SERVICES, EMISSIONS AND VALUES OF MANGROVES AND THEIR IMPORTANCE FOR INCLUESION IN CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGIES

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UNFCCC Workshop on technical and scientific aspects of ecosystems with high-carbon reservoirs not covered by other agenda items under the Convention, such as coastal marine ecosystems, in the context of wider mitigation and adaptation efforts

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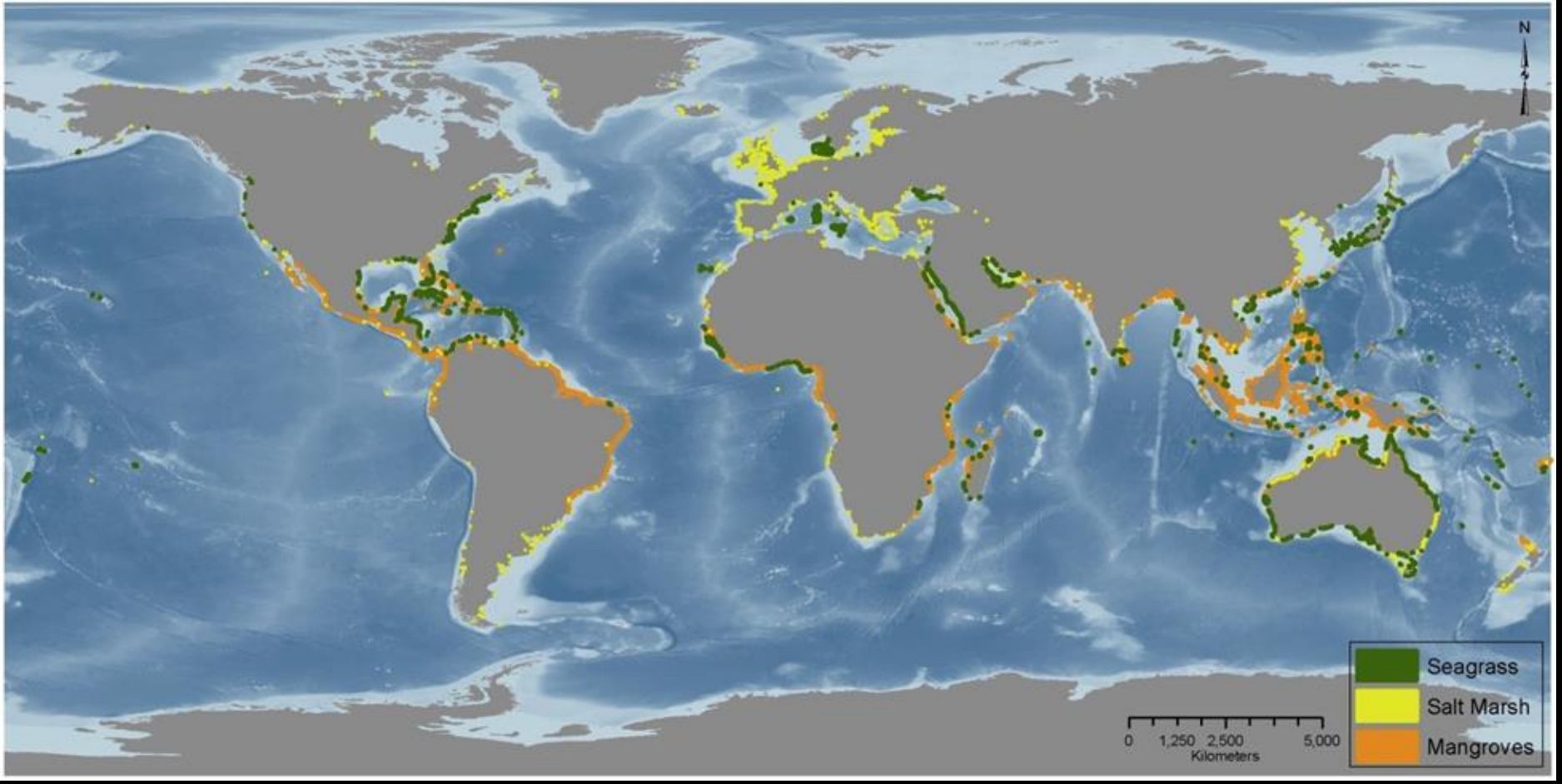
United Nations Framework Convention on Climate Change



Mangroves – a unique tropical forest type

- 138,000 – 152,000 Km^2 (145,000 Km^2)
- **Occur in tropical and subtropical tidal zones**
- **Widely Distributed - 123 countries**
- **Critical provision of ecosystem services**

Spalding et al. (2010)

