

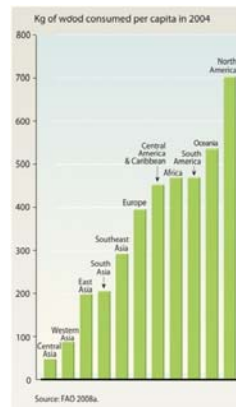
## TROPICAL FOREST MANAGEMENT

### Worldwide consumption

- ~ 3.5 billion m<sup>3</sup>/yr
- 55% fuelwood
- 45% logs, wood products & pulp

### Forest Area Effected

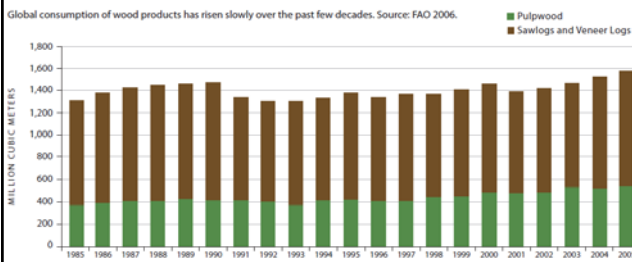
- ~1/3 of global forests logged or relogged/yr
- <2% of tropical forest sustainably managed



## TROPICAL FOREST MANAGEMENT

Figure 1. TOTAL GLOBAL "INDUSTRIAL" WOOD CONSUMPTION, 1985-2005

Global consumption of wood products has risen slowly over the past few decades. Source: FAO 2006.



## TROPICAL FOREST MANAGEMENT

Table 3. ANNUAL PRODUCTION OF THE MOST COMMON WOOD PRODUCTS, 2009

Tropical wood's share of the global market is expected to increase over the next decade. Wood is measured in cubic meters. A cubic meter is about 35 cubic feet—a volume that would make a very comfortable doghouse for a large dog like a Saint Bernard. Paper products, on the other hand, are measured by weight (FAO 2012). Note: FAO data are self-reported by countries, and therefore subject to error and non-compatibility.

PRODUCT	GLOBAL PRODUCTION	TROPICAL PRODUCTION <sup>3</sup>
Newsprint	32.6 Mmt	2.6 Mmt
Printing and writing paper	105 Mmt	15.3 Mmt
Plywood	80.3 Mm³	13.3 Mm³
Sawn wood (wood cut into boards, lumber, planks, etc.)	362 Bm³	72.8 Mm³

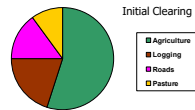
Mmt: million metric tons Mm³: million cubic meters Bm³: billion cubic meters

<sup>3</sup> Tropical production values compiled from available data for those countries included as tropical production countries in ITTO 2009.

### Tropical timber = 8-20% of global production

- \$8 billion/yr export market
- 5<sup>th</sup> ranked non-oil export
- 60% from Asian Dipterocarp forests

## LOGGING



Throughout the tropics, giant trees reduced to lumber, furniture, pulpwood, or even shipping pallets (the majestic *Ceiba* above is rather soft wood, and is used for disposable pallets!)

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**Small-Scale Logging Leads To Clear-Cutting In Brazilian Amazon**

Aug. 16, 2006 — A team of scientists, led by Greg Asner of the Carnegie Institution's Department of Global Ecology, has discovered an important indicator of rain forest vulnerability to clear-cutting in Brazil. Their five-year study is the first to quantify the relationship between selective logging, where loggers extract individual trees from the rain forest, and complete deforestation, or clear-cutting. They found that 90% of rain forests, which had been selectively logged, were completely clear-cut within one year and 50% of logged areas were completely cleared within four years. Virtually all of this double damage occurs within 15 miles (25 km) miles of major roads. Practically no selective logging takes place at distances greater than 15 miles from the roads.

