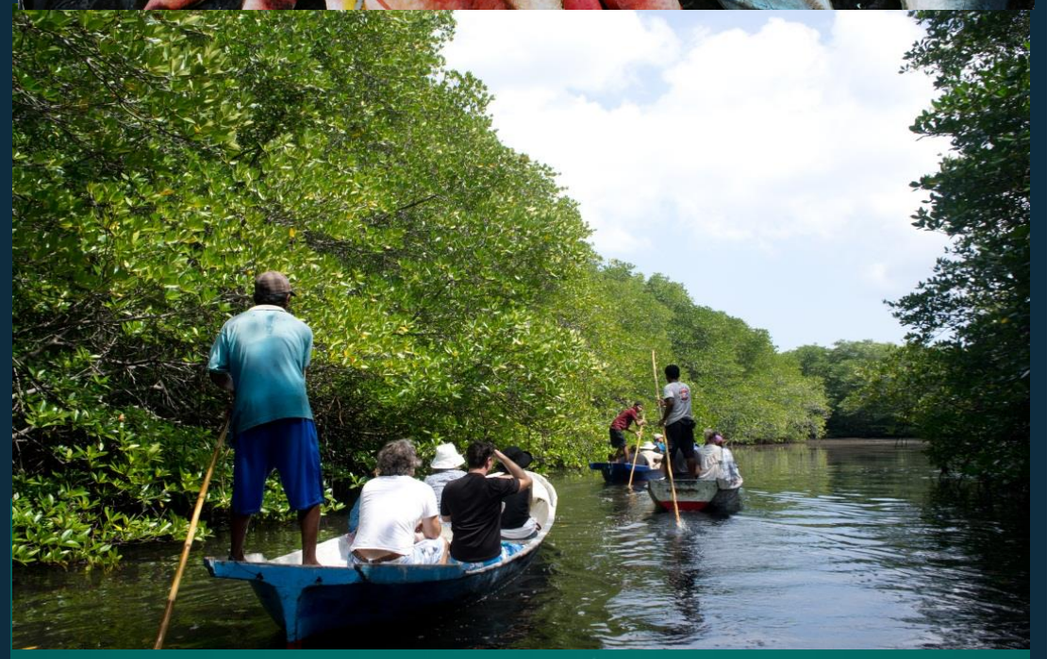
CONSERVATION INTERNATIONAL

Blue Carbon Program

Coastal Ecosystems – many critical ecosystem services



Fisheries
Coastal protection & erosion control
Coastal Water Quality
Livelihoods (tourism etc.)
Cultural value
Food
Biodiversity
Carbon sequestration and storage

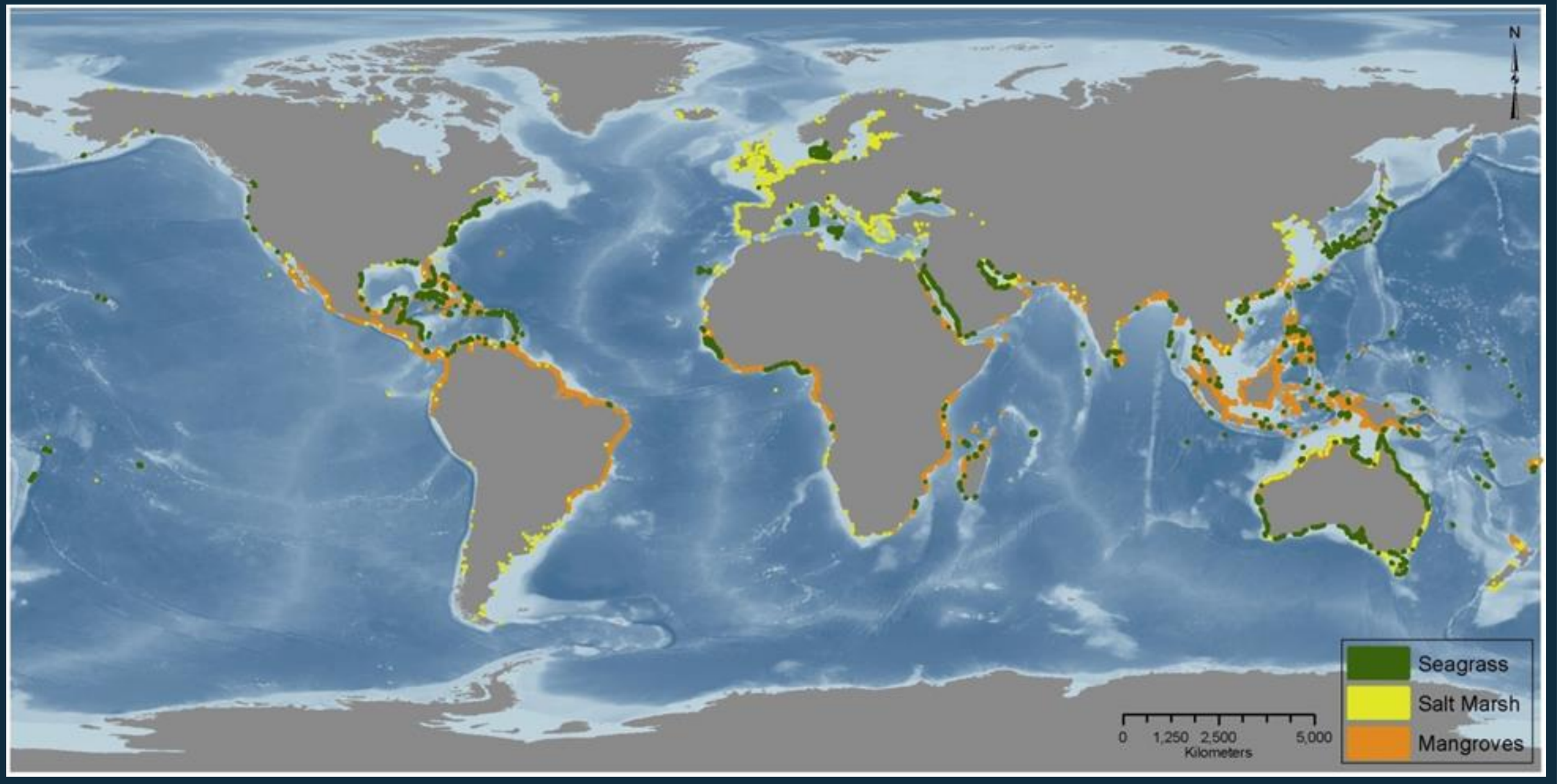
What is Blue Carbon?

The carbon sequestered, stored, and emitted from coastal ecosystems.