Mangroves – Tremendous range in structural diversity

Seneboi River Delta, Papua, Indonesia

***Avicennia marina* mangrove Abu Dhabi, UAE**

Mangle Bajo, Parque Nacional Montecristi, Republica Dominicana


Reserva Biosfera Sian Kaan, Mexico

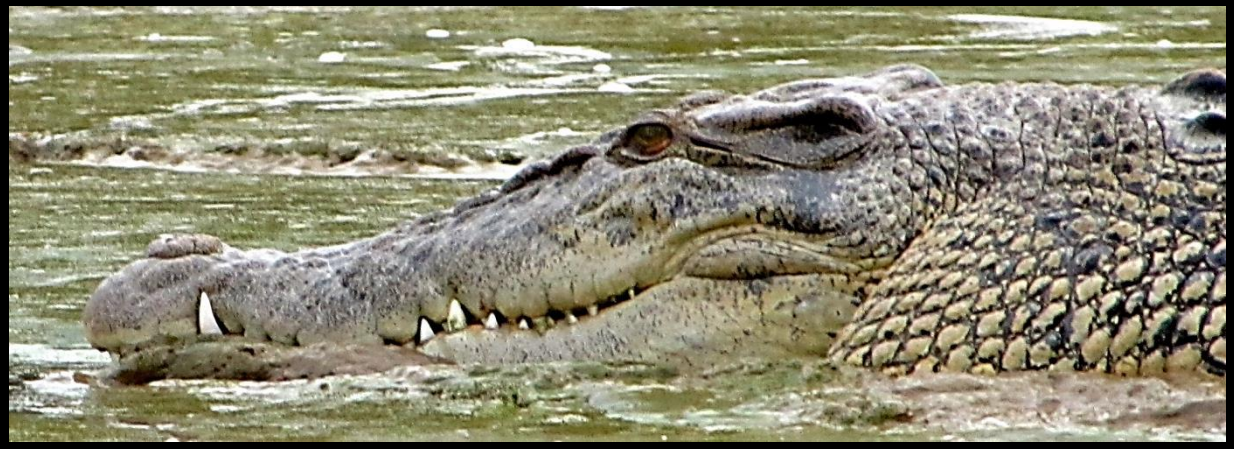
Mangroves are considered as high priorities in climate change adaptation and mitigation strategies throughout the world.

This is for at least 4 reasons:

1. They have exceptionally high carbon stocks – among the highest of any ecosystem on earth;
2. Their rates of land cover change/deforestation are the highest in the tropics;
3. Their emissions from land cover change far exceed emissions from land conversion of upland forests; and
4. Mangroves provide a number of ecosystem services that are vital to the sustainability of local communities, livelihoods, and infrastructure.

Ecosystem Services of Coastal Ecosystems: mangroves, seagrass, and marshes

- Biological diversity
- Water quality and timing
- Flood and storm damage
- Forest and non-timber forest products
- Aesthetic and ecotourism values
- Fish and Shellfish
- Carbon Sinks (of great importance with respect to REDD+ and other mitigation strategies



There exists unique biodiversity values in mangroves

Spoonbill and Ibis, Islas de los pajaros, Honduras

Proboscis Monkey in Nipa Palm , Sekonya River, Central Kalimantan Indonesia

Sundarbans Reserve Forest (Ganges Delta) Bangladesh

Ecosystem Services - Fisheries

32-75% of all tropical commercial fish species pass part of their lives in the mangroves, where they encounter:

- nursery grounds
- shelter
- food

32 - 75% de todas las especies comerciales de peces tropicales pasan parte de su vida en los manglares, donde se encuentran:

- zonas de cría
- abrigo
- comida

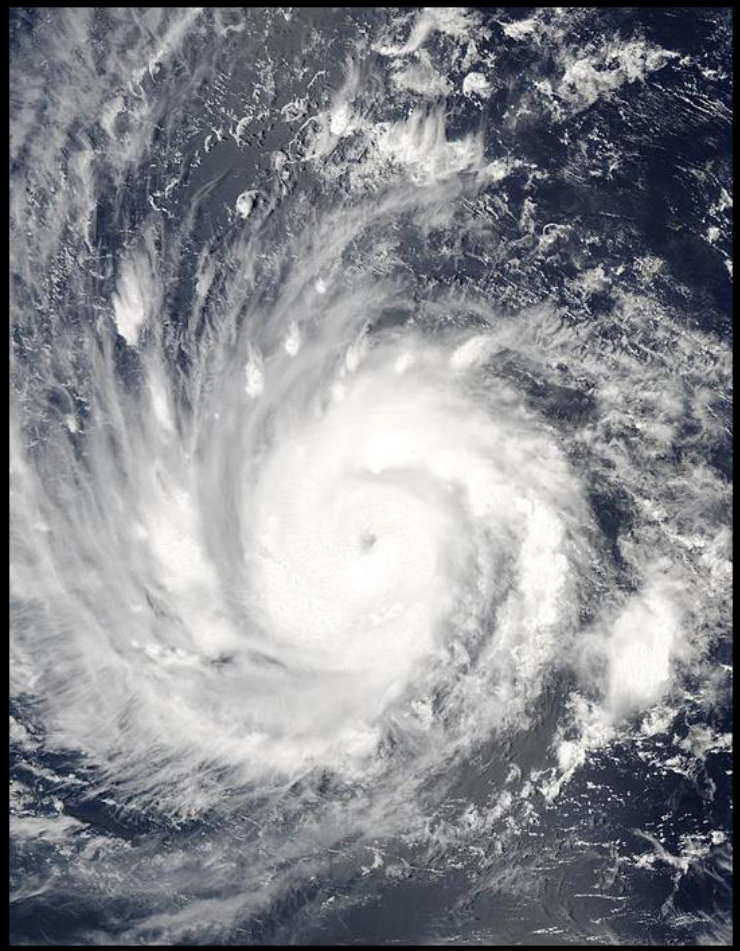
Kosrae, FSM

Estero Damas, Costa RIca

Ecotourism, Inspirational, and spiritual values

Yap, FSM

Mangroves function to protect coastal settlements from storm (and tsunami) damage in a changing climate



