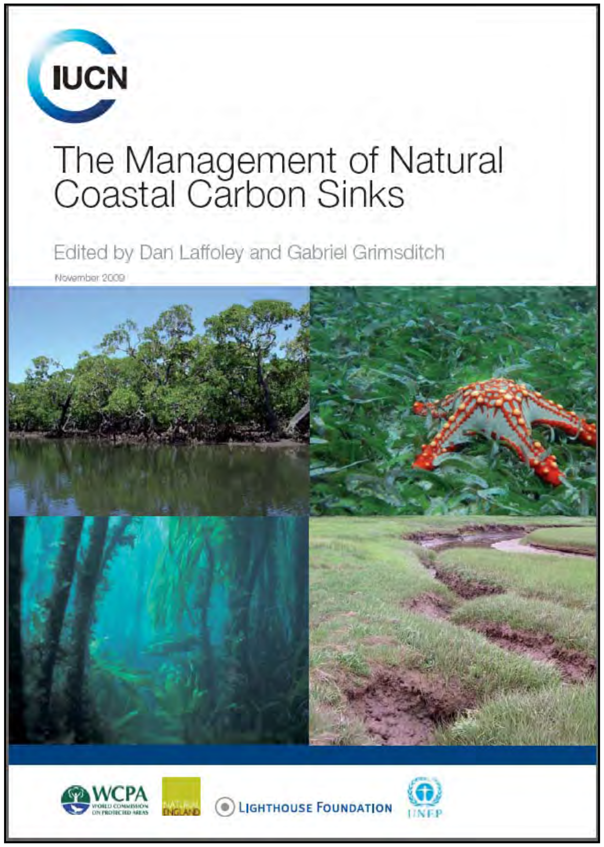
Launch of new publication


IUCN

The Management of Natural Coastal Carbon Sinks

Edited by Dan Laffoley and Gabriel Grimsditch

November 2009


IUCN

The Management of Natural Coastal Carbon Sinks

A short summary

November 2009

Introducing coastal marine carbon sink

Climate change is arguably one of the biggest issues facing humanity. World leaders now recognise that urgent and significant reductions in our emissions of greenhouse gases are needed if we are to avoid future dangerous climate change. Alongside such measures is an increasingly strong recognition that there is a need to properly manage particular habitats that act as critical natural carbon sinks.

The production of the report has been stimulated by an apparent lack of recognition and focus on coastal marine ecosystems. There is an urgent need to complement activities already well advanced on land to address the best practice management of terrestrial carbon sinks such as forests and peatland. This report is therefore timely as a number of Governments are now introducing legislation to tackle climate change and quantify carbon sinks. Interest in and actions to address the underlying causes of climate change are also growing– regulation of anthropogenic emissions of greenhouse gases into the atmosphere, avoiding deforestation, management and protection of other natural terrestrial carbon sinks, and the development of fiscal measures that place a value on carbon and therefore provide an economic incentive to reduce emissions.

(from top left to botton right): Mangroves, New Caledonia © Dan Laffoley; Close up of seagrass © Jerker Tamelander; Temperate water kelp forest © JNCC; Saltmarsh on the St Lawrence, Canada © Sarah Knox

It is important that such quantifications and processes work with the latest science and evidence.

To construct the report we asked leading scientists for their views on the carbon management potential of a number of coastal marine ecosystems: tidal salt marshes, mangroves, seagrass meadows, kelp forests and coral reefs. These ecosystems were selected because of the initial belief that they should be good at sequestering carbon, and are located in situations where management actions could secure the carbon sinks. If evidence substantiated this claim then this could expand the range of global options for carbon management, unlocking new possibilities for financing and protecting the coastal marine environment.

Dan Laffoley and Gabriel Grimsditch


NASA

Climate change adaptation and mitigation: important 'missing' sinks?