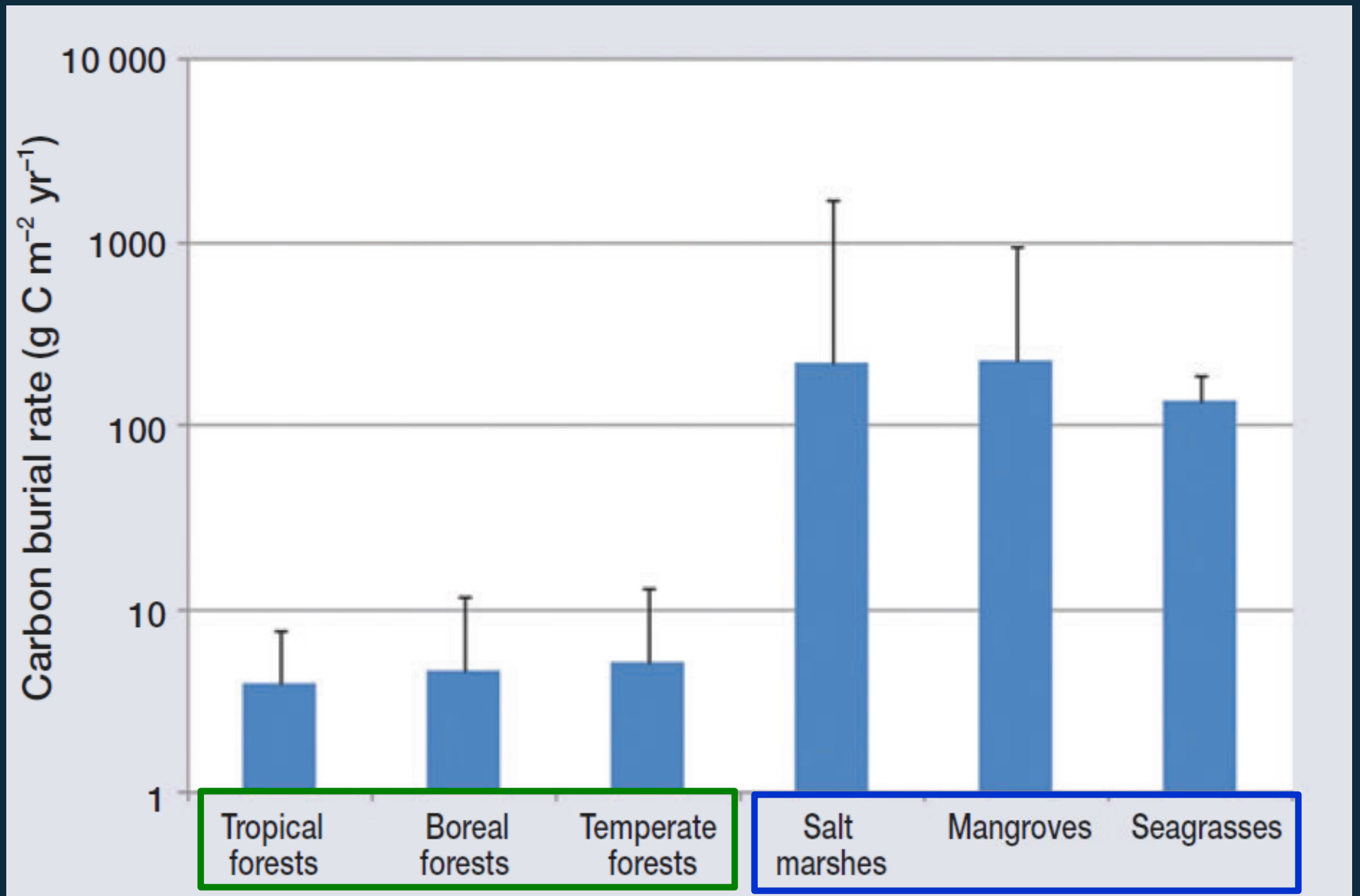
They are the ocean's vegetated habitats: mangroves, salt marshes, and seagrasses.

They are of great importance for inclusion in climate change mitigation and adaptation activities.

