Outline of ‘the ICEF Blue Carbon Roadmap: carbon captured by the world’s coastal and ocean ecosystems’

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“Blue Carbon Roadmap: Carbon captured by the world’s coastal and ocean ecosystems”

- This roadmap focuses on blue carbon, as one of the negative emission technologies (NETs), captured and stored by 1) mangroves, tidal marshes, and seagrasses in the coastal zone, and 2) the cultivation of macroalgae such as kelp and sargassum, which has been remarkably advanced in recent years.
- The roadmap presents the potentials for carbon removals towards 2050, challenges in measurement, reporting and verification (MRV) for carbon credits, and innovative technologies that can be used for MRV.

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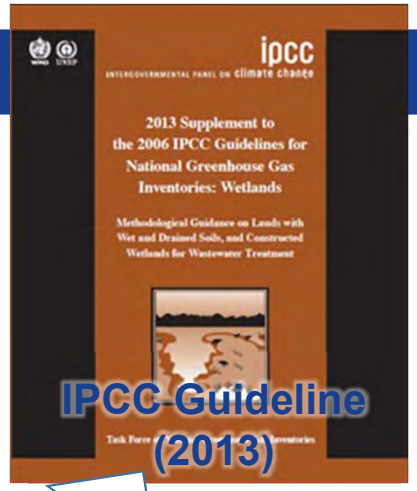
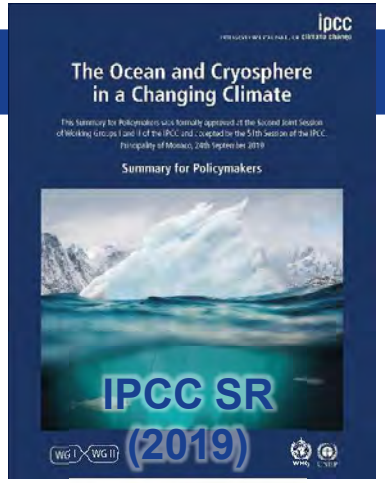
Chapter 1: Introduction: Blue Carbon from its birth to its growth

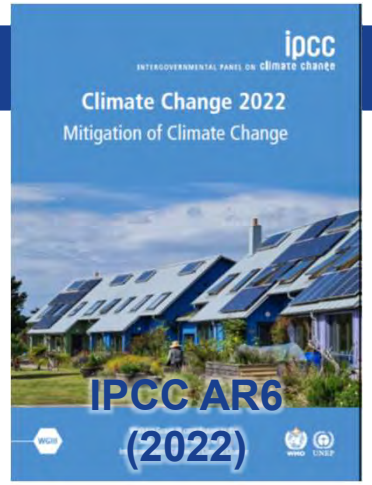
SCIENCE

IPCC (1988-)

UNEP report (2009)







Requested "Wetland Guideline" (2010)

POLICY

UNFCCC (1992-)

Annual inventories, NDCs

COPs

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Chapter 2: Where we are? Scientific understandings of blue carbon components

	criteria for inclusion as actionable Blue Carbon ecosystems					
	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
mangrove	yes[1,2]	yes[3]	yes[4,5]	yes[6,7]	?	yes[8]
tidal marsh	yes[1,9]	yes[9]	yes[10]	yes[11,12]	?	yes[13]
seagrass	yes[1,14]	yes[15]	yes[16]	yes[17]	yes	yes[18]
salt flats (sabkhas)	?	?	yes[19]	?	?	?
freshwater tidal forest	?	yes[20]	yes[21]	yes[22]	?	?
macroalgae	yes[23]	?[23]	yes[24]	yes[25]	?	yes[26]
phytoplankton	yes[27]	?[28]	?	?	?	no
coral reef	no[29]	no	yes[30]	no	?	yes[31]
marine fauna (fish)	no[29]	no	yes[32]	no	?	no
oyster reefs	no[29]	?	yes[33]	no	yes	yes[34]
mud flats	?[35]	?	yes[36]	?	yes	yes[36]

Established *blue carbon*

Emerging *blue carbon*

Lovelock and Duarte (2018)

More recent scientific knowledge on the long-term storage of macroalgal blue carbon should be explored.