The results, published during the week of July 31, 2006, in the on-line early edition of *The Proceedings of the National Academy of Sciences*, came on the heels of recent Brazilian legislation to regulate logging for better sustainability and the announcement by the Brazilian National Space Research Institute (INPE) to develop a remote sensing system to monitor logging in collaboration with the Brazilian non-governmental organization, **IMAZON**. The on-going work of the Carnegie-led team could bring the long-term timber management goals and monitoring efforts of the

Left: Conventional logging damage in the eastern Amazon. Right: Reduced-impact logging damage in the eastern Amazon. (Image courtesy of Asner Lab, Stanford University / Carnegie Institution)

**Related Stories**

- Logging of Tropical Forests Needs Devastating Environment (May 10, 2012)
- Harvesting tropical forests for timber may not be the arch-enemy of conservation that it was once assumed to be, according to a new ...
- Forest Destroying Avalanches On the Rise Due to Clear Cut Logging (Mar. 29, 2012)
- Scientists have been studying the impact of clear-cut logging on avalanche terrain in British Columbia. Understanding avalanche behavior and its destructive potential is an important factor in ...

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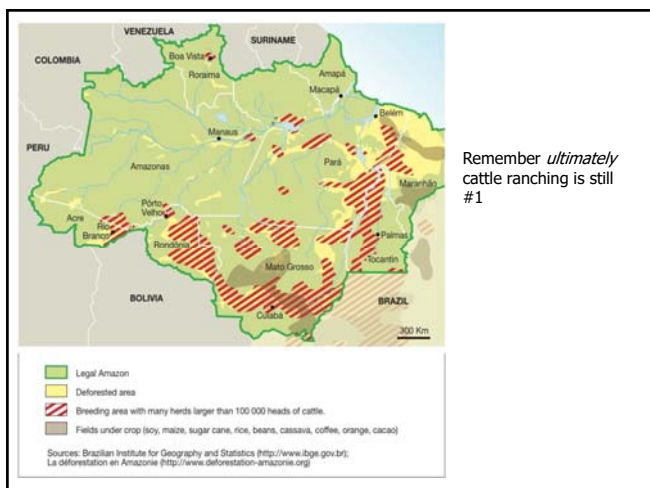
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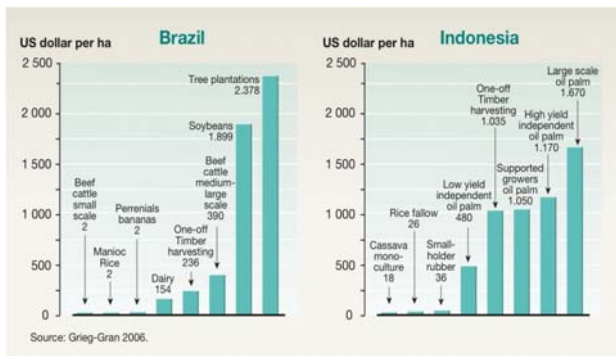
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## Forest Conversion is Profitable




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## Logging - The Role of Suburbs & Yachts

luxury items: cabinetry and decking on expensive yachts, and showy doors for sprawling US suburbs



Logs are brought into sawmills on trucks, processed into lumber (and byproducts like pulp), and finished as doors ... this sawmill in Costa Rica was shipping thousands like this to developers in North Carolina

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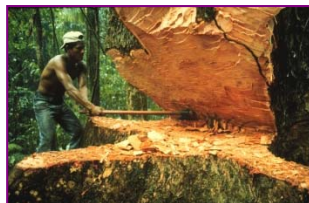
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## CONVENTIONAL LOGGING METHODS

### Clear-cutting

- mostly temperate zone (conifers)
- for pulp & fuel in SE Asia
- post "high-grading" in S. America



### Selective logging

- the norm in tropical forests
- South America: ~1 – 5 trees/ha
- SE Asia: 14 – 70 trees/ha
  - Why?




