Carbon Biomass Estimates using Remote Sensing

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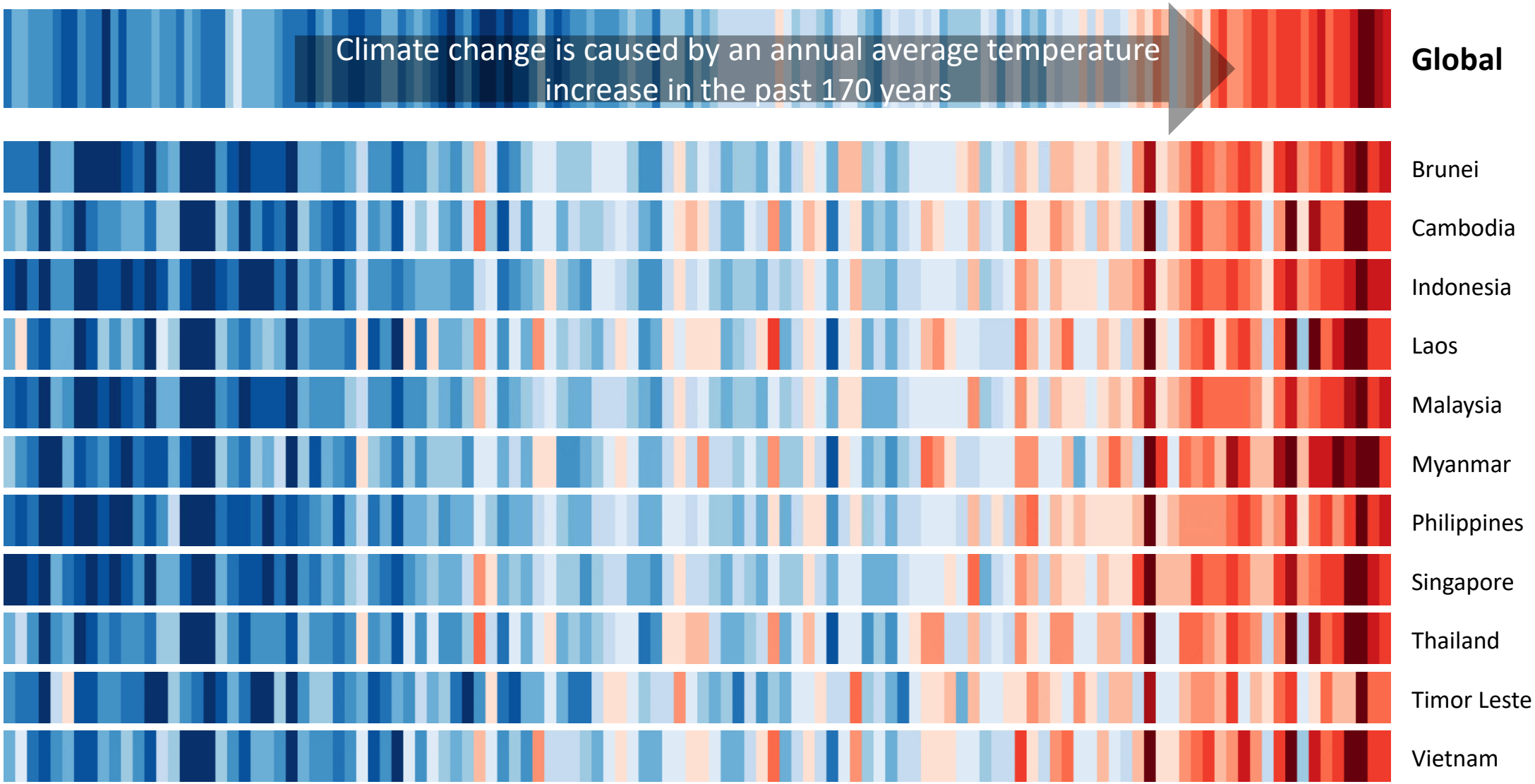
Climate Change