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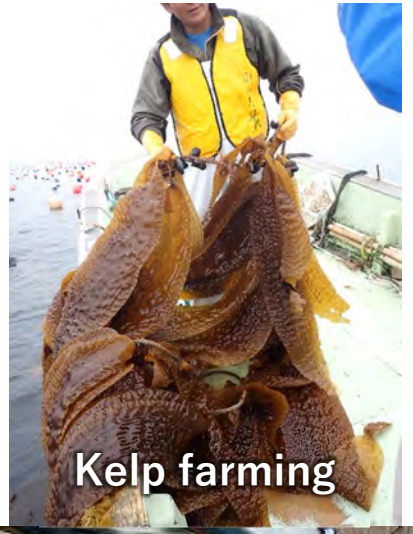
Chapter 3: Current and future technologies to scale the blue carbon

- Technological challenges (including innovative technologies for monitoring)
- Environmental concerns

1. Technology to Create: Seedling production, Floating farming platform, IMTA, Offshore wind & kelp farm
2. Technology to Protect: Remove and use grazers (Sea urchins)
3. Technology to Use: Food, Bioenergy, Feed, Fertilizer, Cosmetics, Drugs, New materials
4. Technology to Measure: Airborne Lidar Bathymetry, Auto-drones, Automatic identification of macroalgal bed (machine learning), *In-situ* real-time monitoring, EIA for large-scale farming (cost effectiveness)


Kelp farming


(Source) Oita Prefecture

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Chapter 3: Current and future technologies to scale the blue carbon

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ICEF roadmap (2018)

1. Possible impacts from large-scale macroalgal farming on deep-sea biological communities (Ricart et al. 2022);
2. Life cycle environmental impacts of macroalgal farming (plastic ropes, CO_2 release during drying) (van Oirschot et al. 2017)
3. Risk of reversal (ICEF, 2018)

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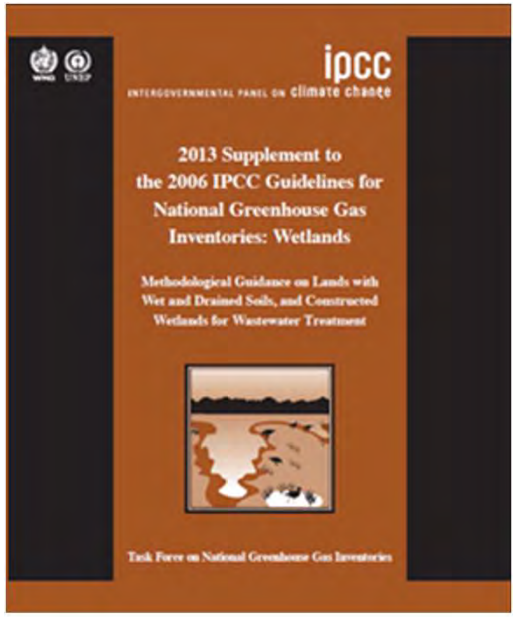
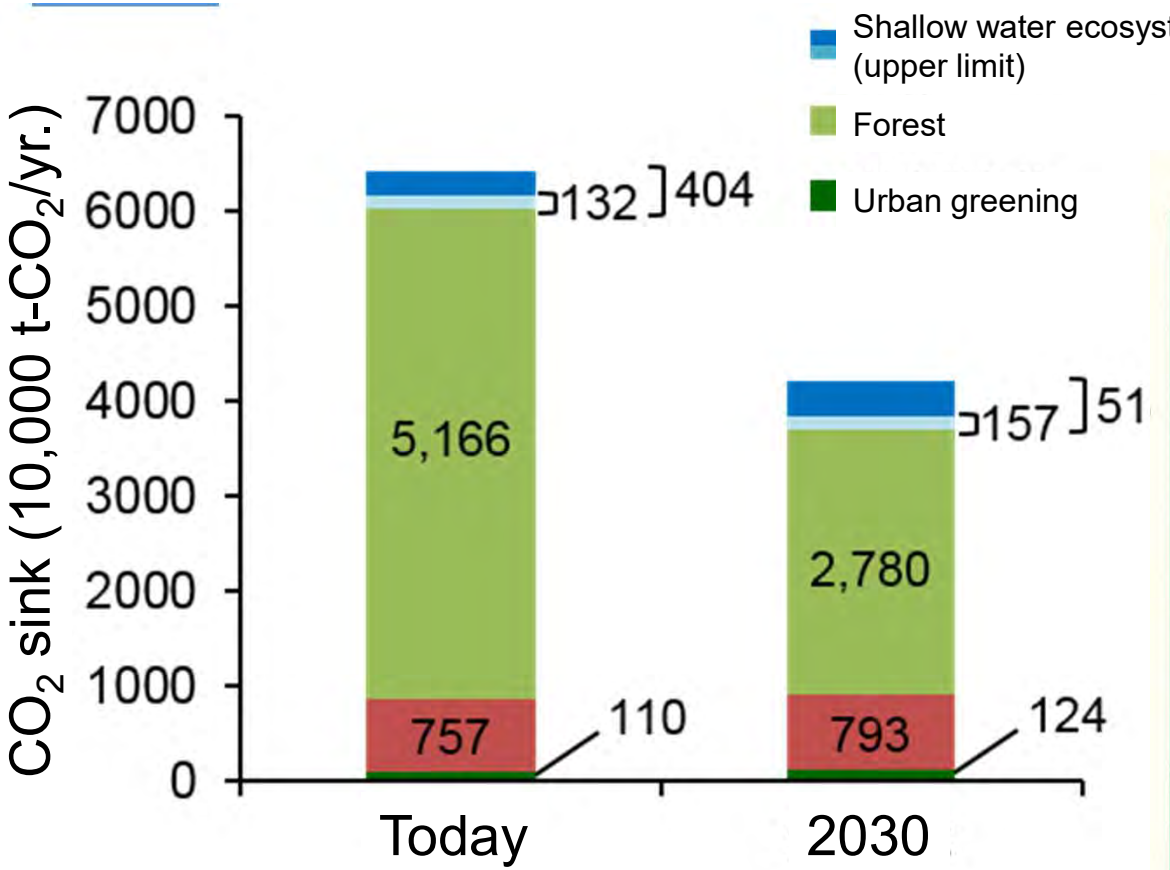
Chapter 4: Policy and institutional requirements

