Restoring C-rich ecosystems

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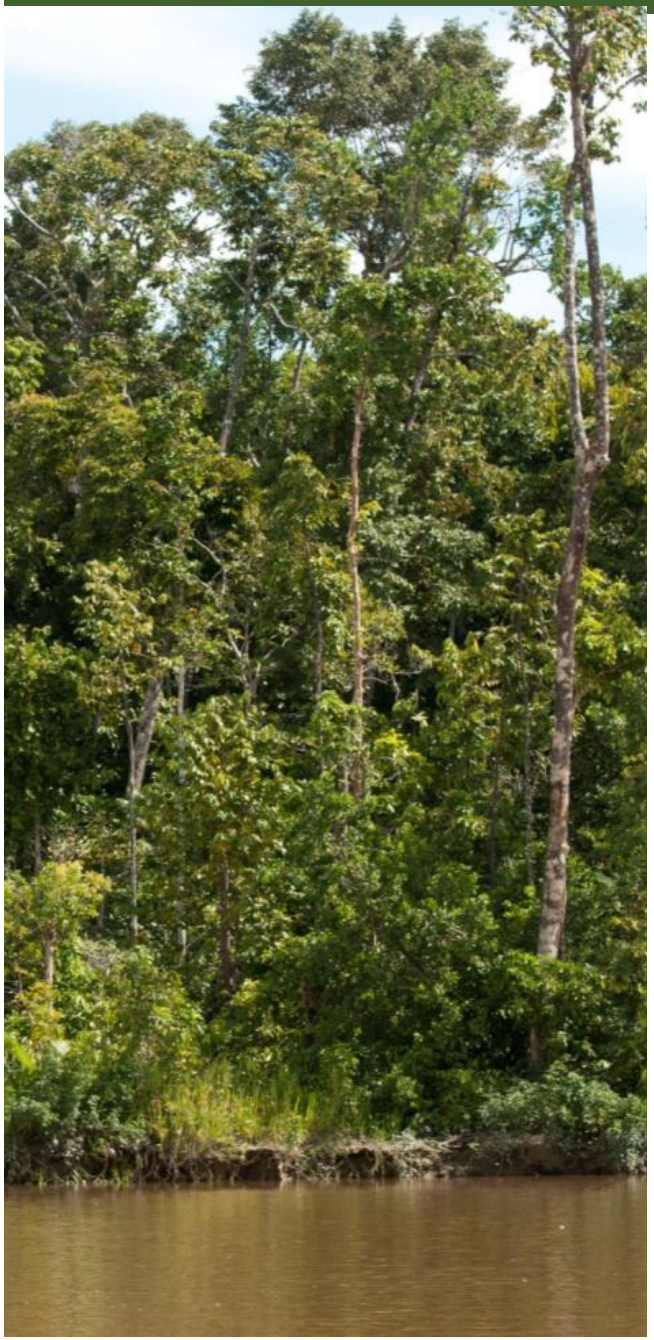
SWAMP

Sustainable Wetlands Adaptation and Mitigation Program

CIFOR

Thinking beyond the canopy

Center for International Forestry Research



Why wetlands?

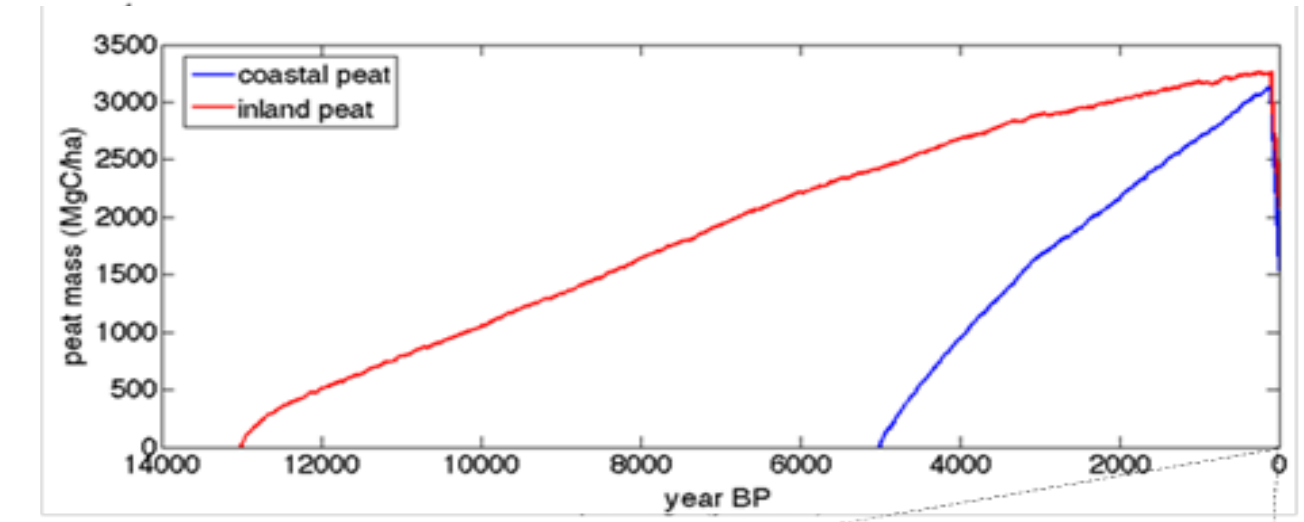
- Wetlands are important in the global carbon cycles
  - Very high C stocks, some of the highest on the planet
  - Highest rates in deforestation/land cover change in the tropics → GHG emissions
- Wetlands provide numerous ecosystem services
  - Natural sponge → flood control
  - Habitat for rare and endangered species
  - Coastal systems protect from storms and tsunamis
  - Breeding and rearing habitat for fish and shellfish
  - Sources of wood and other forest products
  - Ecotourism
  - High biodiversity