Global Distribution of Blue Carbon Ecosystems

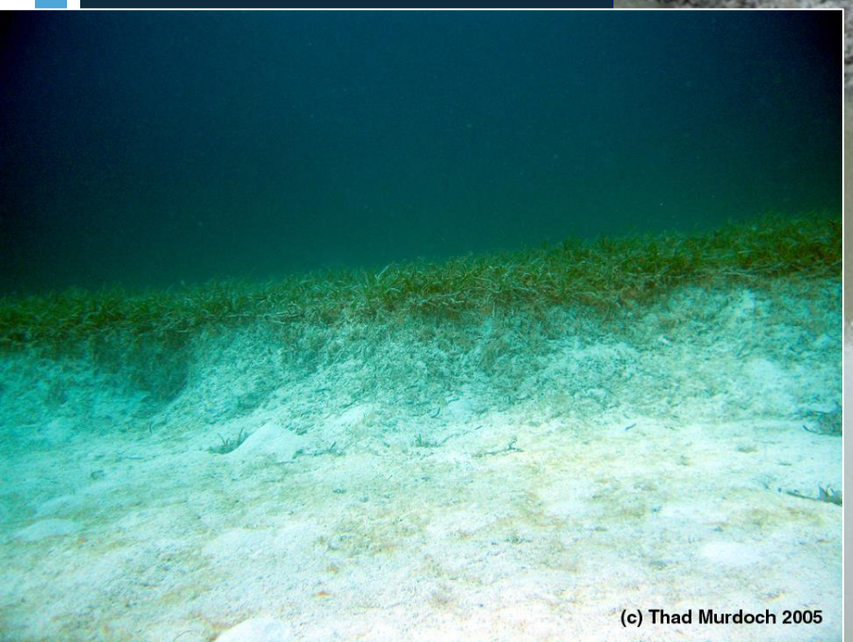


Annual Rate of Carbon Storage

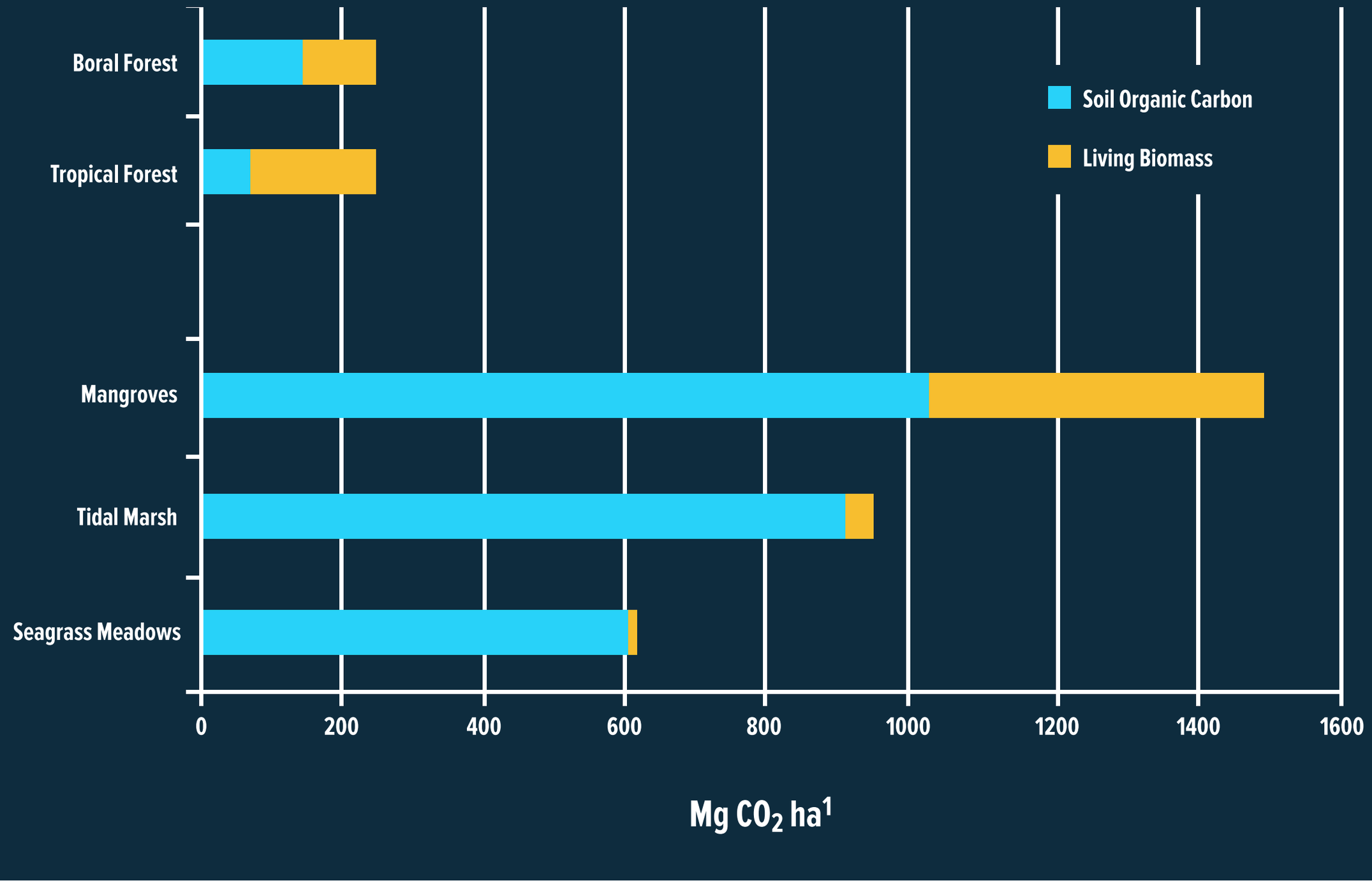


McLeod et al. 2011, Frontiers

Coastal Ecosystems: Long-Term Carbon Sequestration and Storage



Coastal Ecosystem Have Rich Carbon Stores



Numerous causes of degradation and destruction

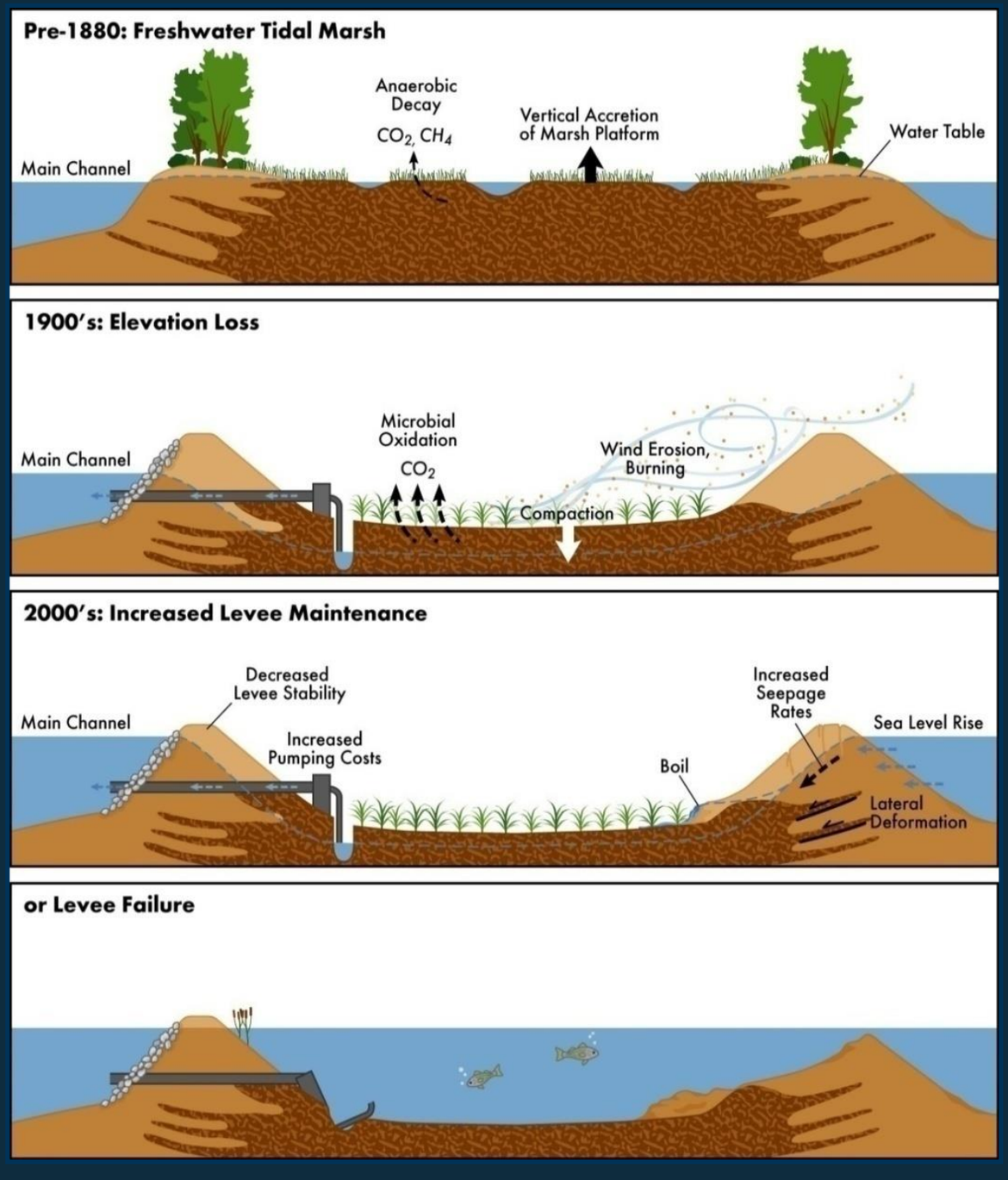
Aquaculture

Agriculture

Development

Pollution

Emissions from Agriculture



Area under agriculture 180,000 ha

Rate of subsidence 1 inch/year

3-5 million tCO_2/yr released

1 $GtCO_2$ release in c.150 years
4000 years of carbon emitted

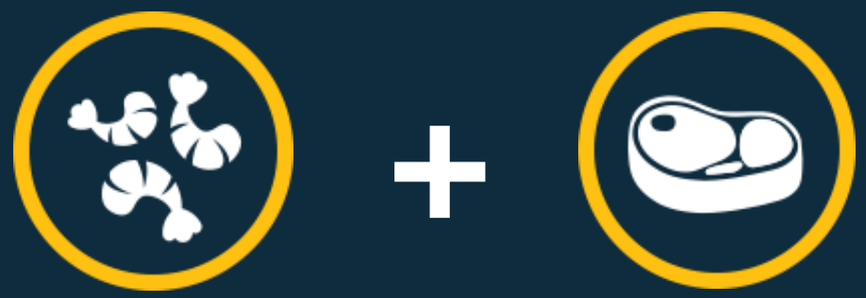
Case study: Indonesia

22% of world's mangroves
30% of the world's blue carbon
40% of Indonesia's mangroves have been lost in last 30 years
42% of global blue carbon emissions are from Indonesia

Stopping mangrove deforestation would reduce current national land-use emissions by 30%.

Giri (2008)
Murdiyarso et al (2015)

carbon footprint of mangrove conversion



4 oz shrimp cocktail + 16 oz steak

Total = 816 Kg CO2e

Equivalent to driving an average car (30 miles/gal) 5000+ miles

San Francisco to New York and back.