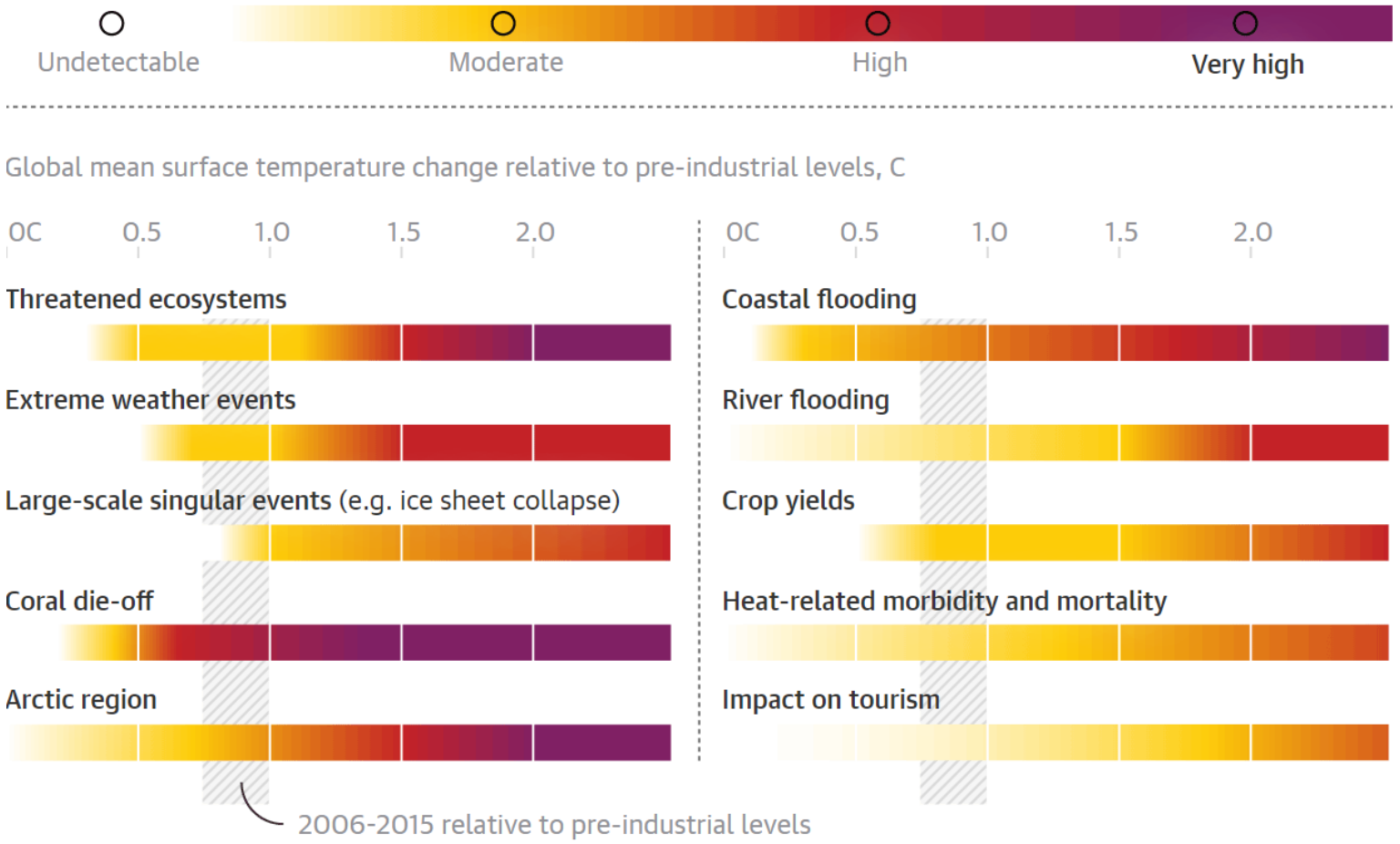


Climate Change Impacts

The impact of climate change is seen worldwide in the form of forest fires, draughts, and floods.

Future Climate Change Impacts

In the coming future, if the temperatures increase, the following are the likely impacts.