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## CONVENTIONAL LOGGING METHODS

- **Non-mechanized**
  - small-scale
  - local consumption
  - uses human labor, draft animals
  - low impact, low yield
- VS.
- **Mechanized (Industrial)**
  - large-scale **concessions**
  - for export
  - heavy machinery
  - high impact, high yield




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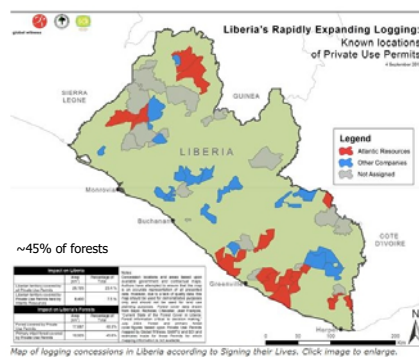
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## THE LOGGING CONCESSION

- granted by governments
- as low as \$1/ha
- short-term
- foreign investment, tax revenue




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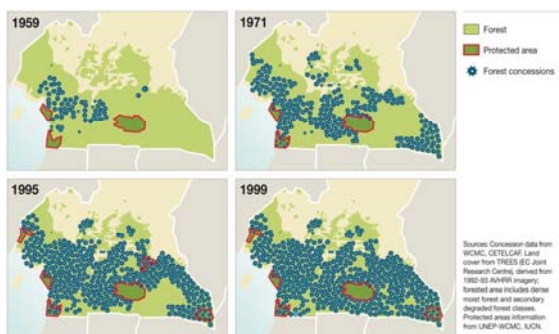
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## Example: Logging Concessions in Cameroon




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## Conventional Logging Methods

### Selective Logging of High Value Timber

#### Purpose: To maximize short-term yield

- No pre-harvest inventory
- No planning of skid-trails & roads
- Use of tracked vehicles = soil damage
- All areas logged, all large trees removed



## BIOLOGICAL IMPACTS of Conventional Logging

- 40% of trees damaged or killed
- habitat loss/degradation
- decr. species diversity
- incr. pioneer species
- erosion
- hunting
- deforestation





## SUSTAINABLE FOREST MANAGEMENT

### Sustainable forest management:

*"To harvest forest in such a way that provides a regular yield of forest produce without destroying or radically altering the composition and structure of the forest as a whole..." (Whitmore 1990)*



### REDUCED-IMPACT LOGGING (RIL)

Purpose = Maximize sustained yield

- reduce damage
- enhance regeneration
- diversify and add value
- sensitive "exclusion zones"
- set aside habitat
- ban certain species



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## Conventional vs. Reduced Impact Logging

### Reduced-Impact Logging

#### 1. Pre-harvest Preparation

- Inventory and mapping of trees
- Planning of roads and skid trails
- Vine cutting
- Optimum road width
- Core habitat areas set aside



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## Conventional vs. Reduced Impact Logging

### Reduced-Impact Logging

#### 2. Felling Operation

- Directional felling
- Reduce waste
- Winching
- Rubber-tired skidders or skyline
- Leave seed trees behind

#### 3. Post-harvest

- Replanting
- Silvicultural treatments



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## Benefits of R.I.L.

### Environmental Benefits

#### Data from 266 studies

- 50% less soil disturbance
- 41% less residual stand damage
- 30% less canopy opening
- Less habitat loss

### Economic Benefits

- Up to 15% lower total cost
- Higher wood recovery
- 13-35% greater profits
- Faster recovery = shorter cutting cycle
- Higher future returns




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## Barriers to Adoption of R.I.L.

- Higher pre-harvest cost (*risk*)
- Politics of logging concessions
- Lack of awareness / training
- Lack of control and *skilled* law enforcement (wood ID)
- Corruption

**ILLEGAL LOGGING IS RIFE!!**




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## ILLEGAL LOGGING

### A "tragedy of the commons" situation

#### Astronomical profits

- no license fees
- no royalties
- no taxes
- no management / operations requirements

#### Depresses timber prices

- lower sale price

Undermines profitability of legal logging

Control difficult; Hard to ID wood!

RIL and sustainable timber management thus depends on better monitoring and enforcement of forestry laws.




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## SOLUTIONS?

Can sustainable management ever be adopted?

