



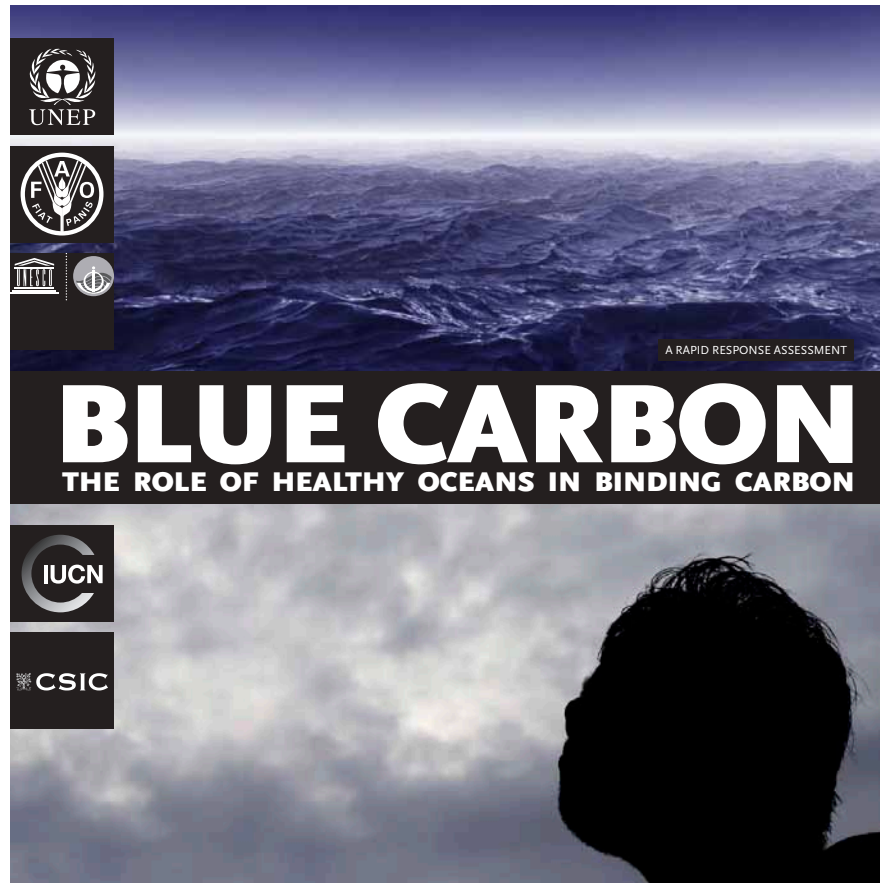
# Blue Carbon – Indonesia: Scientific knowledge and Policy

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Lingkungan Hidup dan Kehutanan

