



Kyoto Protocol

Information Requirement

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Afforestation



Reforestation

IPCC def.



FAO def.



Deforestation

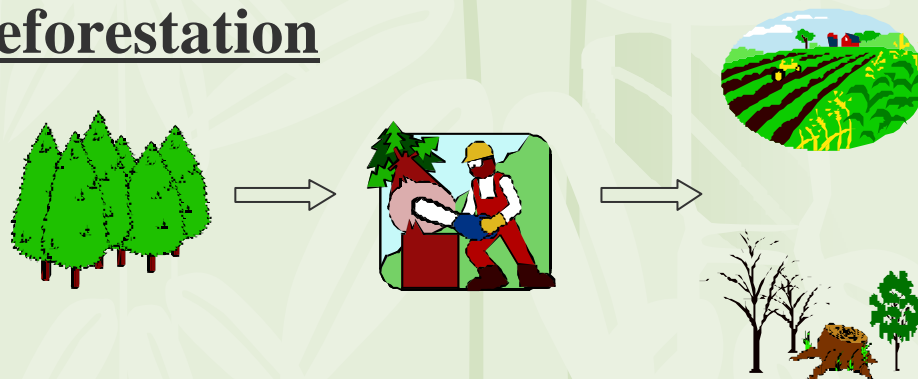
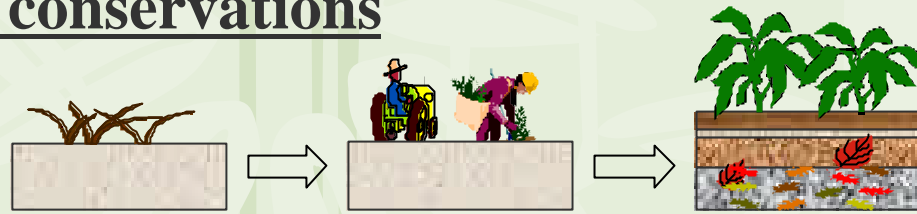