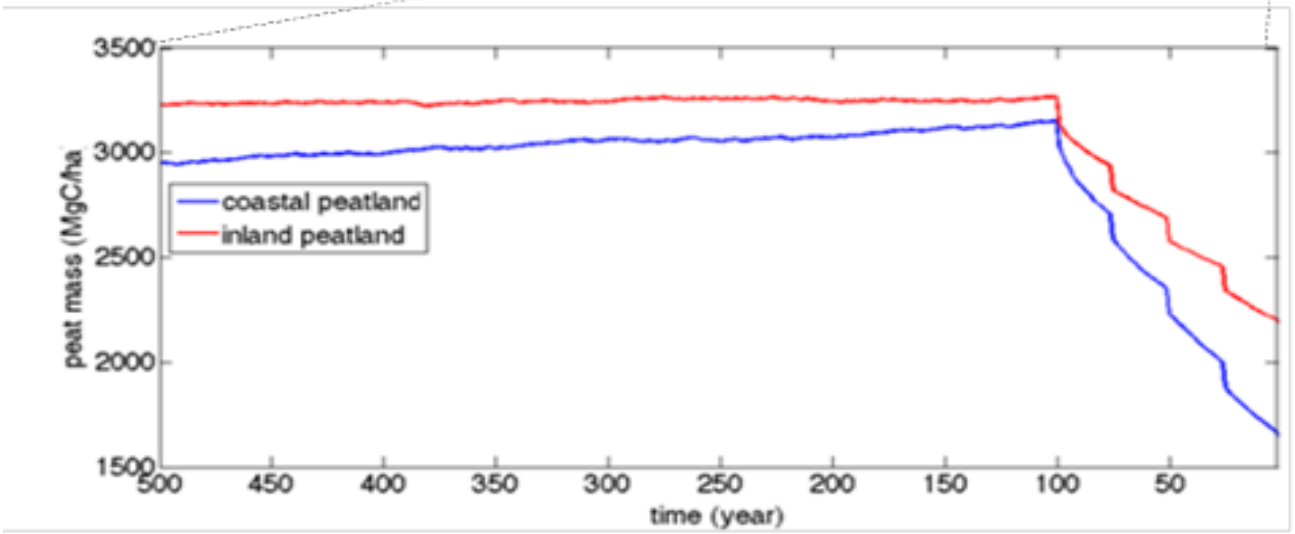
By definition….

Restoration is

- the act or process of returning something to its original condition
- the act of bringing back something that existed before

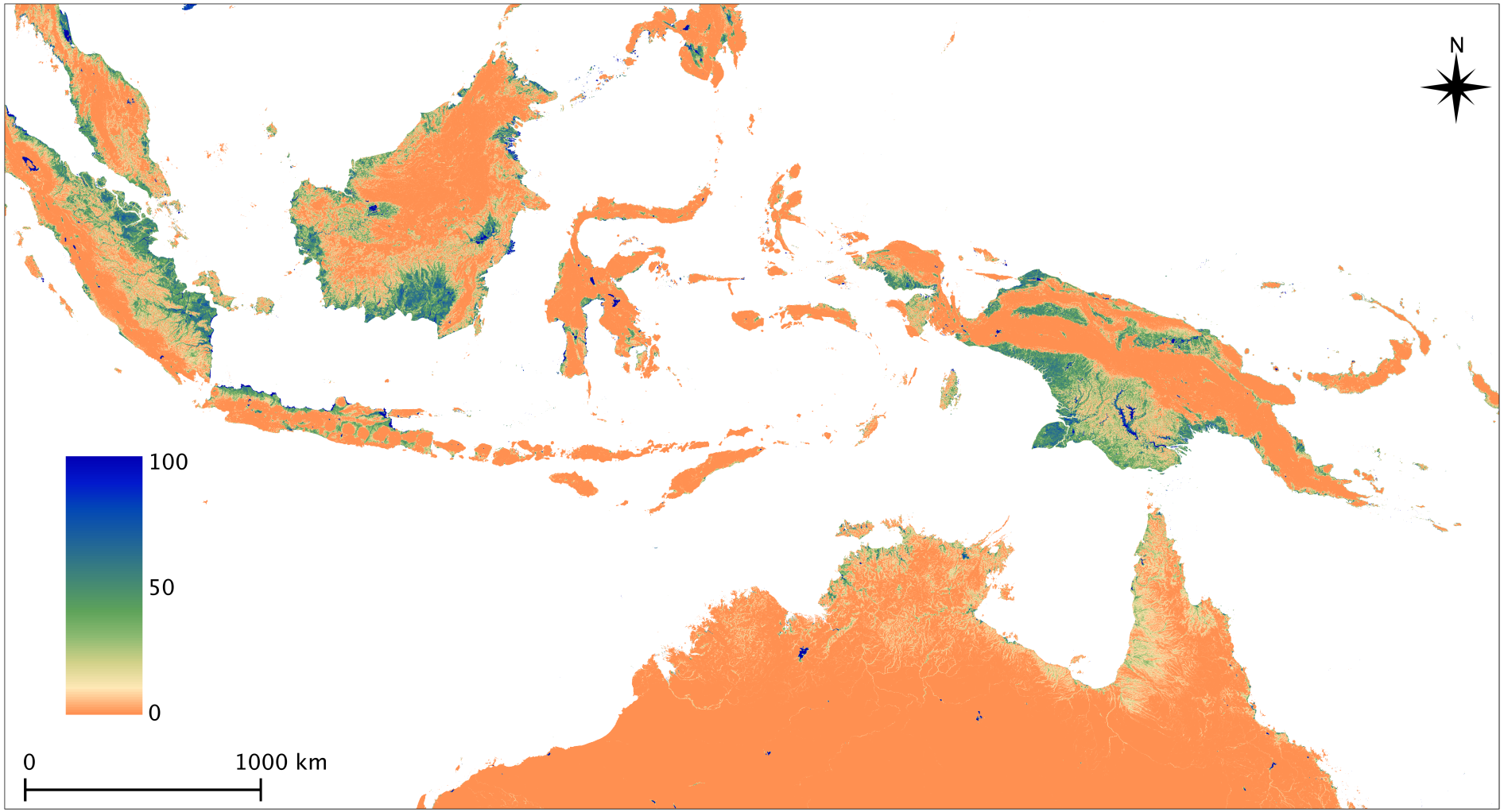
2,800 years' worth of C may be lost in an eyeblink



