Blue Carbon Initiative

Transforming science into effective policy & management

Emily Pidgeon
Vice President
Ocean Science and Innovation
CONSERVATION INTERNATIONAL

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the BLUE CARBON initiative
Increased conservation, restoration and sustainable management of coastal blue carbon ecosystems
http://thebluecarboninitiative.org/
CONSERVATION INTERNATIONAL
IUCN
United Nations Educational, Scientific and Cultural Organization
Intergovernmental Oceanographic Commission

How much carbon?
Where?
Fluxes?

nature geoscience

PUBLISHED ONLI

Mangroves among the most carbon[...] the tropics

Daniel C. Donato[1]*, J. Boone Kauffman[2], Daniel Murdiyarso[3], Sofyan K[...] and Markku Kanninen[5]

nature geoscience — ARTICLES

PUBLISHED ONLINE: 20 MAY 2012 | DOI:10.1038/NGEO1477

Seagrass ecosystems as a globally significant carbon stock

James W. Fourqurean[1]*, Carlos M. Duarte[2,3], Hilary Kennedy[4], Núria Marbà[2], Marianne Holmer[5], Miguel Angel Mateo[6], Eugenia T. Apostolaki[7], Gary A. Kendrick[3,8], Dorte Krause-Jensen[9], Karen J. McGlathery[10] and Oscar Serrano[6]

The protection of organic carbon stored in forests is considered as an important method for mitigating climate change. Like terrestrial ecosystems, coastal ecosystems store large amounts of carbon, and there are initiatives to protect these 'blue carbon' stores. Organic carbon stocks in tidal salt marshes and mangroves have been estimated, but uncertainties in the stores of seagrass meadows—some of the most productive ecosystems on Earth—hinder the application of marine carbon conservation schemes. Here, we compile published and unpublished measurements of the organic carbon content of living seagrass biomass and underlying soils in 946 distinct seagrass meadows across the globe. Using only data from sites for which full inventories exist, we estimate that, globally, seagrass ecosystems could store as much as 19.9 Pg organic carbon; according to a more conservative approach, in which we incorporate more data from surface soils and depth-dependent declines in soil carbon stocks, we estimate that the seagrass carbon pool lies between 4.2 and 8.4 Pg carbon. We estimate that present rates of seagrass loss could result in the release of up to 299 Tg carbon per year, assuming that all of the organic carbon in seagrass biomass and the top metre of soils is remineralized.

OPEN ACCESS Freely available online — PLOS ONE

Estimating Global "Blue Carbon" Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems

nature climate change

Global patterns in mang[...] and losses

Trisha B. Atwood[1,2]*, Rod M. Connolly[3], Hanan [...] Carolyn J. Ewers Lewis[5], Xabier Irigoien[7,8], Jeffrey J. Kellew[...] Oscar Serrano[10,12], Christian J. Sanders[13], Isaac Santos[13], A[...] and Catherine E. Lovelock[1,15]

CONCEPTS AND QUESTIONS

Assessing the risk of ca[...] emissions from blue ca[...]

Catherine E Lovelock[1,2]*, Trisha Atwood[2,3], Jeff Baldock[4], C[...] Pere Masque[6,8,11], Peter I Macreadie[12], Aurora M Ricart[9,10], C[...]

"Blue carbon" ecosystems, which include tidal marshes [...] stocks of organic carbon (C_{org}) in their soils. These car[...] degraded – can be released to the atmosphere in the for[...] relative risk of CO_2 emissions from degraded soils, ther[...] projects and establishing a means to prioritize managen[...] emissions after various kinds of disturbances can be acc[...] soil C_{org} stock at a site and the likelihood that the soil C[...]