Economic values of mangroves

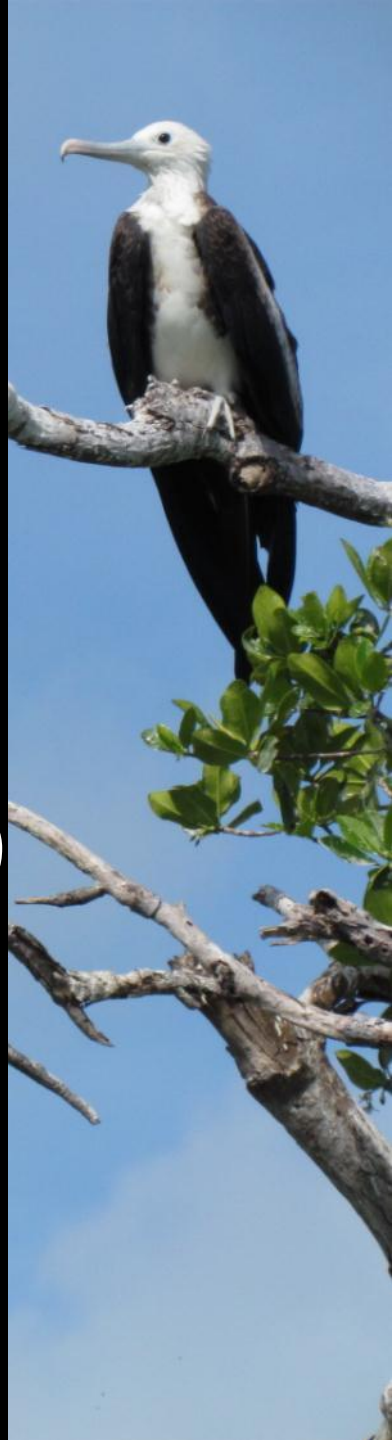
(in US Dollars)

- $200,000-900,000/ha – all products and services they provide (Wells et al. 2006)
- $300,000/km of shoreline storm protection and flood control in Malaysian coastline

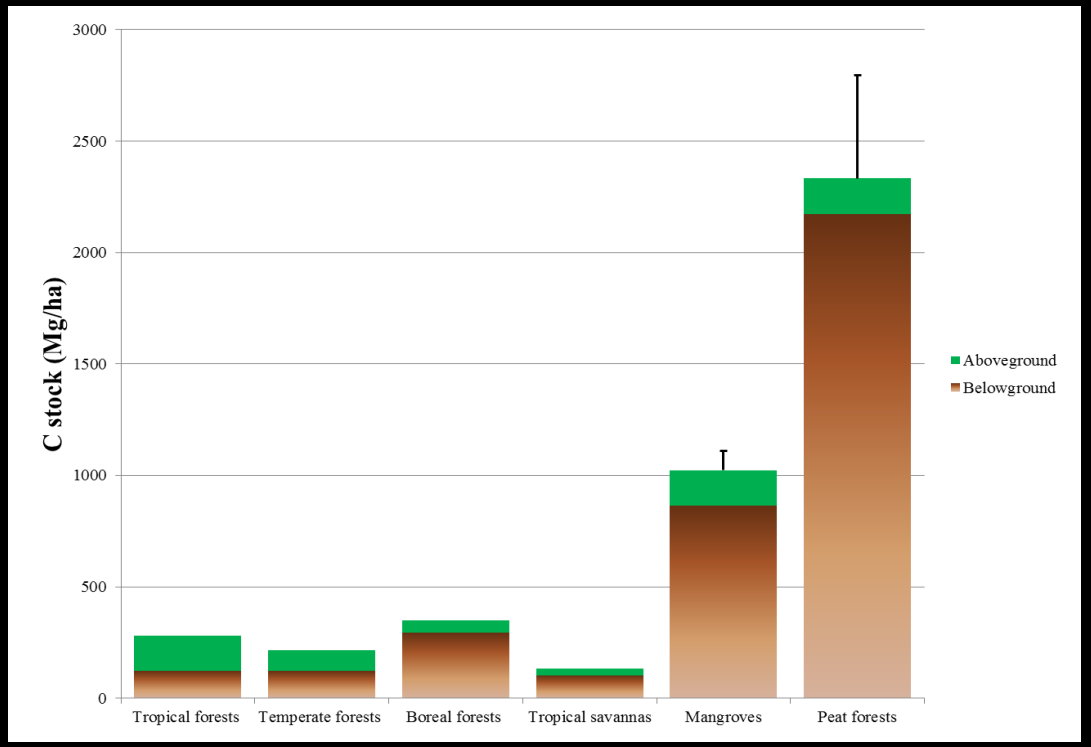
(From Gilman et al. 2008)

- Value of mangroves for fisheries - $37,500/ha 7yr (Mexico) (Aburto-Oropeza et al. 2008)

"Social value" of Blue carbon = $41.00/ton (Pendleton et al. 2012)