Peneliti, Kementerian Kelautan dan Perikanan

# Blue Carbon

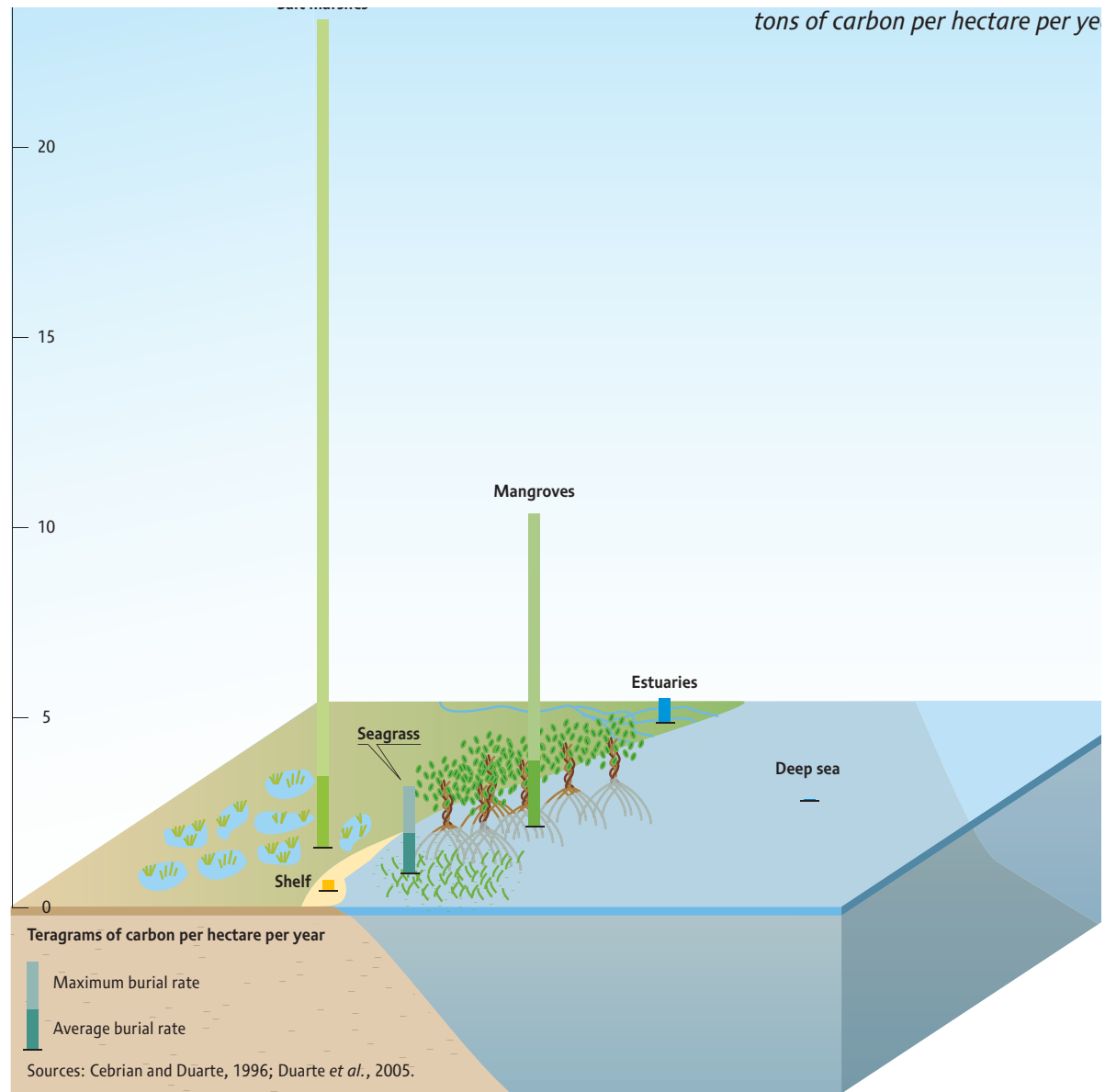


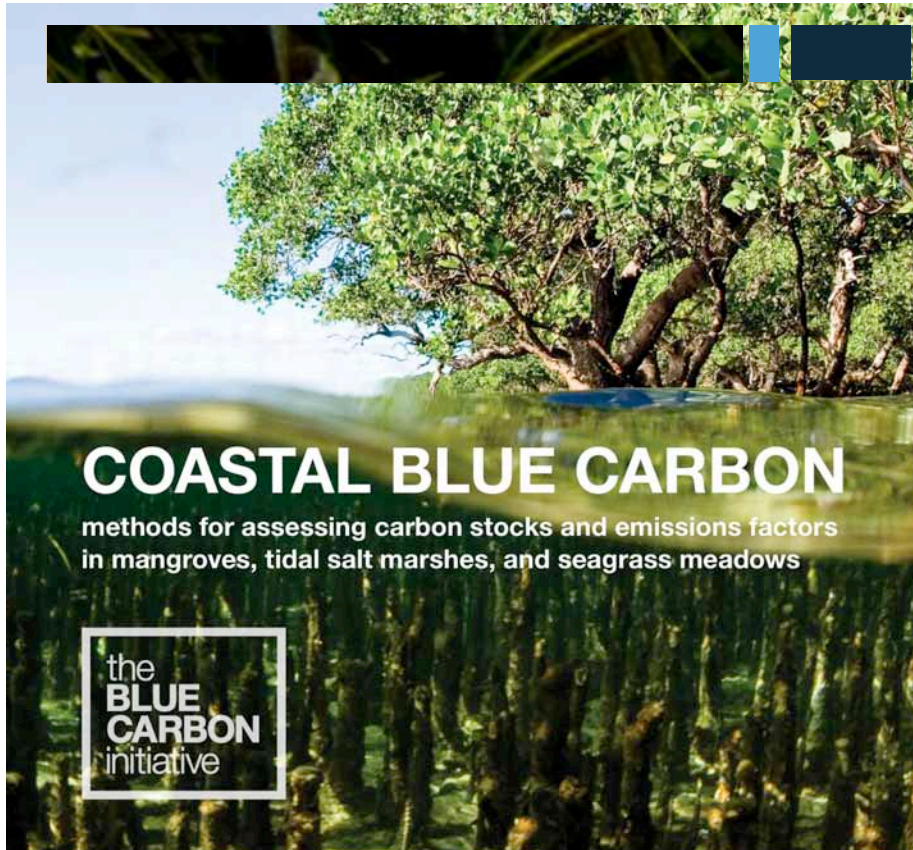
UNEP, 2009

Half of biological carbon is captured by marine living organisms

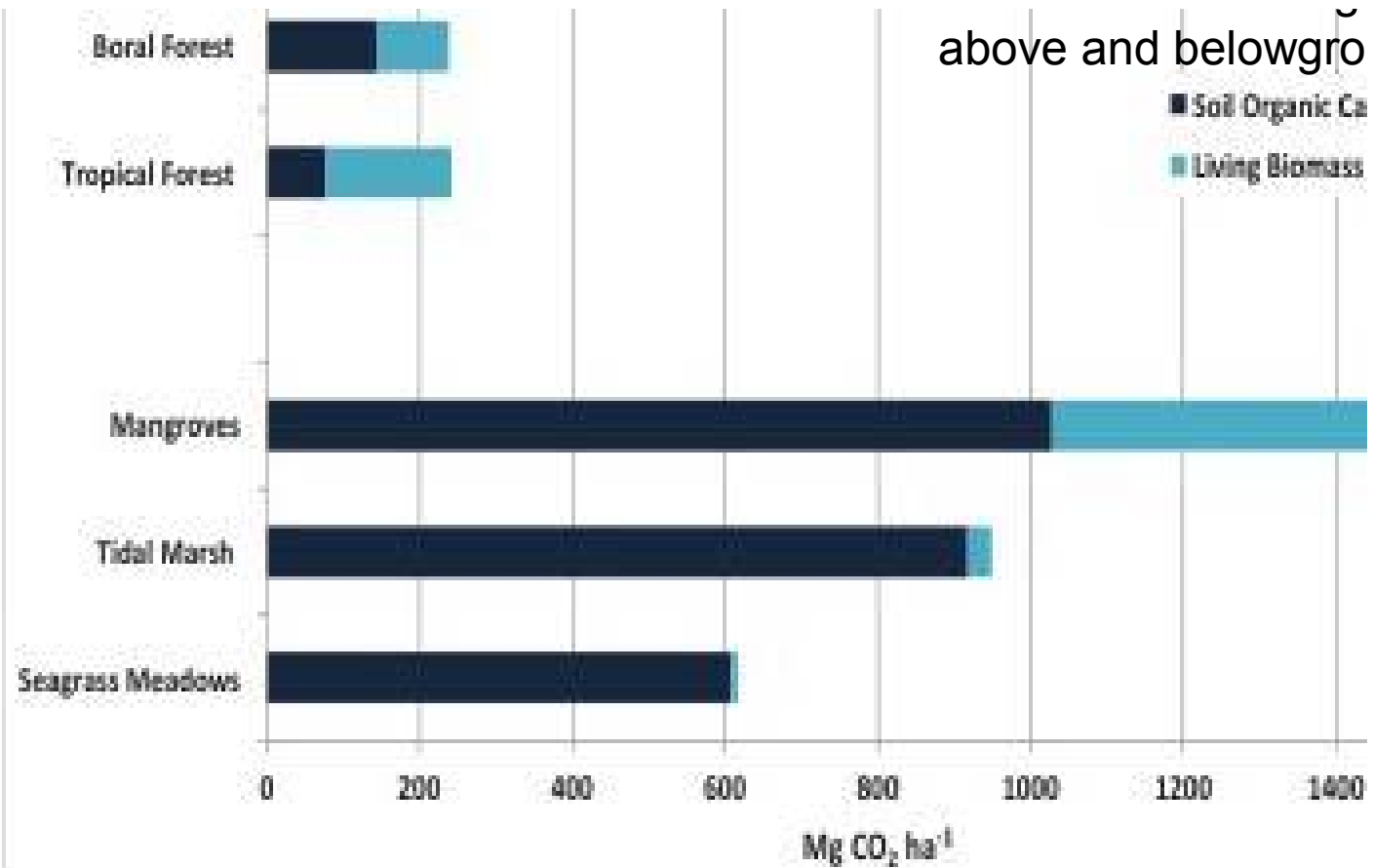
Facts:

- Natural ecosystems are being degraded, reducing their ability to absorb CO<sub>2</sub>
- Critical role of ocean has been overlooked





“Carbon stored in mangroves, salt tidal marshes, seagrasses within the soil, living biomass (aboveground and belowground) and non living biomass.”



