Blue Carbon - Introduction

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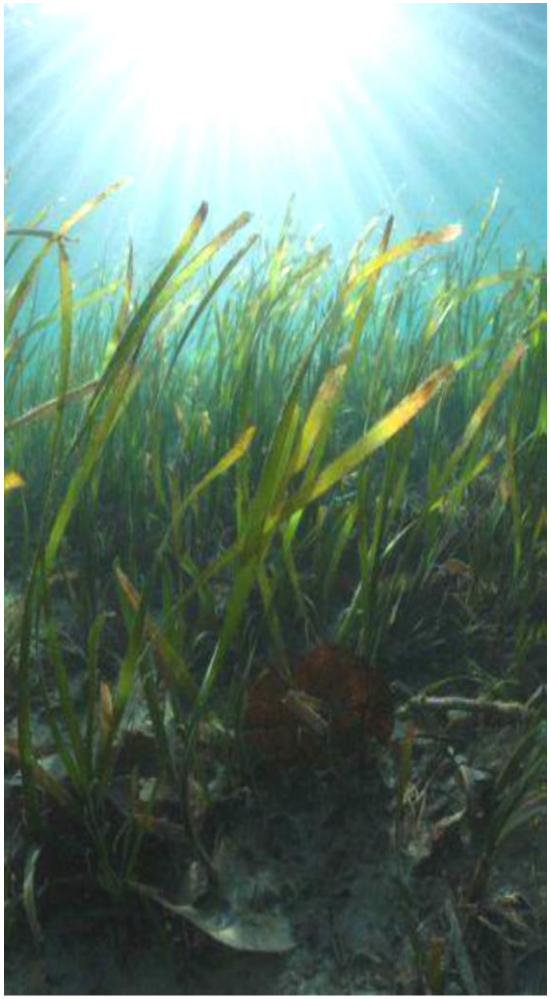
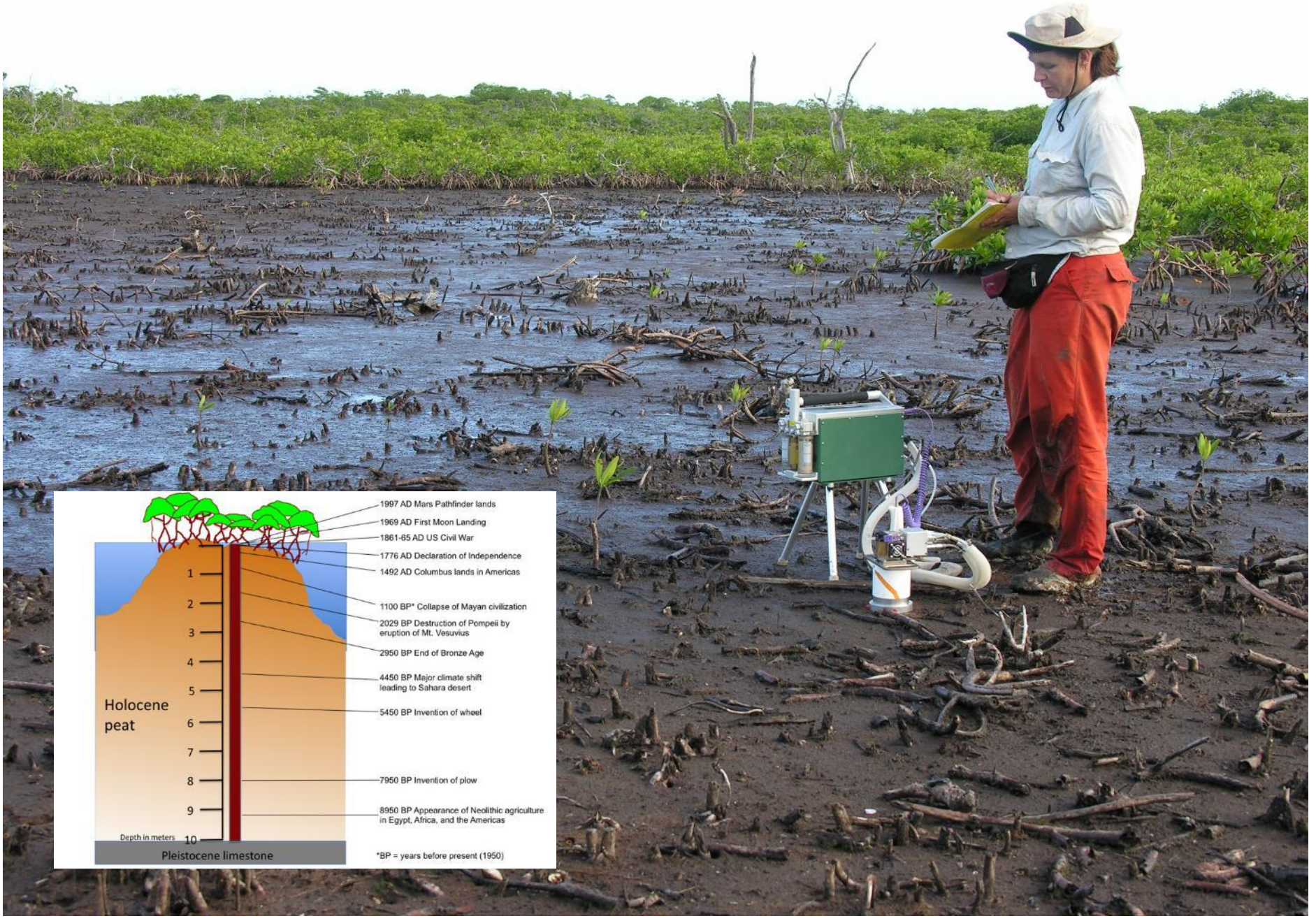
- Blue carbon in its broadest sense is all the organic carbon bound in the oceans