The Guardian; IPCC Special Report 2018

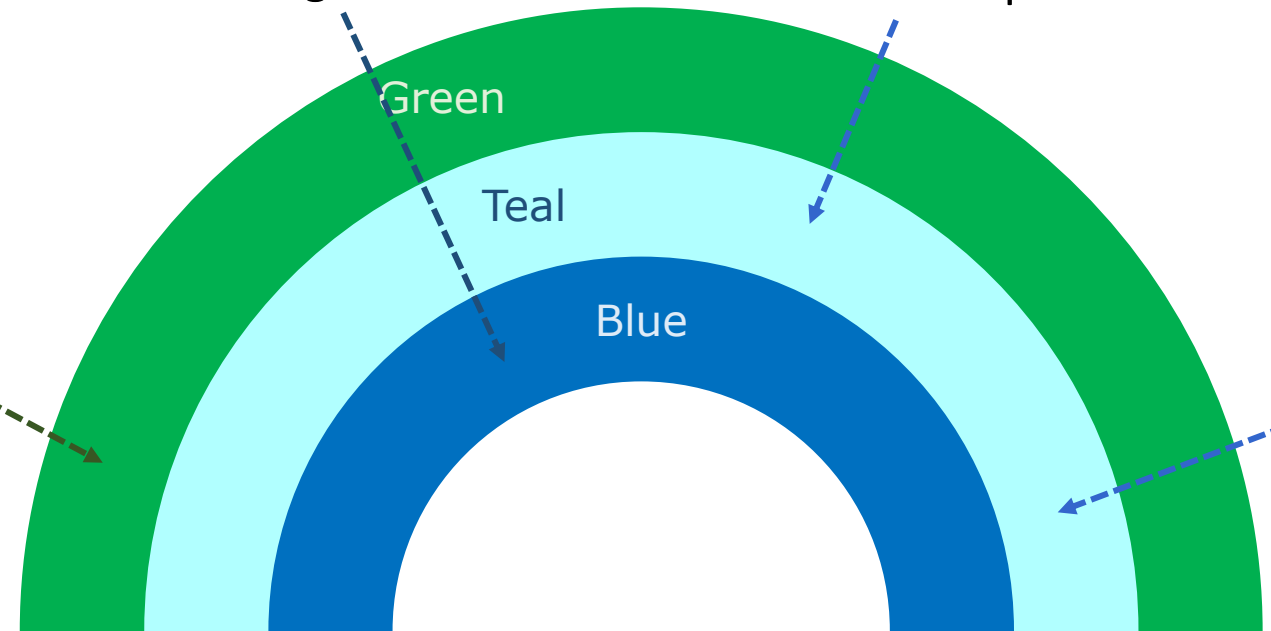
Types of Forest Carbon

To reduce the impact of climate change, climate change mitigation through carbon sequestration of different forests is utilized.

Mangroves

Freshwater swamp forest

Terrestrial forests
(Deciduous & evergreen)