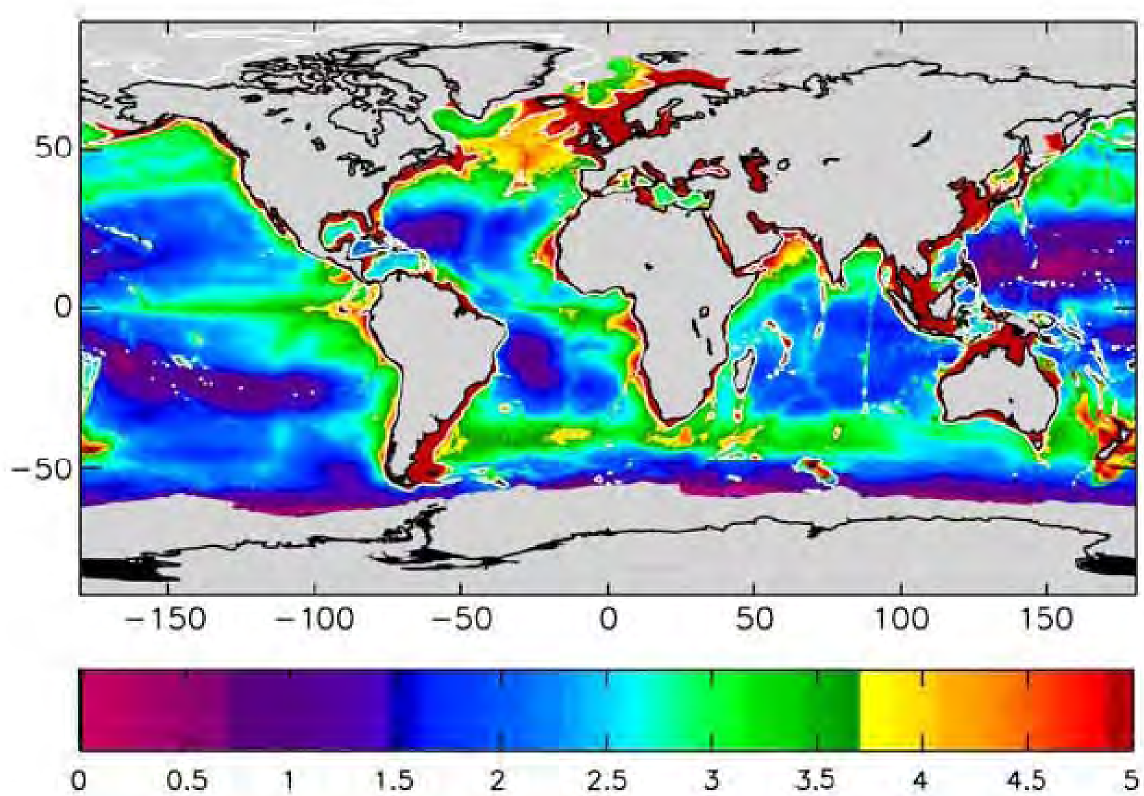


Figure 1. Average annual particulate organic carbon flux [gC m^{-2} y^{-1}] deposited on the ocean bottom between 1998 and 2001, with continental margins outlined in white at the 2000 m depth contour.

MULLER-KARGER ET AL, 2005

Origin and goals of the report

An enquiring mind! Evidence!

3 years in the making

IUCN 'One Program' product

Project ramp-up (WCC, IMPAC 2, CHOW)

Goals – Focus on the ocean
Expose the scientific evidence base

Investing in coastal ecological infrastructure
Reward benefits through payment and markets
Reform environmentally harmful subsidies
Address loss through regulation and pricing

CALL FOR PAPERS!

The Management of Natural Carbon Sinks in Coastal Ecosystems: Investigating and Realising the Potential

Do you research coastal ecosystems that are potentially important carbon sinks?

Climate change is one of the greatest threats to human-kind today, and management of the natural carbon cycle is very important if we want to avoid catastrophic change in the future.

To date, carbon management has focused on terrestrial ecosystems. However, marine ecosystems are the largest carbon sinks in the world, and it is time to tap into the huge potential of coastal ecosystems and to manage them appropriately in order to maximise their potential in mitigating climate change.

Mangroves, seagrasses, upwelling areas, saltmarshes and coastal wetlands, among others, are hugely important in balancing the global carbon budget, and we must protect these systems.

The IUCN, the WCPA and Natural England are producing a publication exploring the possibility of managing natural carbon sinks in coastal ecosystems to mitigate climate change.