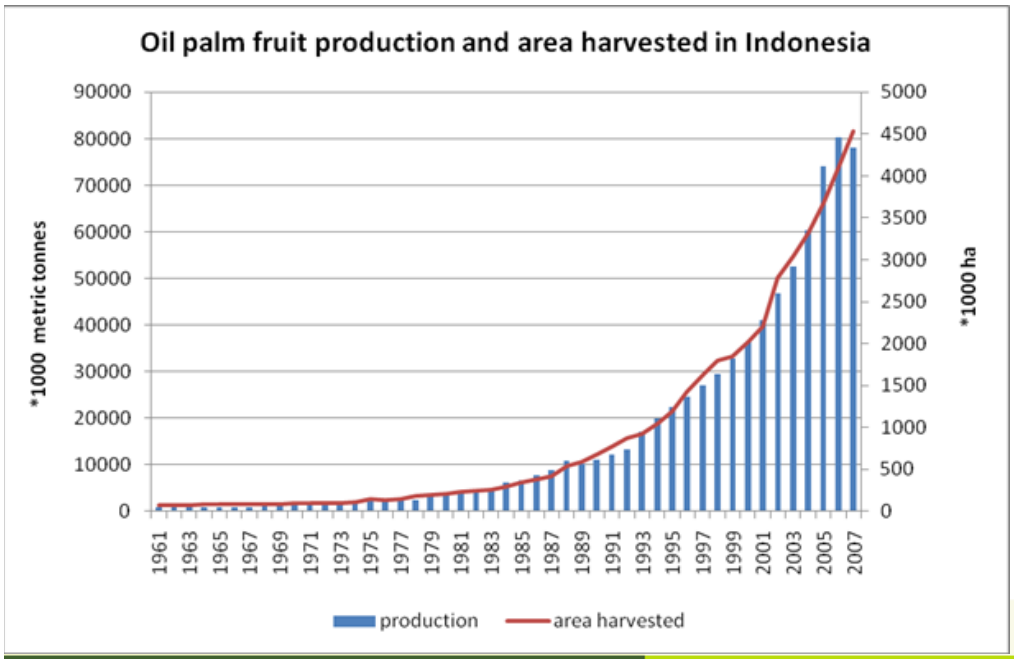


Kurnianto et al., GCB, 2014

Wetlands distribution in Indonesia



Ever expanding oil palm plantation



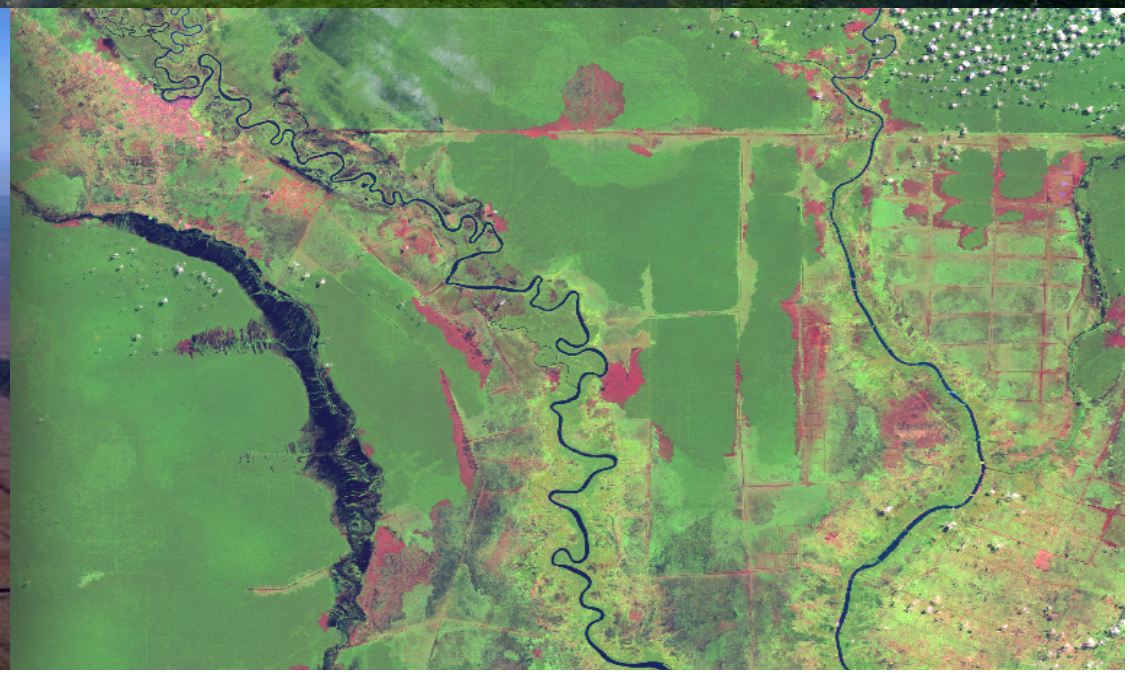
- Intensifying plantation
- On degraded mineral soils
- Avoid peatlands
- Re-assess land banking
- Use moratorium clauses
- Revenue from palm oil: $16 B/yr

Emerging challenges:

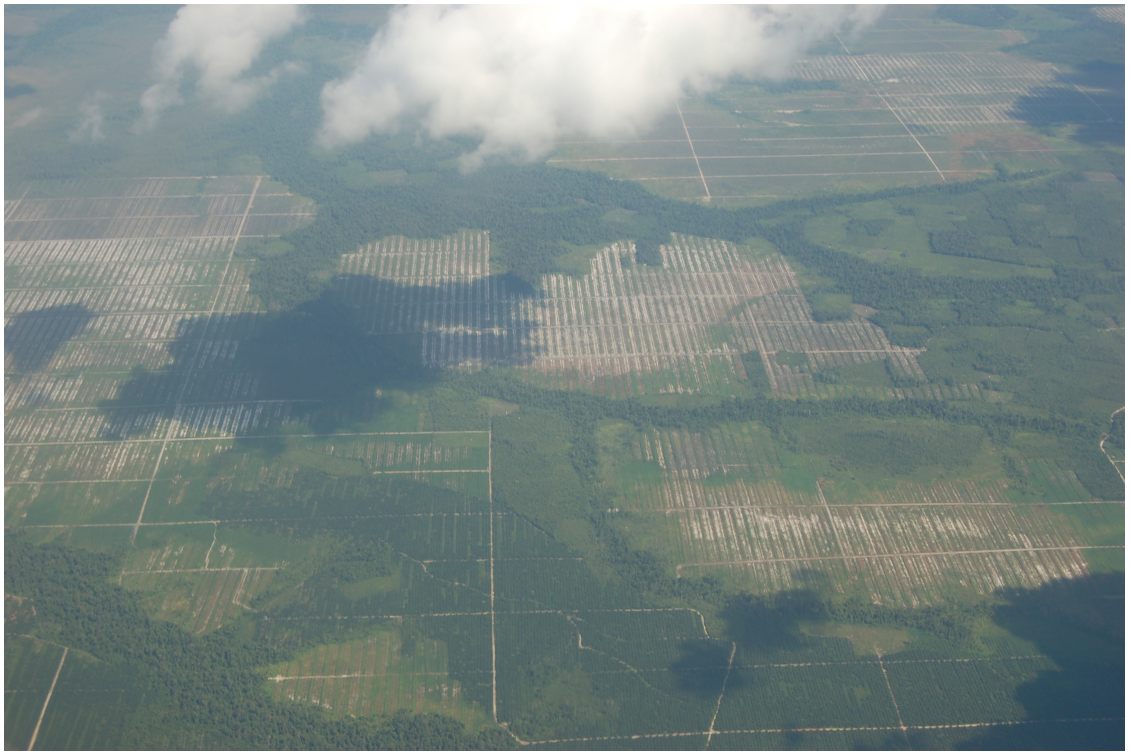
Drainage and water-level control

How science can be best used?

- Measuring GHG fluxes from drained peat swamp and fire emissions
- Quantifying C-stocks change from forests conversions
- Monitoring LUCC (100,000 ha/y in 2000-2005)



What information science can provide?