(Fourqurean et al. 2012; Pan et al. 2011; Pendleton et al. 2012)

Carbon sequestered in coastal soils can be extensive and remain trapped for very long periods of time

# Blue Carbon ecosystem for climate change adaptation and mitigation

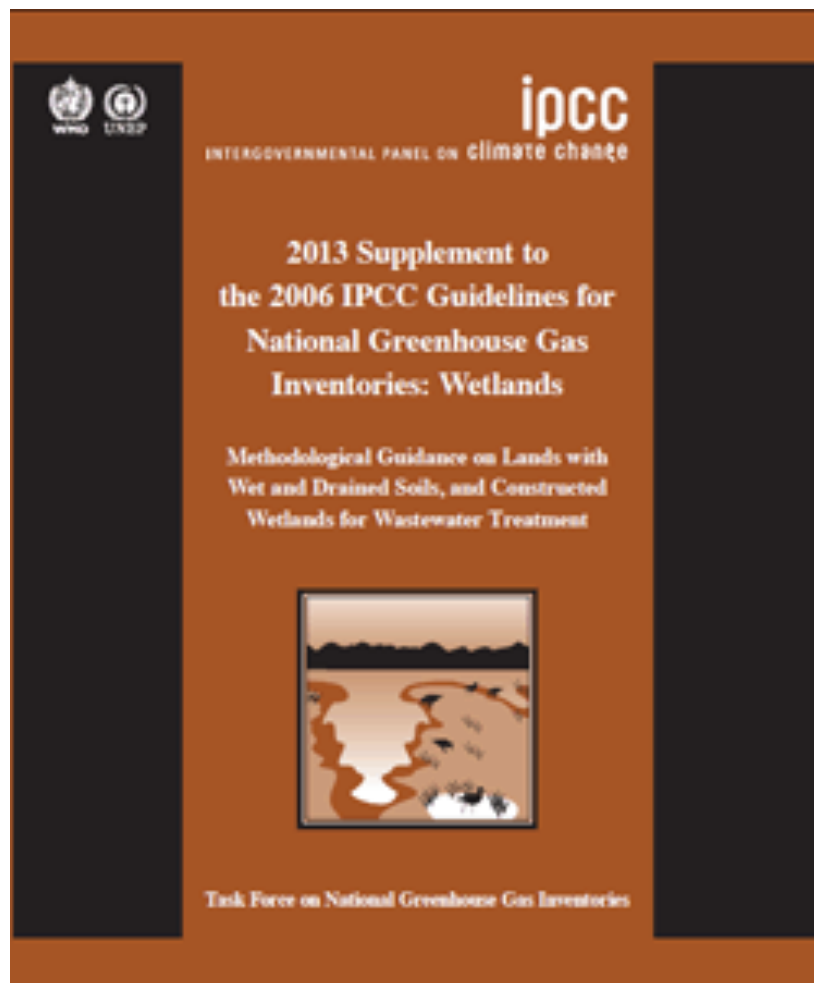


<http://thebluec>

CONSERVATION  
INTERNATIONAL



27/09/2016 09:25



control) to supplement that given in Volume 1 of the 20

A summary of the main methodological updates to the *2006 IPCC Guidelines* is provided below a decision tree to help inventory compilers determine which chapters of this supplement to a coverage and definitions of the wetland types.

**Peatlands and organic soils.** The *2006 IPCC Guidelines* included some guidance on drainage and peat extraction (Chapter 7, Volume 4), but not on rewetting. In this supplement, peatlands with organic soils and both drainage and rewetting are covered. Updated emission factors and for both drained and rewetted organic soils including for off-site carbon dioxide (CO<sub>2</sub>) emissions and carbon losses. Guidance on methane (CH<sub>4</sub>) emissions from rewetting of organic soils (Chapter *Supplement*), ditches on drained inland organic soils and CO<sub>2</sub>, CH<sub>4</sub> and carbon monoxide (CO) emissions are also provided (Chapter 2 of the *Wetlands Supplement*).

**Peatland managed for peat production.** Peat production is covered in the *2006 IPCC Guidelines* (Volume 4) and no additional guidance is given here except some updated emission factors in Chapter 2.

**Rice cultivation.** Rice cultivation is covered in the *2006 IPCC Guidelines* (Chapter 5, Volume 4) and emission factors for lowland rice production are given in Chapter 2.

**Coastal wetlands.** The *2006 IPCC Guidelines* provide no specific guidance for coastal wetlands. Emission factors are given in Chapter 4 of this supplement on how to treat anthropogenic emissions and re

Worksheets that can be used for estimating emissions and removals for each category using the 11 and revised background tables, are included in the annex of the chapter.

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





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

# UNFCCC COP 22



**MARRAKECH 2016**  
COP22 | CMP12 | CMA1  
UN CLIMATE CHANGE CONFERENCE

# Blue Carbon in Indonesia: Opportunities and Challenges



## 5. HALTING MANGROVE DEFORESTATION COULD MAKE A WHOLE LOT OF DIFFERENCE TO CLIMATE CHANGE

Stopping mangrove destruction could meet

1/4

of Indonesia's **26%** emissions reduction target for 2020...