Kauffman et al 2017

the BLUE CARBON initiative

Increased conservation, restoration and sustainable management of coastal blue carbon ecosystems

http://thebluecarboninitiative.org/

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IUCN

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

nature geoscience
LETTERS
PUBLISHED ONLINE: 3 APRIL 2011 | DOI: 10.1038/NGEO1123

Mangroves among the most carbon-rich forests in the tropics

Daniel C. Donato[1]*, J. Boone Kauffman[2], Daniel Murdiyarso[3], Sofyan Kurnianto[3], Melanie Stidham[4] and Markku Kanninen[5]

Mangrove forests occur along ocean coastlines throughout the tropics, and support numerous ecosystem services, including fisheries production extent of mangrove past half century a culture expansion a resulting from man a lack of broad-sca in these ecosystem quantified whole-ec and dead wood bion 25 mangrove forest region—spanning 3 mangrove area and cate that mangrove in the tropics, con hectare. Organic-ric in depth and accoun systems. Combining we estimate that ma of 0.02–0.12 Pg car emissions from def just 0.7% of tropical

Deforestation and of global anthropoge only to fossil fuel agreements highlight Degradation (REDD- for mitigating clima terrestrial carbon (C) conservation (for ex programs require rig underscoring the im various forest types, C density and widesp

Tropical wetland organic soils up to se organic C reserves disproportionate im climate change has re peat fires associated atmospheric CO_2 e fossil fuel emissions specifically address change mitigation str

Overlooked in this discussion are mangrove forests, which occur along the coasts of most major oceans in 118 countries, adding

[1]USDA Forest Service, P Mast Rd., Durham, New [4]USDA Forest Service, I Resources Institute (VIT

A blueprint for blue carbon: t improved understanding of t vegetated coastal habitats in s

Elizabeth Mcleod[1*], Gail L Chmura[2], Steven Bouillon[3], Rodney Salm[1], M Catherine E Lovelock[7], William H Schlesinger[8], and Brian R Silliman[9]

Recent research has highlighted the valuable role that coastal and m bon dioxide (CO_2). The carbon (C) sequestered in vegetated coastal seagrass beds, and salt marshes, has been termed "blue carbon". Alth of mag area to matter and sa at criti seques improv tems. I

Front Ecol En

The glob concent December 2(has reached

- Despite th ecosystems disproport when com
- Although natural sin key mecha associated
- These "blu action is urgently required to prevent further degradation and loss
- Improved scientific understanding of the factors that influence carbon sequestration in these ecosystems is needed to identify sites that are high priorities for restoration and/or conservation management

[1]*The Nature Conservancy, Honolulu, HI* *(emcleod@tnc.org);

mechanism by more recent ap gle emissions reducing anthr supporting CO tion of natural and capacity (

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

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OPEN ACCESS Freely available online
PLOS | ONE

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

Linwood Pendleton[1☯], Daniel C. Donato[2*☯], Brian C. Murray[1], Stephen Crooks[3], W. Aaron Jenkins[1], Samantha Sifleet[4], Christopher Craft[5], James W. Fourqurean[6], J. Boone Kauffman[7], Núria Marbà[8], Patrick Megonigal[9], Emily Pidgeon[10], Dorothee Herr[11], David Gordon[1], Alexis Baldera[12]

1 Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, North Carolina, United States of America, **2** Ecosystem & Landscape Ecology Lab, University of Wisconsin, Madison, Wisconsin, United States of America, **3** ESA Phillip Williams & Associates, San Francisco, California, United States of America, **4** United States Environmental Protection Agency, Research Triangle Park, North Carolina, United States of America, **5** School of Public and Environmental Affairs, Indiana University, Bloomington, Indiana, United States of America, **6** Department of Biological Sciences and Southeast Environmental Research Center, Florida International University, North

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Competing Interests: Appointment funding for one author (SC) comes from ESA Phillip Williams & Associates, a commercial source. This does not alter the authors' adherence to all the PLoS ONE policies on sharing data and materials.

* E-mail: ddonato@wisc.edu

☯ These authors contributed equally to this work.

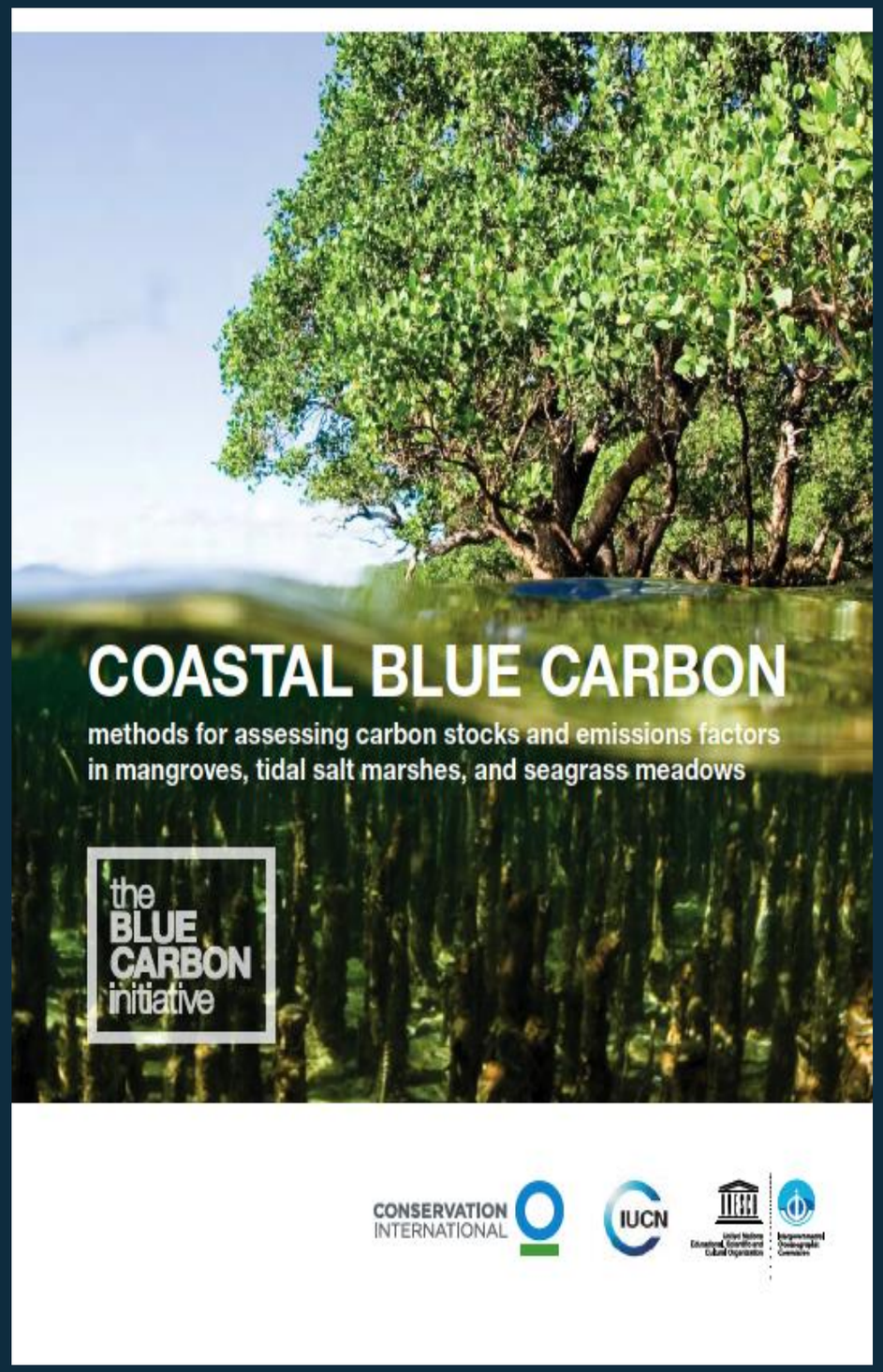
Introduction

tidal marshes, mangroves, and seagrass beds. These coastal carbon stocks are increasingly referred to as "blue carbon" [2,3]. The

How much carbon? Where? What are the potential emissions?