2009

Focus on mangrove, tidal marshes and seagrass



Evidence of carbon storage



Criteria for action

criteria for inclusion as actionable Blue Carbon ecosystems					Lovelock and Duarte 2019
scale of GHG removals or emissions are significant	long-term storage of fixed CO_2	undesirable anthropogenic impacts on the ecosystem	management is practical/possible to maintain/ enhance C stocks and reduce GHG emissions	interventions have no social or environmental harm	alignment with other policies: mitigation and adaptation
1	2	3	4	5	6

Take home message:

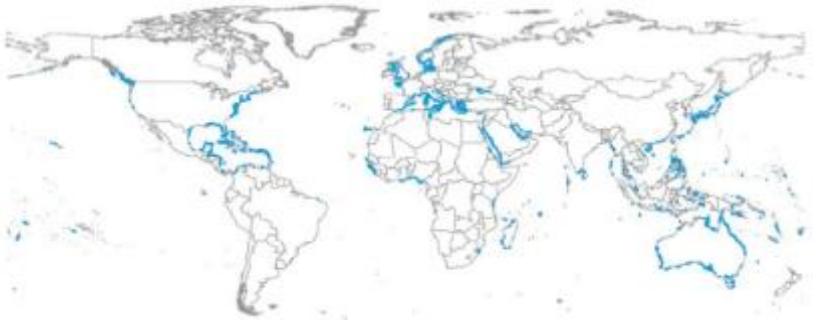
- Information is expanding in all areas of research
- Questioning and examining uncertainties is key to the scientific method
- A role for IPBC and others in sharing and synthesising knowledge

1. Global scale of the ecosystems and their carbon stocks

- Global and regional assessments for mangrove carbon are highly developed
  - distribution, carbon stocks and rates of change
  - Regional and national and site level assessments

