



# Rethinking about Forest Degradation: Key issues for defining and quantifying

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# Outline of the Presentation

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- ❑ **Tropical Forest Landscapes**
- ❑ **Degraded forests – ecological context**
- ❑ **Definition of forest degradation**
- ❑ **Research papers on assessment of emissions from forest degradation**
  - ❖ GHG emissions from forest degradation: an underestimated source
  - ❖ Tropical forests are a net carbon source based on aboveground measurements of gain and loss
- ❑ **Key issues for defining and quantifying forest degradation**

# Tropical Forest landscape: A variety of forest-land use options

250 mm ha

800 – 1,000 mm ha

110 mm ha

700-800 mm ha



Non-accessible  
old-growth forest,  
Effectively Protected  
Areas

Openly accessible Forest Area:  
Opened-up forests,  
Degraded old-growth forests,  
Secondary forests,  
Degraded forest land

Timber production  
forests,  
with or without  
concessions

“Forest areas” in a  
multiple landscape,  
tree plantations,  
agrofor, small  
wood lots

**Global Forest Area: 4033 million ha**  
**One third of the world's land area is forest**

Source: Blaser and Sabogal (2002): ITTO Guidelines for Forest Restoration and Secondary Forest Management

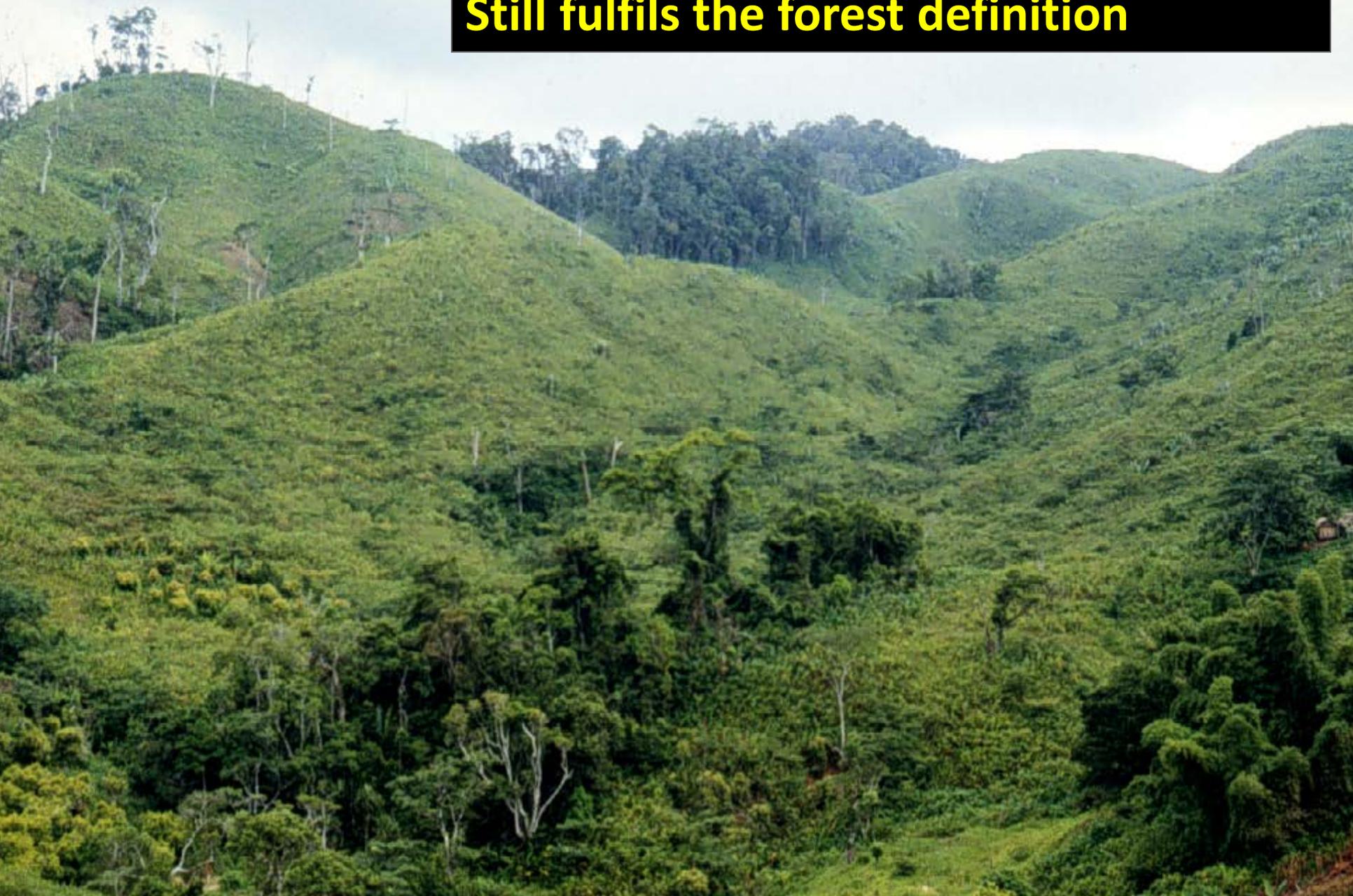
**“unsustainable logging”**





**Fuelwood,  
Charcoal making**

**Gradually highly degraded forest  
Still fulfils the forest definition**



# Extent of degraded forest

Only rough estimates exist, no thresholds

## ITTO (2002): about 850 million ha

Source: Blaser and Sabogal (2002): ITTO Guidelines for Forest Restoration and Secondary Forest Management Authors' estimates. Based on FAO (1982, 1990, 1995, 2001); Sips (1997); Wadsworth (1997); WRI-World Bank (2000). In tropical America, about 38 million ha are classified as secondary forests (second-growth forests). For the other regions it is not possible to distinguish between degraded primary forests and secondary forests

## Laestadius and Potapov (2009): More than 1 billion ha

## WRI (2014): 104 million ha (more than 8 percent) of the world's Intact forest landscapes (IFLs) have been degraded since 2000

<http://www.wri.org/blog/2014/09/8-percent-worlds-remaining-pristine-forests-degraded-2000>

## WRI (2014): More than two billion hectares worldwide offer opportunities for restoration

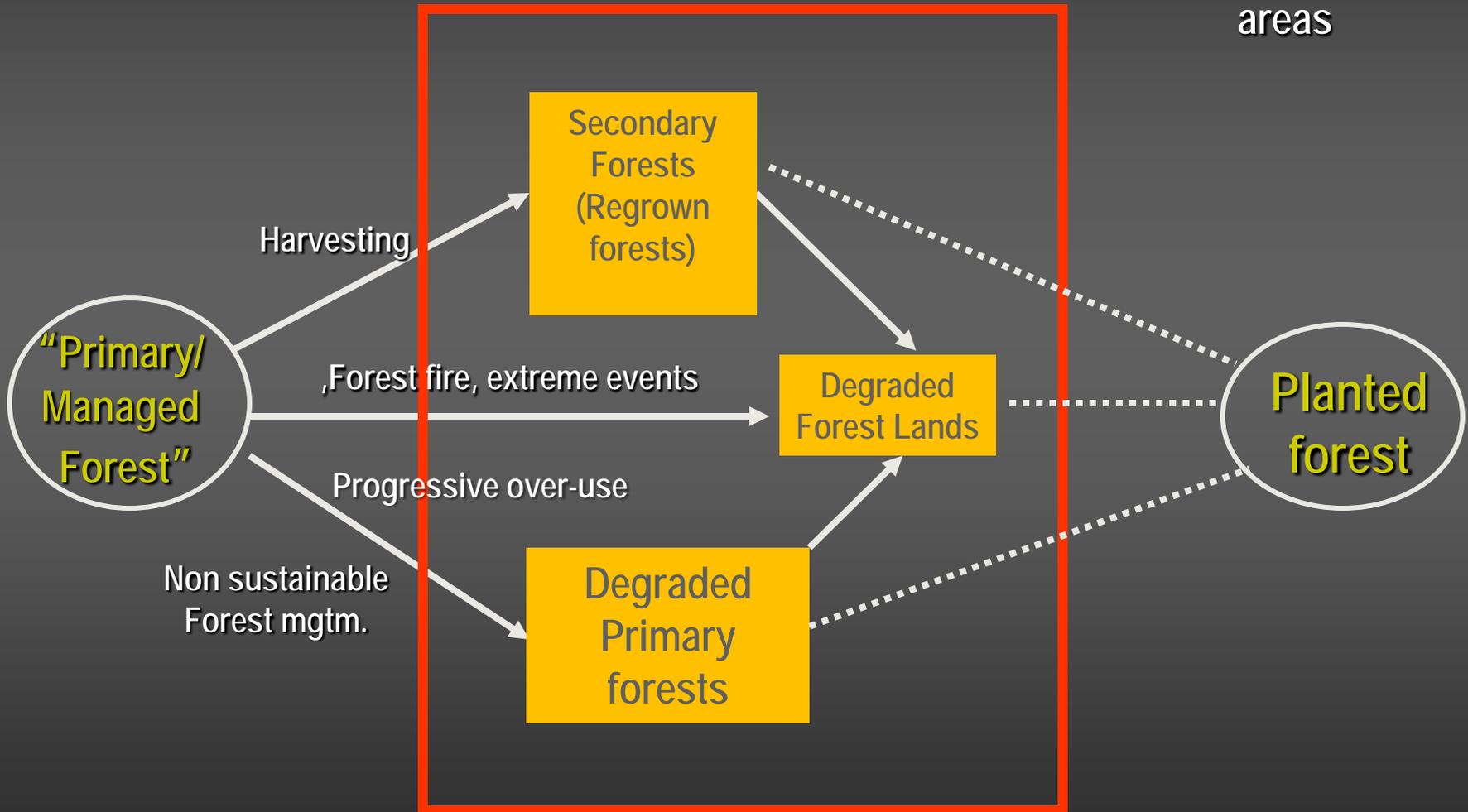
an area larger than South America. Most of these lands are in tropical and temperate areas  
<http://www.wri.org/resources/maps/atlas-forest-and-landscape-restoration-opportunities>.