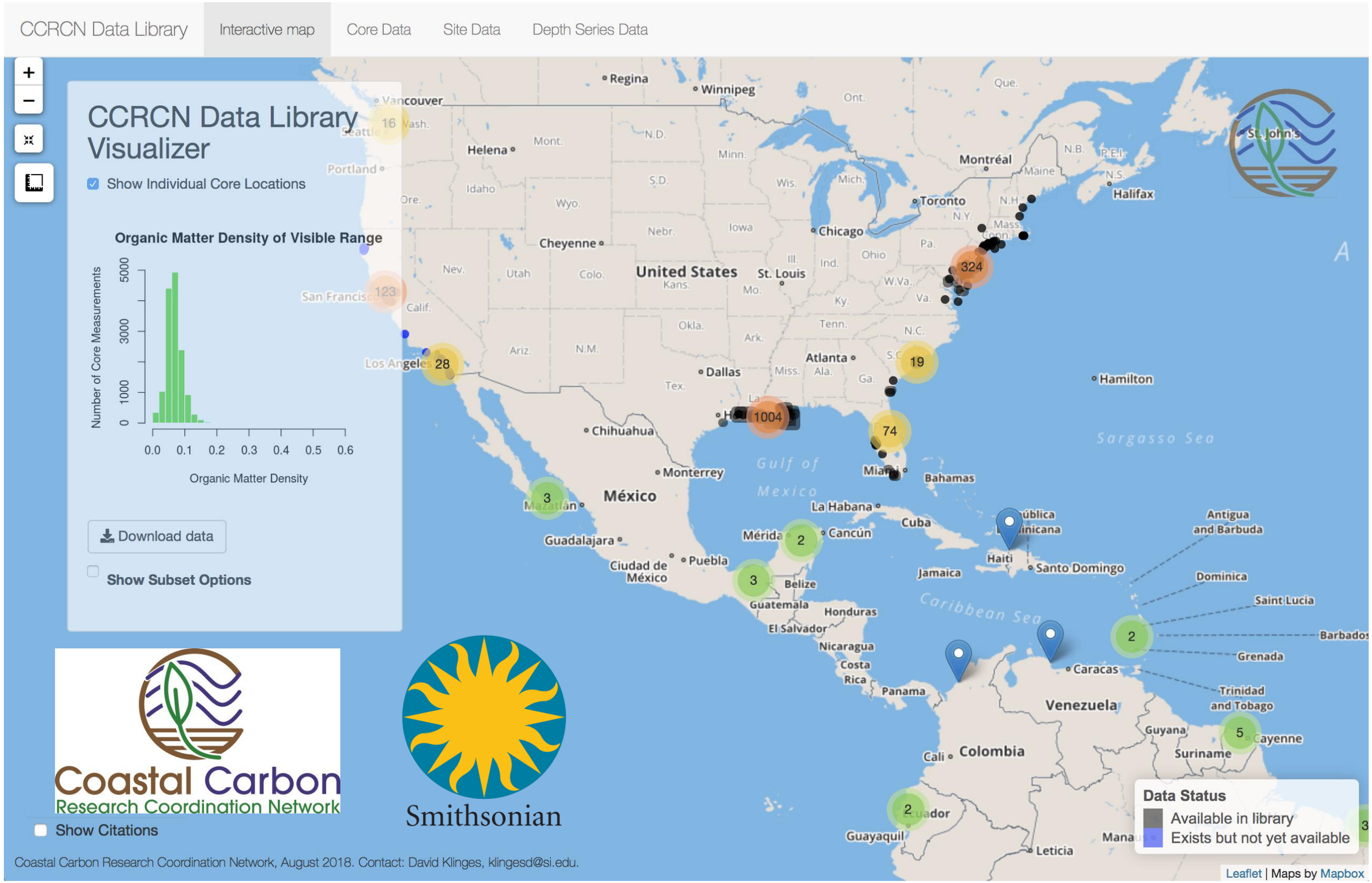
International Blue Carbon Scientific Working Group