- To be included in the inventory as a sink under the UNFCCC;
- To be included in the NDCs;
- To develop a new IPCC guideline to accommodate macroalgal blue carbon;
- To answer if deep-sea storage of macroalgae meets the requirements under the London Convention/London Protocol;
- To satisfy offset carbon criteria (The Core Carbon Principles)
- To coordinate with other stakeholders in the sea area, such as fishers and port managers.



IPCC Guideline (2013)

Chapter 5: Potentials of carbon removals by and credits from blue carbon



Kuwae et al. (2019) (in Japanese)

J Blue Credit

2022: 65tCO_2e/yr.
2030: ~10,000t
2050: ~1,000,000t

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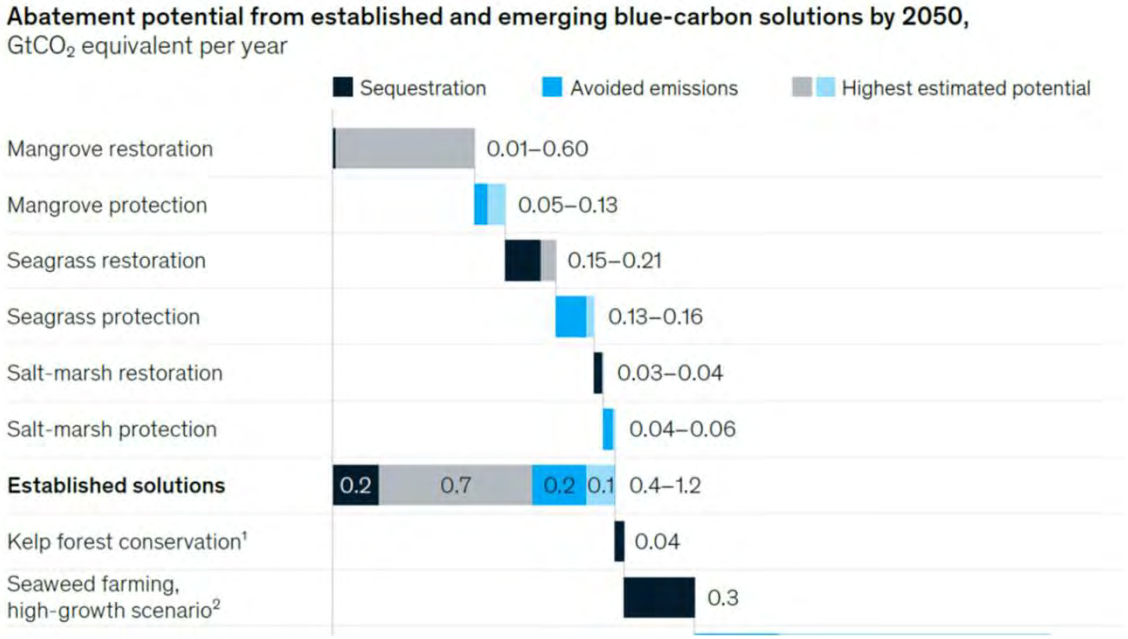
Chapter 5: Potentials of carbon removals by and credits from blue carbon

Blue Carbon Potential

0.32-0.89 $GtCO_2e$/yr. by 2030
and
0.4-1.5 $GtCO_2e$/yr. by 2050
(Ocean Panel, 2019; McKinsey 2022)

Blue Carbon Credit

0.3 $MtCO_2e$/yr. in 2020
VCMs will develop by a factor of 15 by 2030 and 100 by 2050



Modified after McKinsey (2022)

Timeline

<Schedule>

Blue Carbon Roadmap

6th Oct.	Present an outline at ICEF 2022, open for public comment
15th Oct.	End of public comments
15th Nov.	Present a draft at COP27, open for public comment
30th Nov.	End of public comments
28th Dec.	Finalize
TBD	Present at an event and release