

Deforestation and Reforestation: Costs and Gains in Ecosystem Services

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Outline

- Overview
- Main drivers
- Consequences
- Responses
- A Vietnam's example

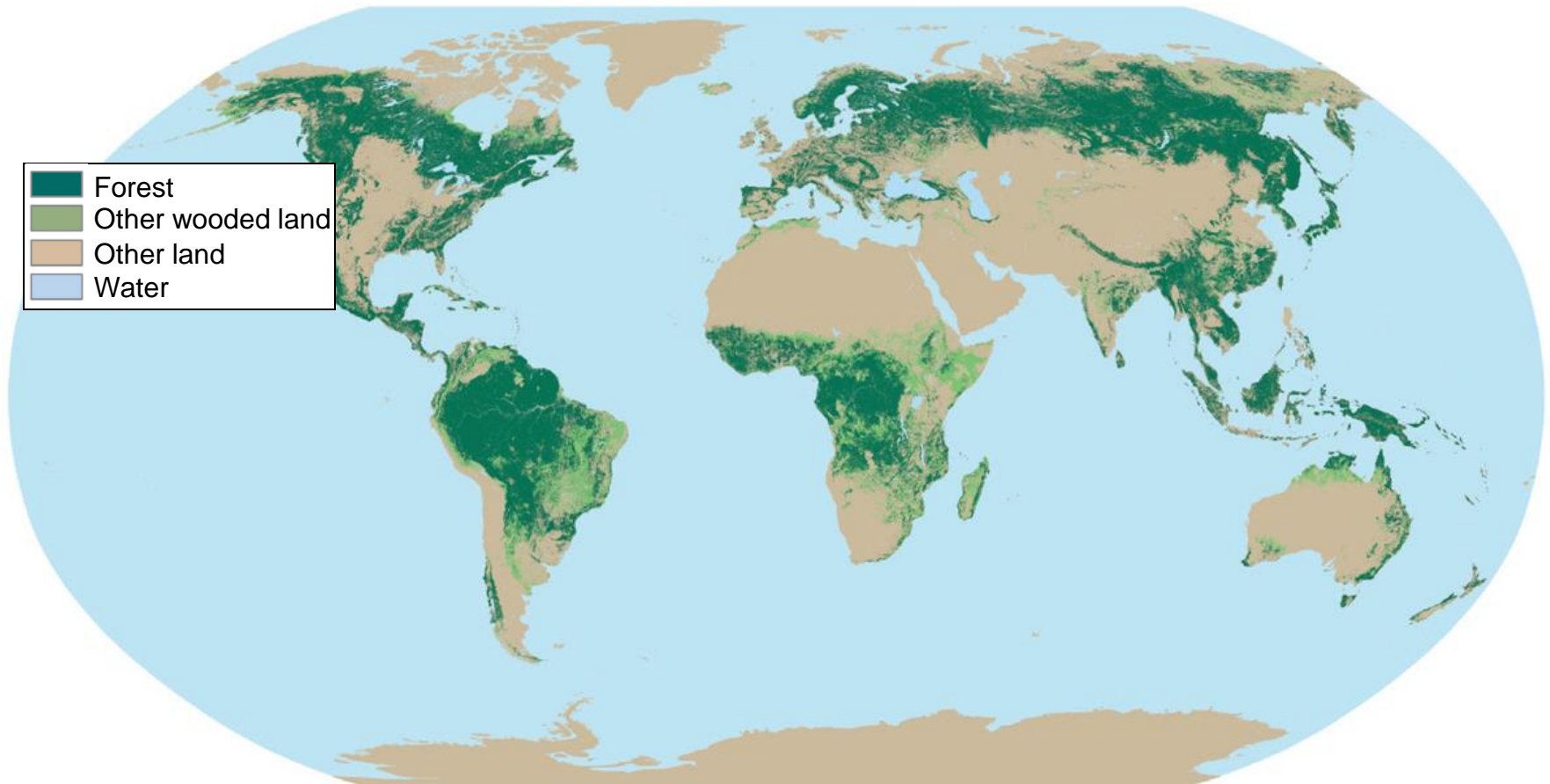


Overview

- How much forests do we have?