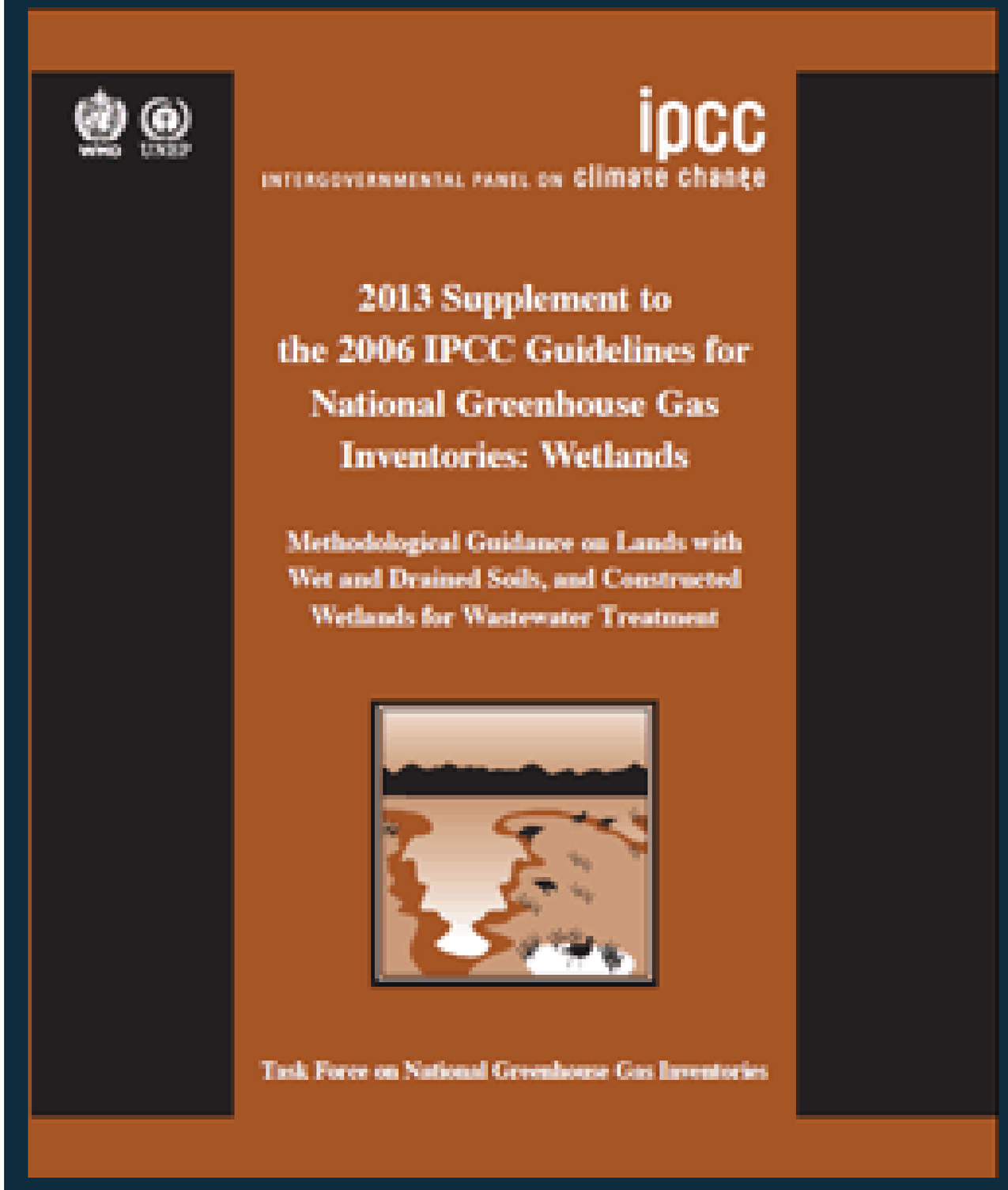
the BLUE CARBON initiative



Free to download:
thebluecarboninitiative.org/manual

Coastal Carbon Research Coordination Network





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

Coastal Wetlands now included

UNFCCC COP 21
Paris Agreement

Article 5

1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests.

Art. 4 p.1d of the Convention reads:

(d) Promote sustainable management, and promote and cooperate in the conservation

and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled

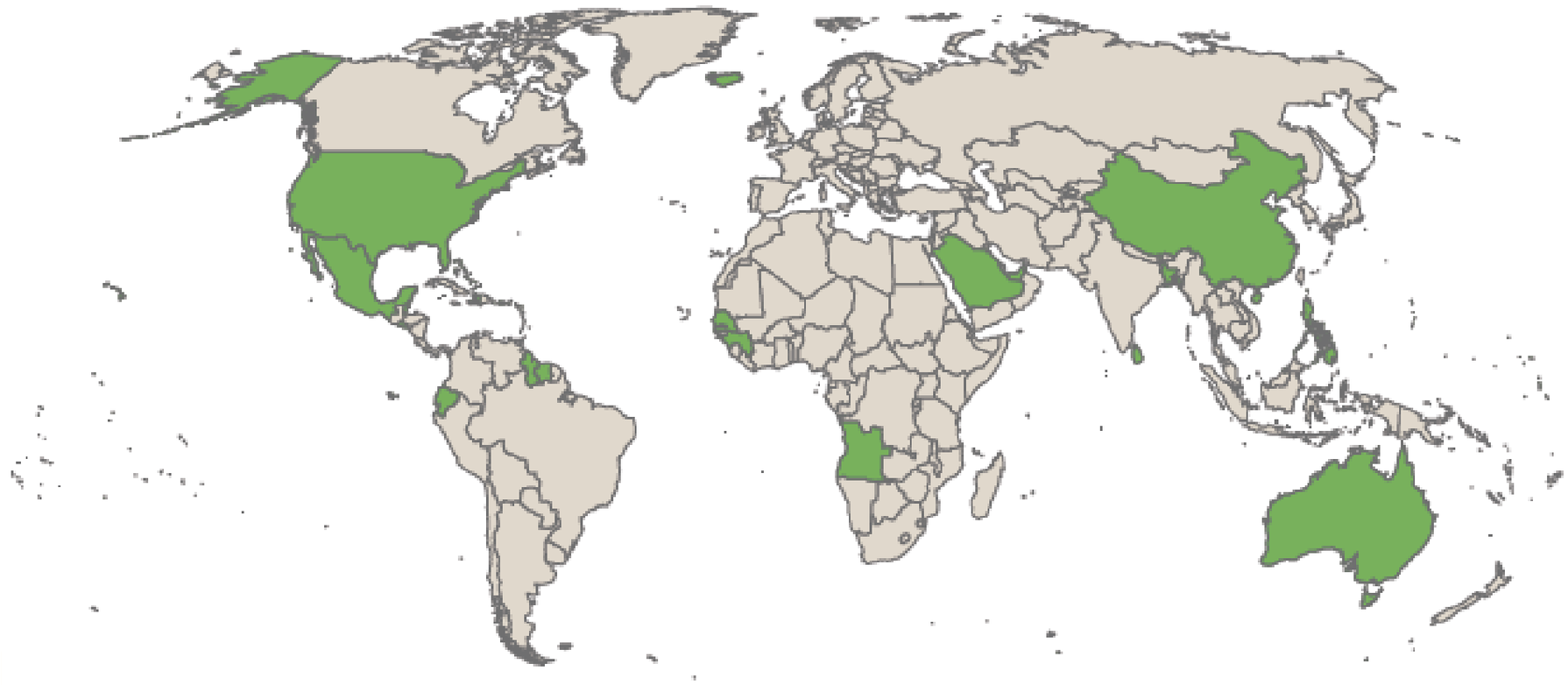
by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, **coastal and marine ecosystems**;