...equivalent to **40,000,000** fewer cars on the road

### References:

Illustration & design: Jim O'Neill

**Cut emissions, not mangroves:  
Indonesia's best hope for slowing climate change**  
[blog.cifor.org/31112](http://blog.cifor.org/31112)

**Available for download:**  
<http://dx.doi.org/10.1038/nclimate2734>

**Read more:**  
[blog.cifor.org/wetlands](http://blog.cifor.org/wetlands)

**Full infographic and additional references:**  
[blog.cifor.org/31193](http://blog.cifor.org/31193)

# Blue carbon – Climate change

## Scenario For 2030

► Focus on 5 sector for emission reduction in NDC:

ENERGI

LIMBAH

IPPU

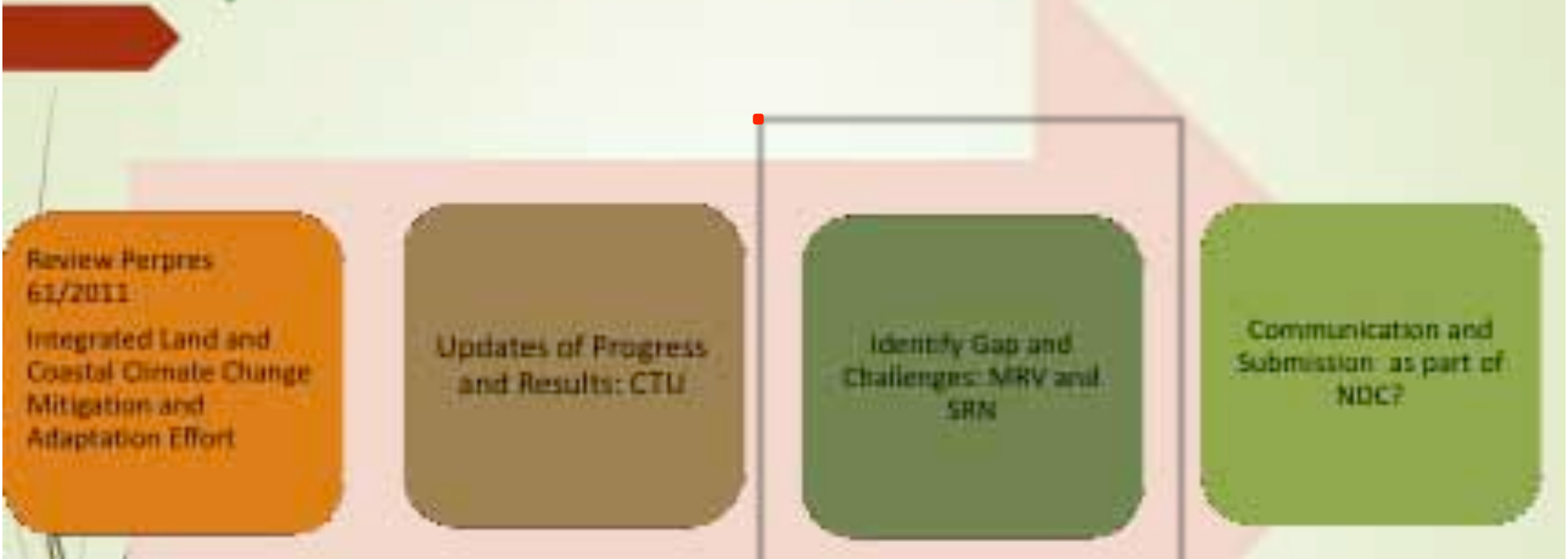
PERTANIAN

KEHUTANAN

Mangrove,  
etc. Blue  
Carbon?

(KLHK, 2016)

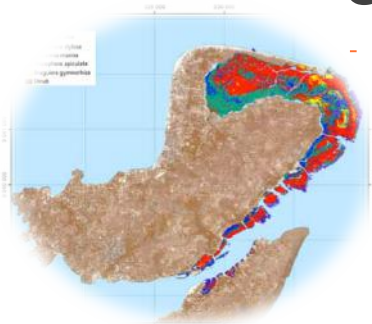
## Next Steps for Coastal Wetlands in NDC?



(KLHK, 2016)