# Degraded forests – ecological context

Natural forests

The forgotten middle ground in the past: Degraded forest ecosystems:

“Forested area  
Outside natural forest  
areas

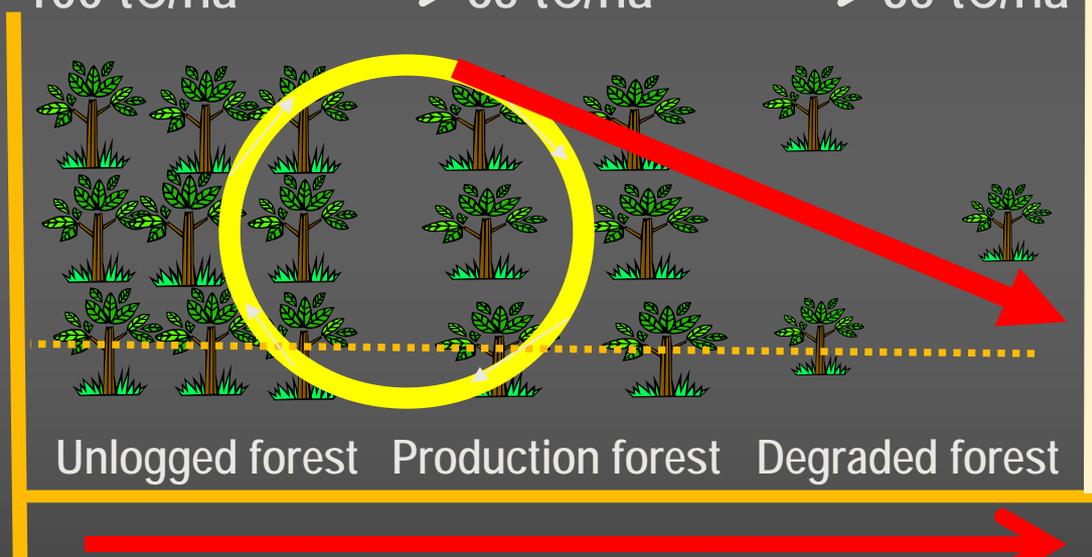


# Degrading forest

Carbon	+++	→	+
Protective functions	+++	→	+
Biodiversity	+++	→	+

Deforestation  
(land-use change)