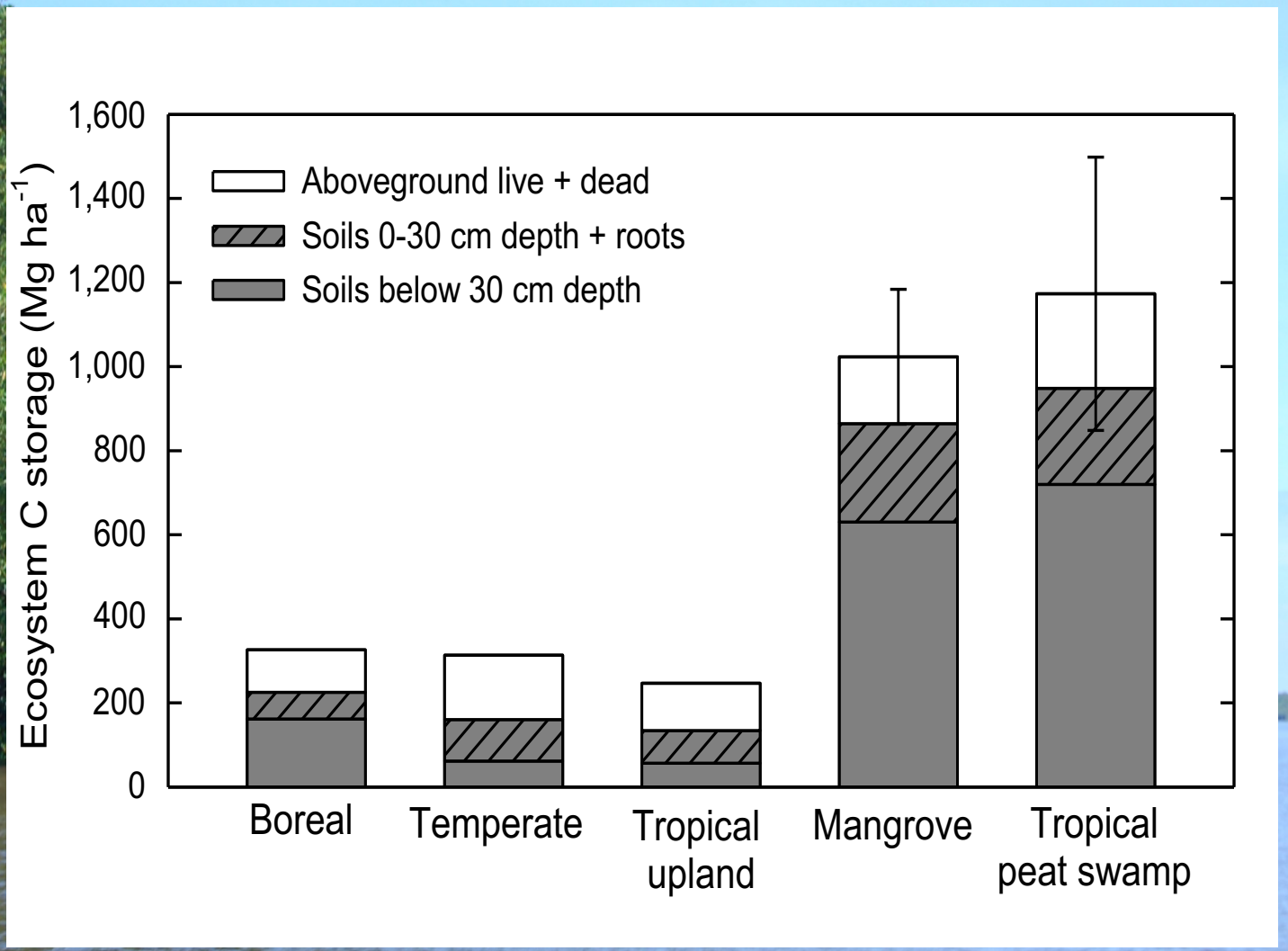
- C-loss due to peatland conversion 60 tCO2/ha/y or 1,500 tCO2/ha during the first 25 yrs
- 25% are released immediately from land-clearing fire

Murdiyarso et al. PNAS (2010)