# Knowledge gaps

## GEOGRAPHICAL EXTENT



Map of existing habitat, loss or change

## EMISSION AND REMOVAL



Emission from exposed organic soil and removal to restored ecosystem

## SEQUESTRATION AND STORAGE



Data in scientific literatures

## HUMAN DRIVERS

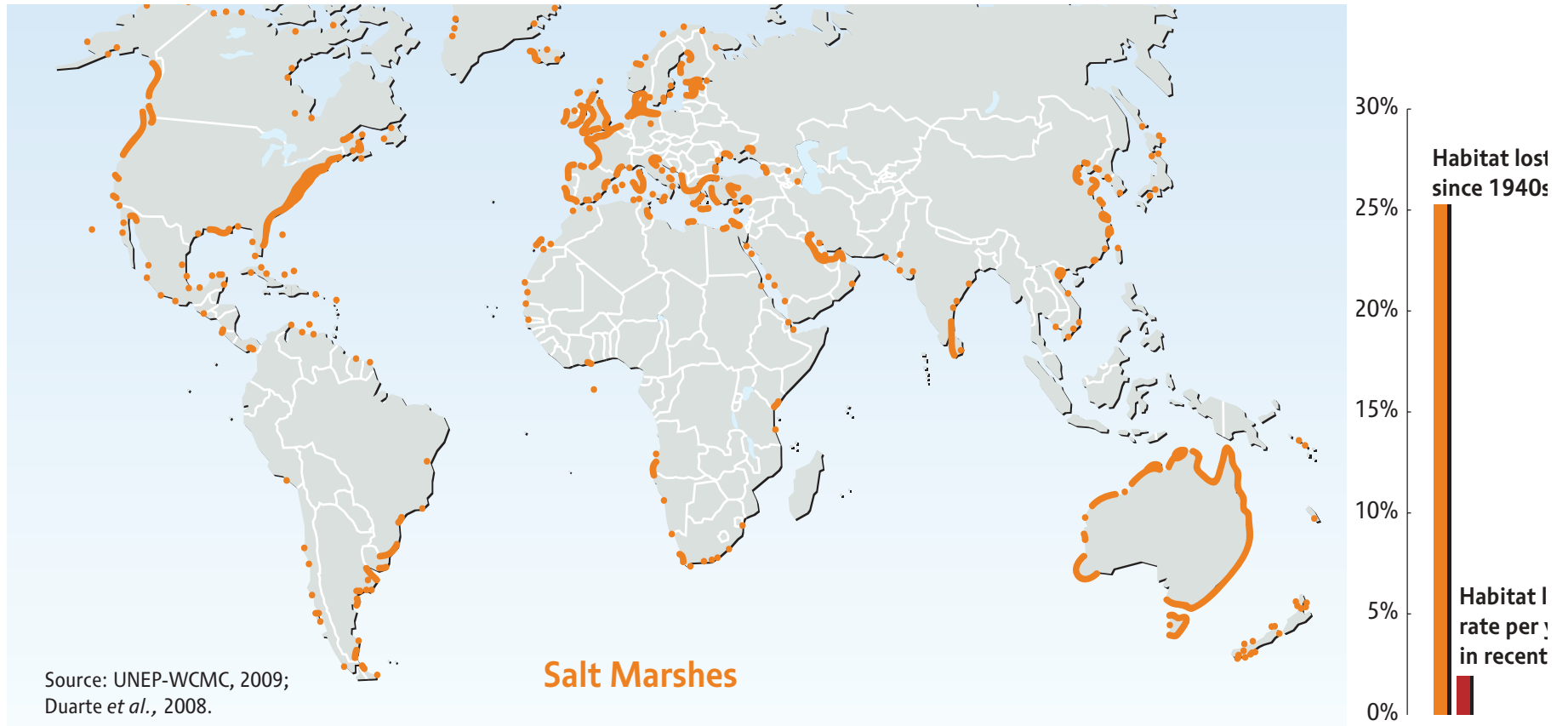


Emission rates associated with human activities

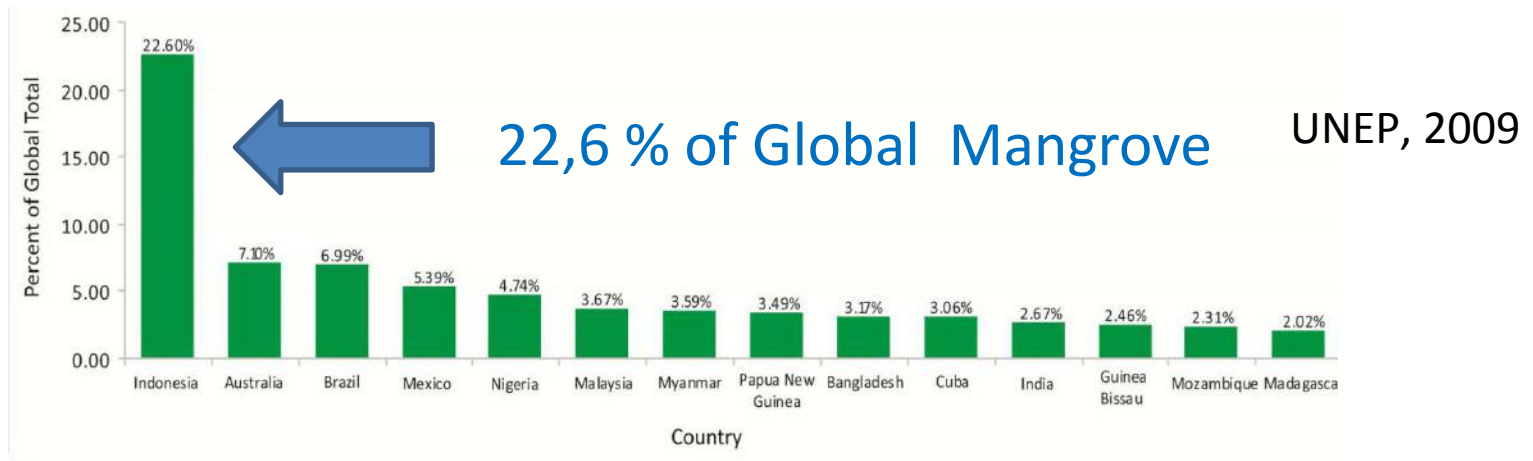
## COASTAL EROSION



Fate of eroded coastal carbon



36





some countries results in potentially unrealistic estimates of when mangroves may be lost outside protected areas (Table 4), based on the assumption that each country had 20.7% of its mangrove resource under protection (the global average).

For most countries, however, such worst-case scenarios are unlikely, due to the high variability amongst trends, and possible policy responses to rapidly declining mangroves. Indeed, although a subset of 13 countries may lose

*Global Ecology and Biogeography*, © 2013 John Wiley & Sons Ltd



as policy-makers react to declining mangrove cover. For these reasons, we do not extrapolate deforestation trends to an unrealistic 0% mangrove cover.

## RESULTS

### Annual rates of mangrove change

There is considerable variability in the estimated rate of change of mangroves, depending on the data being modelled (Fig. 1), particularly for Indonesia, Brazil, Malaysia, Bangladesh, Cuba, the Philippines, Thailand and Singapore; for these countries, we were able to derive models of forest loss, of forest gain or of no change (Tables 2 & 3). High variability meant that many countries showed a large standard deviation in mangrove change when averaged across all models, such as Nigeria ( $-92.09 \pm 188.95 \text{ km}^2 \text{ yr}^{-1}$ ), Bangladesh ( $6.98 \pm 29.75 \text{ km}^2 \text{ yr}^{-1}$ ), Cuba ( $-34.82 \pm 142.17 \text{ km}^2 \text{ yr}^{-1}$ ), the Philippines ( $-2.86 \pm 36.44 \text{ km}^2 \text{ yr}^{-1}$ ) and Thailand ( $7.08 \pm 42.99 \text{ km}^2 \text{ yr}^{-1}$ ). High variability between data points also manifests itself in a very wide 95% individual prediction interval (see Fig. 2, highlighting selected countries). For example, using all data points, historical projections of mangrove area in Australia in 1888