Front Ecol Environ 2017; 15(5): 257–265, doi:10.1002/fee.1491

Wetlands (2011) 31:831–842
DOI 10.1007/s13157-011-0197-0

ARTICLE

Salinity Influence on Methane E[...] from Tidal Marshes

Hanna J. Poffenbarger & Brian A. Needelman & J. Patrick Megonigal

Received: 2 August 2010 / Accepted: 13 June 2011 / Published online: 5[...]
Society of Wetland Scientists 2011

Abstract The relationship between methane emissions and salinity is not well understood in tidal marshes, leading to uncertainty about the net effect of marsh conservation and restoration on greenhouse gas balance. We used published and unpublished field data to investigate the relationships between tidal marsh methane emissions, salinity, and porewater concentrations of methane and sulfate, then used these relationships to consider the balance between methane emissions and soil carbon sequestration. Polyhaline tidal marshes (salinity >18) had significantly lower methane emissions (mean ± sd=1±2 g m^{-2} yr^{-1}) than other marshes,

OPEN ACCESS Freely available online — PL[...]

CO_2 Efflux from Cleared Mangrove Peat

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1 School of Biological Sciences, The University of Queensland, St Lucia, Queensland, Australia, 2 Institute of Arctic Biology, University of Alaska Fairbanks, Fa[...] United States of America, 3 Smithsonian Environmental Research Center, Edgewater, Maryland, United States of America

Abstract

Background: CO_2 emissions from cleared mangrove areas may be substantial, increasing the costs of continued lo[...] these ecosystems, particularly in mangroves that have highly organic soils.

Methodology/Principal Findings: We measured CO_2 efflux from mangrove soils that had been cleared for up to 20 y[...] the islands of Twin Cays, Belize. We also disturbed these cleared peat soils to assess what disturbance of soils after [...] may have on CO_2 efflux. CO_2 efflux from soils declines from time of clearing from ~10 600 tonnes km^{-2} year^{-1} in t[...] year to 3000 tonnes km^{-2} year^{-1} after 20 years since clearing. Disturbing peat leads to short term increases in CO[...] (27 umol m^{-2} s^{-1}), but this had returned to baseline levels within 2 days.

Conclusions/Significance: Deforesting mangroves that grow on peat soils results in CO_2 emissions that are compar[...] rates estimated for peat collapse in other tropical ecosystems. Preventing deforestation presents an opportun[...] countries to benefit from carbon payments for preservation of threatened carbon stocks.

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Table 1. Estimates of CO_2 efflux from modified mangrove and other habitats with peat soils.

Habitat	Modification	CO_2 efflux tonnes km$^{2\,2}$ year$^{2\,1}$	Method	Reference
Mangrove, Belize	Cleared	2900	CO_2 efflux	THIS STUDY
Mangrove, Honduras	Forest damaged by hurricane	1500	Inferred from peat collapse	Cahoon et al. 2003
Mangrove, Australia	Shrimp pond	1750 (220–5000)	CO_2 efflux	Burford and Longmore 2001
Rainforest, Indonesia	Drained for agriculture	3200	Inferred from peat collapse and measured as CO_2 efflux	Couwenburg et al. 2010 and references therein
Tundra, Alaska	Thawed (vegetation intact)	150–430	Net CO_2 exchange	Schuur et al. 2009