United nations conference on climate change

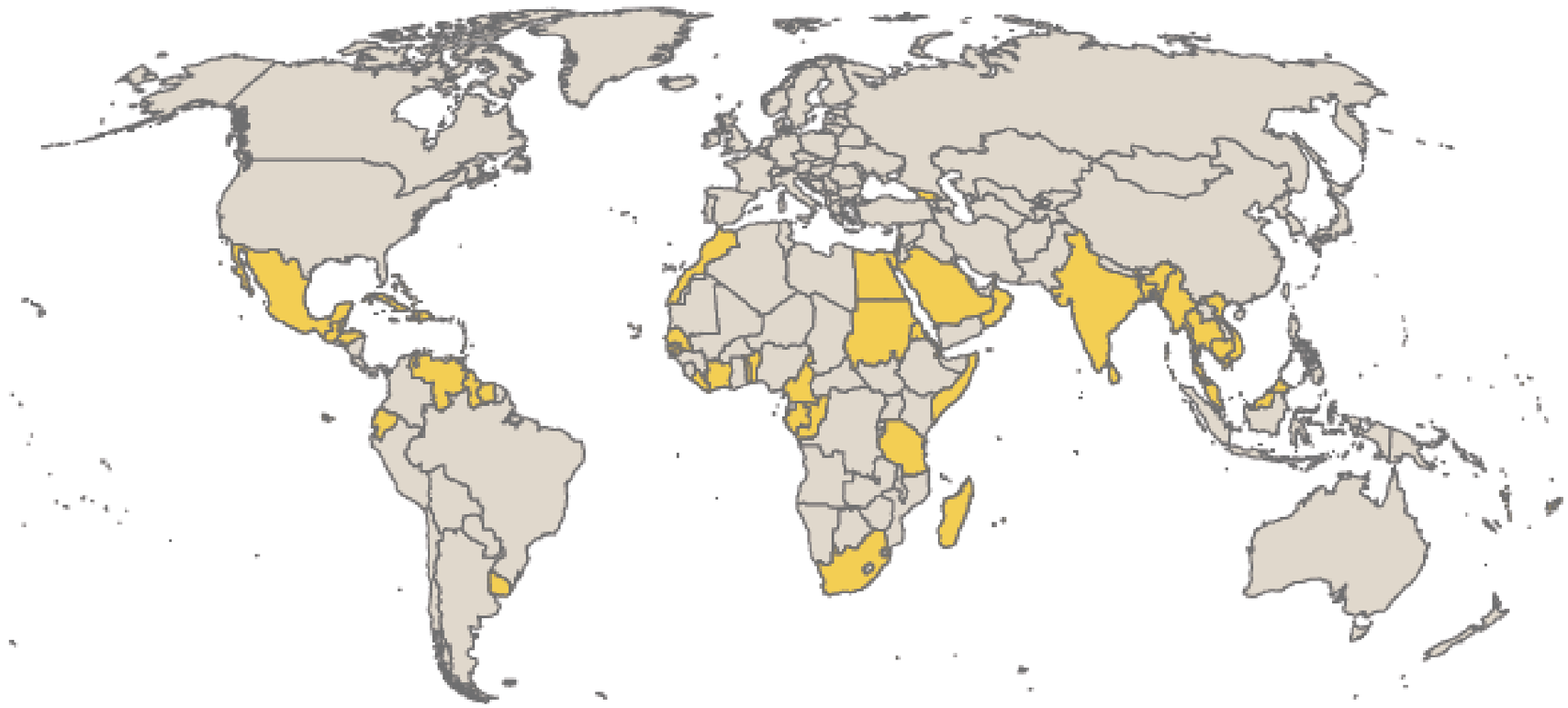
COP21/CMP11

Blue Carbon in NDCs

MITIGATION



ADAPTATION



The Nature Conservancy

IUCN

INTERNATIONAL PARTNERSHIP FOR BLUE CARBON

- integration into national greenhouse gas inventories
- development of innovative approaches to protect BC ecosystems
- science and research
- capacity building and knowledge transfer
- mobilization of funding for BC management

Global Mangrove Alliance

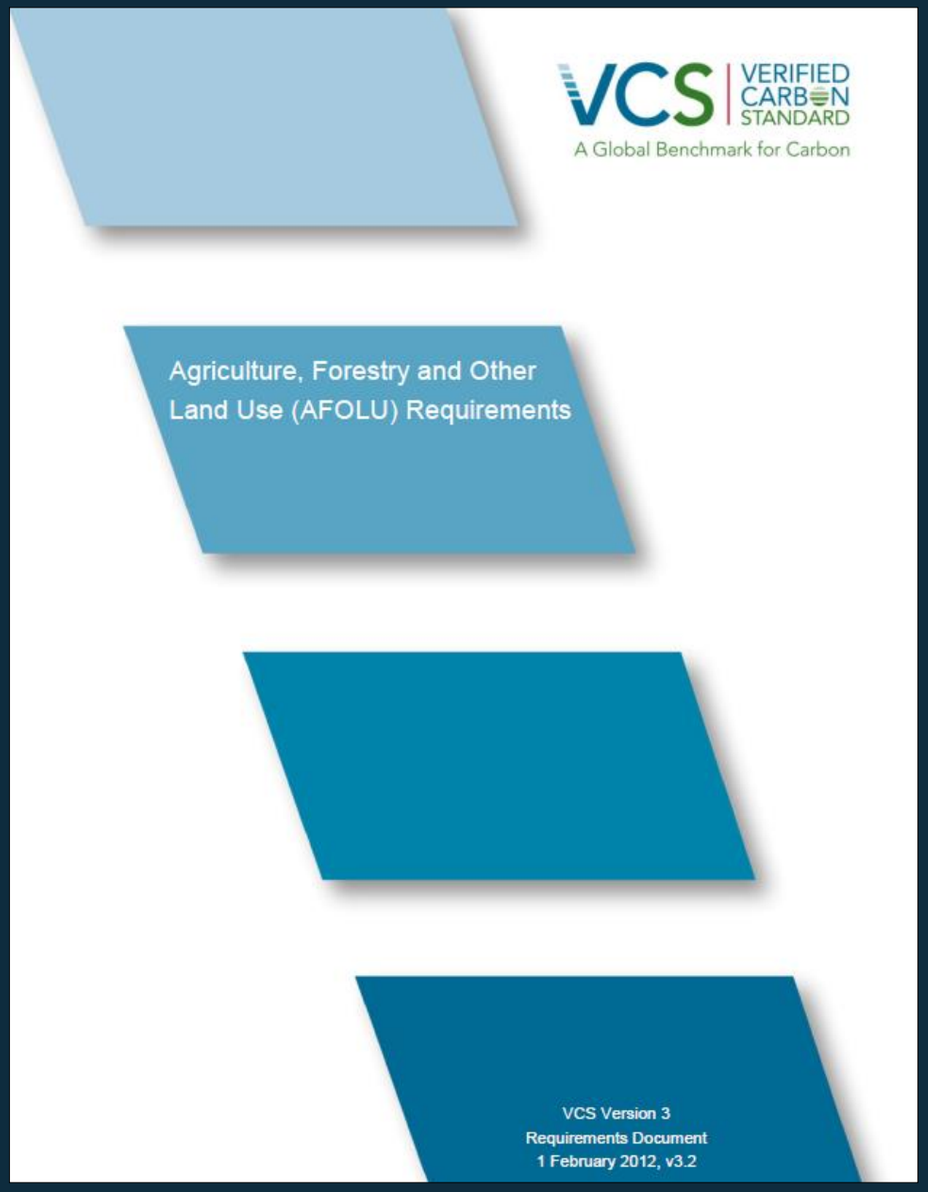
Increase the global area of mangroves by 20% over current extent by 2030.

Audubon
blue ventures beyond conservation
CONSERVATION INTERNATIONAL
Gulf of California Marine Program
IUCN
MANGROVE ACTION PROJECT
The Nature Conservancy
ORCA OCEAN RESEARCH & CONSERVATION ASSOCIATION, INC.
rare
WCS
Wetlands INTERNATIONAL
WWF
ZSL LET'S WORK FOR WILDLIFE
RESTORE AMERICA'S ESTUARIES

Connecting Blue Carbon to Carbon Markets

Wetlands Restoration and Conservation (WRC)
http://v-c-s.org/wetlands_restoration_conservation

Coastal Wetlands Conservation
(Under verification, expected any day now…)