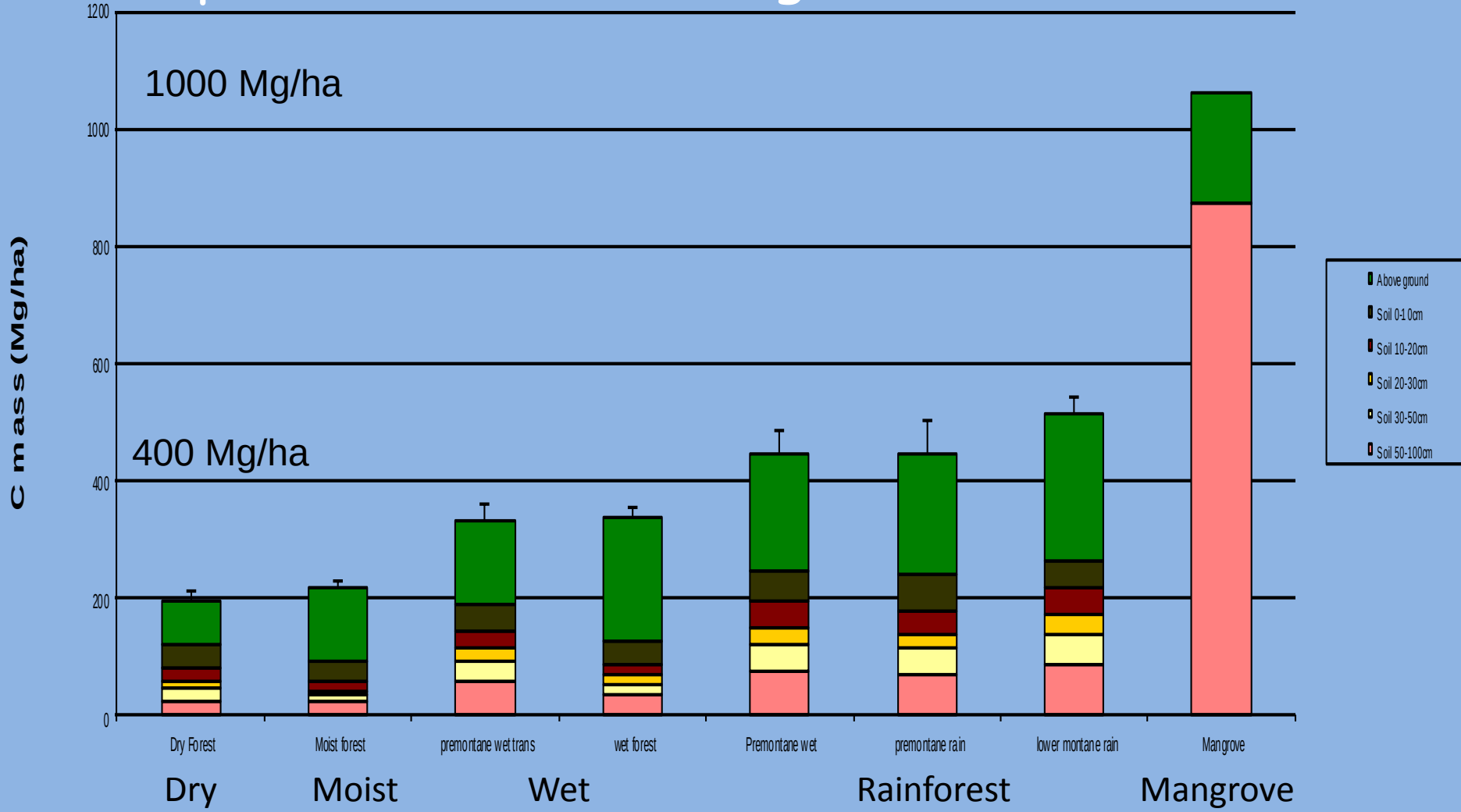


Forest Carbon stocks



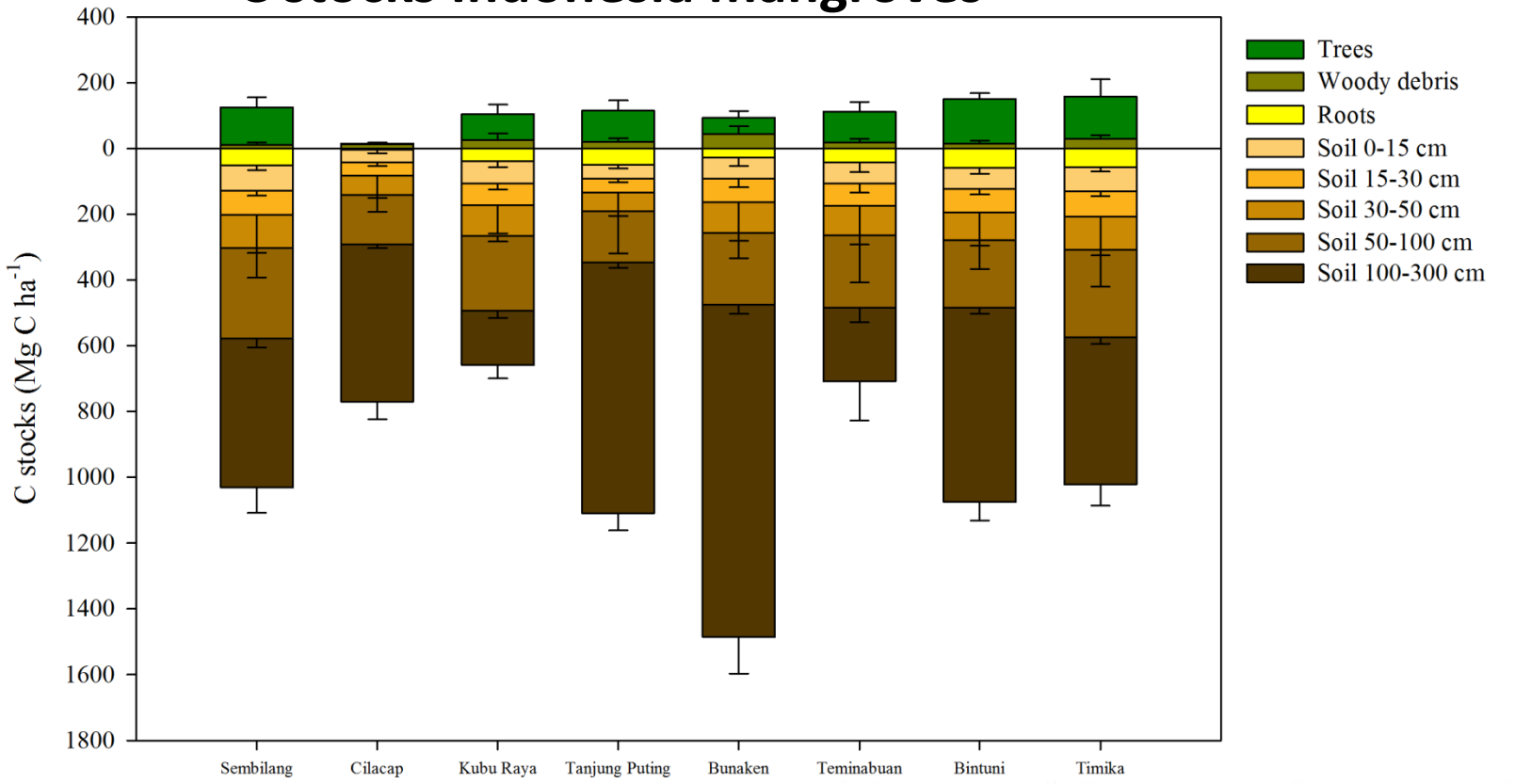
Data are from: IPCC, 2001: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change ; Donato et al. (2011), and this presentation.