100 tC/ha → 65 tC/ha → 35 tC/ha



Forest Degradation

Forest Restoration Process

Sustainable Forest Management

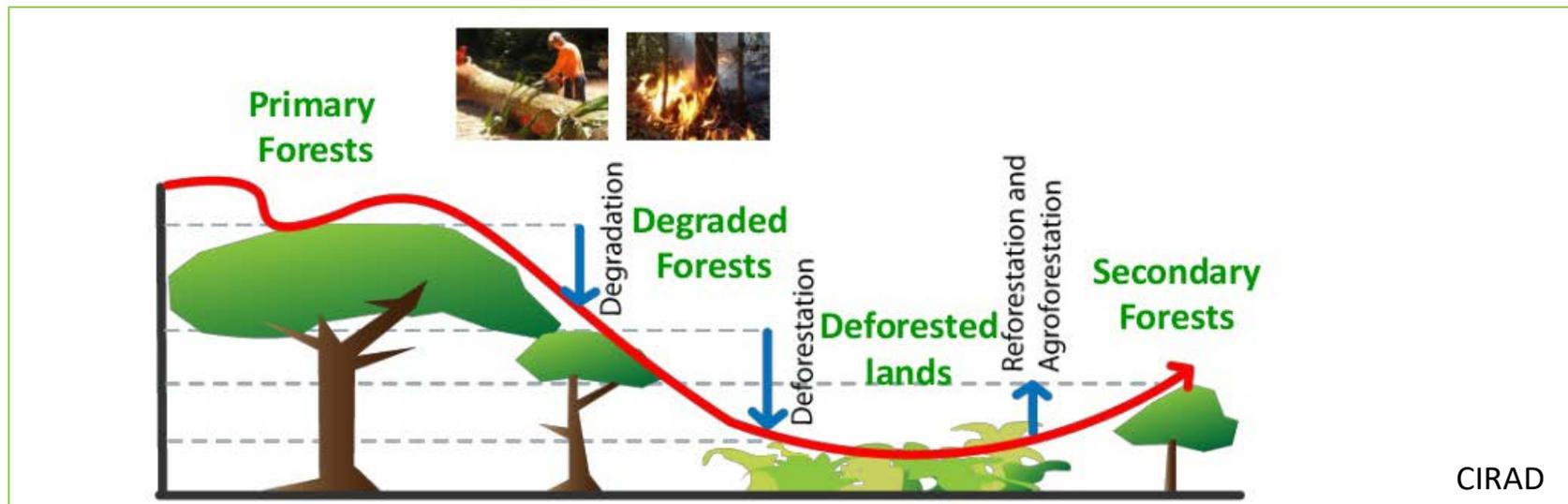
(Conservation and sustainable use of existing forest)

# Many definitions of Forest Degradation

Agency	Definition	Source
FAO	Reduction in the capacity of forest to provide goods and services	FAO 2002 & FAO 2008
ITTO	Long-term reduction of the overall potential supply of benefits from the forest, including wood, biodiversity and other products or services. Also, a direct human-induced loss of forest values (particularly carbon), likely to be characterized by a reduction of tree crown cover. <b>Routine management from which crown cover will recover within the normal cycle of forest management operations is not included</b>	ITTO 2002 & ITTO 2005
SBSTA/UNFCCC workshop on defining and measuring degradation for REDD	Proposal that degradation should be defined in terms of comparison with intact forest of the same vegetation type: “Forest degradation is the <b>reduction of the carbon stock in a natural forest</b> , compared with its natural carbon carrying capacity, due to the impact of all human land-use activities”.	Cadman (2008/2009)
IPCC	<b>A direct human-induced long-term loss</b> (persisting for X years or more) of at least Y% of forest carbon stocks (and forest values) since time T and not qualifying as deforestation or an elected activity under Article 3.4 of the Kyoto Protocol	IPCC 2003

# General Definition of Forest Degradation

Reduction of the capacity of a forest to provide goods and services by human disturbances



