



**OCEAN
VISIONS**

Transforming Science & Engineering into Ocean Solutions



Smithsonian



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WE FACE AN ENORMOUS CHALLENGE

The “Climate Emergency” is Now;
Evidence Mounts Daily.

One climate crisis disaster happening every week, UN warns

Developing countries must prepare now for profound impact, disaster representative says



▲ Aftermath of the damage left by Cyclone Kenneth in a village north of Pemba, Mozambique in May. Photograph: [Kilian Hinkelmann/Outlook](#)

the **guardian**

Climate crisis: 11,000 scientists warn of ‘untold suffering’

Statement sets out ‘vital signs’ as indicators of magnitude of the climate emergency

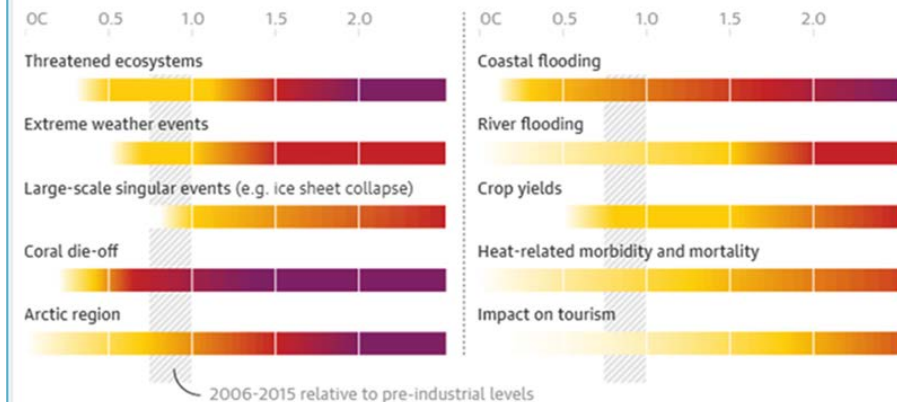
- **Most countries’ climate plans ‘totally inadequate’ - experts**

Rising temperatures, rising risks

Key to impacts and risks



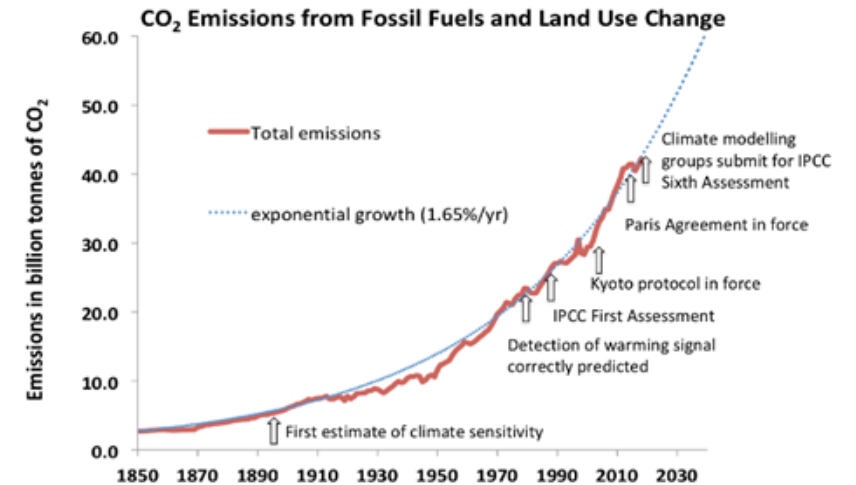
Global mean surface temperature change relative to pre-industrial levels, C