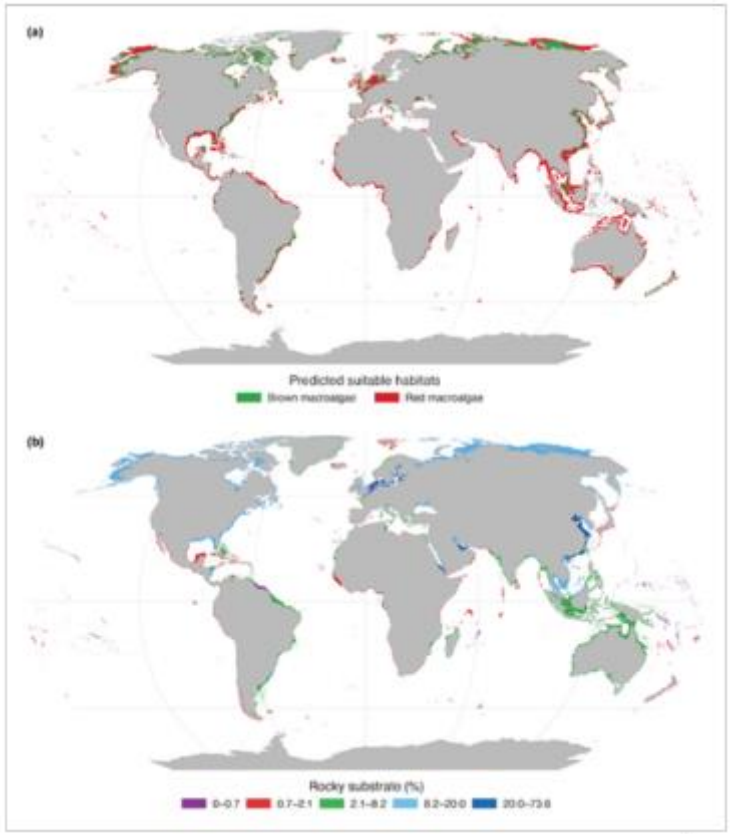
- Saltmarsh, seagrass, seaweeds, mudflats, oyster reefs
  - global distribution established and maps are improving
  - characterisation of carbon stocks and fluxes are increasing