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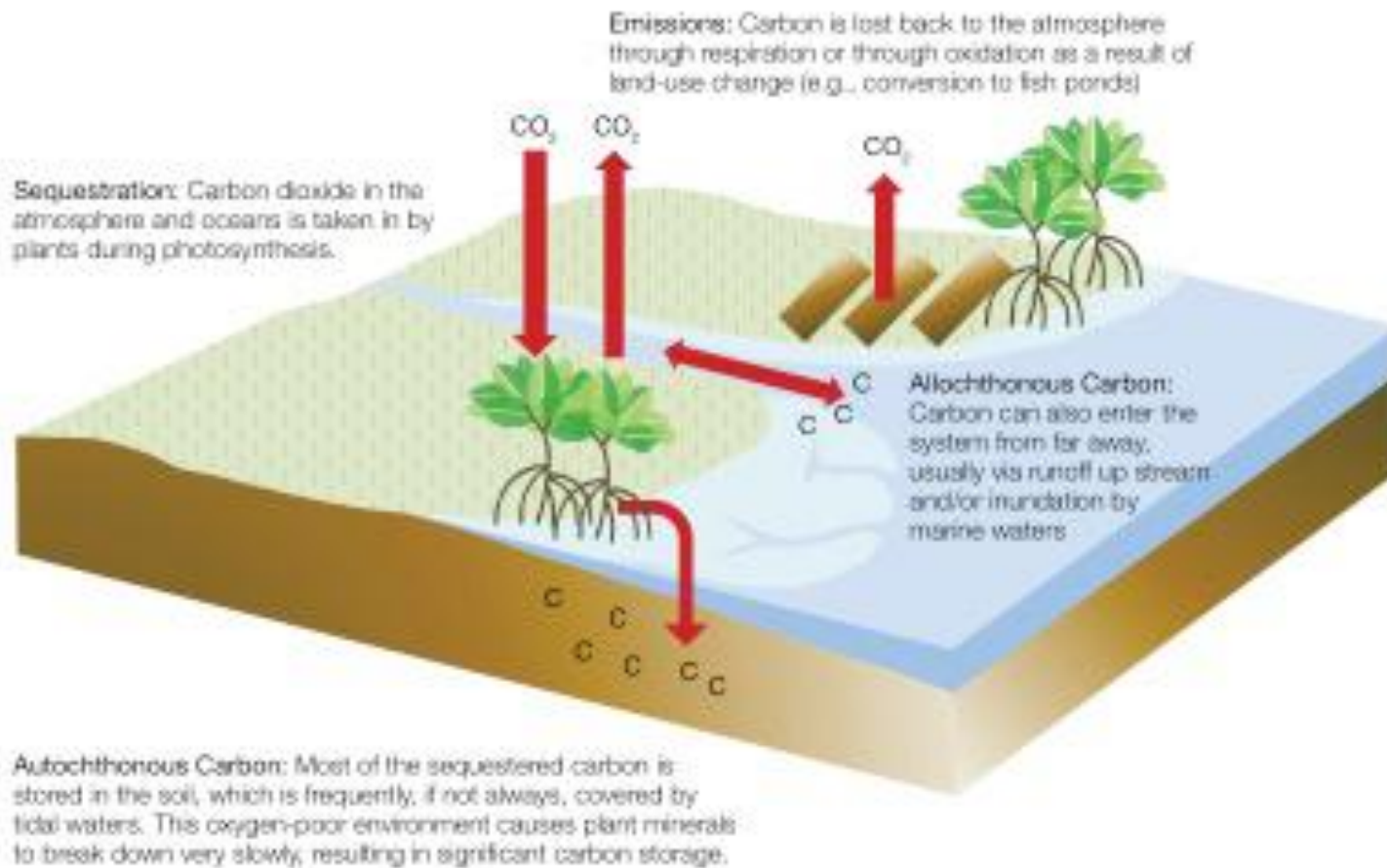
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Carbon sequestration, storage, emission, removal:

How much carbon stored and sequestered ?

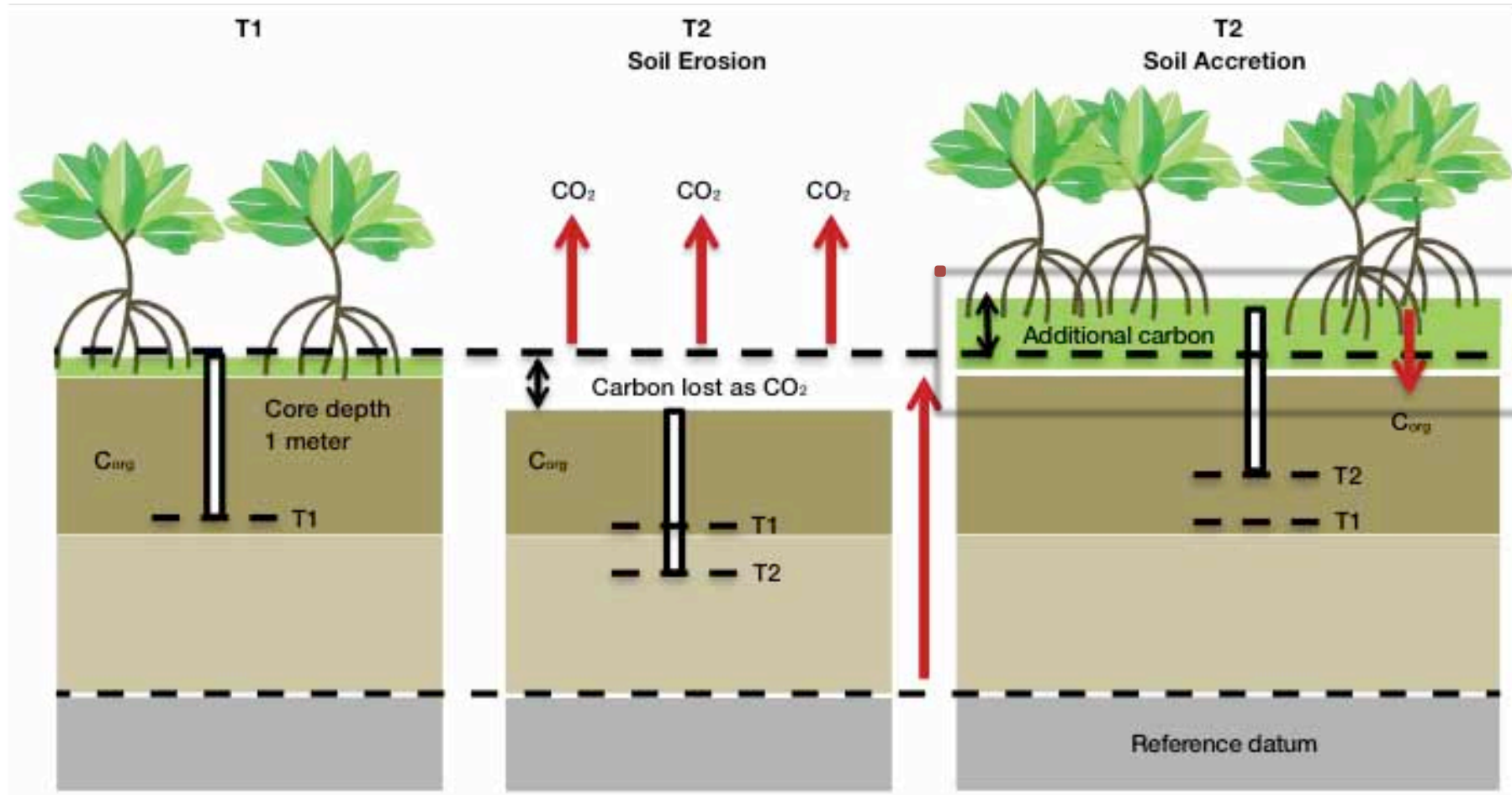
Where?