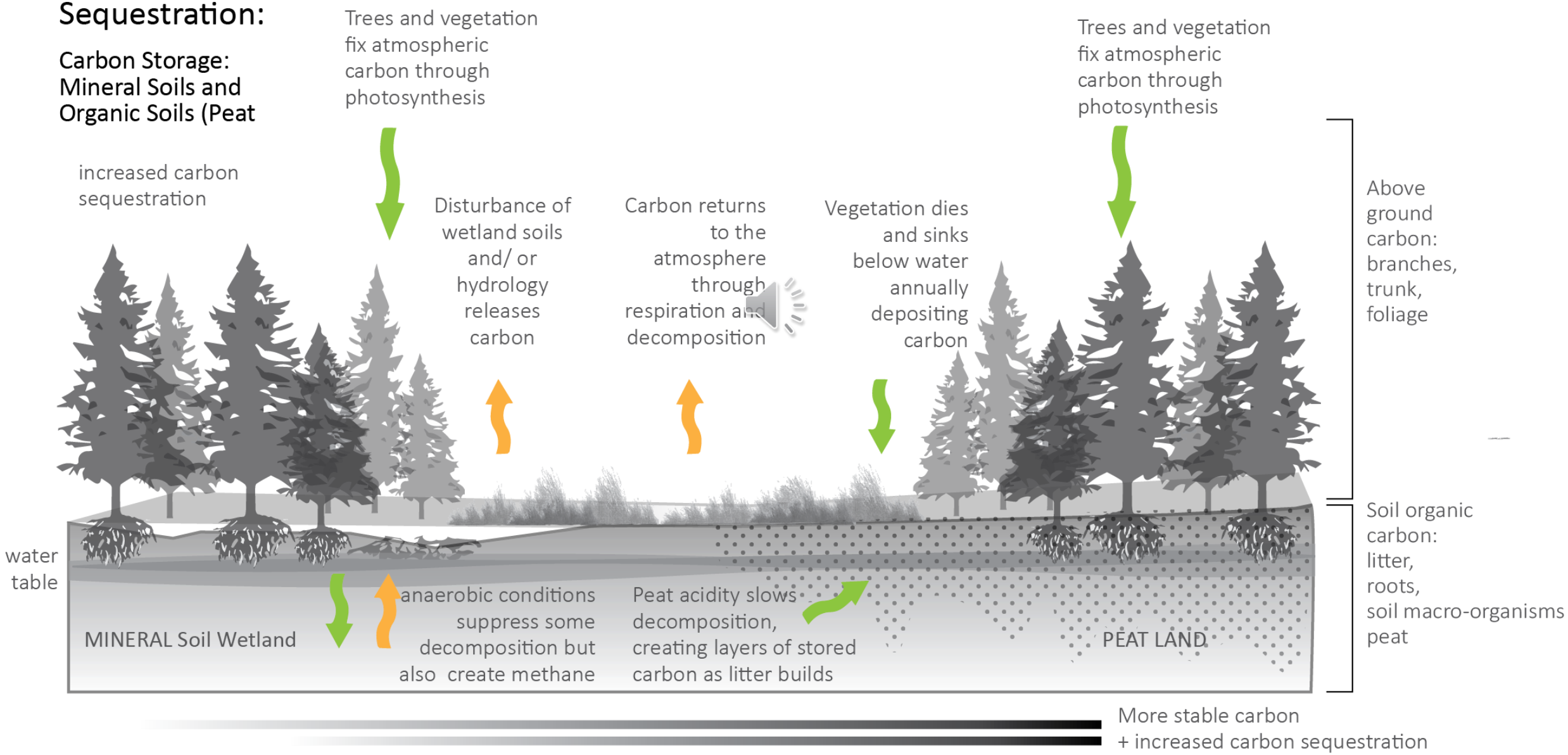
Peat swamp forest

Credit: Tasya Sarira

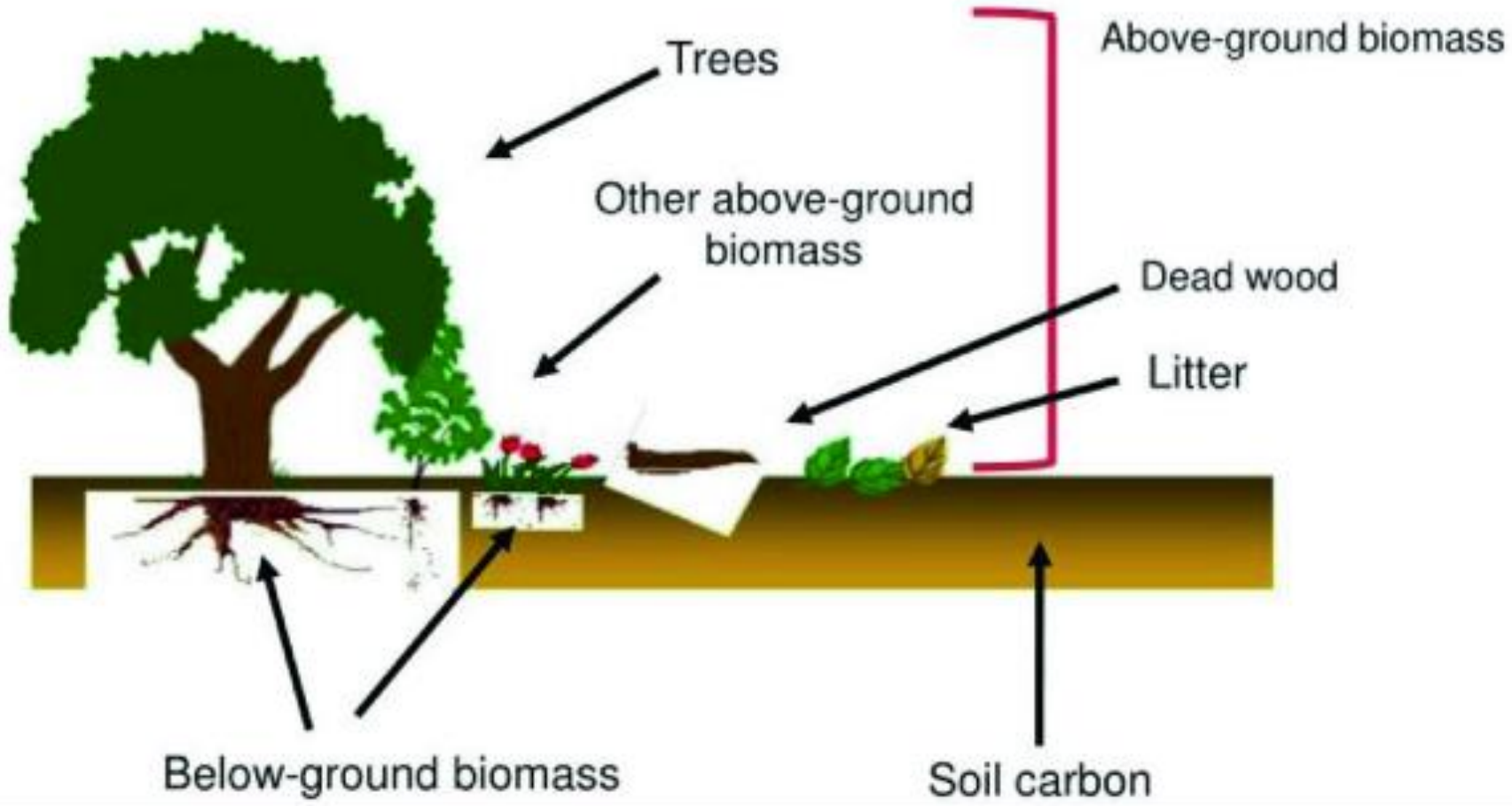
Storage, emissions, and sequestration of carbon

Wetland Carbon Sequestration:

Carbon Storage: Mineral Soils and Organic Soils (Peat



- The IPCC GPG (2003) - five carbon pools:
  aboveground biomass, belowground biomass, litter, dead wood, and soil organic carbon



Carbon Storage in Earth's Ecosystems

Achieving net-zero by 2050 depends on the Earth's natural carbon sinks.