Overview

- About 4 billion ha (31% of land surface), 0.6 ha per capita, 571 billion m³
- Russia, China, USA, Canada, Brazil account for more than half



Source: FAO, 2010

Overview

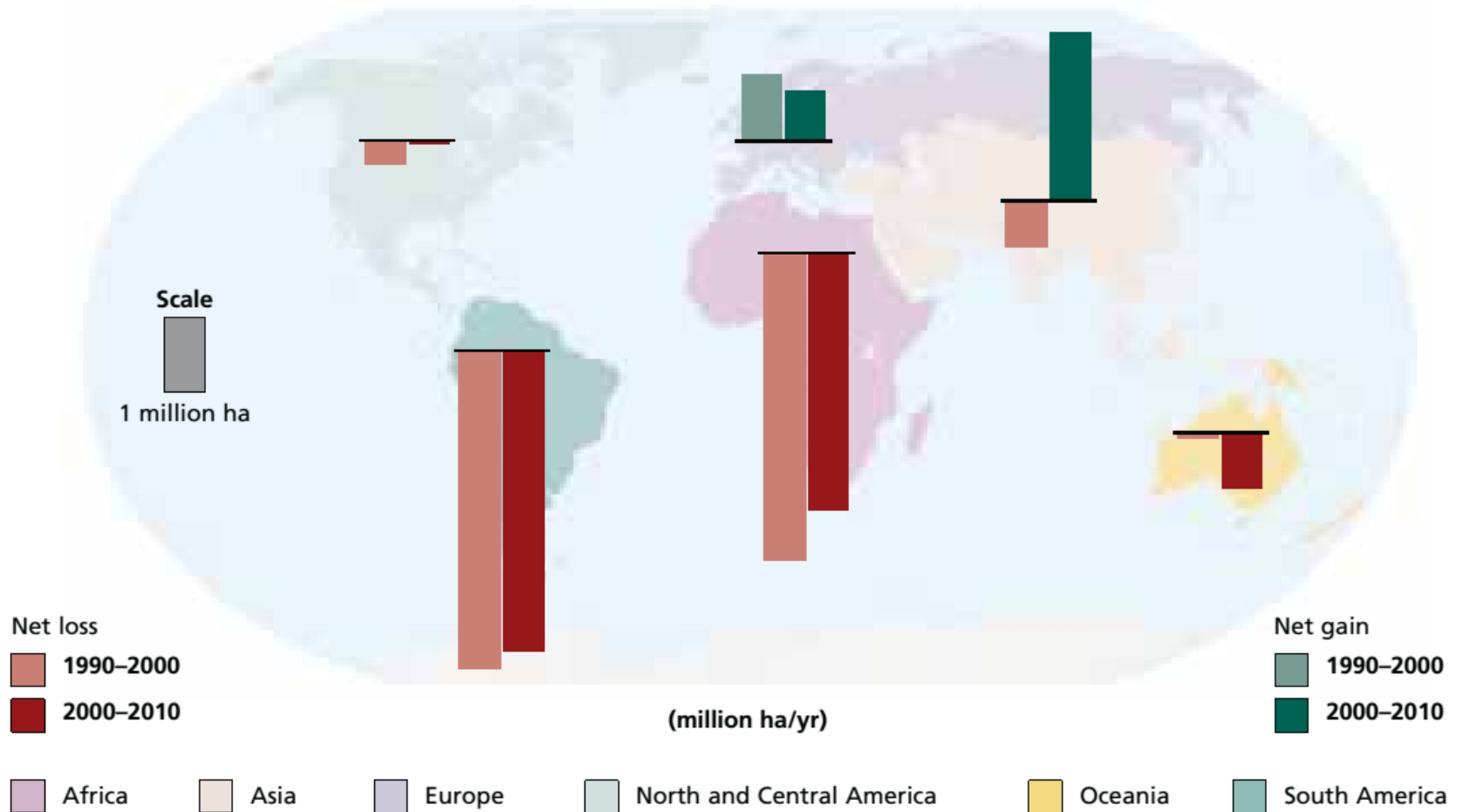
Region/subregion	Forest area	
	1 000 ha	% of total forest area
Eastern and Southern Africa	267 517	7
Northern Africa	78 814	2
Western and Central Africa	328 088	8
Total Africa	674 419	17
East Asia	254 626	6
South and Southeast Asia	294 373	7
Western and Central Asia	43 513	1
Total Asia	592 512	15
Russian Federation	809 090	20
Europe excl. Russian Federation	195 911	5
Total Europe	1 005 001	25
Caribbean	6 933	0
Central America	19 499	0
North America	678 961	17
Total North and Central America	705 393	17
Total Oceania	191 384	5
Total South America	864 351	21
World	4 033 060	100