→ However, still considered as a forest in the « legal » sense

→ Action that reverse degradation = restoration

# Greenhouse gas emissions from tropical forest degradation: an underestimated source

Source: Pearson *et al. Carbon Balance Manage (2017) 12:3*

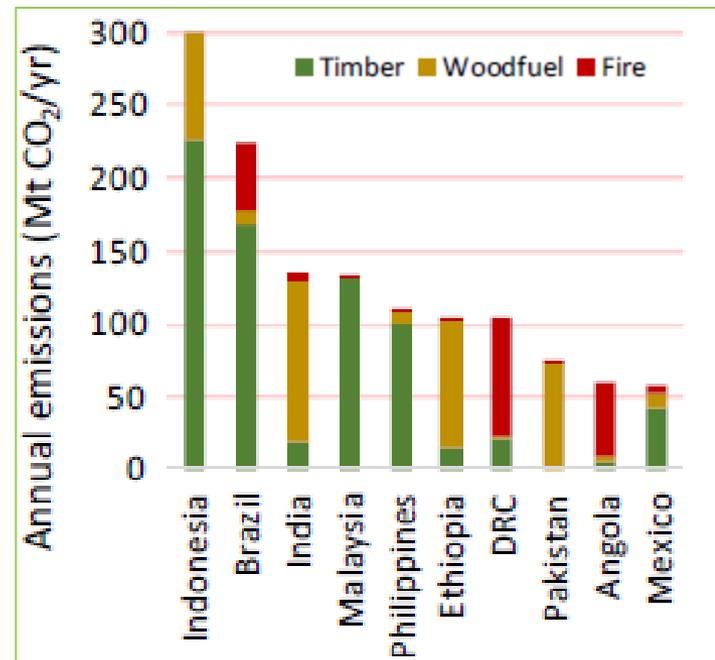
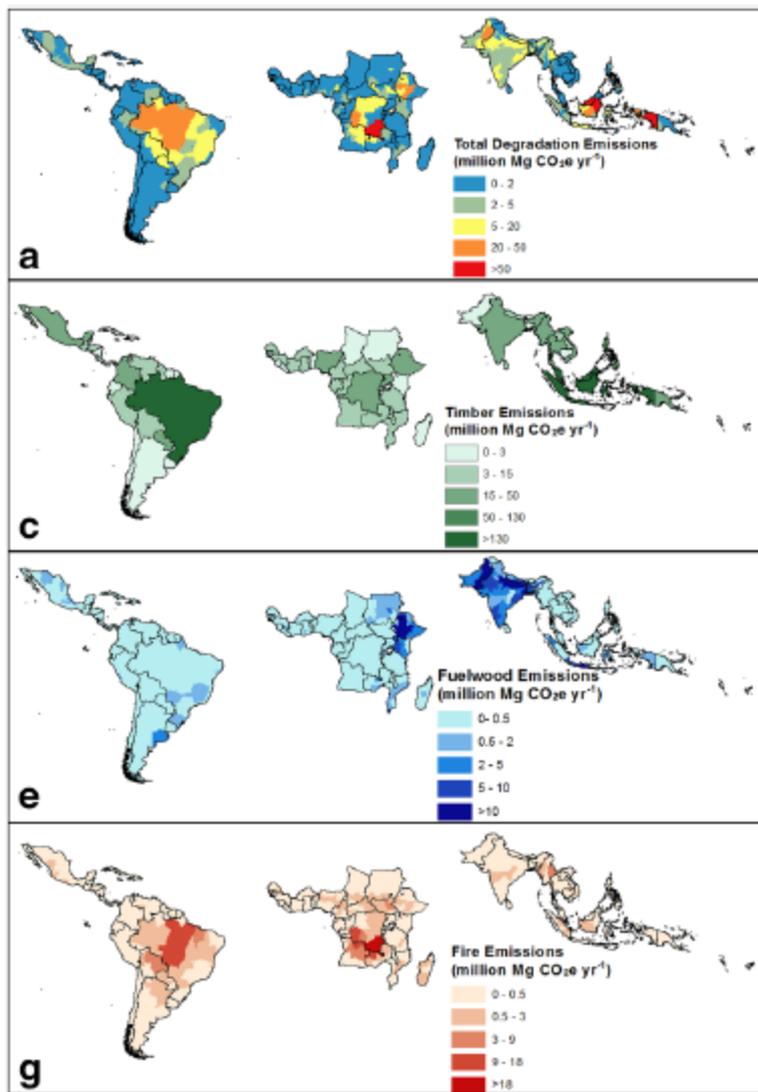
- Estimation of forest degradation emissions b/n 2005-2010 in 74 developing countries covering 2.2 billion ha of forests.
- Total emissions from deforestation and forest degradation

Activity	Annual emission (Gt CO <sub>2</sub> e year <sup>-1</sup> )	%
Deforestation	6.22	75
<b>Degradation</b>	<b>2.06</b>	<b>25</b>
✓ Timber	1.09	(53)
✓ Woodfuel	0.62	(30)
✓ Fire	0.35	(17)

- ❖ Forest degradation accounted for 25% In 28 of the 74 countries, emissions from forest degradation exceeded those from deforestation
- ❖ Selective **timber** harvest in native forests include **extracted log emissions**, logging damage and logging infrastructure factors