doi:10.1371/journal.pone.0021279.t001

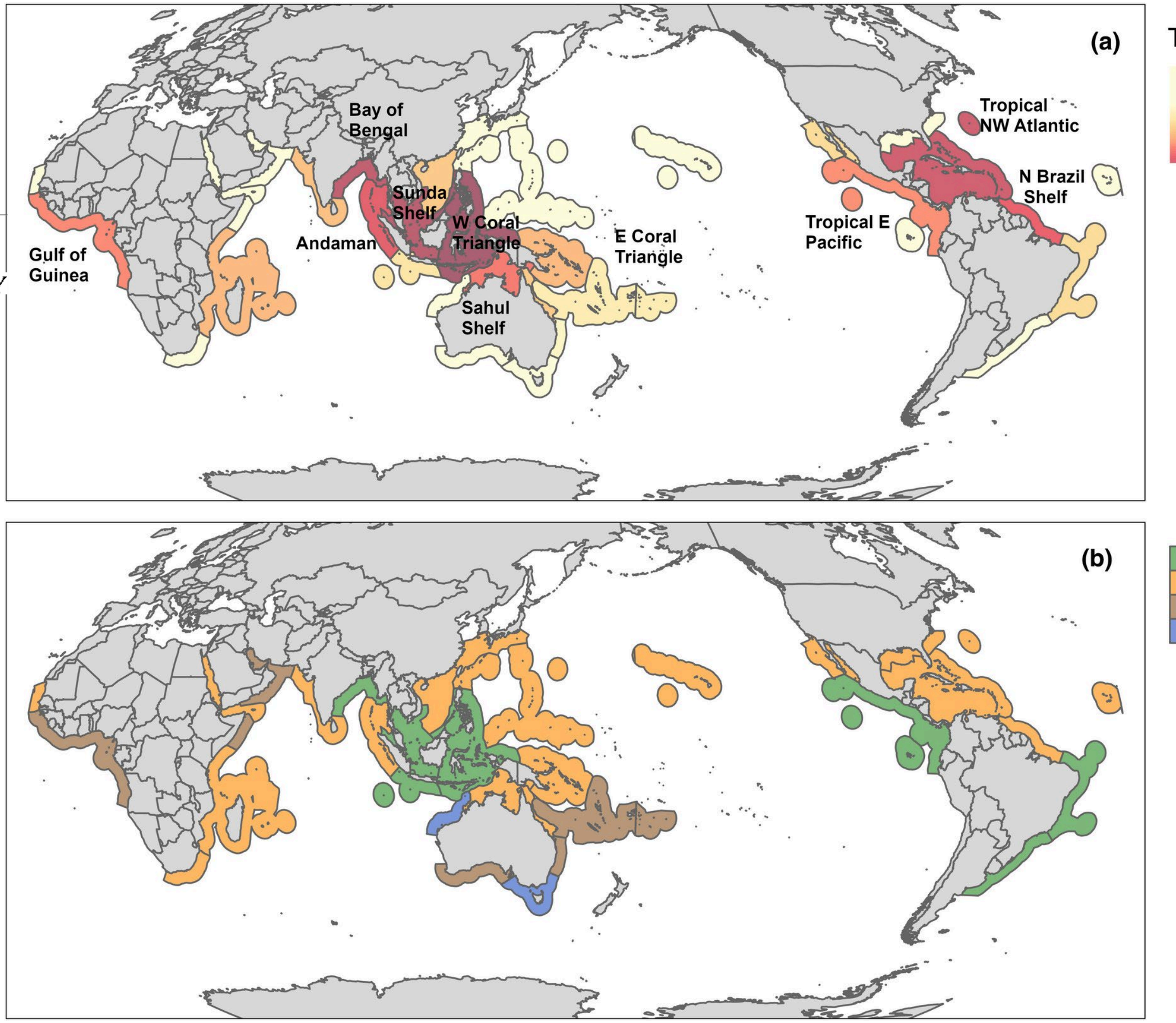
DOI: 10.1111/gcb.15571

Global Change Biology WILEY

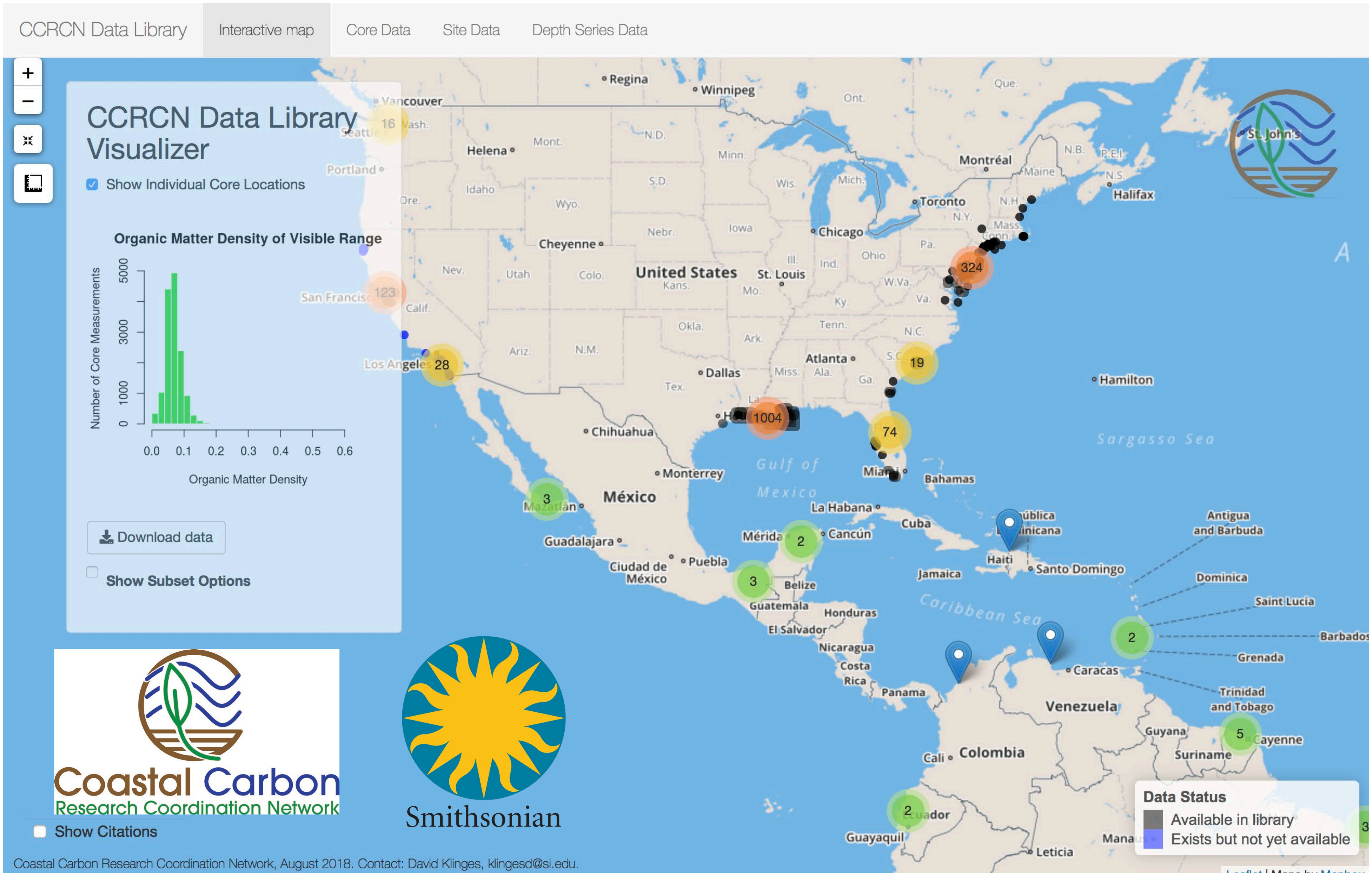
PRIMARY RESEARCH ARTICLE