Distribution of forests (FAO, 2010)

Overview

- How have forests changed over years?

Overview



Annual change of forest area by regions (FAO, 2010)

Overview

- Signs of decreasing deforestation rate, still alarmingly high
(-16 million ha in 1990-2000, -13 million ha in 2000-2010 annually)



Overview

- Planting trees reduces the net loss of forest area

(- 8.3 million ha in 1990-2000, - 5.2 million ha in 2000-2010, annually)

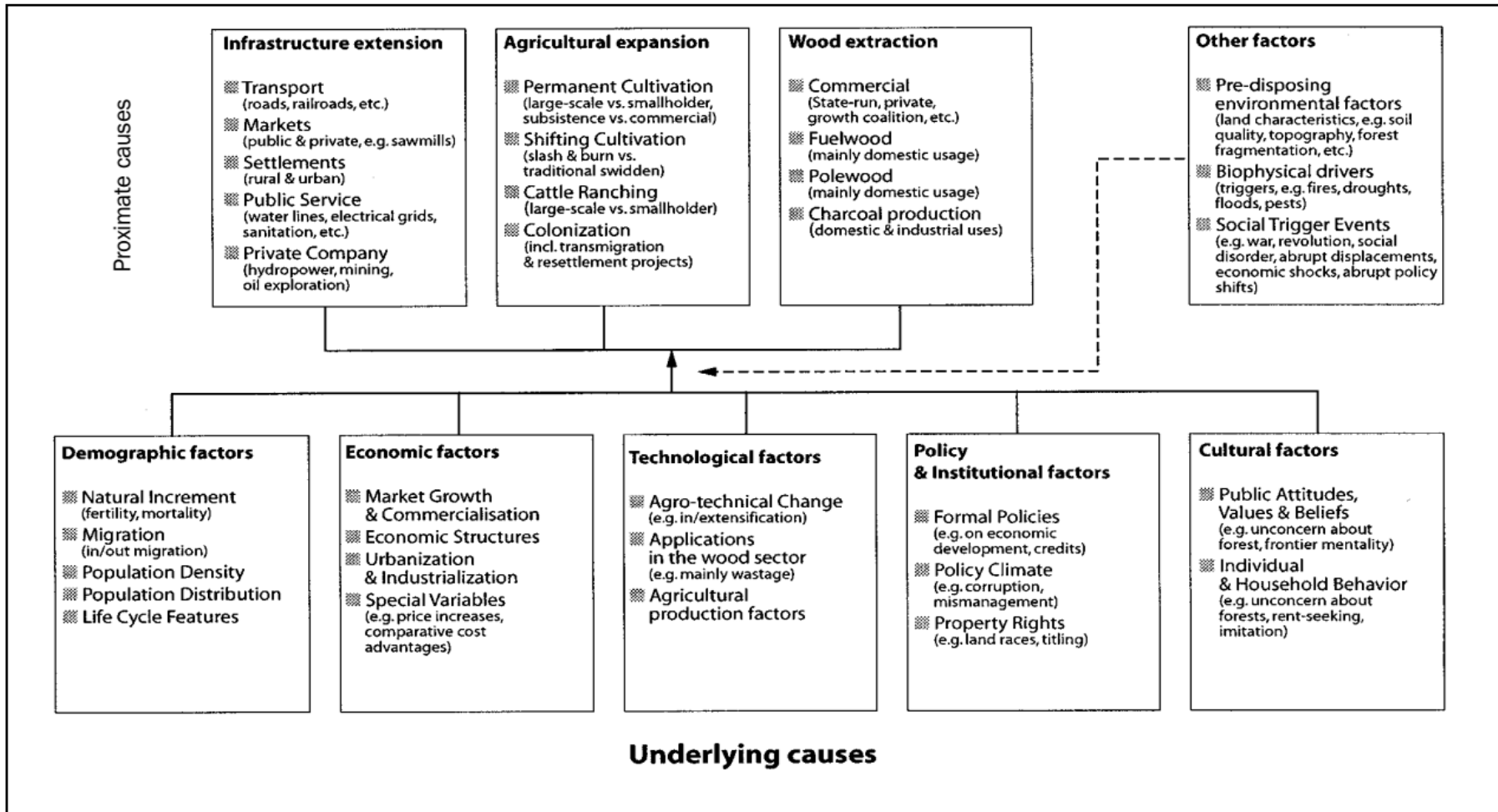


Overview

- South America and Africa continue to have the largest loss of forests



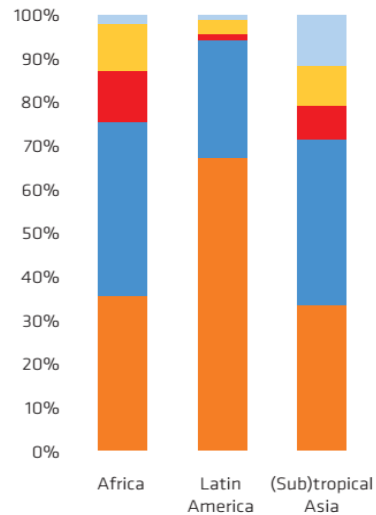
Causes of deforestation



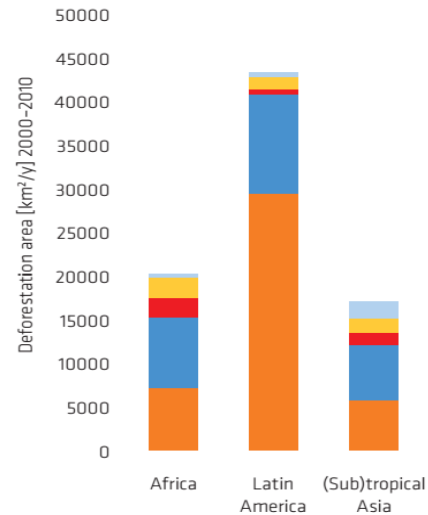
Causes of deforestation (Geist and Lambin, 2002)