Forests play a critical role in regulating the global climate. They absorb carbon from the atmosphere and then store it, acting as natural carbon sinks.

Where is Carbon Stored?

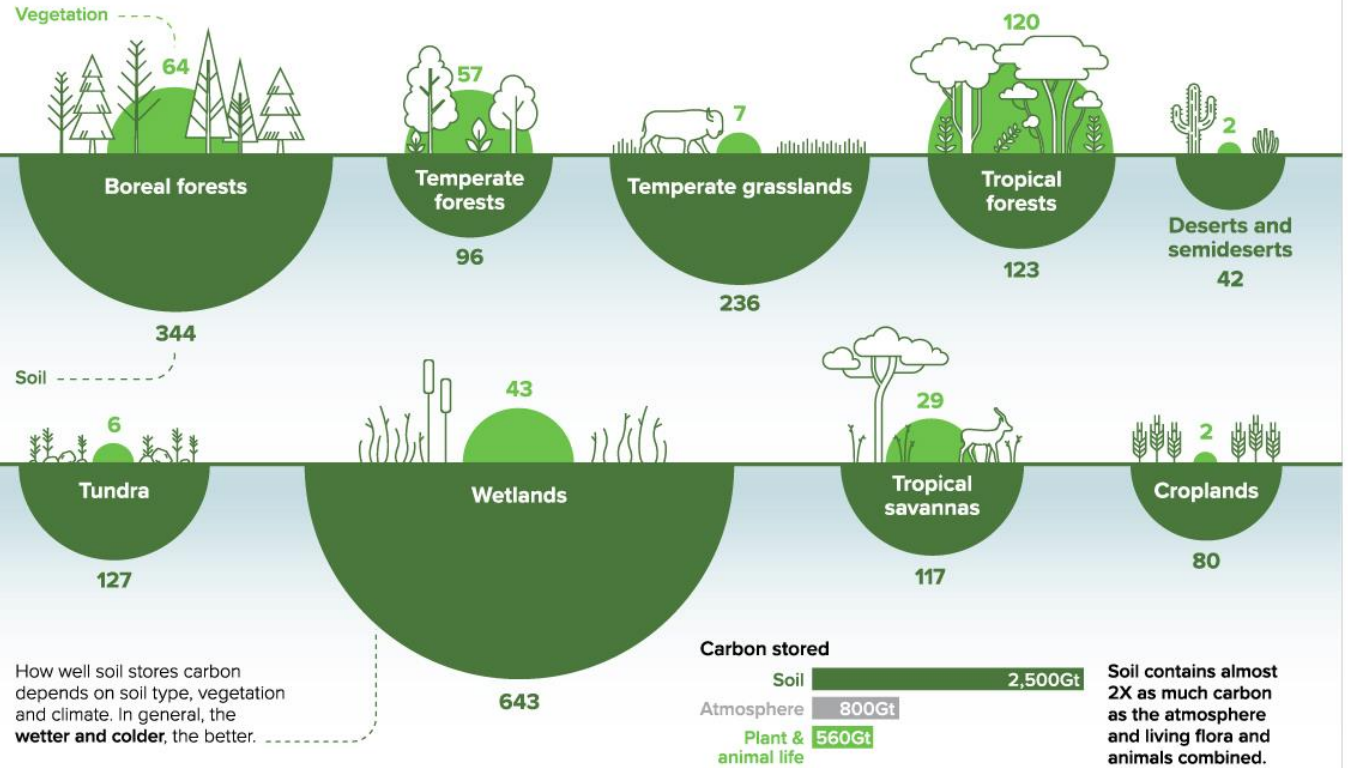
There are various carbon pools in a forest ecosystem.

Carbon Storage

Tonnes of Carbon

The world's forests absorb around **15.6 gigatonnes** of CO_2 each year. That's around 3X the annual CO_2 emissions of the United States.

However, around **8.1 gigatonnes of CO_2 leaks back into the atmosphere** due to deforestation, fires and other disturbances.