Emission factors for drained peatlands

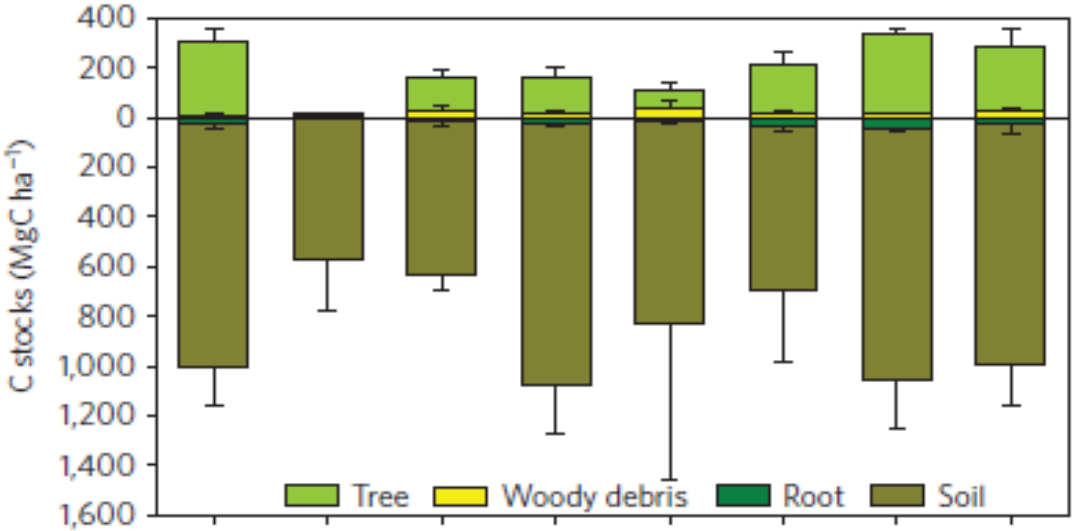
Land-use category	Climate / vegetation zone	Emission factor[a] (tonnes CO_2-C $ha^{-1}yr^{-1}$)	95% Confidence interval[b]		No. of sites	Citations/comments
Plantations, drained, unknown or long rotations[f]	Tropical	15	10	21	n.a.	Average of emission factors for acacia and oil palm
Plantations, drained, short rotations, e.g. acacia[f, g]	Tropical	20	16	24	13	Basuki *et al.*, 2012; Hooijer *et al.*, 2012; Jauhiainen *et al.*, 2012*a*; Nouvellon *et al.*, 2012; Warren *et al.*, 2012
Plantations, drained, oil palm[f]	Tropical	11	5.6	17	10	Comeau *et al.*, 2013; Couwenberg & Hooijer, 2013; Dariah *et al.*, 2013; DID & LAWOO, 1996; Henson & Dolmat, 2003; Hooijer *et al.*, 2012; Lamade & Bouillet, 2005; Marwanto & Agus, 2013; Melling *et al.*, 2005*a*, 2007*a*, 2013; Warren *et al.*, 2012
Plantations, shallow-drained (typically less than 0.3 m), used for agriculture, e.g. sago palm[f]	Tropical	1.5	-2.3	5.4	5	Dariah *et al.*, 2013; Hairiah *et al.*, 1999; Ishida *et al.*, 2001; Lamade & Bouillet, 2005; Matthews *et al.*, 2000; Melling *et al.*, 2005*a*, 2007*a*; Watanabe *et al.*, 2009