Figure. Article 3.3 Activities

Agricultural Soil conservations



Forest conservation

Conservation tillage



Forest Management

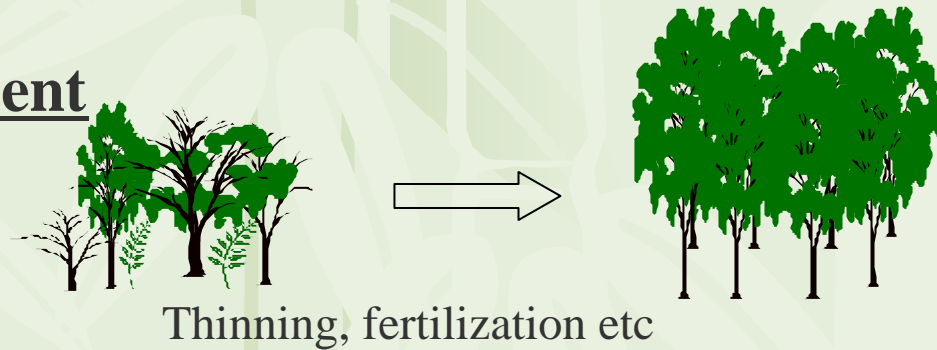


Figure. Article 3.4 activities

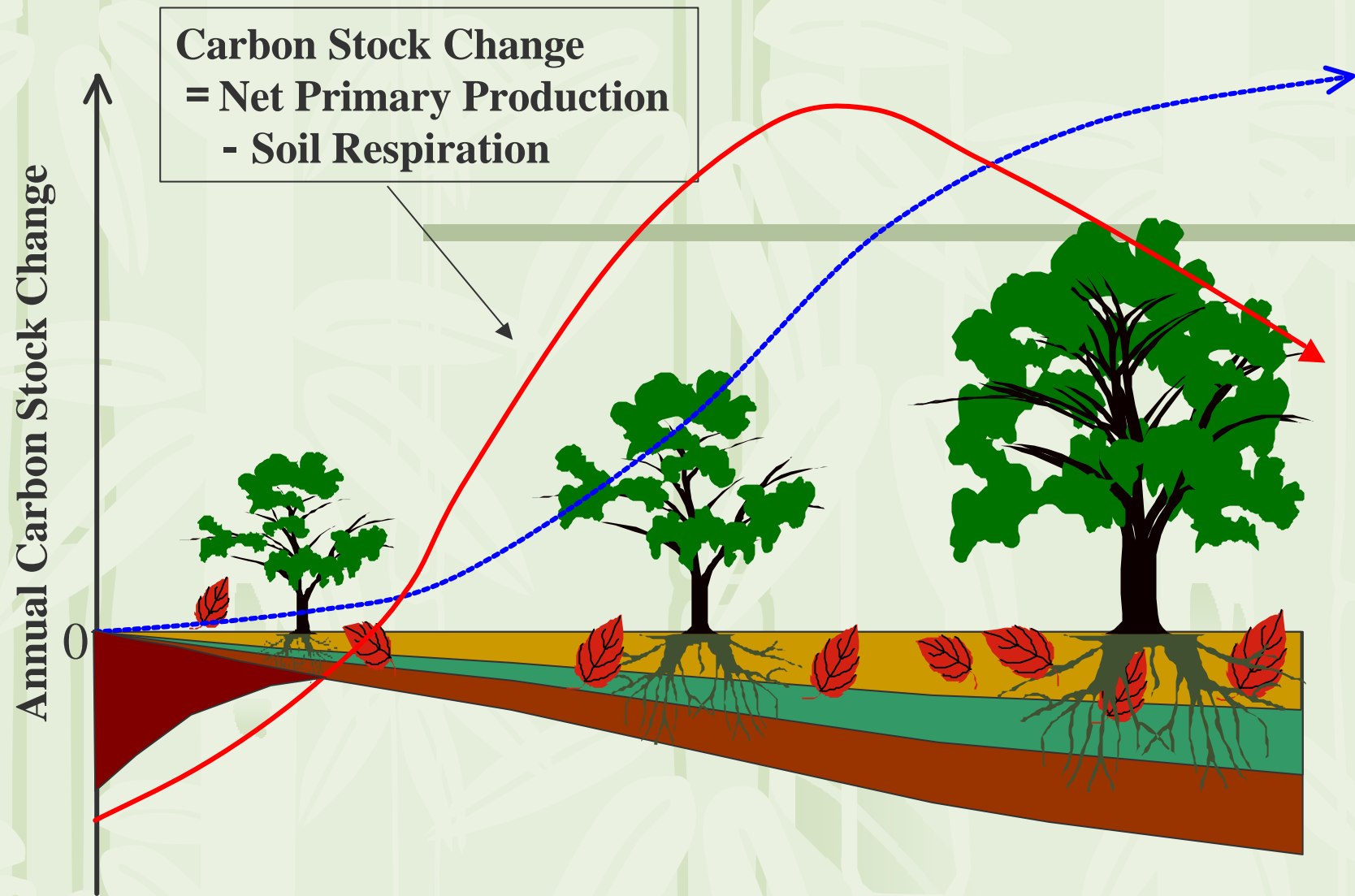


Figure. Forest Ecosystem accumulate CO₂ into above- and below- ground carbon stocks