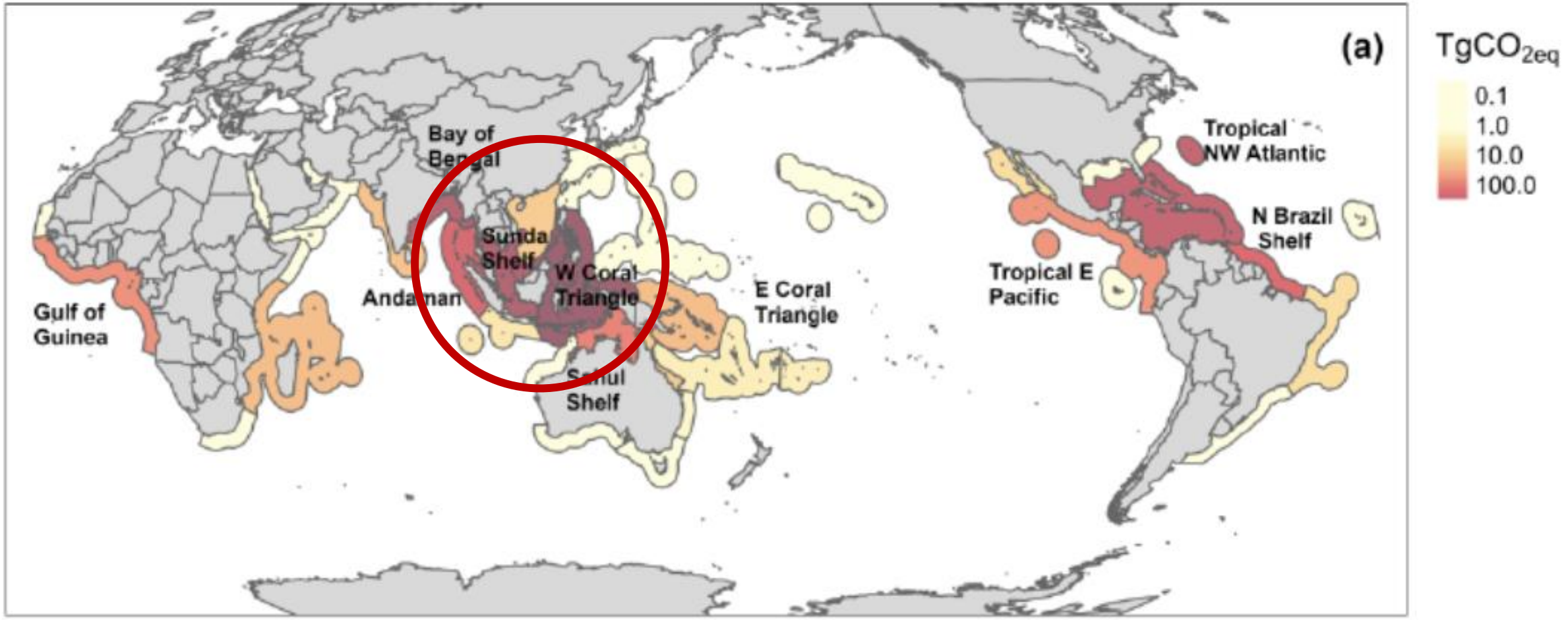
How well soil stores carbon depends on soil type, vegetation and climate. In general, the **wetter and colder**, the better.

Soil contains almost 2X as much carbon as the atmosphere and living flora and animals combined.

Average stored carbon in tonnes per hectare at a ground depth of one meter

Sources: IPCC; NASA

Carbon Emissions due to Mangrove Deforestation



Adame et al. 2021. **Global Change Biology** 27, 2856-2866.

Mangrove deforestation emissions + lost sequestration could be 3392 $TgCO_2$-e by 2100

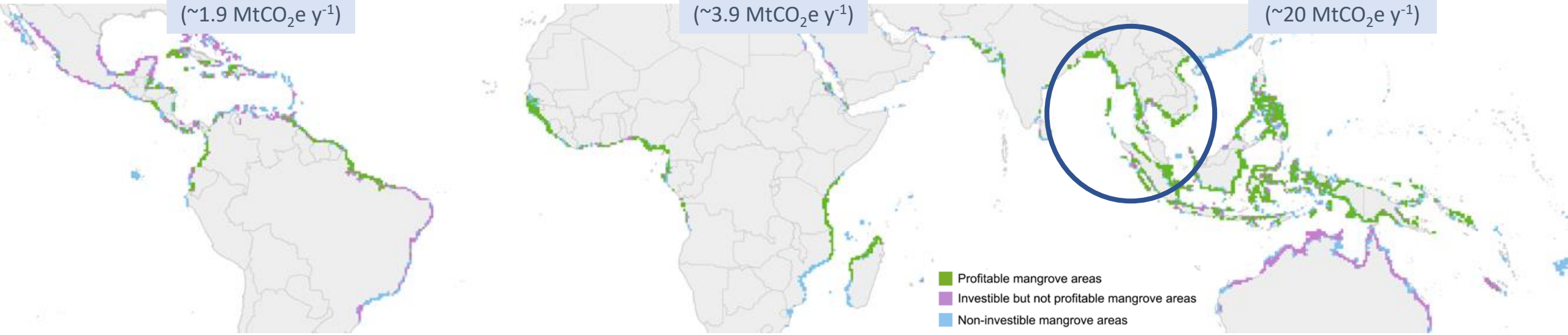
Where are the Opportunities for NCS?

