef off the coast of Papua New Guinea, where boulder corals or even algae beds have replaced many of the complex branching corals, owing to excess carbon dioxide dissolved in surrounding waters.



Figure 2. Coral Reef showing the effect of acidification. (Source: Michael Aw, at The Maldives)



Figure 3. Ocean acidification threatens coral reefs (Source: Author, at Great Barrier Reef)

## Role of Ocean in Climate Action

Ocean conservation is a nature-based solution to climate change due to the role of the ocean as a natural carbon sink in storing carbon emissions, commonly known as “blue carbon”. Coastal ecosystems capture carbon dioxide for their growth and development, such as mangroves, seagrass beds, and salt marshes. These blue carbon sources are five times more effective carbon sinks than terrestrial tropical forests. In addition to climate mitigation, coastal ecosystems are essential for climate adaptation and resilience as they form a natural buffer against storm surges and extreme weather events. However, 50% of the coastal wetlands were lost in the past century due to sea level rise, extreme events, and localised human pressure. Restoring ocean and coastal ecosystems should be a priority to address climate change.

Natural capital accounting is a market-based mechanism to calculate the stocks and flows of natural resources in monetary value, ensuring development projects account for the immediate and long-term benefits generated from marine conservation. This method enables the private sector to capture and mobilise tremendous value offered by the blue economy instead of extracting it unsustainably.

### Projected changes, impacts and risks for ocean ecosystems as a result of climate change

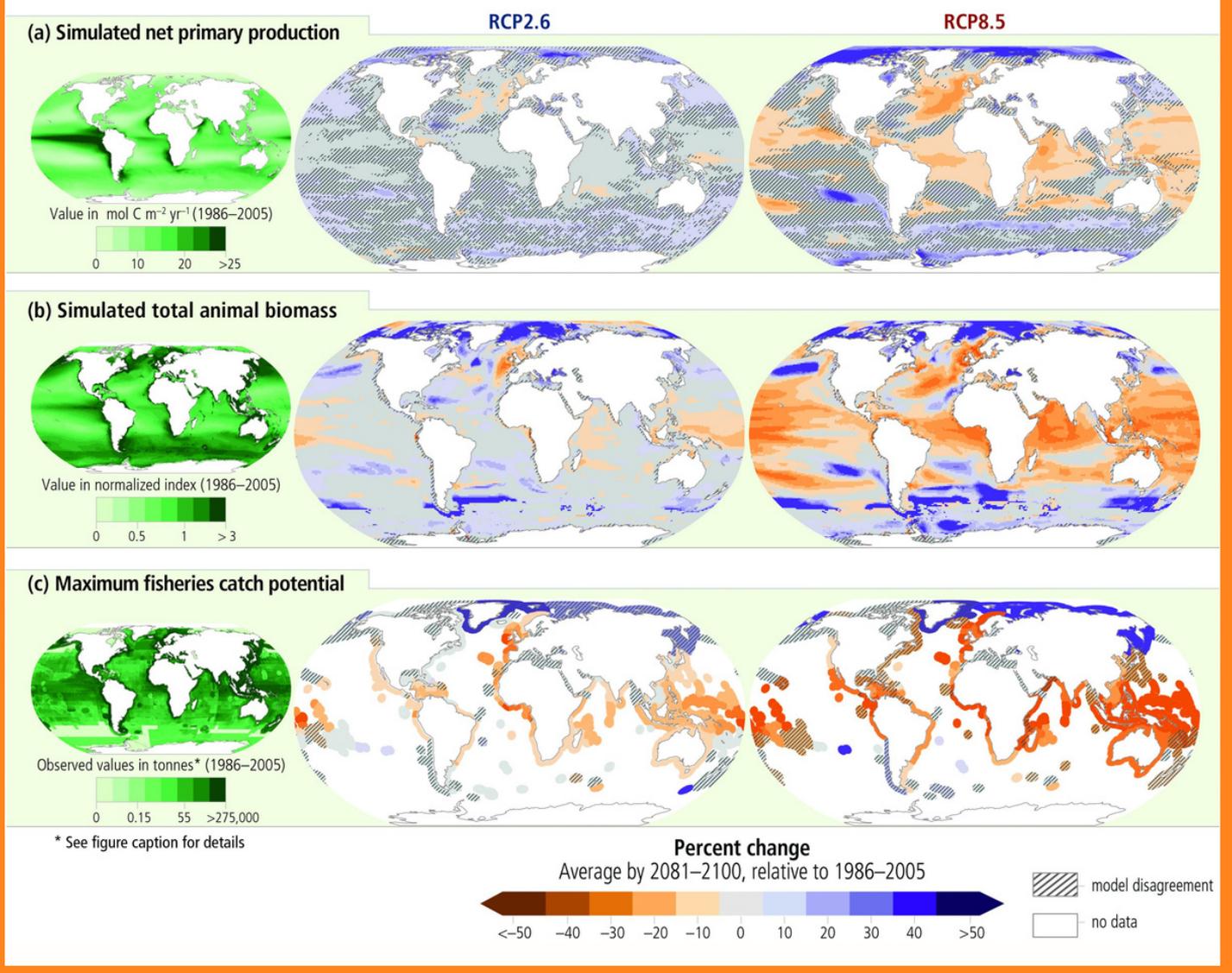


Figure 3. Projected changes, impacts and risks for ocean regions and ecosystems under low and high emission scenarios (Source: IPCC, 2019)

For cases where ecosystems are impossible to restore, scientists propose geoengineering techniques to artificially store more carbon dioxide into the ocean, one of which is iron fertilisation. It is estimated that over 30% of open ocean is high nitrate low chlorophyll (HNLC), where marine productivity is limited by the lack of nutrients like iron. The addition of iron to open ocean stimulates phytoplankton growth, enhancing the biological pump to sequester organic carbon into the deep ocean for long geological periods. However, geoengineering techniques may destruct the equilibrium state of biogeochemical cycles. For instance, past research has shown how iron fertilisation shifts phytoplankton composition in fertilised regions, leading to detrimental effects on ecosystem functions. Close monitoring of ecosystems is required to evaluate the long-term efficacy of these carbon dioxide removal technologies.

The ocean is the basis of different forms of life, providing habitat, food source, climate moderation, disaster buffer, cultural significance, and many more. As we realise the importance of ocean conservation for climate mitigation, adaptation, and resilience, it is time to devise governance framework, policies, and behavioural approaches that are effective and inclusive. Policymakers should initiate open dialogues with all layers of the society, especially the indigenous people living by and with the ocean, young people, and women with innovative minds and entrepreneurial spirit.

**By leveraging the potential of the vast blue ocean, we can accelerate much-needed climate action for a habitable future.**

In the next issue, we will share more on Blue Carbon.



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