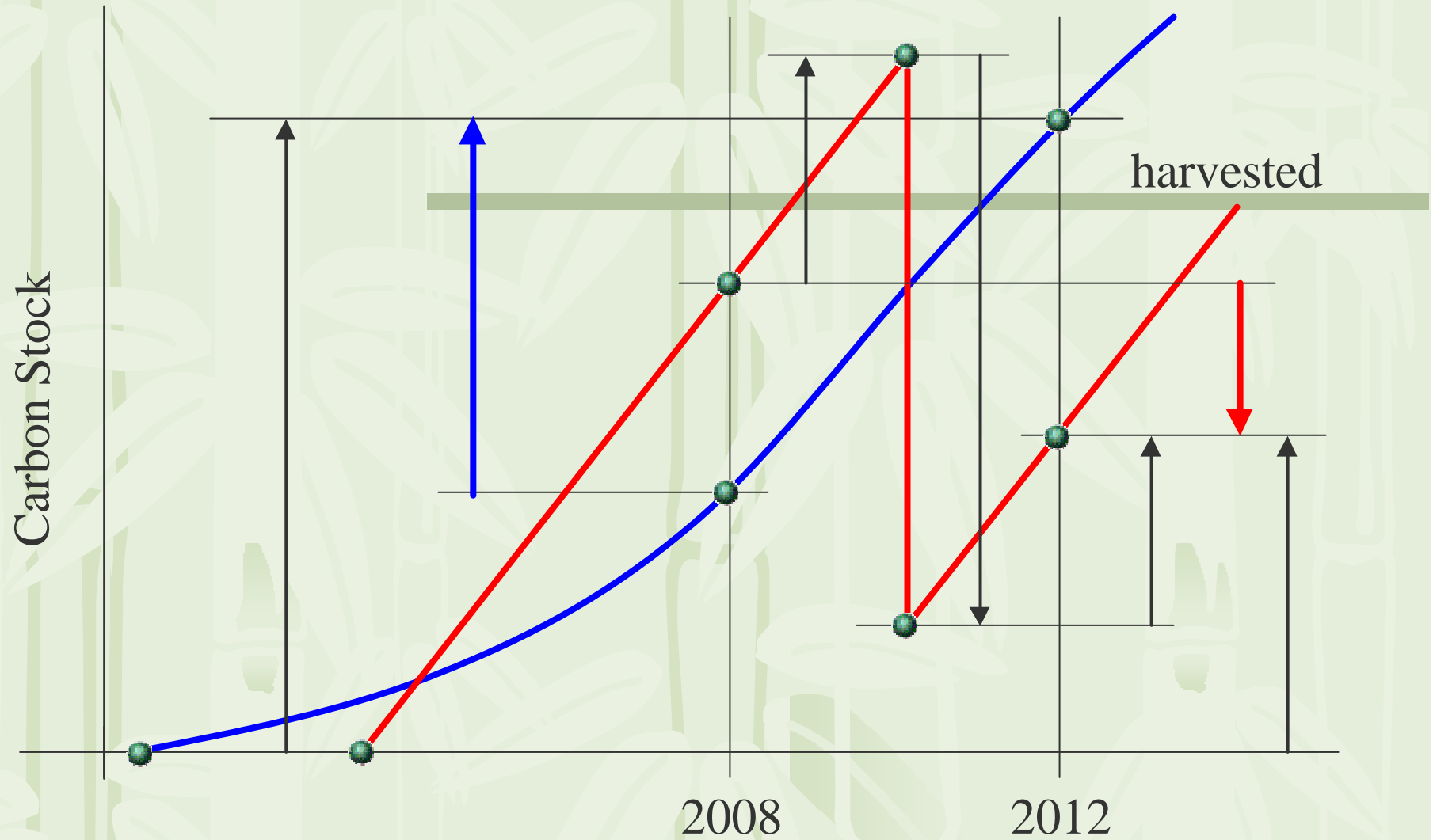