Causes of deforestation

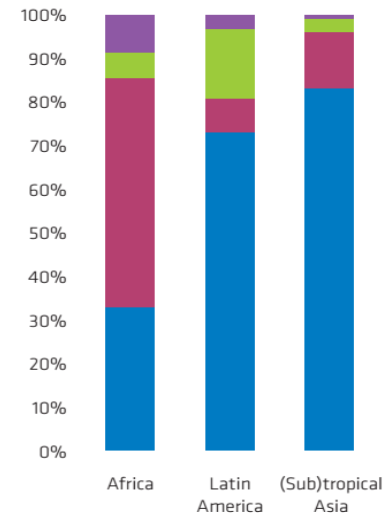
a) Proportion of deforestation drivers



b) Area proportion of deforestation drivers



c) Proportion of forest degradation driver



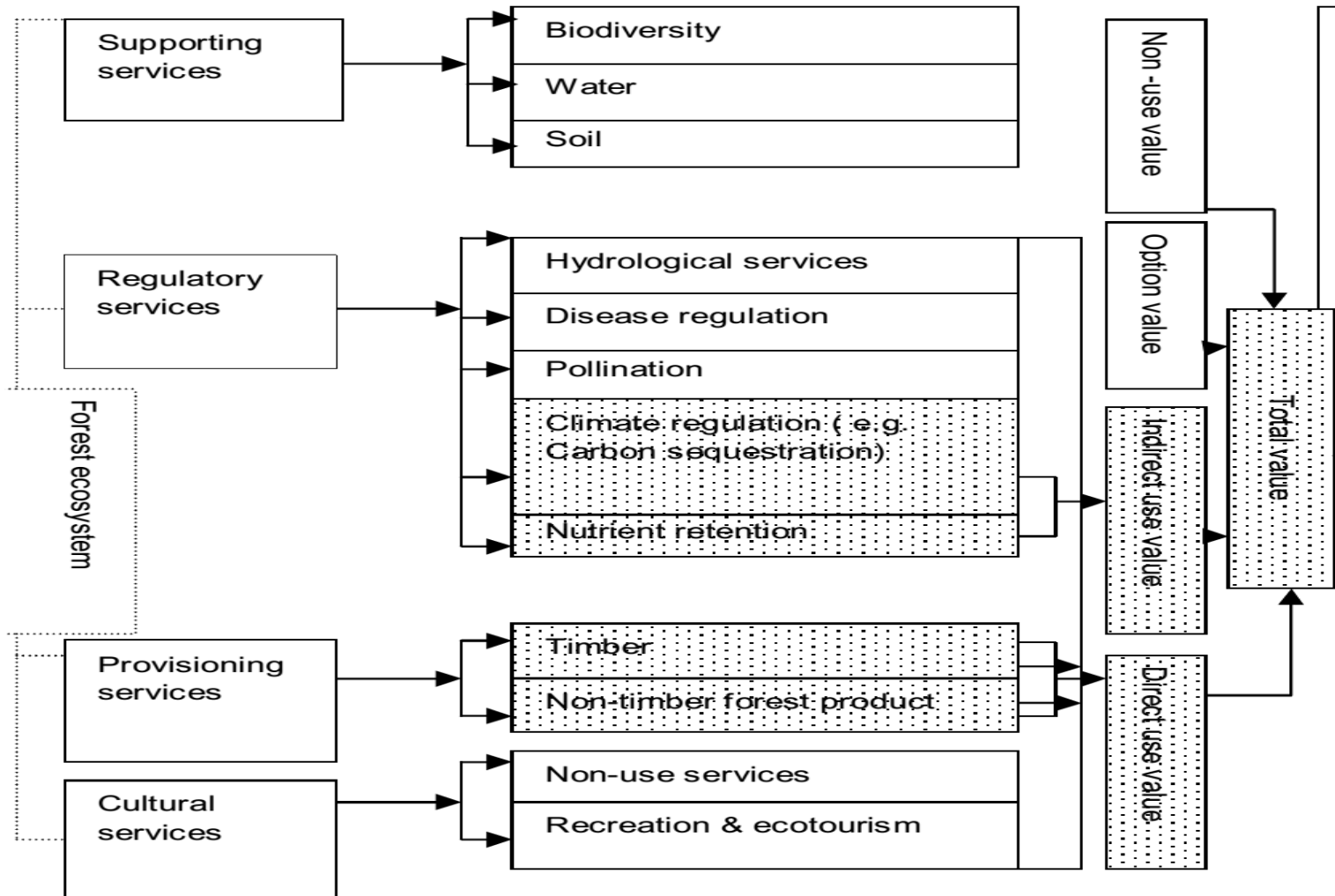
■ Urban expansion
■ Infrastructure
■ Mining
■ Agriculture (local / subsistence)
■ Agriculture (commercial)

■ Livestock grazing in forest
■ Uncontrolled fires
■ Fuelwood charcoal
■ Timber logging