If your work is relevant to this topic, and you would like to participate, please contact:

Gabriel Grimsditch (IUCN):

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Tidal Salt Marshes	Gail L Chmura, McGill Uni.
Mangroves	Steve Bouillon, KU Leuven Victor Rivera-Monroy, Louisana State Uni. Robert Twilley, Louisana State James Kairo, KMFRI
Seagrass	Hilary Kennedy, Bangor Uni. Mats Björk, Stockholm Uni.
Kelp Forests	Daniel C Reed, Uni of California Mark A Brzezinski, Uni of California
Coral Reefs	Stephen Smith, CICESE Jean-Pierre Gattuso, Université Pierre et Marie Curie
Comparative analysis	Emily Pidgeon, Conservation International
Next steps	David Thompson, Natural England

Focus of the report

'When one considers feedbacks to climate, each molecule of carbon dioxide sequestered in soils of tidal salt marshes and their tropical equivalents, mangrove swamps, probably has greater value than that stored in any other natural ecosystem, due to the lack of production of other greenhouse gases.'

Gail L Chmura

'A tidal salt marsh soil that contains 5% carbon but has a bulk density of 0.53 g cm^{-3} can hold the same amount of carbon as a bog soil that contains 46% C, but has a bulk density 0.06 g cm^{-3}'

Tidal Salt Marshes

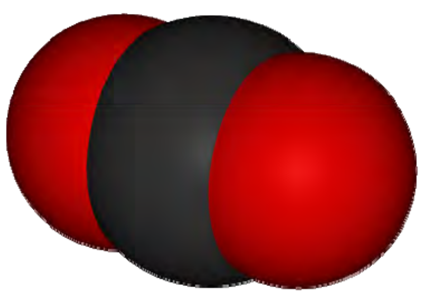
• Intertidal ecosystems (mostly temperate) dominated by vascular plants that photosynthesise and take CO_2 out of the atmosphere

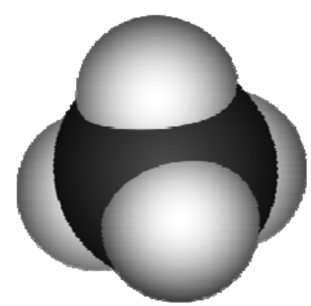
• Average carbon storage of 210 g C $m^{-2}yr^{-1}$ or 770 g of CO_2

• Sulphates in the soil reduce microbial activity that produces methane (25 times more potent as a greenhouse gas than CO_2) - salt marshes do not produce methane like freshwater wetland soils

• Tidal floodwater saturates soil and reduces aerobic decomposition. Anaerobic decomposition allows accumulation of organic matter – Effective carbon sink

• Although carbon % content might be lower, bulk density is high





Mangroves

- Mangroves are trees or shrubs that grow above mean sea level in the tropical intertidal zones
- Effective carbon storage by burial in sediments (long term sink)
- Also through net growth of forest biomass during development, e.g. after replantation (short term sink)
- Global carbon burial of ~18.4 Tg C y^{-1}
- Carbon source can be direct from mangrove production or through trapping of organic matter coming in with tide
- Highly variable sink depending on species/latitute/hydrology

Seagrass Meadows

- **Underwater flowering plants with global distribution**
- **Responsible for about 15% of total carbon storage in the ocean**
- **Long-term carbon burial of 83 g C $m^{-2}yr^{1}$. This translates to a global storage rates of between 27 and 40 Tg C yr^{1}.**