Coastal landscape – equally important

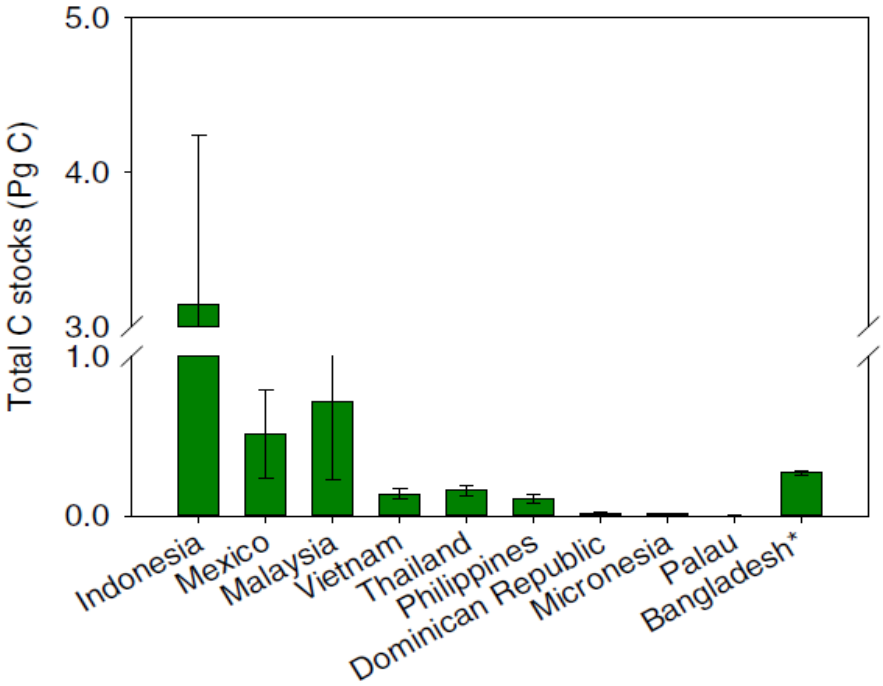


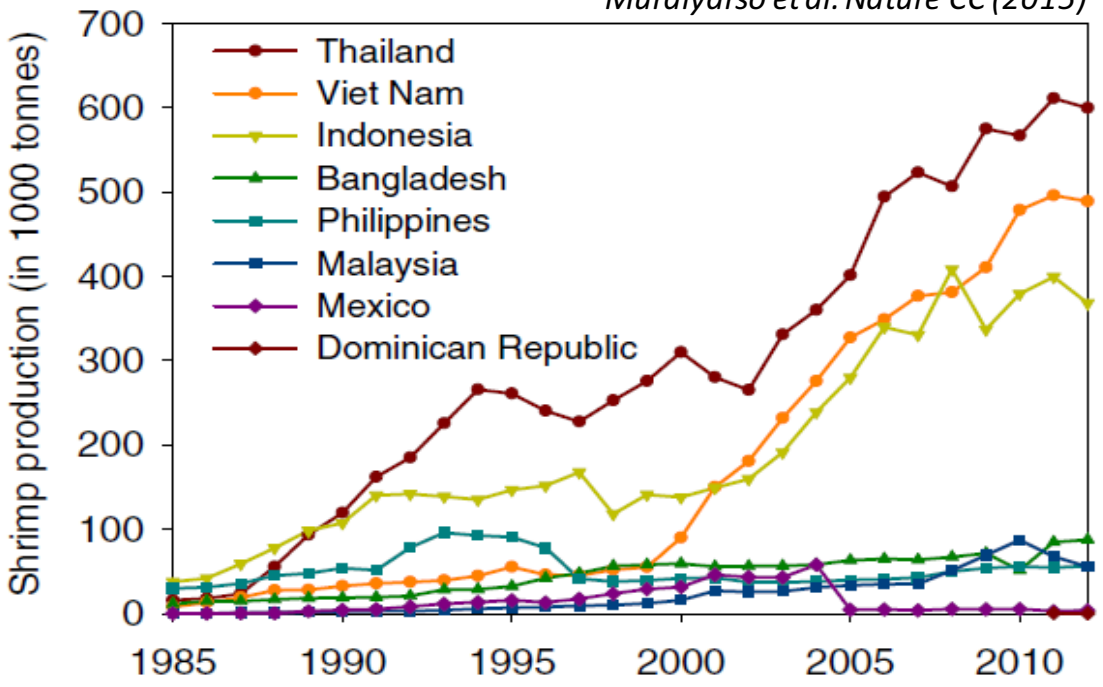
Donato et al. Nature CC (2011)