Guardian graphic. Source: IPCC Special Report on Global Warming of 1.5C

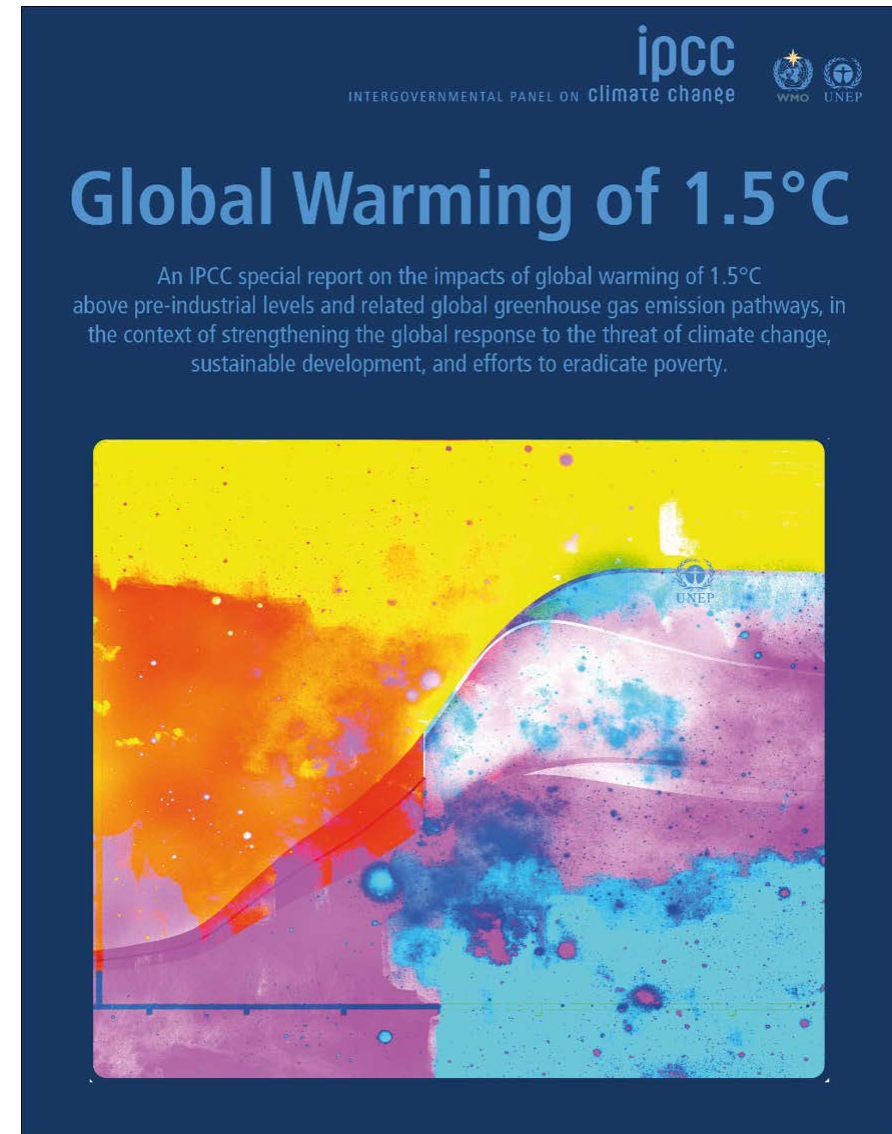
CURRENT ACTION AND POLICY ARE INADEQUATE

- Greenhouse gas emissions have continued to rise, as have investments in new fossil fuel infrastructure.
- 80% of global energy use is still fossil-fuel based; we are locked in for the foreseeable future.
- It is now clear: ***cutting carbon emissions alone will not be sufficient to halt, much less reverse, dangerous climate outcomes.***



WHY CO₂ REMOVAL?