What are the potential emissions ?



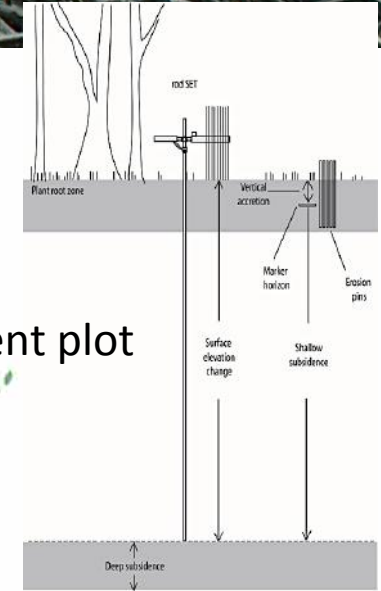
(Blue carbon protocol, 2014)

# Gain or Loss ?



(Blue Carbon Protocol, 2014)

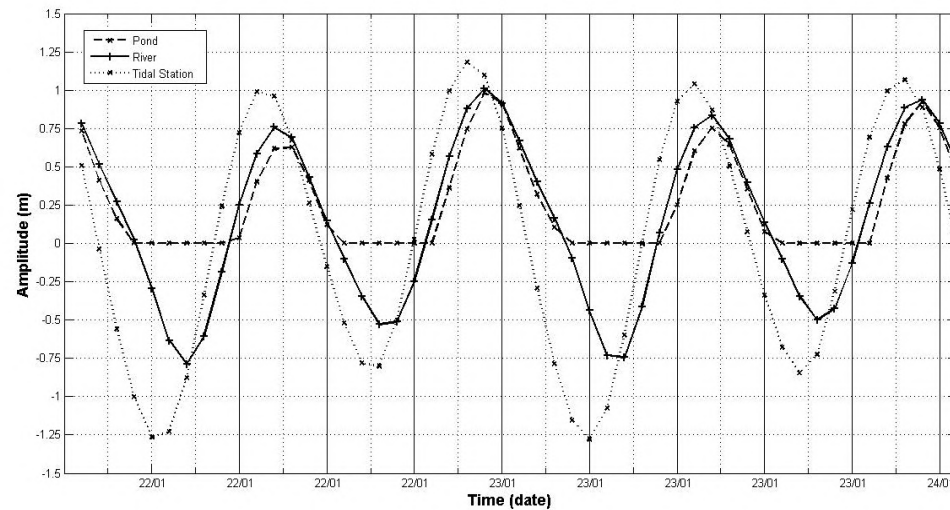
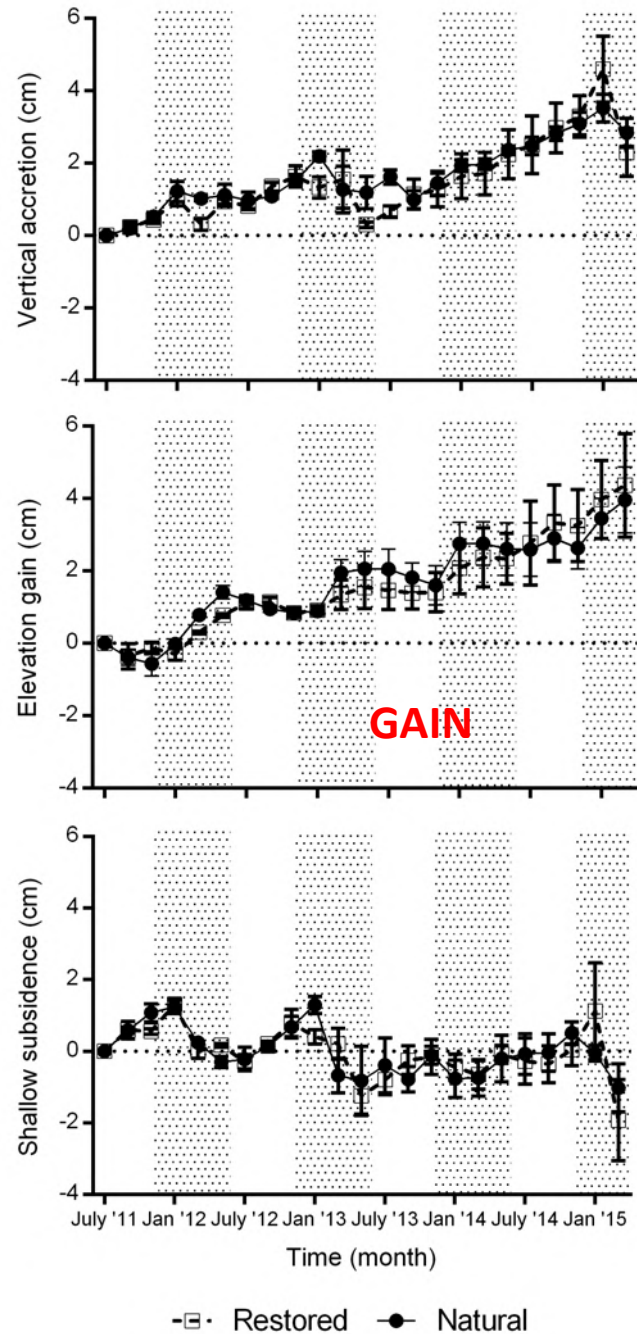
# RSET-MH Network (Indo-Pacific)