Coastal Deforestation and aquaculture development

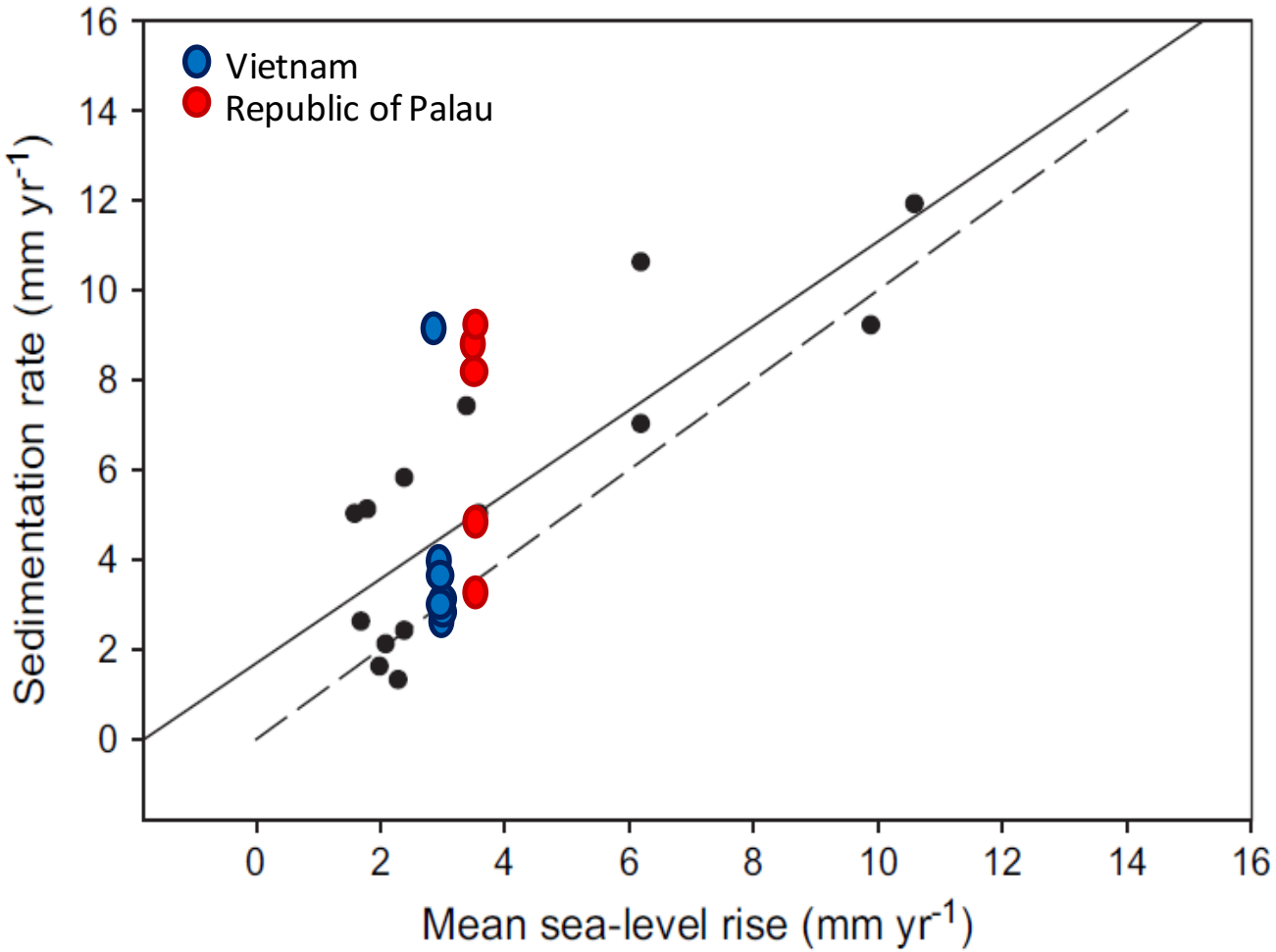


Murdiyarso et al. Nature CC (2015)