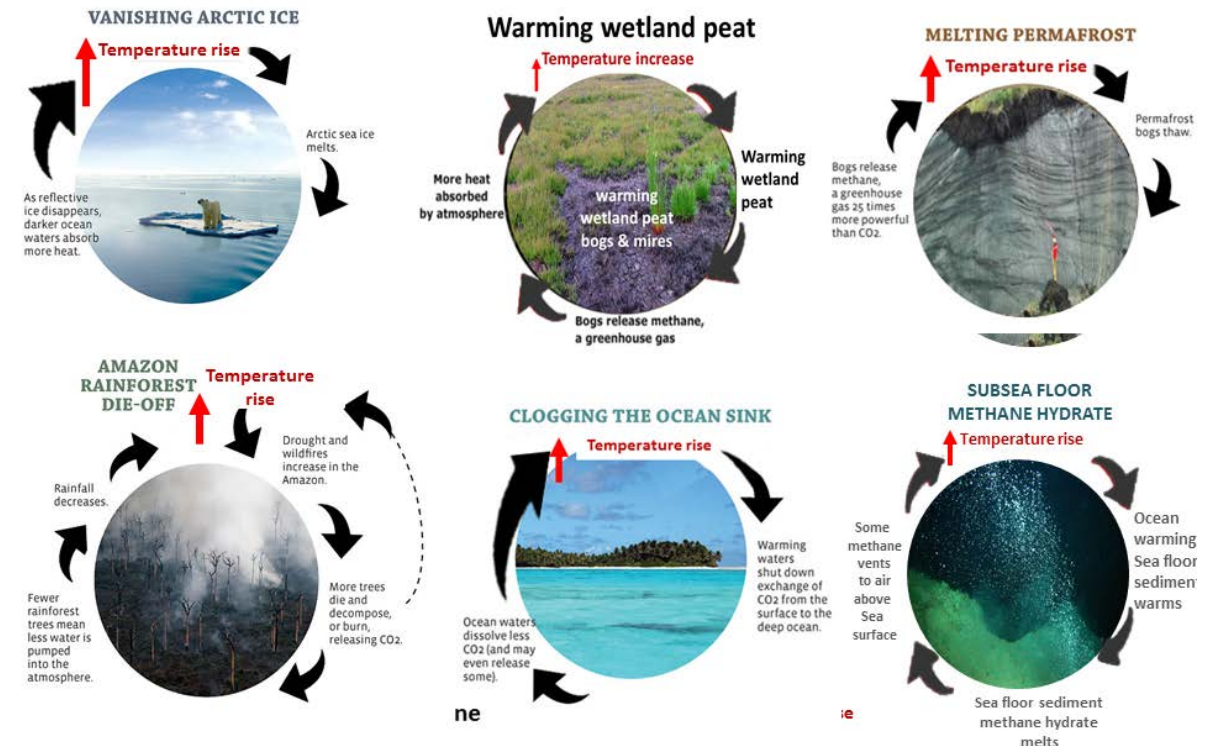
- The science is clear; we must remove very large quantities of CO₂ from the atmosphere (IPCC 2013, 2018)
- The IPCC Special Report on Global Warming of 1.5° specifically states that “**All pathways** that limit global warming to 1.5°C with limited or no overshoot **project the use of carbon dioxide removal (CDR) on the order of 100–1000 GtCO₂** over the 21st century.”



AND, WE NEED EVEN GREATER AMBITION FOR A SAFE CLIMATE

- Aiming to “stabilize” global temps at @ 1.5° C above pre-industrial is neither *safe nor durable*.
- Currently at +1.1° and climate is dangerously unsafe for hundreds of millions, and many other forms of life on the planet.
- “Stabilizing” at 1.5° increase is unlikely; global temps are distributed unevenly and **positive feedback loops** lead to climate destabilization.