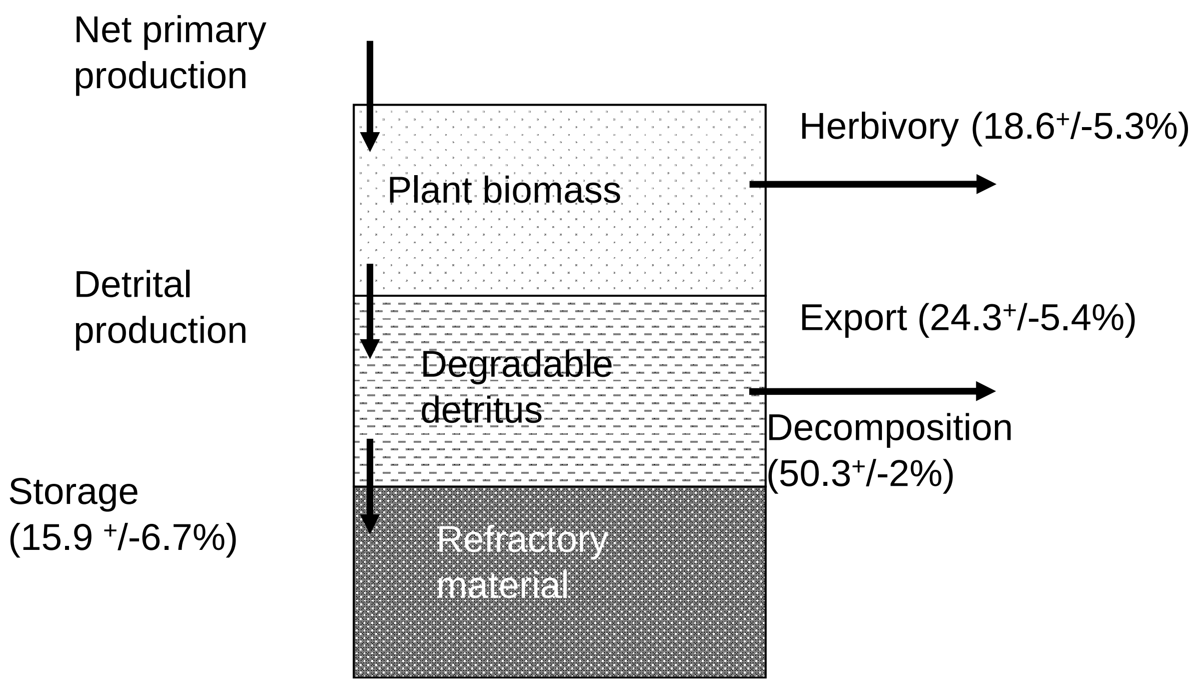


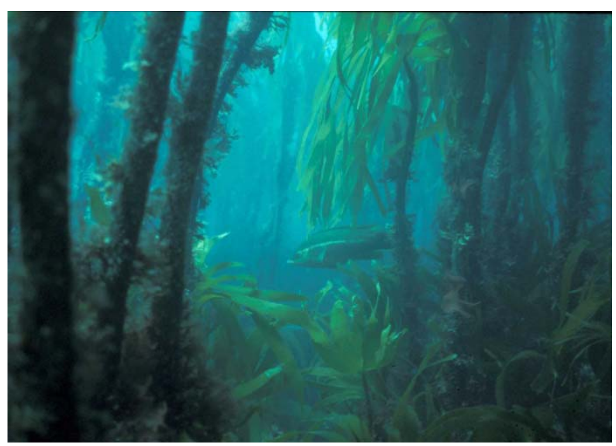
Figure 2 Fate of primary production, values in brackets represent% of net primary production. The data were derived by averagingindependent estimates from a range of seagrass species (adapted from Cebrian 1999 & Duarte & Cebrian 1996)

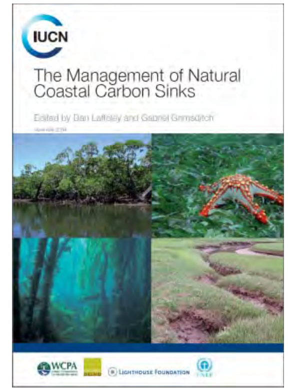
‘Most seagrass burial rates are about half as high as those for mangroves and salt marshes on an areal basis, and account for 12%, 9% and 25% respectively of the total carbon burial in coastal sediments. However, the rates of long-term carbon accumulation by Posidonia oceanica, exceeds those of terrestrial ecosystems and show values commensurate with wetlands’

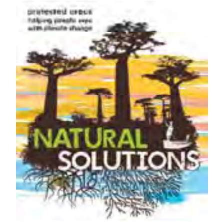
Hilary Kennedy and Mats Björk

Kelp Forests

- Global distribution – arctic & temperate to deep water tropical
- Effective stand of carbon – size of sink is function of size of standing biomass and amount and condition of suitable habitats
- Global kelp standing crop c7.5Tg C to perhaps 20 Tg C
- Global kelp production of 15 Tg C yr^{-1} to perhaps 39 Tg C yr-1
- Runoff and coastal discharges a major issue to deteriorating this carbon sink, with less widespread fishing/harvesting impacts







Overall conclusions

- Represent ‘missing’ sinks
- Globally significant role
- High carbon storage capacity by unit area
- Comparative value estimated 10x temperate and 50x tropical forests
- Contribution visible % at country level
- Carbon fixing process important – below ground
- Under significant threat/incomplete inventories
- Mangroves/seagrass meadows loss equivalent to Amazon loss
- Need to account for in international climate change mechanisms
- Need for inclusion in National Inventory Submissions
- MPAs have a critical role to play in securing the future of these carbon sinks