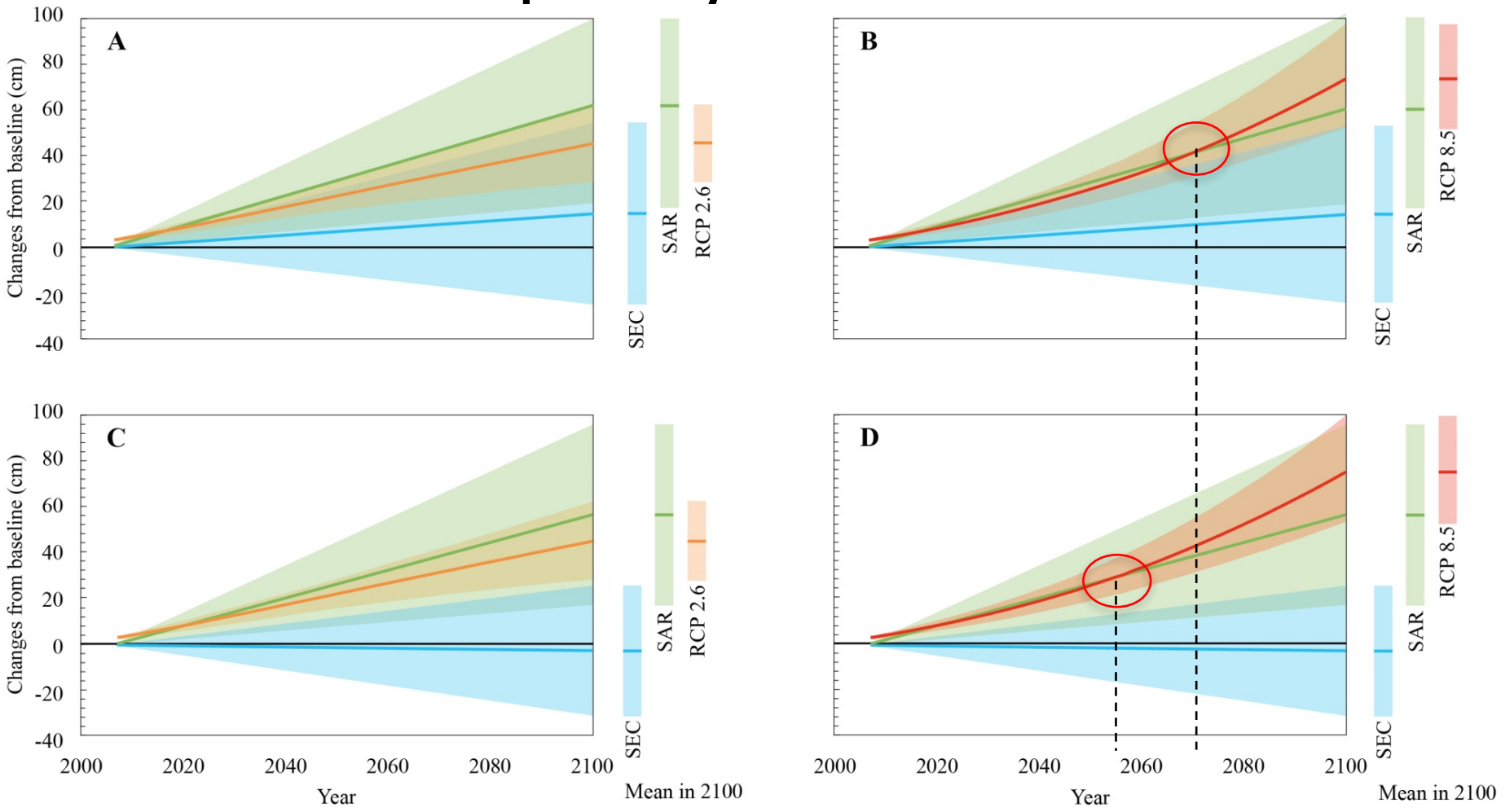


Slow sedimentation and land building



MacKenzie et al. WEM (2016)

Mangroves might keep pace with contemporary Sea Level Rise



Sasmito et al. Wetland Ecology and Manage (2015)

What is in it for me?

- Tenure security (Potential conflicts)
- Decision-making process
- Livelihood options
- Multiple objectives

Concluding remarks

- Restoration may not be the objectives but means and processes
- Wetlands including peatlands and mangroves are among the highest carbon storage on earth yet facing the most serious challenges from deforestation and degradation
- Restoring peatlands and mangroves from carbon perspectives are crucial for CC mitigation and adaptation
- Wetlands landscape restoration is multi-faceted and is NOT a stand-alone means but will have to integrate multiple objectives of multiple stakeholders

Thinking beyond the canopy

Center for International Forestry Research

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