Future carbon emissions from global mangrove forest loss

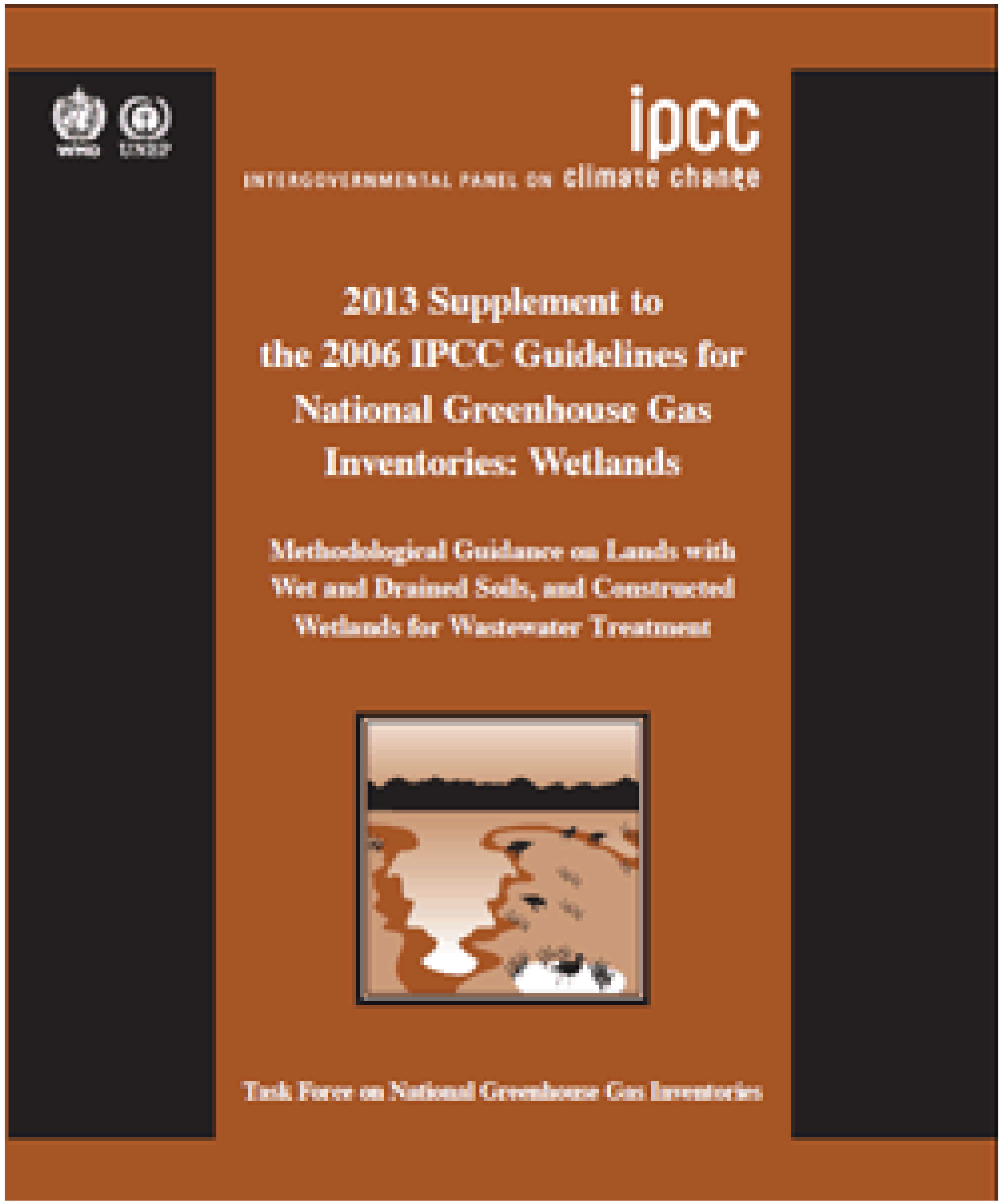
Maria F. Adame[1,2] | Rod M. Connolly[2] | Mischa P. Turschwell[1] | Catherine E. Lovelock[3] | Temilola Fatoyinbo[4] | David Lagomasino[5] | Liza A. Goldberg[6] | Jordan Holdorf[2] | Daniel A. Friess[7,8] | Sigit D. Sasmito[9,10,11] | Jonathan Sanderman[12] | Michael Sievers[2] | Christina Buelow[2] | J. Boone Kauffman[13] | Dale Bryan-Brown[1] | Christopher J. Brown[1,2]