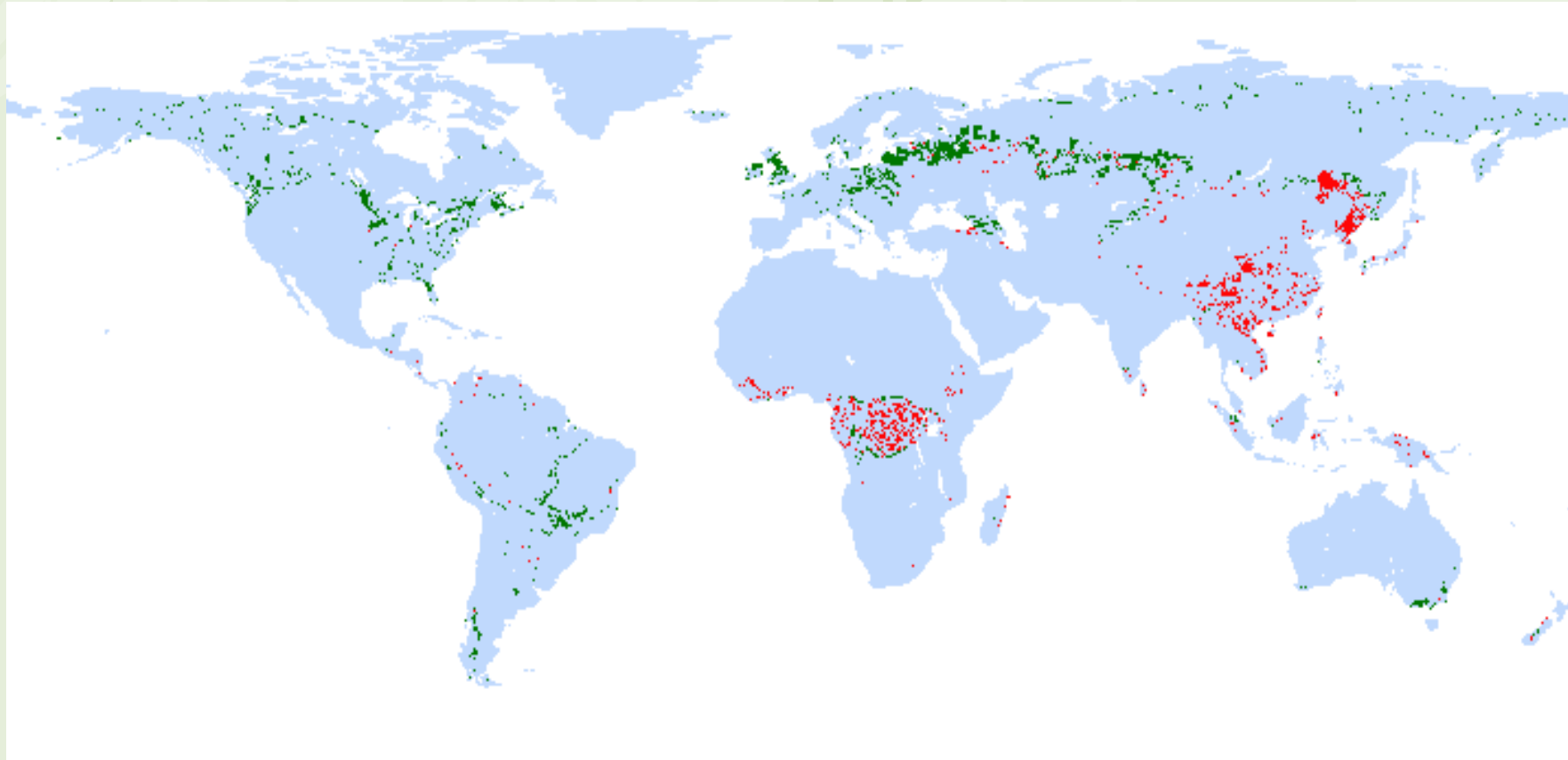