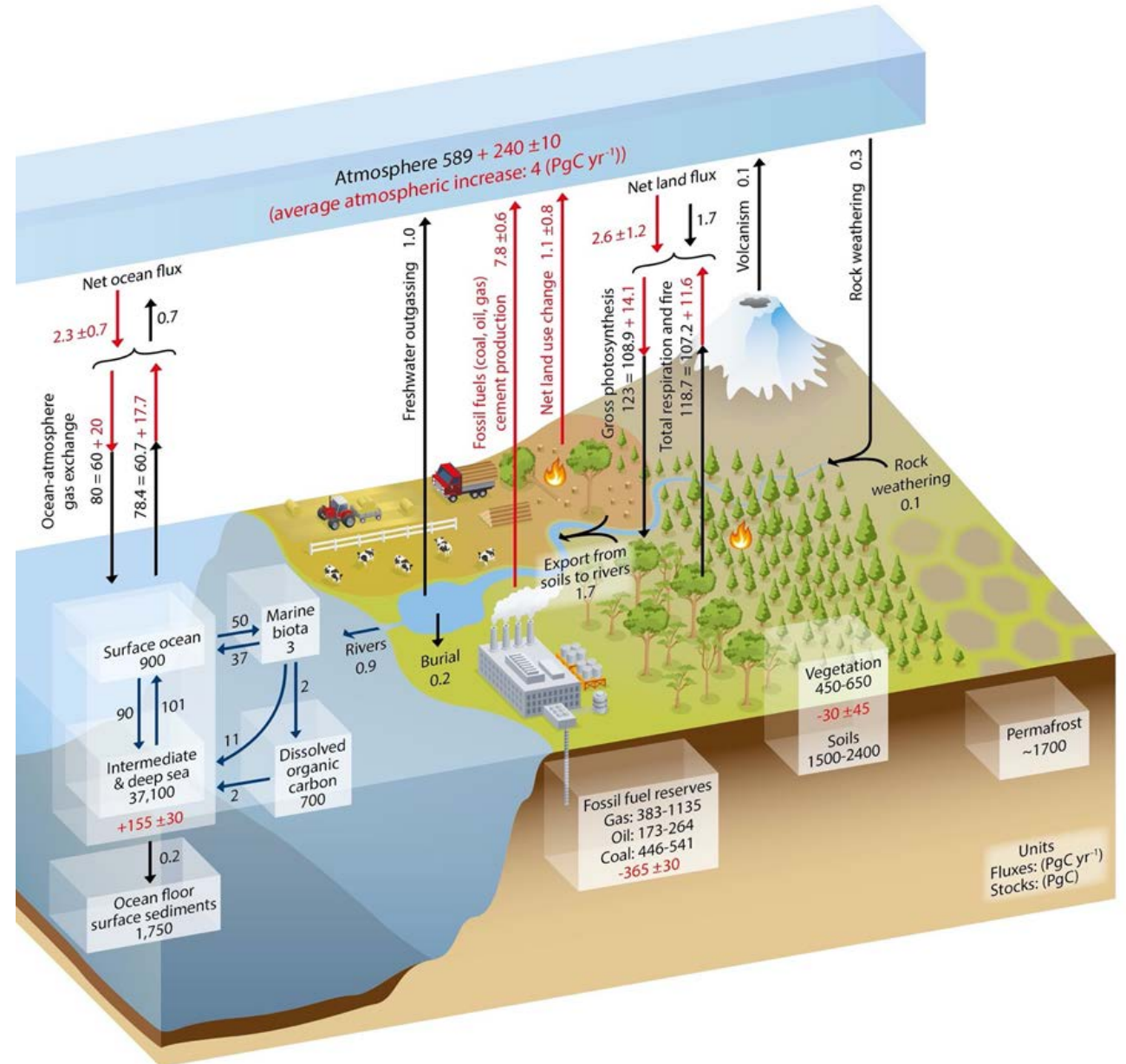
Dangerous ‘Positive’ Feedback Loops



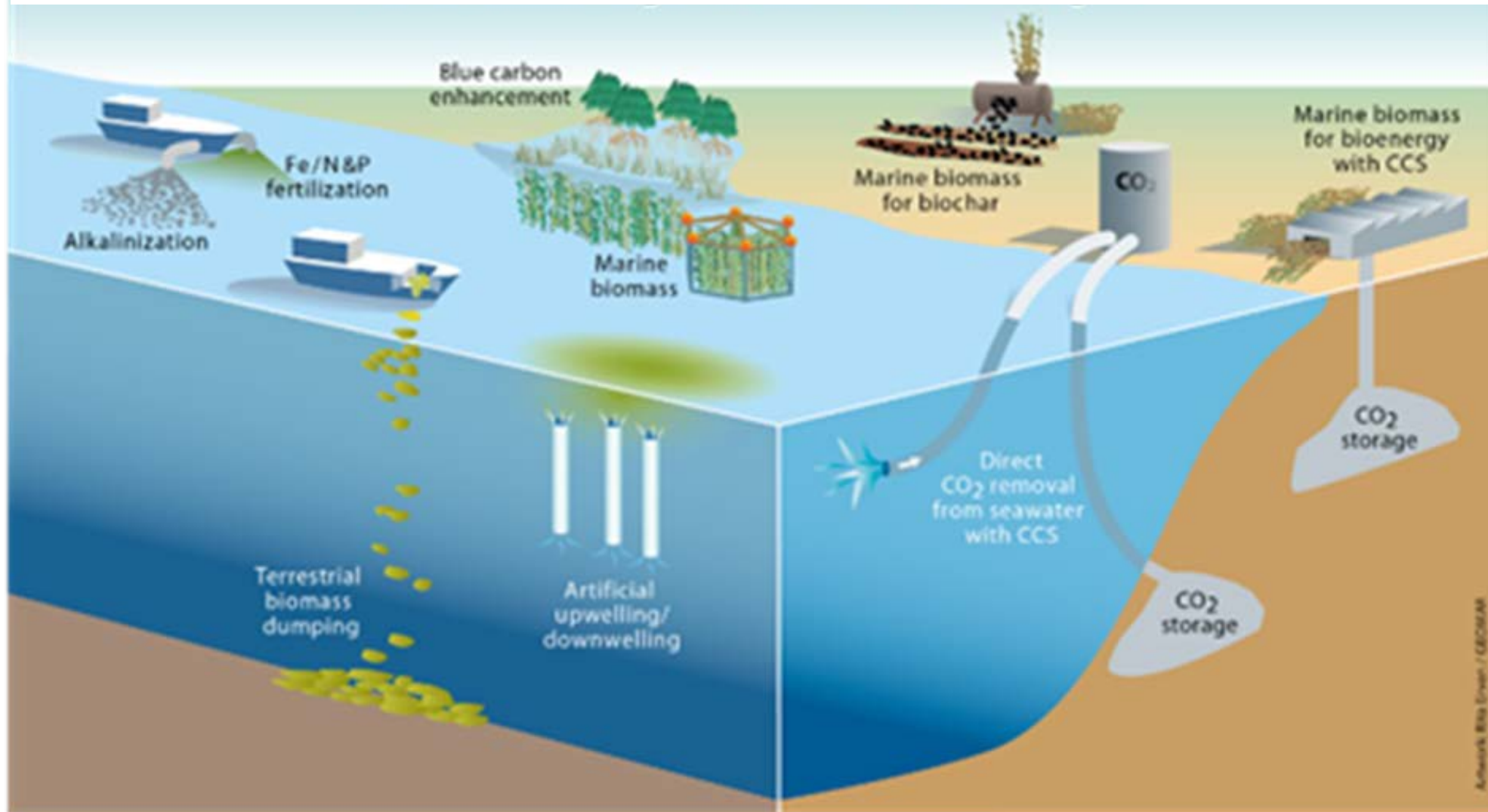
BUT WHY OCEANS?

ENORMOUS CAPACITY FOR CO₂ REMOVAL

- Given the Ocean's size and biological productivity, it can play a leading role in CO₂ capture and permanent storage.



MANY OCEAN CDR APPROACHES ARE BASED ON BIOMIMICRY AND “GEO-MIMICRY”