Coastal Carbon Research Coordination Network

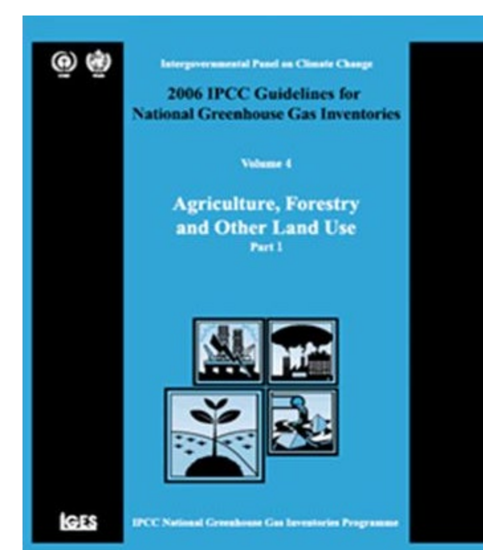


Integrating Blue Carbon Science into Policy Tools



2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

+ 2019 Refinement



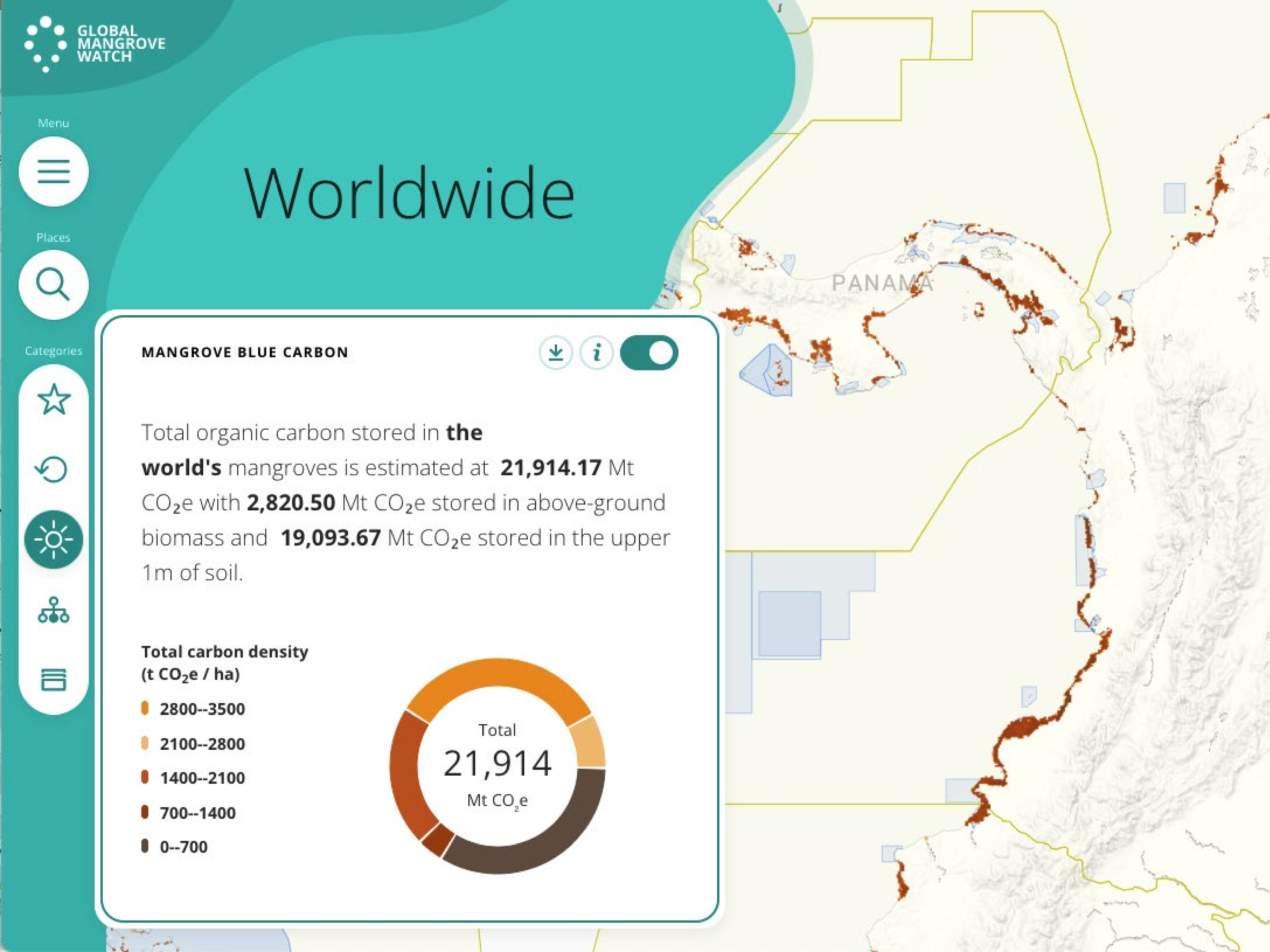
Vida Manglar

Cispatá, Colombia

Protect and restore 11,000+ hectares of mangrove forests

1 million tons of VCUs

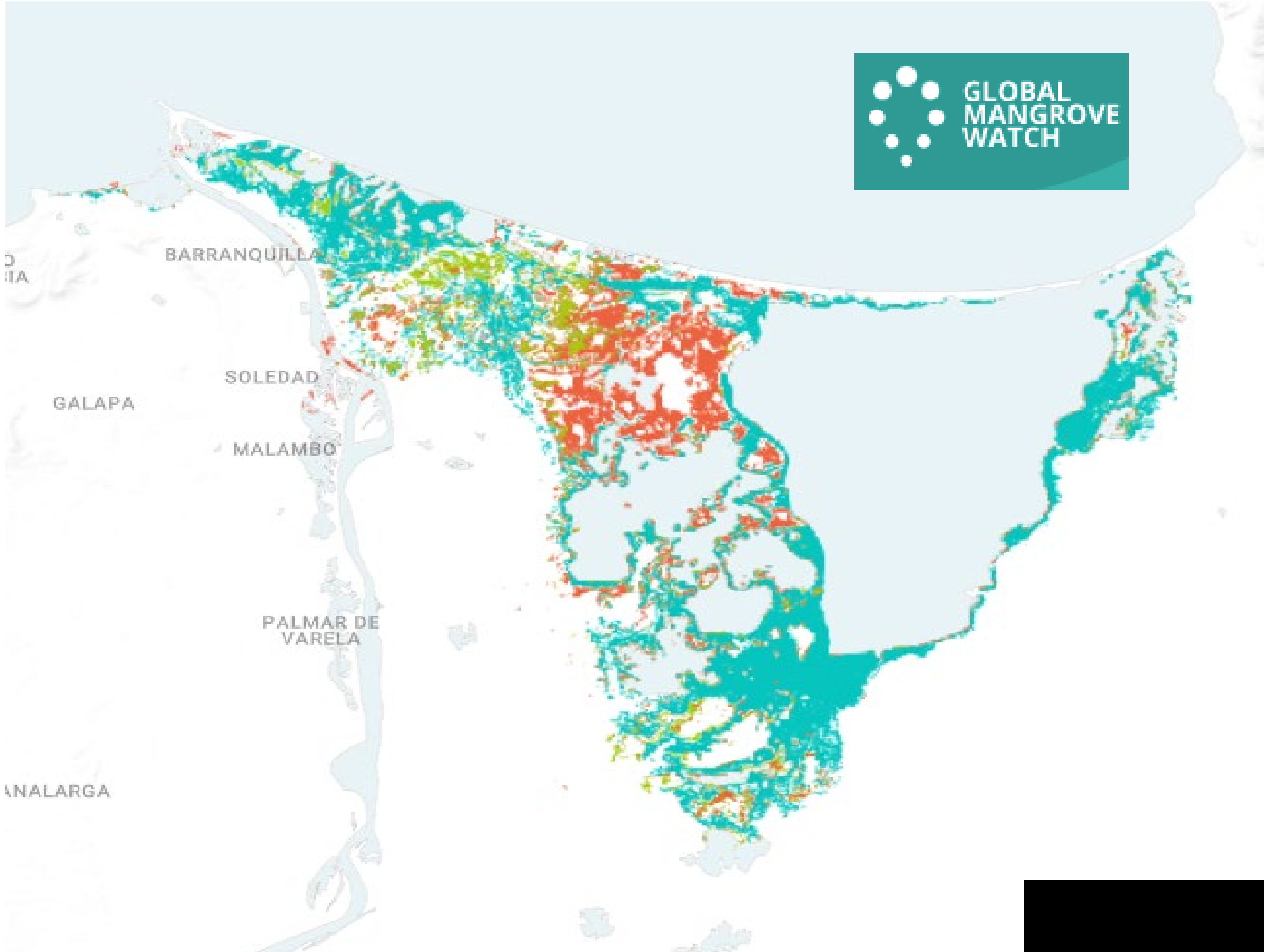
financing for sustainable ecotourism, aquaculture, and improved fishing practices in community of 12,000


GLOBAL MANGROVE WATCH
Menu
Places
Categories
Worldwide
PANAMA
MANGROVE BLUE CARBON
Total organic carbon stored in **the world's** mangroves is estimated at **21,914.17** Mt CO_2e with **2,820.50** Mt CO_2e stored in above-ground biomass and **19,093.67** Mt CO_2e stored in the upper 1m of soil.
Total carbon density (t CO_2e / ha)
2800--3500
2100--2800
1400--2100
700--1400
0--700
Total
21,914
Mt CO_2e