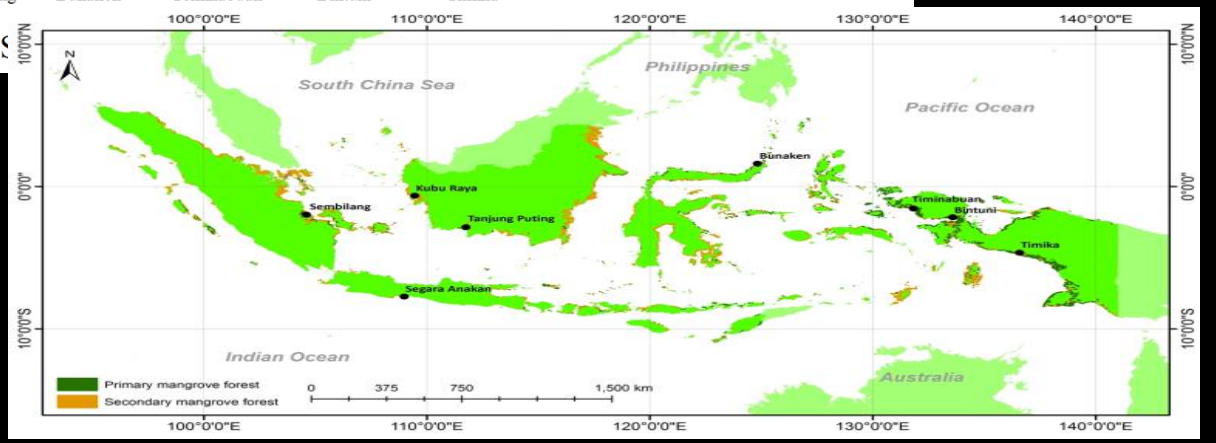
Carbon Stocks
Tropical forests and mangroves of Costa Rica



Kauffman, Cifuentes et al. in preparation

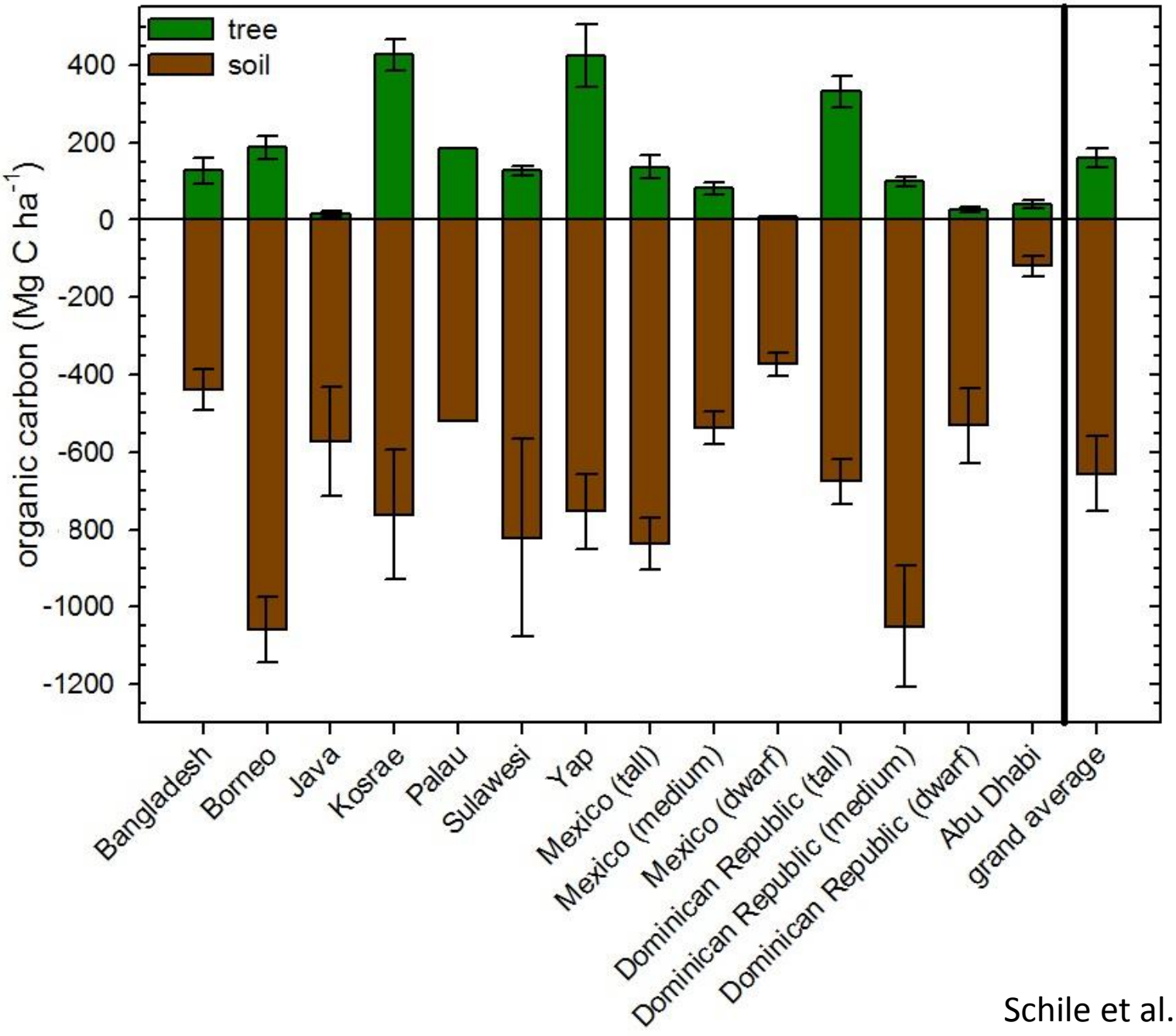
C stocks Indonesia mangroves





Stratified sampling across Countries allows for Tier 2 or even Tier 3 level of certainty

Examples- Honduras, Indonesia, Yap, Kosrae UAE



Schile et al. (in prep)

Currently, on average, between 1-7% of blue carbon sinks are being lost annually:

Upstream disruptions

Salt Ponds

Aquaculture

Rice/Agriculture

Road development /hydrological disruptions

Coastal development

What are the emissions from mangrove conversion?