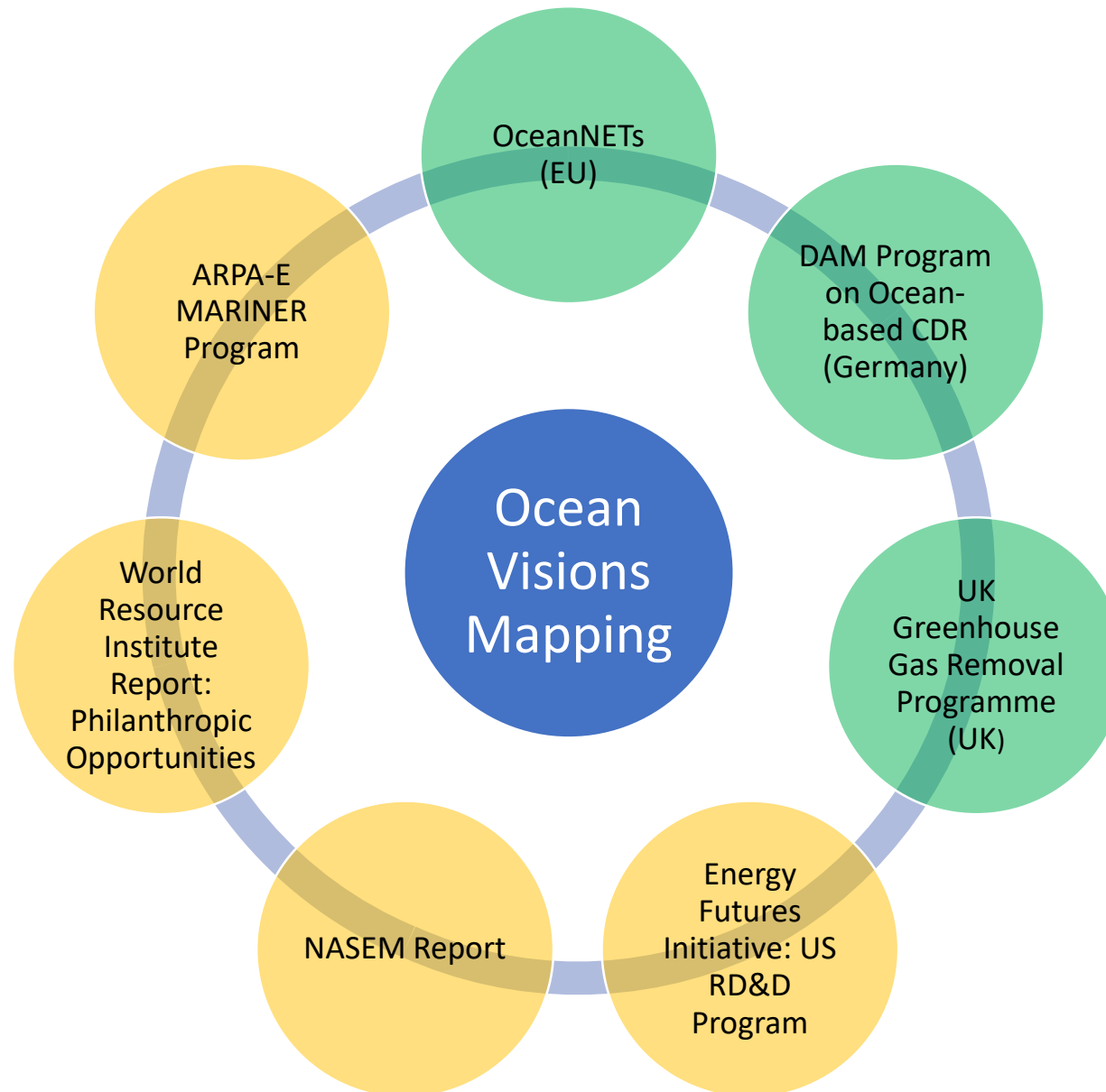
Ocean CDR = Ocean Conservation

The 21st Century Ocean/Climate Conservation Agenda Must Address:

- Rebuilding sea ice
- Reducing rates of loss of land ice - Greenland and Antarctica
- Reducing heat absorbed by oceans
- Flattening the curve on acidification
- Slowing the permafrost “time bomb”



The Current Landscape of Ocean-Based CDR Research and Pre-Competitive Efforts



Developing Actionable Roadmaps for Ocean-Based Carbon Dioxide Removal

An Initiative of Ocean Visions

- *Identify key needs, obstacles, opportunities and priorities for ocean-based CDR pathways.*
- *Examine them from a range of perspectives and disciplines, including natural sciences, engineering, policy, governance, economics, social equity and others.*
- *Build community and momentum amongst existing and interested potential practitioners and interested parties.*

Made possible through generous support from:



ClimateWorks

Purpose and Scope

Project Scope

Road maps will identify key needs, obstacles, opportunities and priorities for ocean-based CDR pathways and examine them from a range of perspectives and disciplines, including natural sciences, engineering, policy, governance, economics, social equity and others.

Process will also seek to build community and momentum amongst existing and interested potential practitioners and interested parties.