Seagrass meadows
Mapped distribution



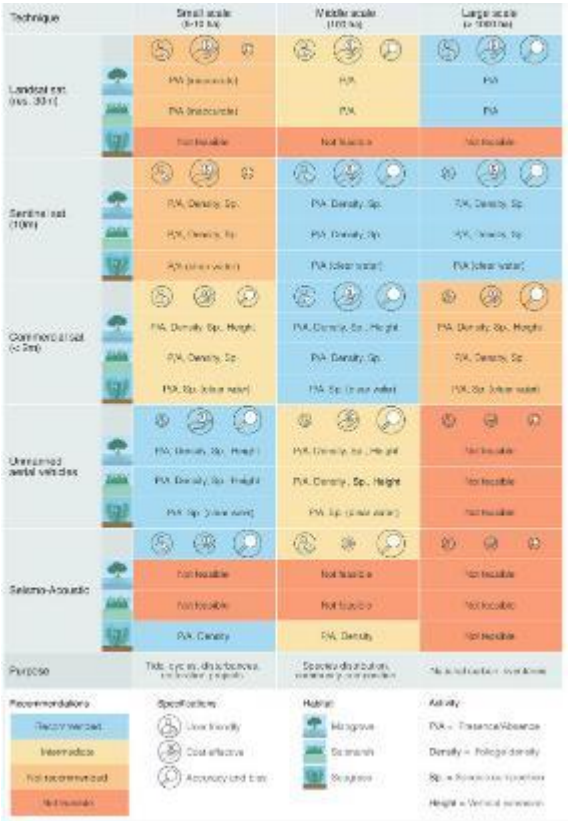
Seagrass meadows
Modelled distribution

Seaweed



Duarte et al. 2022

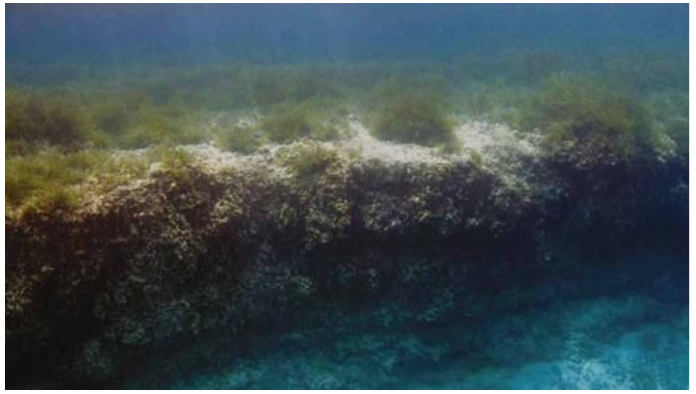
Guidance on how to map



Malerba et al. 2023

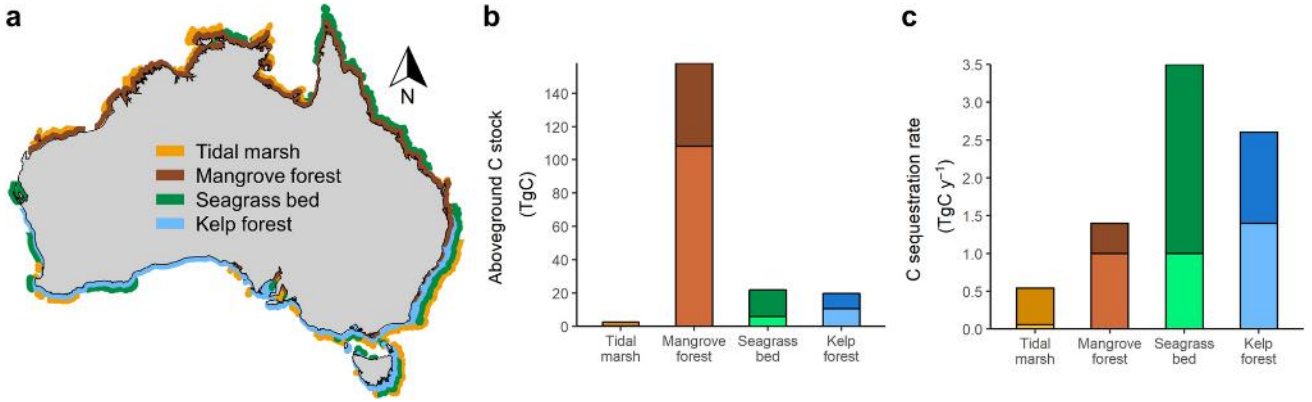
2. Long term storage of CO_2

- Inundated, saline soils slow decomposition, enhancing carbon accumulation (ongoing characterization, particularly for seagrass)



Seaweeds, mudflats

- Exploring uncertainty – where is the carbon and how permanently is it stored?
  - These are highly productive and “open” ecosystems, so much of the production may be exported – under investigation
  - Farmed seaweed systems – accumulation in sediments
  - Impacts of climate change on seaweeds and seagrass – marine heatwaves/potential for poleward expansion
  - Other pathways for seaweed (supplements for cattle)



Filbee-Dexter and Wernberg 2020

3. Undesirable anthropogenic impacts

- Mangroves, tidal marshes, seagrass, kelp, mudflats
- Monitoring technology is improving rapidly
- Managing offsite impacts and linking to carbon storage remain a challenge (e.g. water quality)

WETLAND ECOLOGY

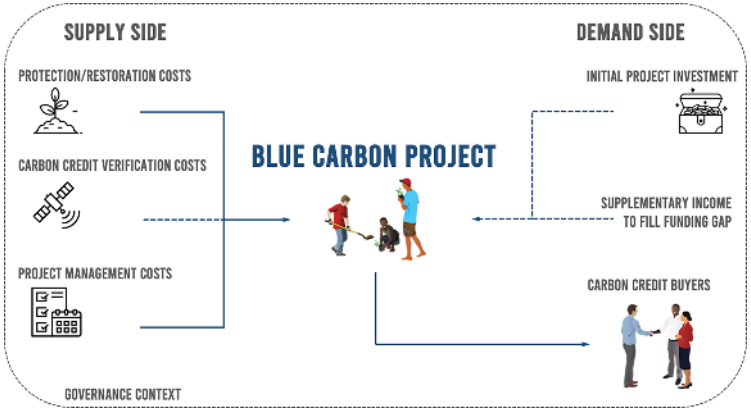
High-resolution mapping of losses and gains of Earth's tidal wetlands

Nicholas J. Murray[1*], Thomas A. Worthington[2], Pete Bunting[3], Stephanie Duce[1], Valerie Hagger[4], Catherine E. Lovelock[4], Richard Lucas[3], Megan I. Saunders[5], Marcus Sheaves[1], Mark Spalding[6], Nathan J. Waltham[1,7], Mitchell B. Lyons[8]