TOTAL Greenhouse gas emissions 2601 Mg CO_2e/ha

Conversion/Land use

Loss of Ecosystem Services: Fish/Shellfish Coast Protection Water quality, etc.

350 Mg CO2e/ha; a 89% loss

Camaronera abandonado, Monte Cristi, RD

What are the emissions from rain forest conversion to cattle pasture?

Tropical evergreen forest (602 Mg CO2e/ha)

Slash burn

Cattle pasture, Brazilian Amazon (8 Mg CO2/ha)

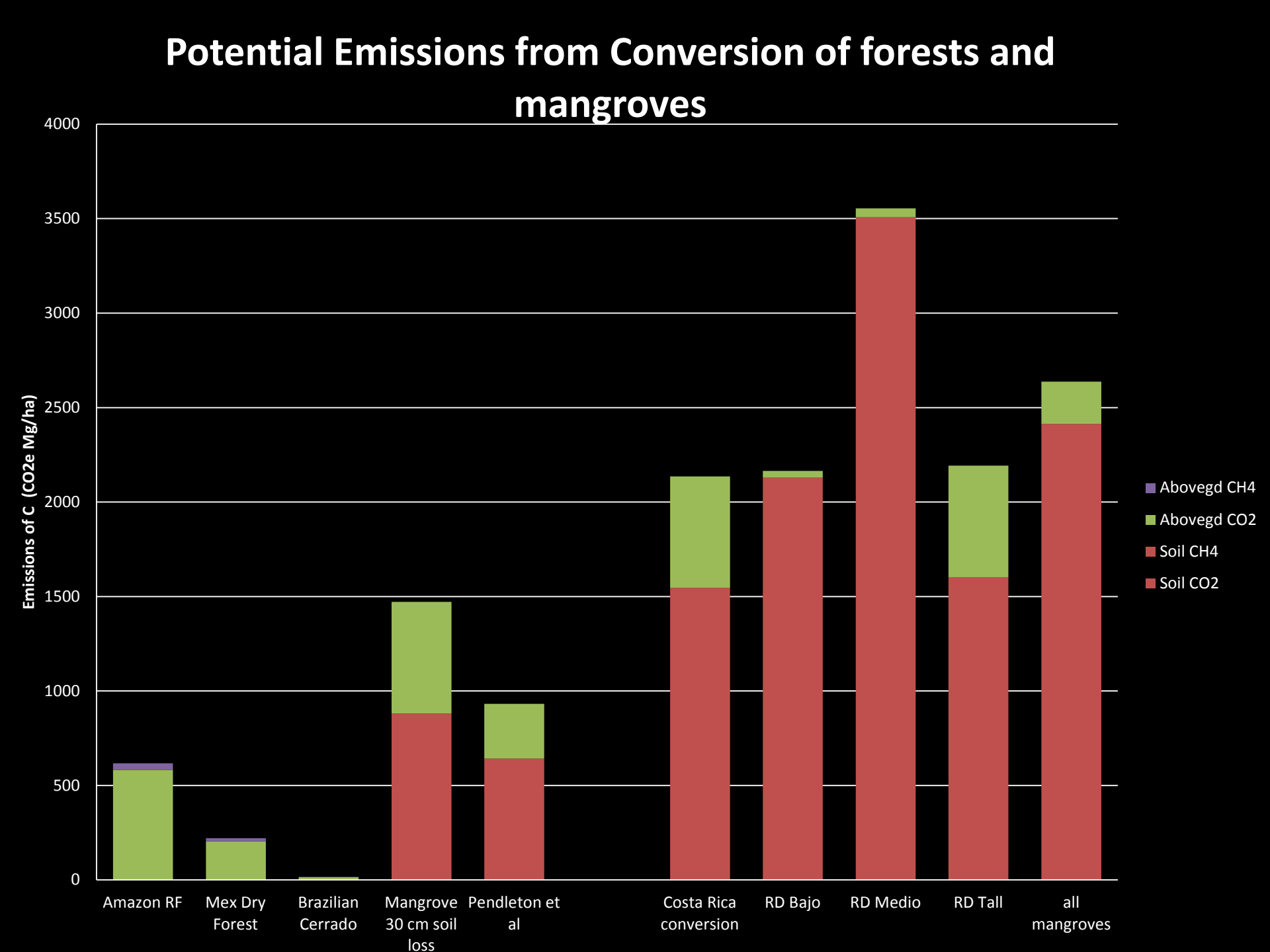
TOTAL Greenhouse gas emissions 620 Mg CO_2e/ha

Loss of other Ecosystem Services: biodiversity Water quality, etc.