Figure. Carbon counted as sink under the Kyoto Protocol



Green: Reforestation and Restoration
Red: Deforestation

**Figure. Predicted Reforestation and Deforestation during
1990-2010 (IMAGE2.1 model)**

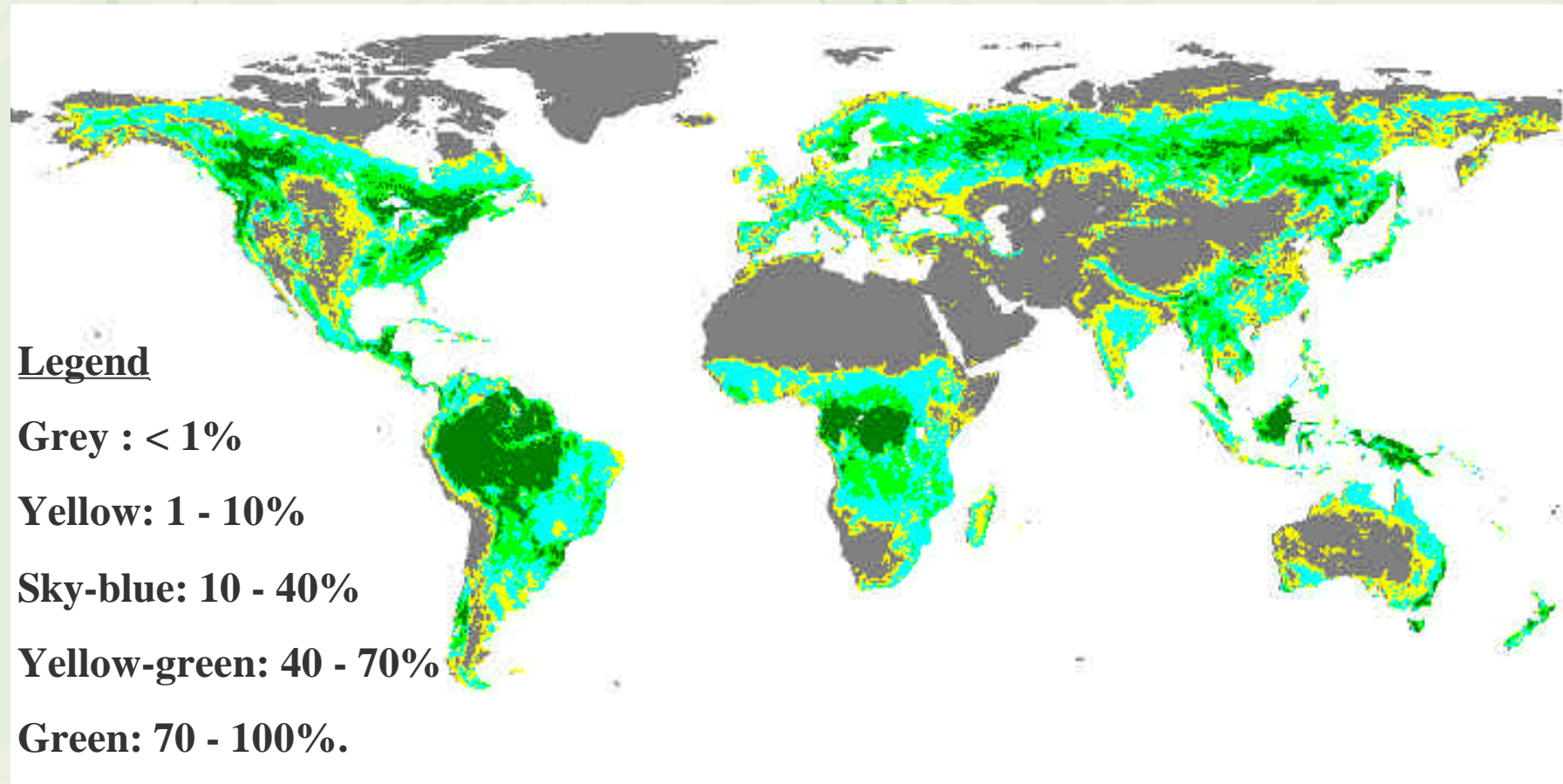


Figure. Tree Canopy Cover Ratio in 1995 estimated from NOAA data (from Dr. Nemani et al.)

Table. Predicted global carbon sink by forest related activities (3.3 + some 3.4) under the Kyoto Protocol

| Annex I total (non-AnnexI) | Tree Canopy Cover threshold in “forest” definition | | |
|---------------------------------------|---|------------------|-------------------|
| | No threshold | 10% | 40% |
| Sink (MtC/yr) | 228 (206) | 78 (0.041) | 170 (174) |
| Source (MtC/yr) | 17 (591) | 17 (586) | 12 (478) |
| Net Sink (MtC/yr) | 211 (-385) | 61 (-545) | 158 (-304) |

The Bonn Agreement

- ❖ Article 3.3:

- ❖ Eligible activities:

- ❖ Afforestation, Reforestation and Deforestation

- ❖ Accounting:

- ❖ Carbon stock change (2008-2012)

- ❖ No capping, no discounting

- ❖ Article 3.4:

- ❖ Eligible activities:

- ❖ Choose among forest management, cropland and grazing land management, and revegetation before 1st commitment period

The Bonn Agreement

- ❖ Article 3.4 (continued):

- ❖ Accounting:

- ❖ Net-net for cropland and grazing land management, and revegetation
 - ❖ Carbon stock change (2008-2012) for forest management

- ❖ Ceiling on amount of carbon uptake by forest management

- ❖ Applied to national and JI activities
 - ❖ Country-specific (EU-total 5.2%; Japan 3.9% compared to base year emissions)