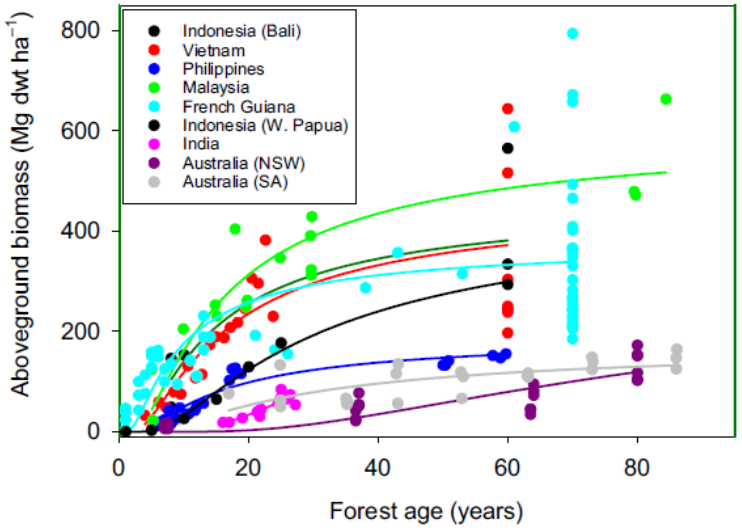
https://www.globalintertidalchange.org *Nature*, 2022

4. Management to reduce GHG and enhance C sequestration is practical/possible

- Science has recently focused on restoration – mangroves, tidal marshes and seagrass, establishing rates of GHG emissions and C sequestration (underpinning methods)
- Economic studies are emerging (conservation)
- Social science is increasing
- Managing under climate change



Friess et al. 2022



Lovelock et al. 2022

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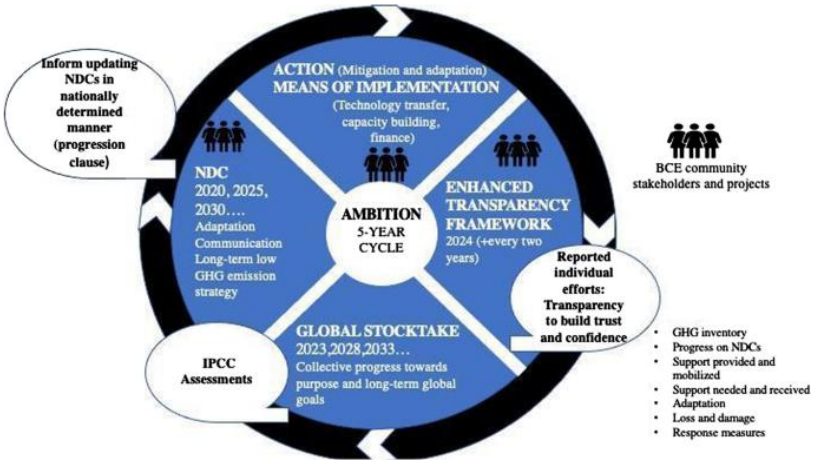
Social science research

- Fairness and equity
- Governance systems
- Indigenous land (land tenure)
- Community forestry
- Economics



Dencer-Brown et al. 2022

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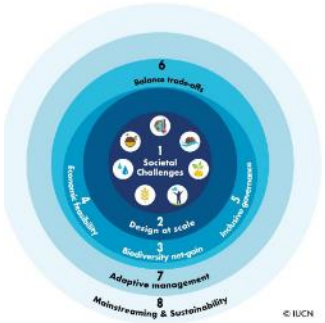
Development of Standards



IUCN – NbS Standards

HIGH-QUALITY BLUE CARBON PRINCIPLES AND GUIDANCE

A TRIPLE-BENEFIT INVESTMENT FOR PEOPLE, NATURE, AND CLIMATE

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2021 2030 United Nations Decade of Ocean Science for Sustainable Development

UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION 2021-2030

SUSTAINABLE DEVELOPMENT GOALS

United Nations Climate Change

UNDRR UN Office for Disaster Risk Reduction

Ramsar

UNCLOS

Convention on Biological Diversity

unesco World Heritage Convention

Conclusions

- Research has expanded – biophysical, economics, social sciences
- Gaps in our knowledge remain
  - Exploring uncertainties will ultimately strengthen blue carbon strategies
  - Social science
- A strong role for IPBC in synthesising and distilling expanding knowledge
- Exciting times

Acknowledgements

the BLUE CARBON initiative

CONSERVATION INTERNATIONAL

IUCN

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Australian Government
Department of Climate Change, Energy, the Environment and Water

INTERNATIONAL PARTNERSHIP FOR BLUE CARBON

Australian Government
Clean Energy Regulator

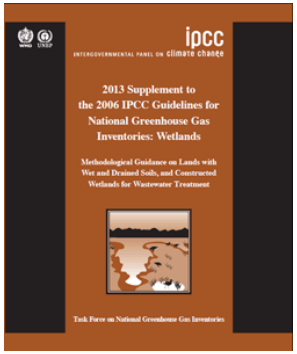
EMISSIONS REDUCTION FUND

CSIRO

WWF

REGENERATE AUSTRALIA

4. Methods for accounting for blue carbon

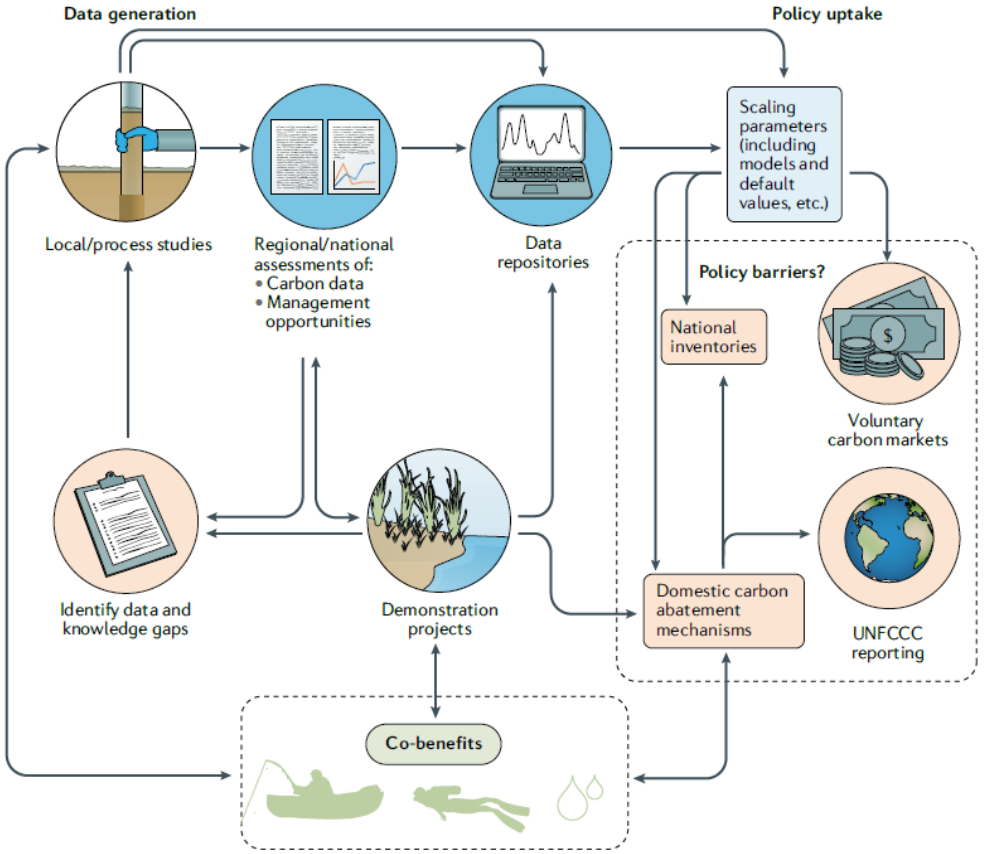


- Blue carbon in National Greenhouse Gas Inventories – IPCC Guidance
- International methods

VERRA

VCS | VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

- The development of a national method in Australia for the voluntary market – and other applications (Environmental Accounts - CBD)



Macreadie et al. 2021
Nature Reviews