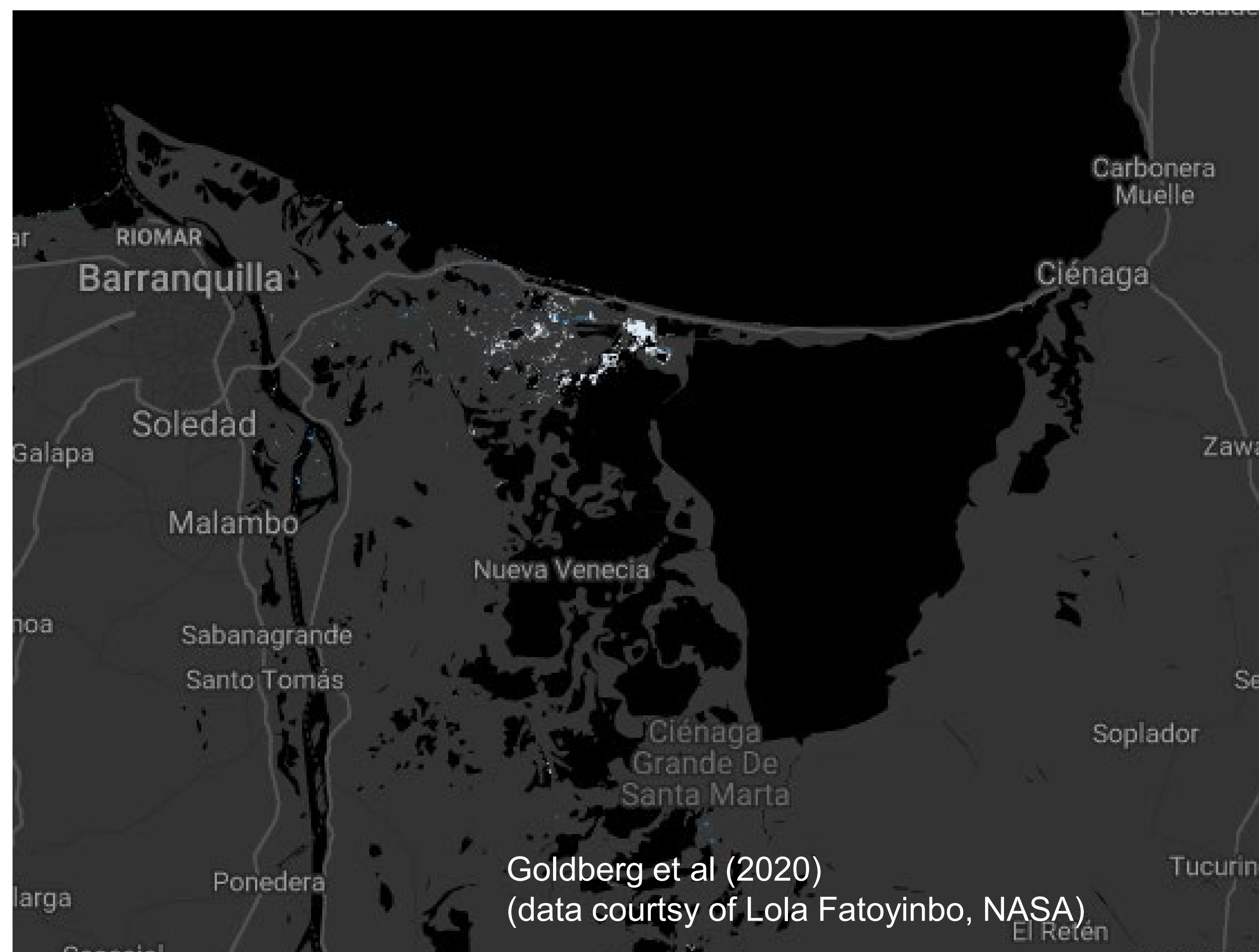
Ciénaga Grande de Santa Marta

Restorable area = 14,531 ha

Carbon benefit from restoration = 7,309,093 MgC



Mangrove conversion to open water



Goldberg et al (2020)
(data courtsy of Lola Fatoyinbo, NASA)


Thank you
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