The Bonn Agreement

- ❖ Clean Development Mechanism (CDM)
 - ❖ Eligible activities: afforestation and reforestation
 - ❖ Ceiling on amount of carbon uptake limited to 1% of 1990 emissions
- ❖ Joint Implementation (JI)
 - ❖ Article 3.3 ARD activities – No Cap
 - ❖ Forest Management:
 $JI\ 3.4 + National\ 3.4 < National\ Cap$

The Bonn Agreement

- ❖ Selected definitions under the KP:

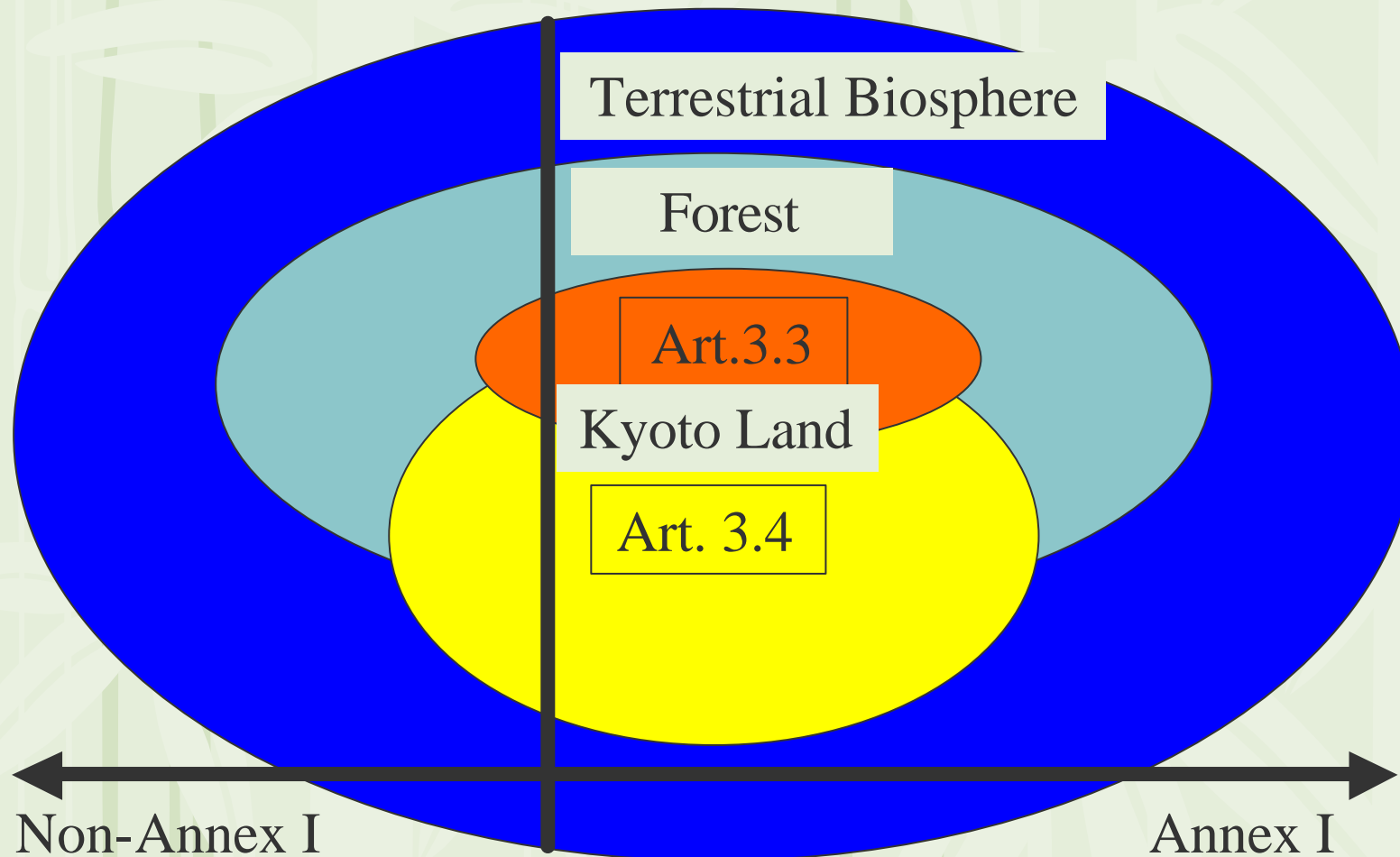
- ❖ Forest

- ❖ FAO definition: minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ

- ❖ Afforestation

- ❖ direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land

Terrestrial Biosphere and Kyoto Forests



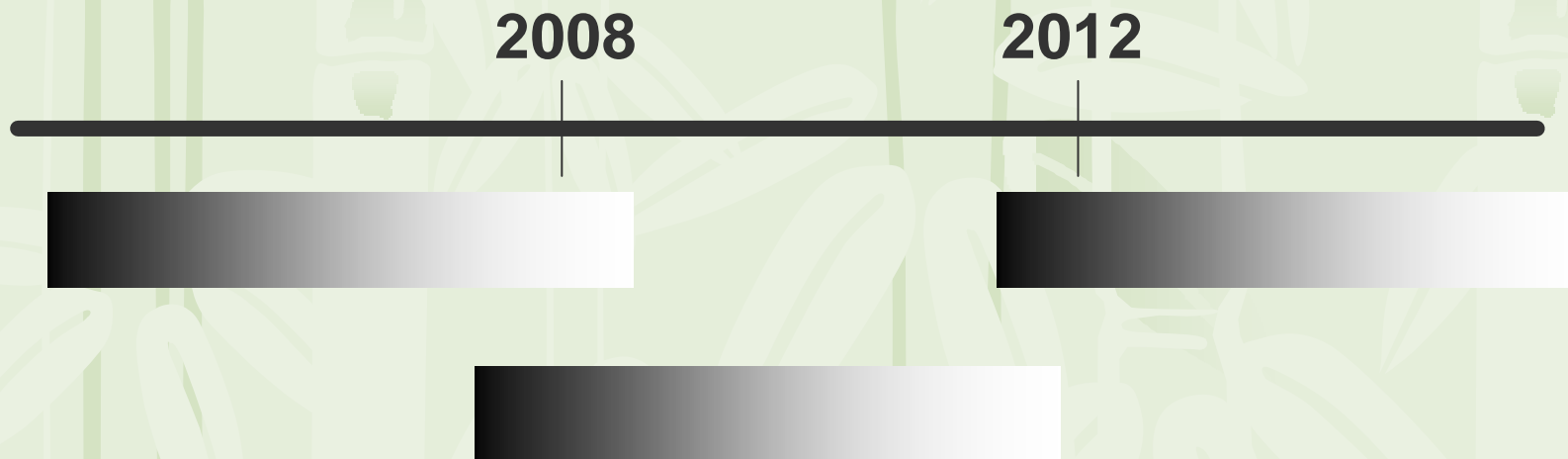
Necessary Resolution for R/S (Time&Space)

❖ Terrestrial Biosphere

250m? ~ MODIS etc.

❖ 'Kyoto Land'

20m? ~ LANDSAT
ALOS



Needs for Coordinated International Carbon Sink Monitoring

❖ In Japan

- ❖ No official monitoring system except meteorological observation exists so far
- ❖ Only R&D budget is allowed for R/S
- ❖ Need for national law for monitoring C sinks

❖ European Acid Rain Treaty has its own monitoring system – Kyoto does not

- ❖ Encouraged integrated assessment based emission reduction strategy (RAINS model)
- ❖ Made comparison and verification of emission data feasible

Major uses of Remote Sensing in Carbon Sink Modeling

Remote Sensing images
and ground truth data

Length of
growing season,
LAI, FPAR, DW



NPP (net primary
production)

Chemical
components
(N, Lignin) of
leafs and litter



NEP (net ecosystem
production)

Land use and
tree canopy
cover
disturbances



NBP (net biome
production)

International Collaboration between Carbon Sink Assessment Activities

Coordinated Global
“Kyoto Land” R/S
observations



NASA-ESA-
NASDA etc.

IPCC and COP related
reporting of carbon sinks
on “Kyoto lands”



Exchanging ideas
on model validation

Assessments of
national /regional
carbon sink activities
using R/S Data



International
Collaboration