Regulate extraction methods  
 Long-term concessions  
 Enforce laws  
 Educate public & law enforcement  
 Provide incentives
 

- Tax-incentives
- Certification
- Carbon-offsets

 Conservation concessions & REDD+?




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## PROGRESS

### International Timber Trade Agreement 2006

*"to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests..."*

#### Since 1990:

112 countries have National Forest Inventories (77% of forests since 2010!)  
 99% of forests covered by policies or laws that favor SFM  
 52% of all forests have management plan (2010)




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## PROGRESS

### The U.S. Lacey Act of 1900

Amended in 2009 to include plants

*"anyone who imported, exported, transported, sold, received, acquired or purchased wood products made from illegal timber, who knew or should have known that the wood was illegal, may be prosecuted for violation of the Lacey Act."* - ITTO

### EU FLEGT (Forest Law Enforcement, Governance and Trade)

#### COMPLIANCE IS CHALLENGING!

Rules don't require sustainability...




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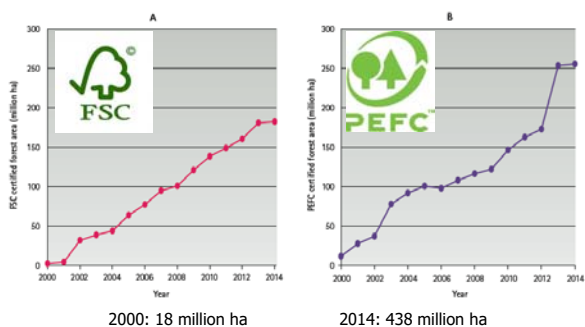
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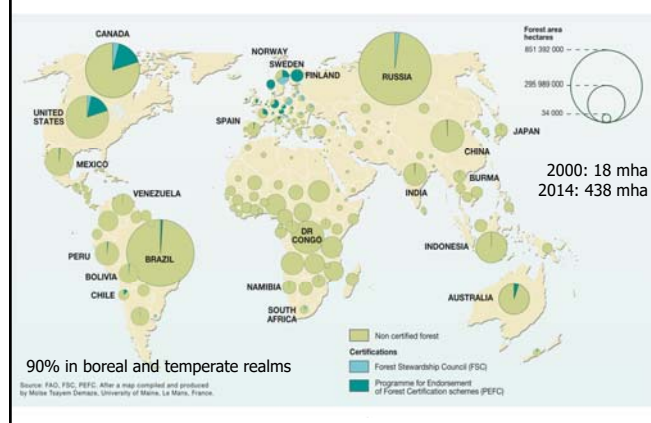


## Forest Management Certification

FIGURE 16 A AND B Area of international forest management certification (2000–2014): (A) Forest Stewardship Council (FSC); (B) Programme for Endorsement of Forest Certification (PEFC)



## Very little is certified...



## Solutions?

### TREE PLANTATIONS

#### Benefits:

- higher yield
- more efficient
- can rehabilitate degraded lands
- take pressure of natural forest (?)
- carbon sinks

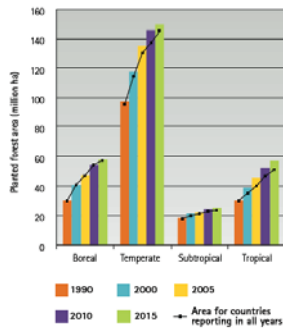
#### Challenges:

- may replace natural forest (!)
- problematic in seasonal climates
- expensive
- risky
- low biodiversity



## Plantations

FIGURE 8 Planted forest area by climatic domain



fuelwood (*Acacia mangium*)  
pulp (*Eucalyptus* spp., *Pinus* spp.)  
timber (*Tectona grandis* – teak)  
biofuel (*Populus* spp.)

### Community-based Forestry

## The Role of YOU

### A few things you can do:

- reduce wood & paper use
- reuse/repurpose whenever possible
- recycle and buy recycled
- buy only certified timber
- avoid tropical hardwoods
- support forest conservation
- spread the word!

**REUSE**  
**REDUCE**  
**RECYCLE**



E-readers may make environmental sense for avid readers of books and magazines.