- Peatlands
- Mangroves

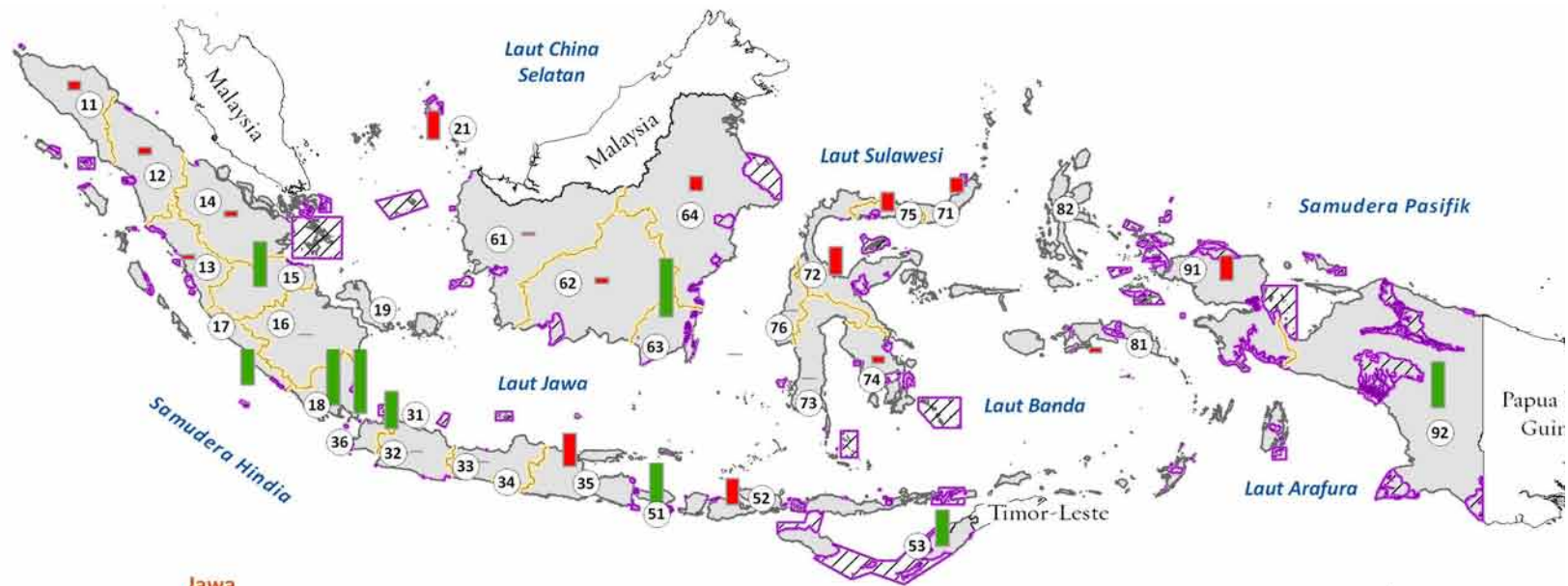


Similar trends in restored and natural forests  
(elevation:  $1.0 \pm 0.1 \text{ cm year}^{-1}$ ) (Sidik *et al*, in prep)



# What's next ?

- Science:
  - National mapping and assessments
- Policy:
  - National GHG inventories
  - Mangroves into national REDD+ strategies
  - Coordination among ministries-local government-NGOs, policy development and implementation



**Sumatera**

- 11 Aceh
- 12 Sumatera Utara
- 13 Sumatera Barat
- 14 Riau
- 15 Jambi
- 16 Sumatera Selatan
- 17 Bengkulu
- 18 Lampung
- 19 Kepulauan Bangka Belitung
- 21 Kepulauan Riau

**Jawa**

- 31 Daerah Khusus Ibukota Jakarta
- 32 Jawa Barat
- 33 Jawa Tengah
- 34 Daerah Istimewa Yogyakarta
- 35 Jawa Timur
- 36 Banten

**Nusa Tenggara**

- 51 Bali
- 52 Nusa Tenggara Barat
- 53 Nusa Tenggara Timur

**Sulawesi**

- 71 Sulawesi Utara
- 72 Sulawesi Tengah
- 73 Sulawesi Selatan
- 74 Sulawesi Tenggara
- 75 Gorontalo
- 76 Sulawesi Barat

**Kalimantan**

- 61 Kalimantan Barat
- 62 Kalimantan Tengah
- 63 Kalimantan Selatan
- 64 Kalimantan Timur

**Maluku**

- 81 Maluku
- 82 Maluku Utara

**Papua**

- 91 Papua Barat
- 92 Papua

**Persentase Ekosistem Hutan Mangrove Yang Dili Menurut Provinsi - Dengan Keterwakilan Ekosistem**





A photograph of a blue crab on a muddy, wet surface. The crab is positioned in the lower-left quadrant, facing towards the center. The mud is dark brown and glistening with water, reflecting light. In the center of the image, there is a circular hole in the mud. The background is filled with more mud and some small, dark rocks or debris. A semi-transparent white rectangular box is overlaid in the center of the image, containing the text "Terima kasih" in a bold, black, sans-serif font.

**Terima kasih**



- 1) drained mineral soil
- 2) wet mineral soil
- 3) wet organic soil
- 4) drained organic soil.

In the case of dry mineral soil, the guidance in the Forest Land, Cropland or Grassland Chapters *IPCC Guidelines* should be used as appropriate. Chapter 4 of the *Wetlands Supplement* provides n for drained coastal mineral soils, and Chapter 5 presents new guidance for drained inland wetland 1

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<sup>1</sup> Cf. Section 3.3.1, Chapter 3 in Volume 4 of the *2006 IPCC Guidelines*

<sup>2</sup> Other management activities on coastal wetland mineral soils covered in the Supplement include extraction and aquaculture.

<sup>3</sup> The guidance for rice cultivation provided in Chapters 2 and 5 of the *Wetlands Supplement* should be used i with Chapters 5 and 11 in Volume 4 of the *2006 IPCC Guidelines*.