Southeast Asia has tremendous potential for profitable blue carbon

Americas
(~1.9 $MtCO_2e\ y^{-1}$)

Africa
(~3.9 $MtCO_2e\ y^{-1}$)

Asia Pacific
(~20 $MtCO_2e\ y^{-1}$)



Blue Carbon Prospecting

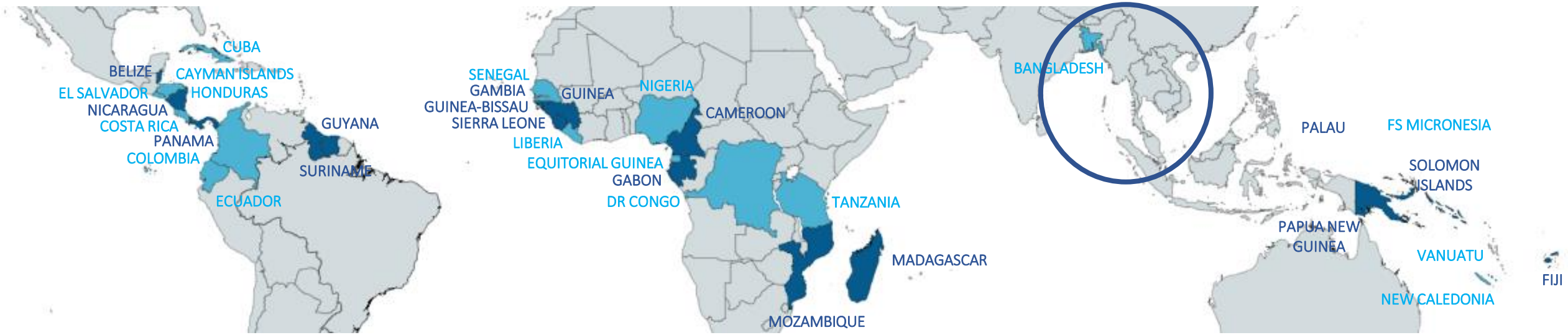
(Protecting Threatened Mangroves)

Zeng et al., *Current Biology*(2021)

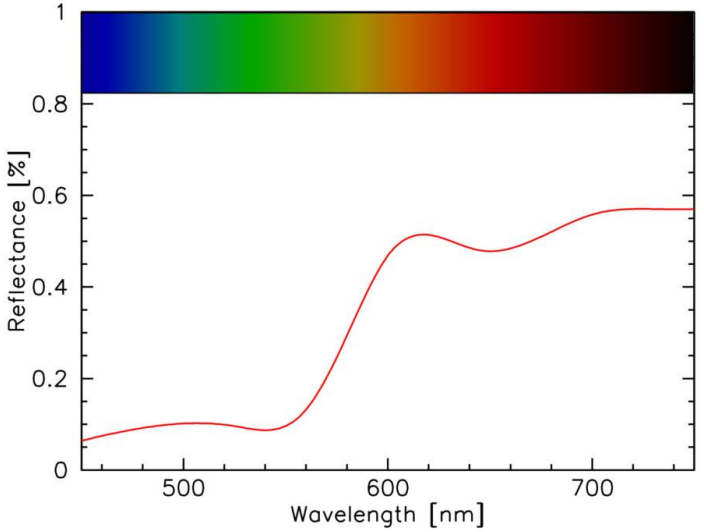
United Nations
Framework Convention on
Climate Change

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

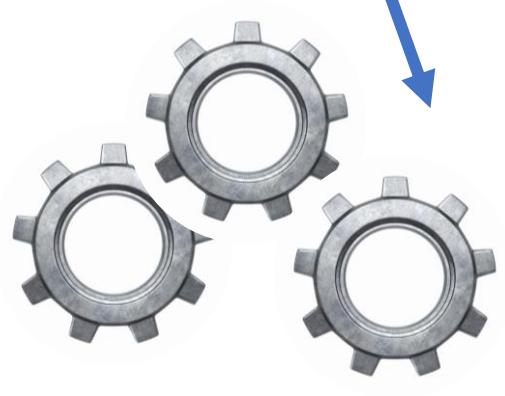
- 17 countries where **mangrove** carbon sequestration offsets >5% of national greenhouse gas emissions
- 17 countries where **mangrove** carbon sequestration offsets 1-5% of national greenhouse gas emissions



Satellites revolving around the Earth emit wavelengths and detect reflectance from the Earth's surface



Using reflectance, several indices can be created which give information about Earth's surface, for example, wetlands.