# Spatial distribution of forest degradation emissions

Source: Pearson *et al. Carbon Balance Manage* (2017) 12:3

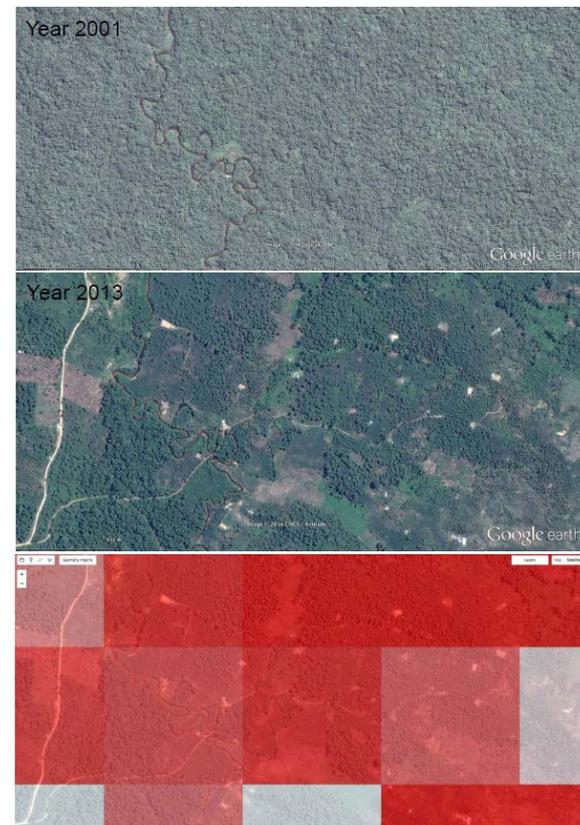


Tropic	Timber (%)	Woodfuel (%)	Fire (%)
America	69	10	21
Africa	31	36	33
Asia	61	35	5

# Tropical forests are a net carbon source based on aboveground measurements of gain and loss

Source: A. Baccini et al., Science 10.1126/science.aam5962 (2017)

- 12 years (2003–2014) of MODIS pantropical satellite data to quantify net annual changes in the aboveground carbon density of tropical woody live vegetation
- World's tropical forests are a net release of carbon of  $425.2 \pm 92.0 \text{ Tg C yr}^{-1}$  (losses of  $861.7 \pm 80.2 \text{ Tg C yr}^{-1}$  and gains of  $436.5 \pm 31.0 \text{ Tg C yr}^{-1}$  from forest growth)
- Losses result from (i) deforestation and (ii) reductions in carbon density within standing forests (degradation) - accounting for **68.9%** of overall losses