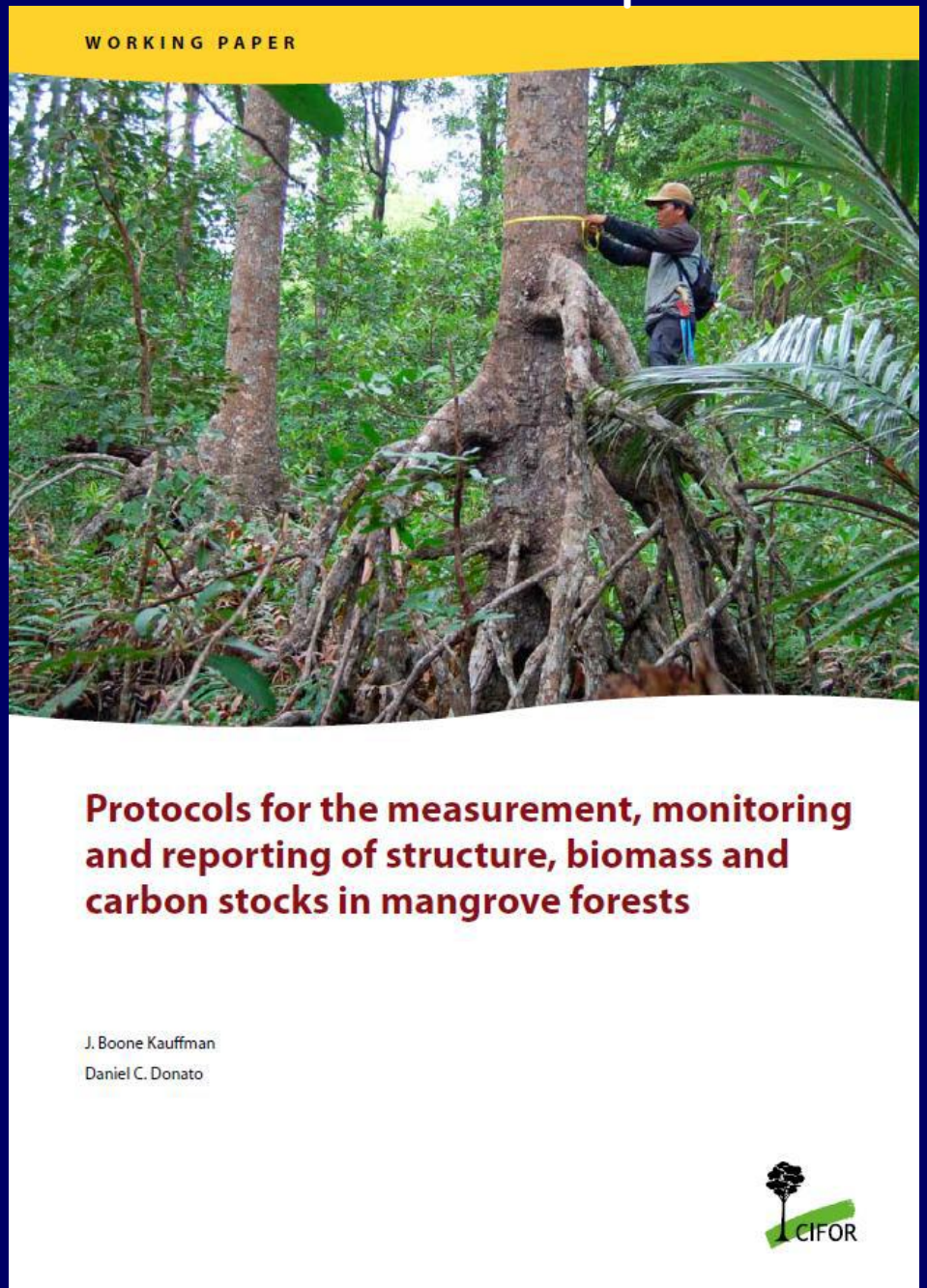
Soil Cores from Mangrove above and a site converted to shrimp ponds, Dom. Rep.

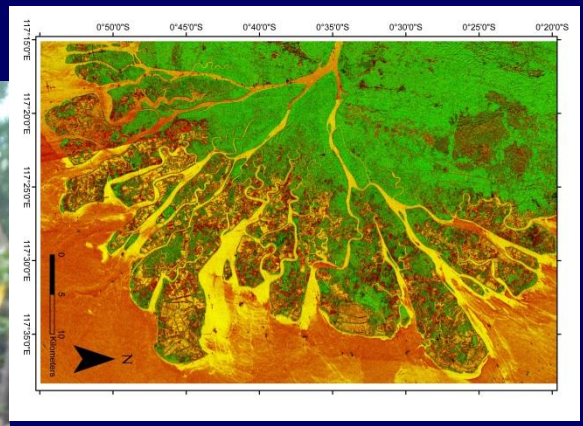
C concentration 11.29% Mangrove; 1.01% Shrimp Pond
N concentration 3.7 mg/g Mangrove; 0.2 mg/g Shrimp Pond