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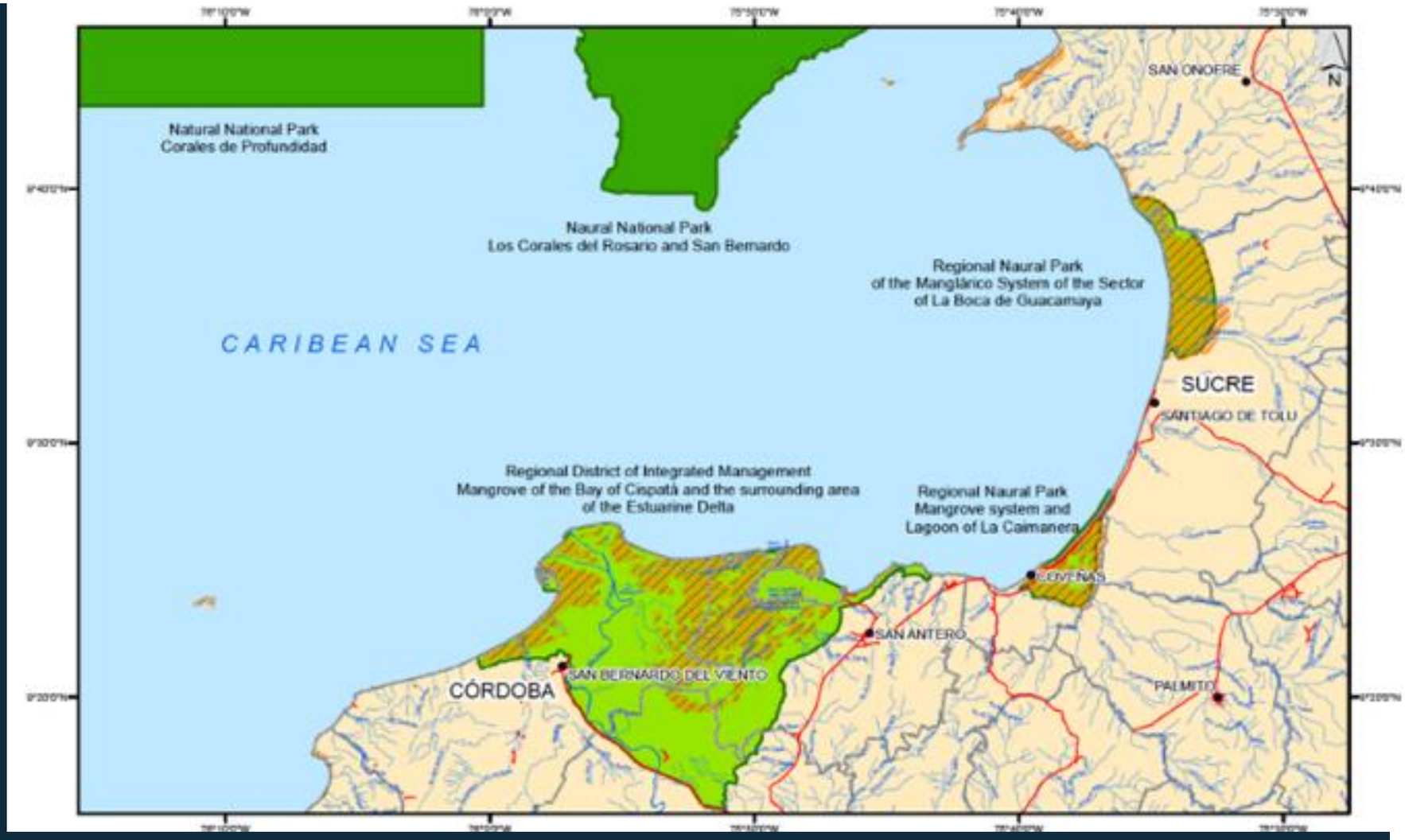
RESTORE AMERICA'S ESTUARIES

VERRA

Cispata Colombia



12,000 people live in the project area

Communities depend on the mangroves for wood, agriculture, forestry, fisheries and tourism activities

Increasing pressure from expansion of agricultural lands, establishment of destructive tourism infrastructure, and increased logging for commercial and domestic purposes

Cispata Colombia

The newly launched initiative with Apple will protect and restore over 11,000 hectares of mangrove forests

Pioneer a new VCS “blue carbon” methodology

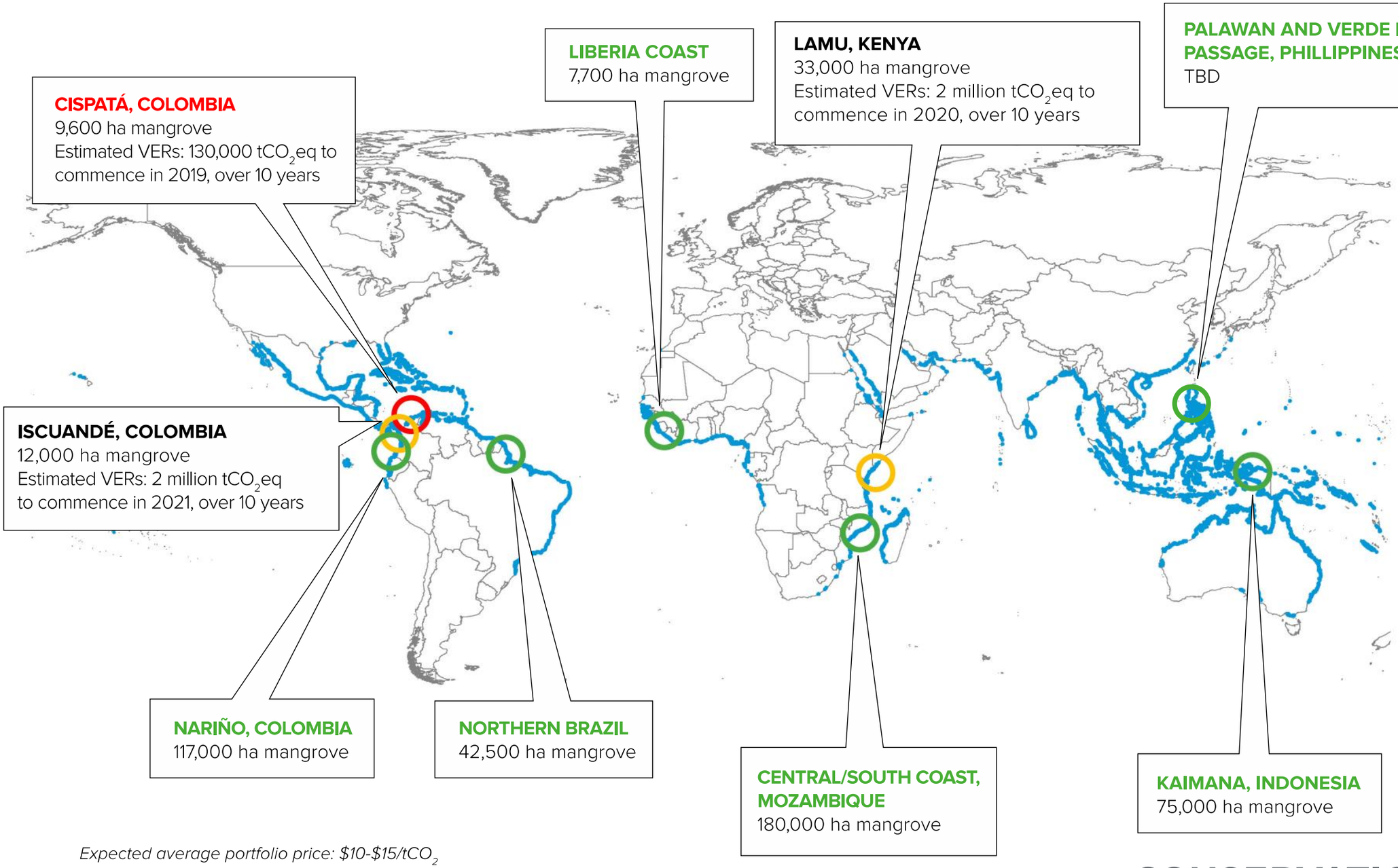
Expected to deliver over approximately 1 million tons of verified carbon units throughout the life of the project

The project designed to deliver long-term sustainable financing for local communities through sustainable ecotourism, aquaculture programs, and improved fishing practices in the region

The Ripple Effect of Blue Carbon

● Worldwide mangrove distribution ○ Under development ○ Pre-feasibility ○ Prospective

Estimated VERs are based on avoided carbon dioxide emissions as a result of a combination of avoided deforestation and restoration activities of mangrove forests.



Expected average portfolio price: $10-$15/tCO$_2$

CONSERVATION INTERNATIONAL

Thank you

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the BLUE CARBON initiative