Focal Pathways for Ocean-based CDR



Macroalgal
Cultivation and
Sequestration



Ocean
Alkalinization



Electrochemical
CO₂ Stripping

Cross-Cutting Issues

- Building social and political license
- Expanding finance and investment in oceans-based CDR

Project Scope

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Cross-Cutting Issues

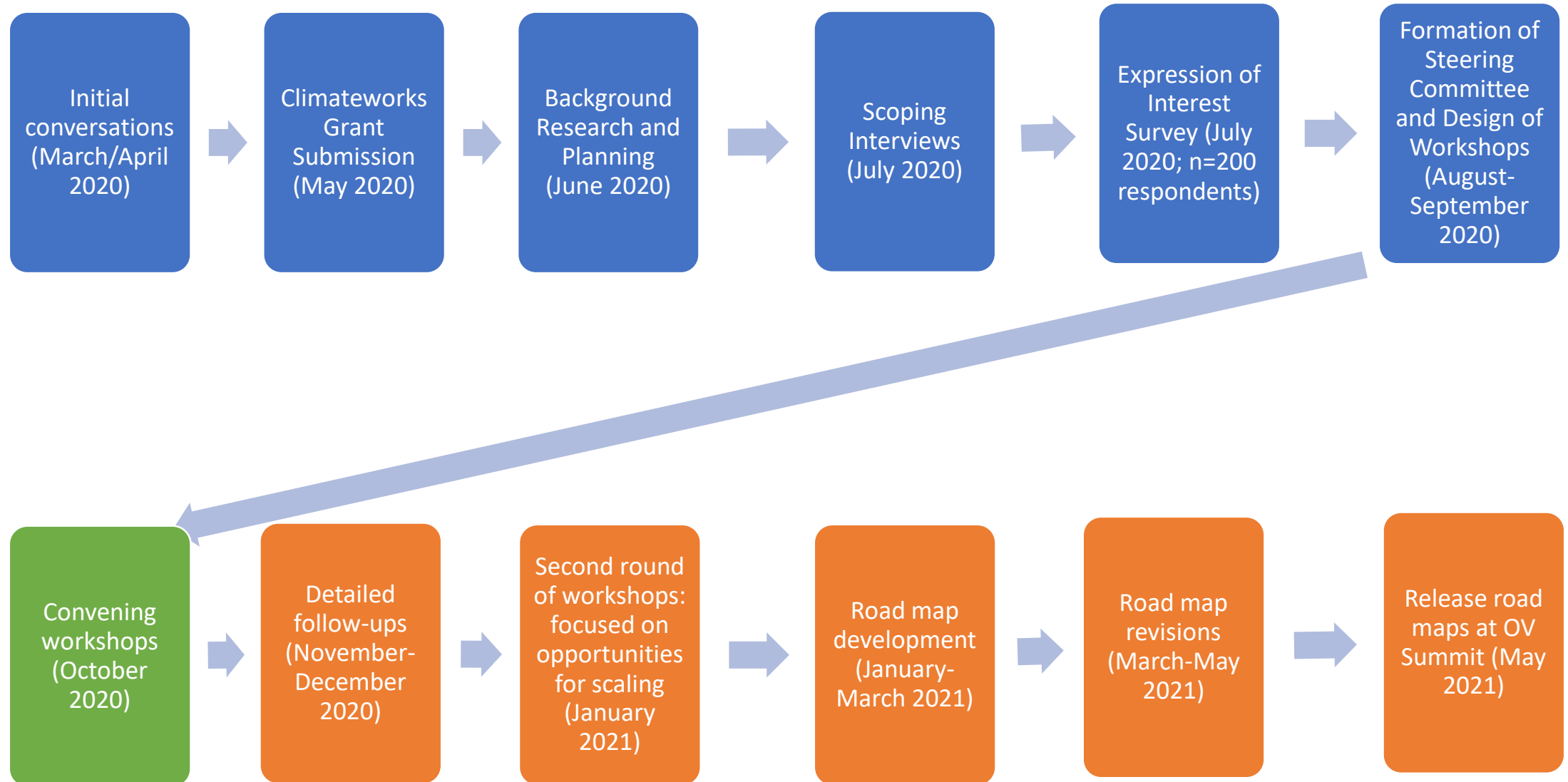
***Social and
Political
License***



***Finance and
Investment***



Work Plan





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