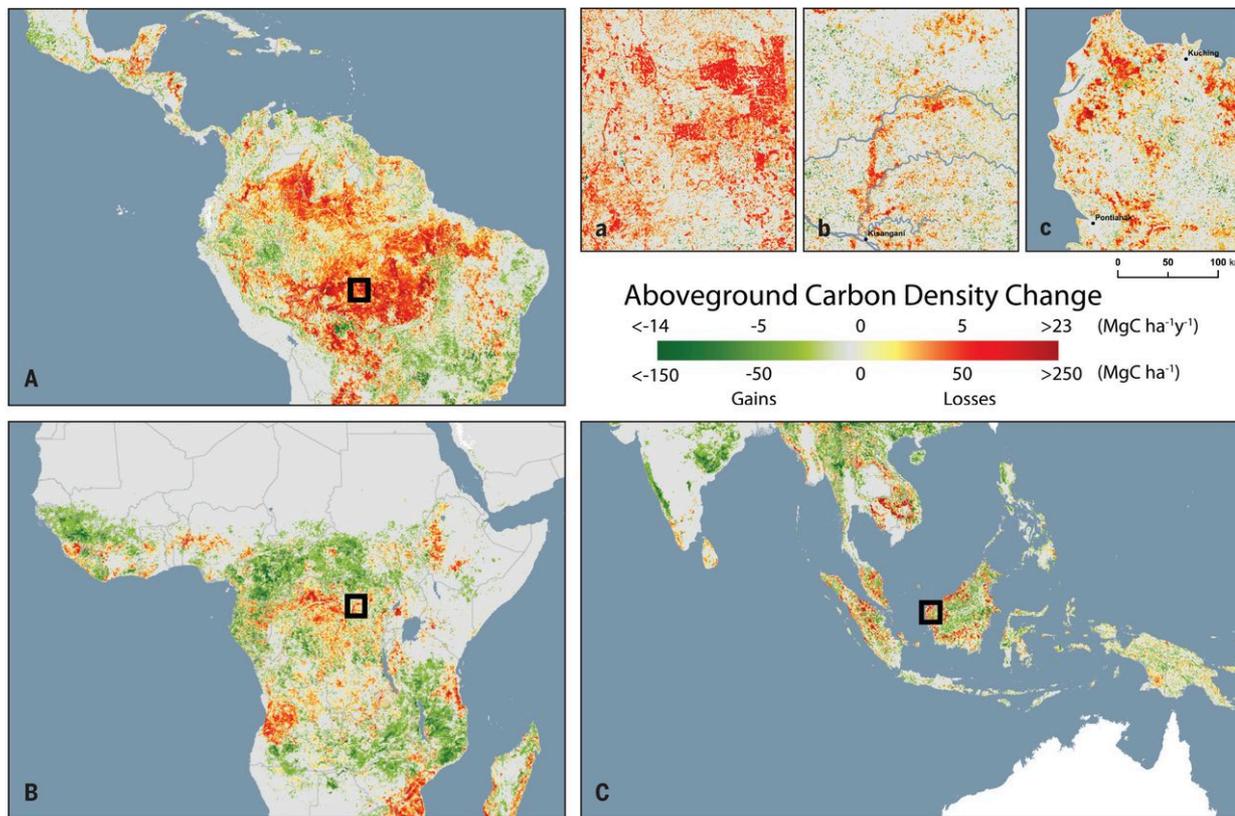


Example of degradation/disturbance detected. Losses in carbon density in the bottom panel as shades of red scaled from light to dark (i.e., low to high carbon loss)

# Aboveground measurements of gain and loss

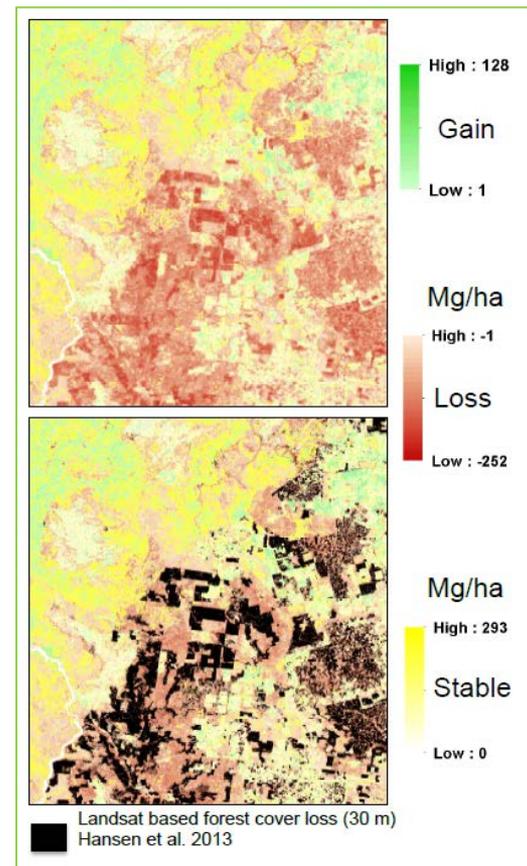
Source: A. Baccini et al., Science 10.1126/science.aam5962 (2017)

## Geography of carbon density change



Degradation and disturbance accounts for 70%, 81%, 46% of carbon losses respectively across tropical America, Africa, and Asia.

## Trajectories of carbon density



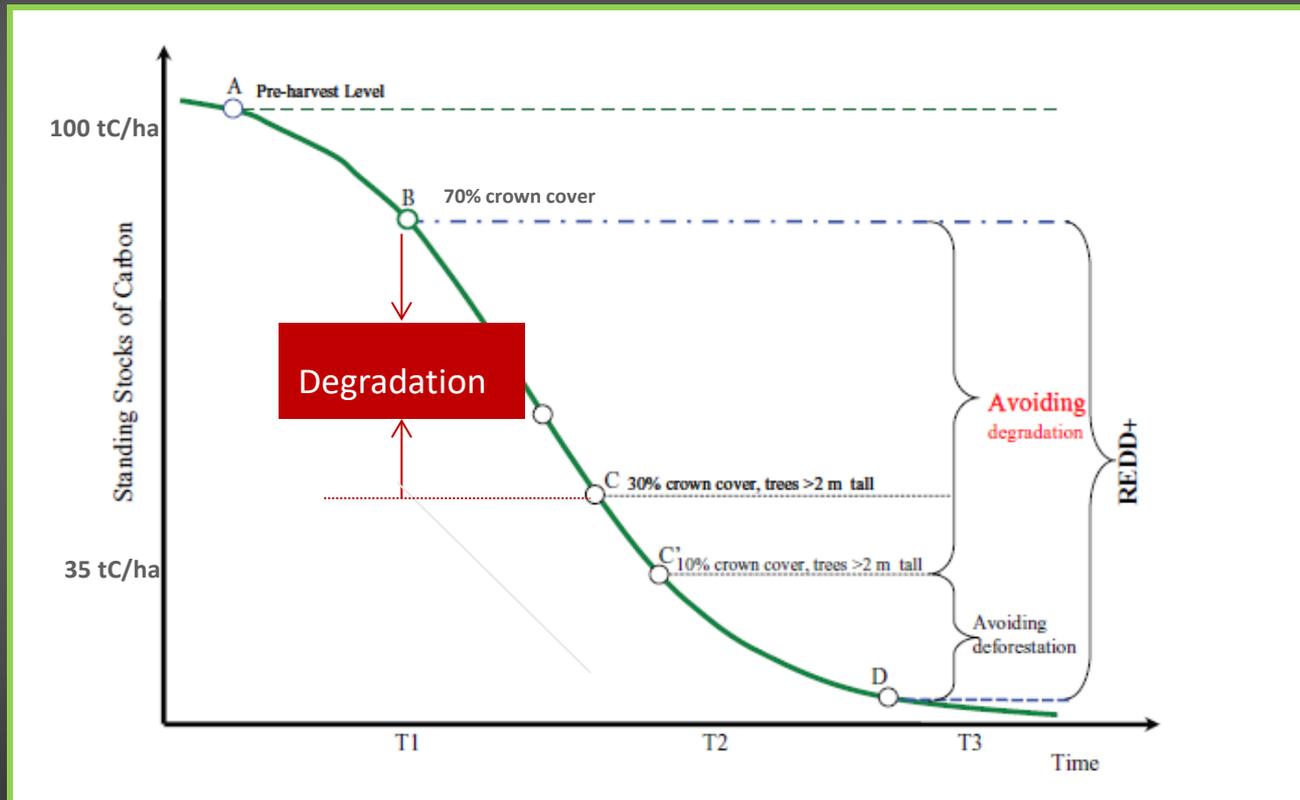
Forest cover loss data superimposed in black