Potential Emissions from Conversion of forests and mangroves

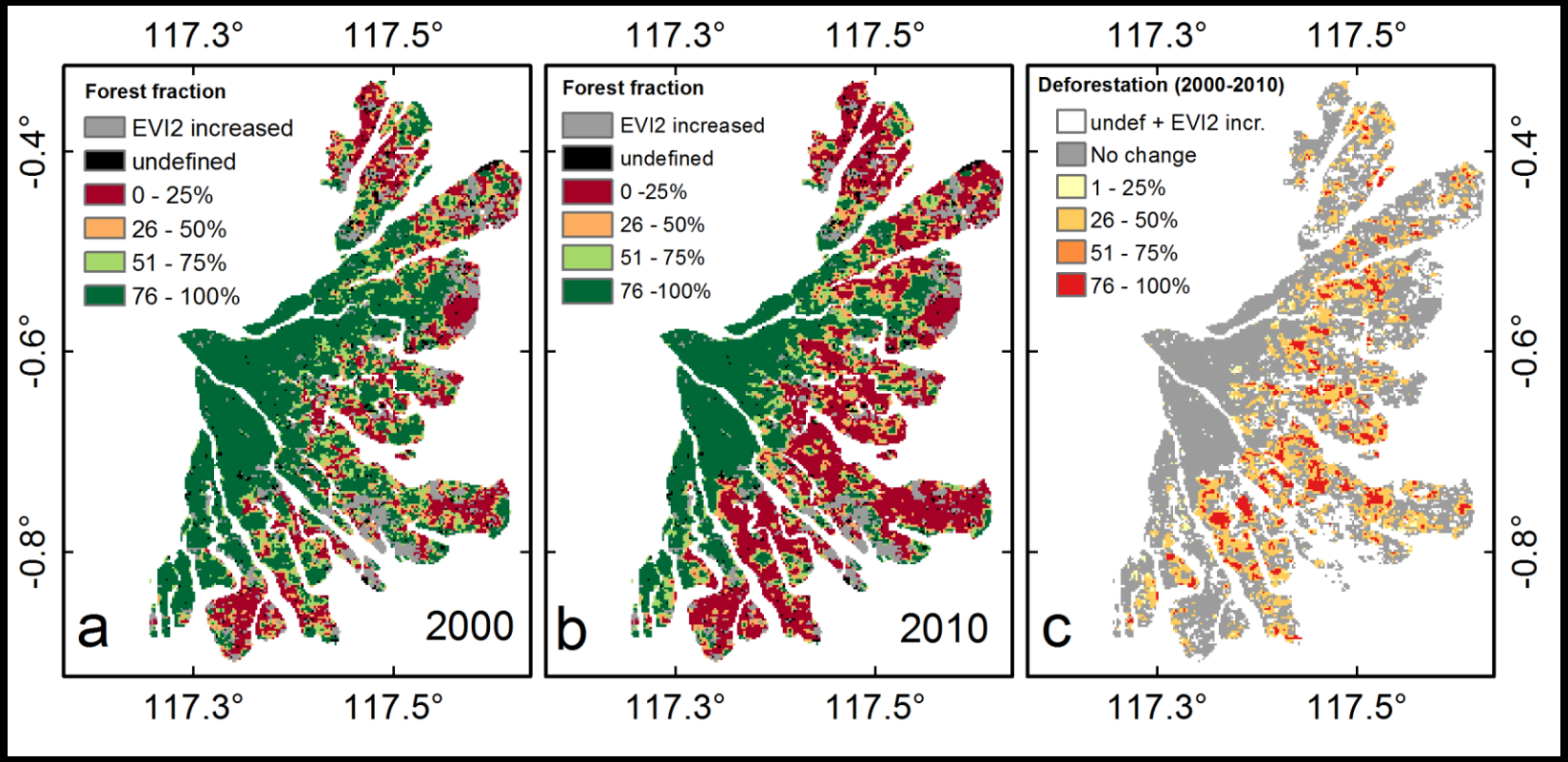


Accurate MRV is possible for mangroves





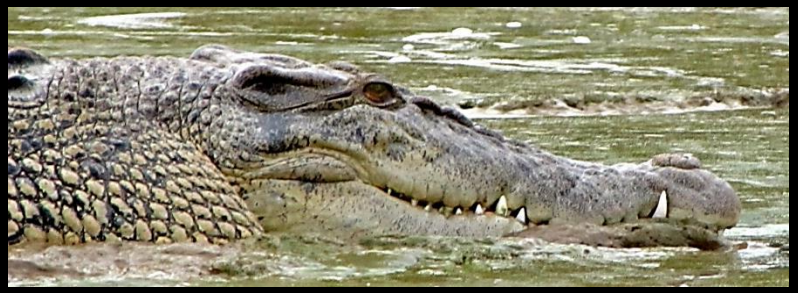
Land cover change of the Mahakam delta, East Kalimantan, Indonesian from 2000 to 2010 (bottom). The figure shows the forest cover fraction in 2000 (a) and 2010 (b), and absolute change in forest cover fraction between 2000 and 2010



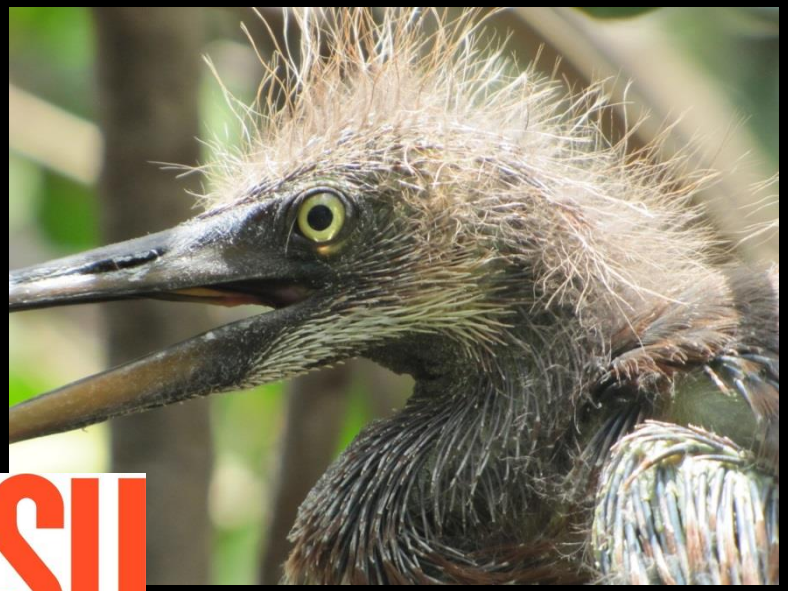
- Accurate monitoring of activity data is possible with remote sensing
- C stocks, emissions, and sequestration is possible with combinations of field and remote sensing – examples Indonesia, Dominican Republic, Yap FSM

SUMMARY
Why are mangroves so attractive for REDD+, other NAMAs, and Adaptation?

- There are a number of critical ecosystem services provided by mangroves;
- The carbon stocks in mangroves are among the highest of any ecosystem on earth;
- Rates of land use/land cover change in mangrove conversion are high;
- Greenhouse gas emissions from mangrove conversion are high;
- The MRV is possible in mangroves.



Thank you



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