FIGURE 2.1 Continental-level estimations of the importance of deforestation drivers as reported by 46 countries: (a) in terms of overall continental proportions as sum of country data weighted by net forest area change by country (km^2/y , FAO, 2010a) for the period 2000–2010 (b) the same data shown in terms of absolute national net forest area change by (km^2/y , FAO, 2010a), and (c) for continental estimations of relative importance of degradation drivers (Source: Hosonuma et al., 2012)

Causes of deforestation (Hosonuma et al., 2012)

Consequences



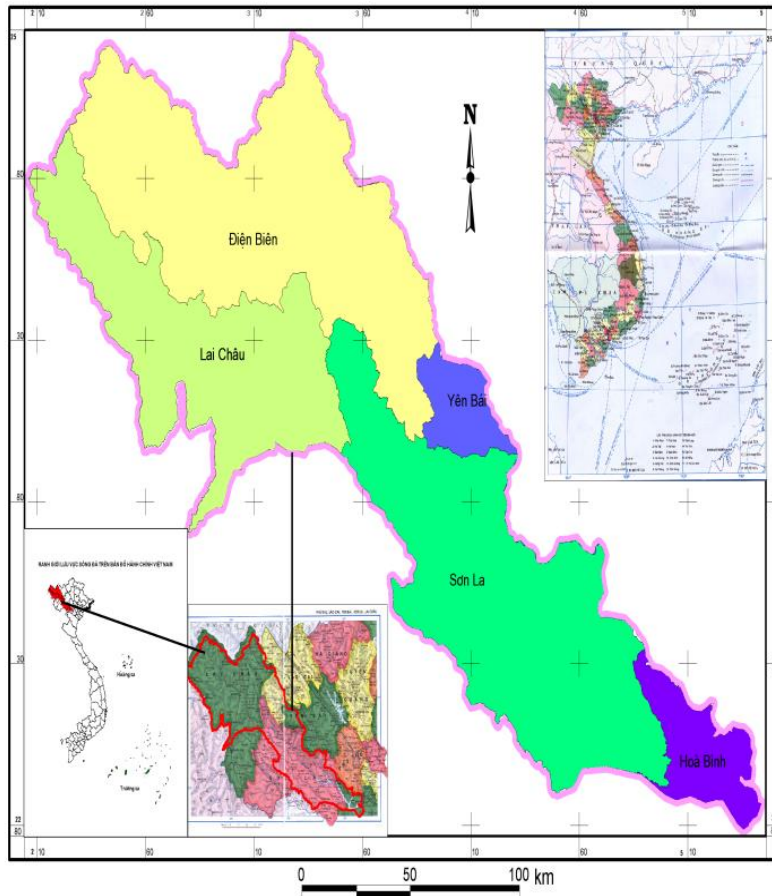
Ecosystem service losses due to deforestation

Responses

- Promoting tree planting: PFES, extension, credit, etc.,
- Devolution and decentralization,
- Securing land and tree rights,
- Developing off-farm economies
- Strengthening regulations on forest extraction and protection
- Substituting forest products
- And many others...