# Forest Degradation – Key issues

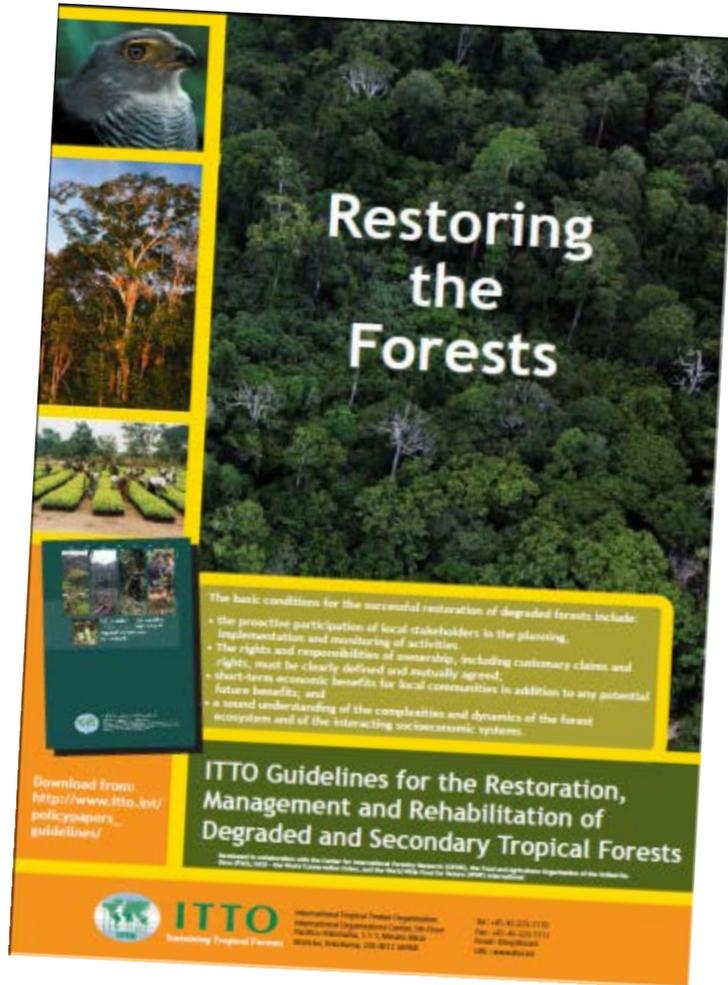
- ⇒ Degradation is location-specific (spatial and temporal)
- ⇒ Degradation is difficult to define.
- ⇒ Any assessment of degradation is dependent on the scale to which the definition applies
- ⇒ Need for defining forest degradation in a consistent and operational manner to permit cross site comparability
- ⇒ Strategies to increase the mitigation potential of addressing degradation

# Conclusion:

Operational framework for defining and quantifying forest degradation is a key element of REDD+



Modified from Sasaki and Putz



# Thank You!

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<http://www.itto.int>