These indices can be used to create models, for example to detect carbon biomass

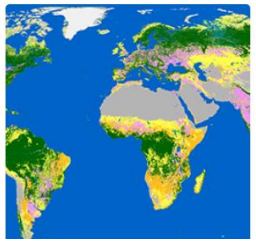
Using satellite data to estimate carbon storage in wetlands of Southeast Asia

Estimated values of stored carbon

- Above-ground biomass (MgC/hectare, uncertainty)
- Below-ground biomass (MgC/hectare, uncertainty)
- Soil Organic Carbon (5g/kg)
- Leaf Litter
- Dead Wood
- Loss in forest area (km sq.)
- Gain in forest area (km sq.)
- Loss in carbon estimated by loss in forest cover* (MgC/hectare, uncertainty)
- Gain in carbon estimated by gain in forest cover* (MgC/hectare, uncertainty)

Datasets

ESA WorldCover 10m v200

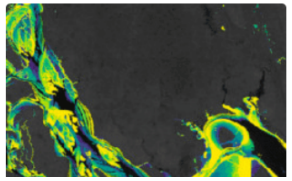


DESCRIPTION | BANDS | TERMS OF USE | CITATIONS

The European Space Agency (ESA) WorldCover 10 m 2021 product provides a global land cover map for 2021 at 10 m resolution based on Sentinel-1 and Sentinel-2 data. The WorldCover product comes with 11 land cover classes and has been generated in the framework of the ESA WorldCover project, part of the 5th Earth Observation Envelope Programme (EOEP-5) of the European Space Agency.

See also:

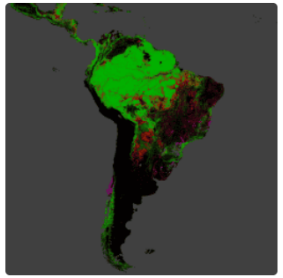
Murray Global Intertidal Change Classification



DESCRIPTION | BANDS | TERMS OF USE | CITATIONS | DOIS

The Murray Global Intertidal Change Dataset contains global maps of tidal flat ecosystems produced via a supervised classification of 707,528 Landsat Archive images. Each pixel was classified into tidal flat, permanent water or other with reference to a globally distributed set of training data.

Hansen Global Forest Change v1.10 (2000-2022)



DESCRIPTION | BANDS | TERMS OF USE | CITATIONS | DOIS

Results from time-series analysis of Landsat images in characterizing global forest extent and change.

The 'first' and 'last' bands are reference multispectral imagery from the first and last available years for Landsat spectral bands corresponding to red, NIR, SWIR1, and SWIR2. Reference composite imagery represents median observations from a set of quality-assessed growing-season observations for each of these bands.

Please see the User Notes for this Version 1.10 update, as well as the associated journal article: Hansen, Potapov, Moore, Hancher et al. "High-resolution global maps of 21st-century forest cover change." Science 342.6160 (2013): 850-853.

Dataset Availability

2000-01-01T00:00:00 - 2022-01-01T00:00:00

Dataset Provider

Hansen/UMD/Google/USGS/NASA

Collection Snippet

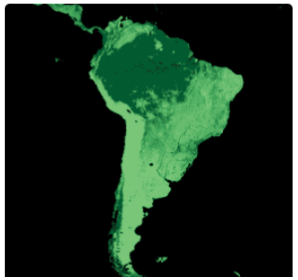
```
ee.Image("UMD/hansen/global_forest_change_2022_v1_10")
```

See example

Tags

CLOSE | IMPORT

Global Aboveground and Belowground Biomass Carbon Density Maps



DESCRIPTION | BANDS | TERMS OF USE | CITATIONS | DOIS

This dataset provides temporally consistent and harmonized global maps of aboveground and belowground biomass carbon density for the year 2010 at a 300-m spatial resolution. The aboveground biomass map integrates land-cover specific, remotely sensed maps of woody, grassland, cropland, and tundra biomass. Input maps were amassed from the published literature and, where necessary, updated to cover the focal extent or time period. The belowground biomass map similarly integrates matching maps derived from each aboveground biomass map and land-cover specific empirical models. Aboveground and

OpenLandMap Soil Organic Carbon Content

DESCRIPTION | BANDS | TERMS OF USE | CITATIONS | DOIS

Soil organic carbon content in x 5 g / kg at 6 standard depths (0, 10, 30, 60, 100 and 200 cm) at 250 m resolution

Predicted from a global compilation of soil points. Processing steps are described in detail here. Antarctica is not included.

To access and visualize maps outside of Earth Engine, use this page.

If you discover a bug, artifact or inconsistency in the LandGIS maps or if you have a question please use the following channels:

- Technical issues and questions about the code
- General questions and comments

Dataset Availability

1950-01-01T00:00:00 - 2018-01-01T00:00:00

Dataset Provider

EnvirometriX Ltd

Collection Snippet

```
ee.Image("OpenLandMap/SOL/SOL_ORGANIC-CARBON_USDA-6A1C_M/v02")
```

See example

Tags

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Thank you!

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