PES for forest hydrological services in Vietnam

SƠ ĐỒ VỊ TRÍ LƯU VỰC SÔNG ĐÀ



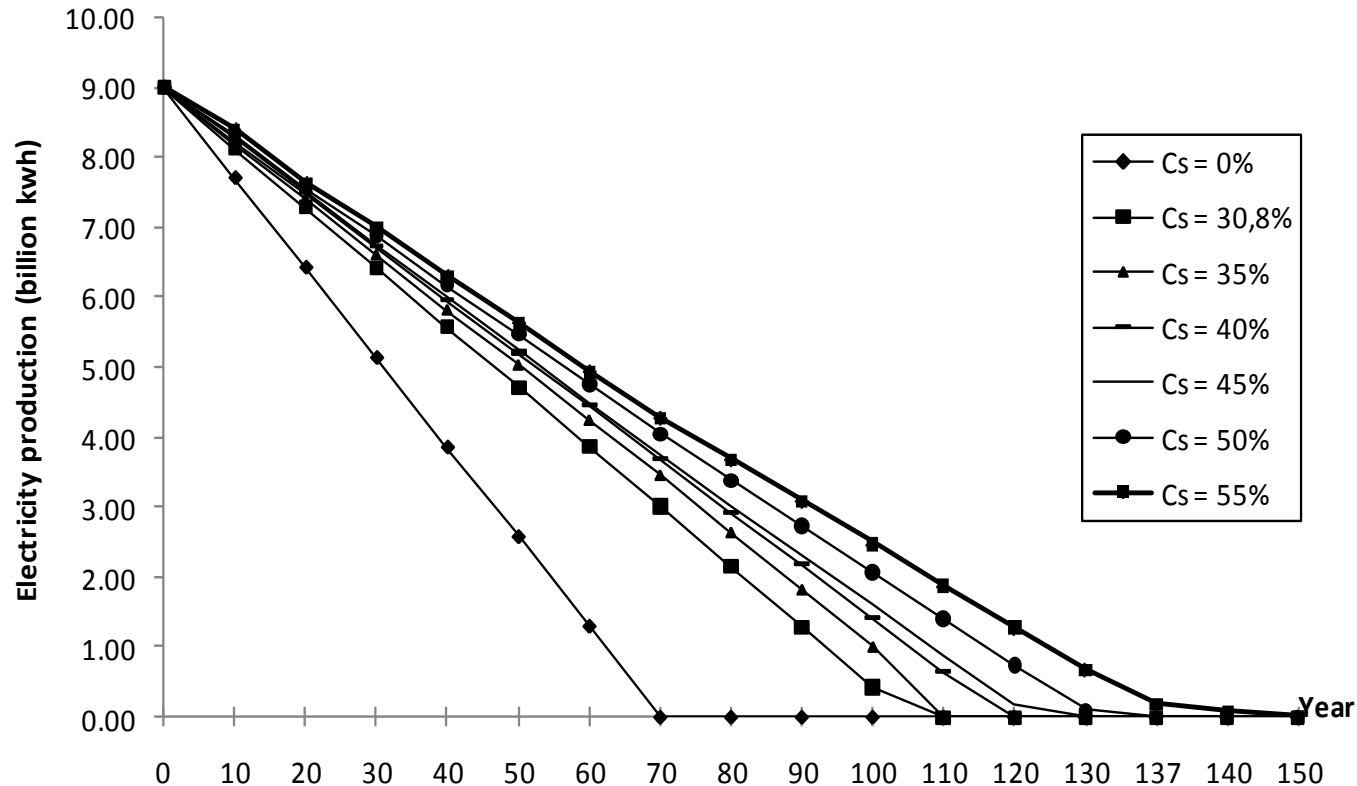
Year	Forest area (1000 ha)			Forest cover (%)	Forest area per capita (ha)	Average annual change	
	Natural forest	Plantation	Total			Area (1000 ha)	%
1943	14,300	0	14,300	43.0	0.70		
1976	11,077	92	11,169	33.8	0.22	−94.88	−0.66
1980	10,186	422	10,608	32.1	0.19	−140.25	−1.26
1985	9038	584	9892	30.1	0.16	−143.20	−1.35
1990	8430	745	9175	27.8	0.14	−143.40	−1.45
1995	8252	1050	9302	28.2	0.12	25.40	0.28
2000	9444	1471	10,915	33.2	0.14	322.60	3.47
2005	10,283	2334	12,617	36.4	0.15	340.40	3.12
2010	10,305	3083	13,388	39.5	0.15	154.20	1.22

Forest changes in Vietnam, 1943-2010 (Lambini and Nguyen, 2014)

Determinants of reforestation in Vietnam

	Participation	Success
Education	27.72***	14.14*
Age	22.74*	-2.48
Ethnicity	14.72*	21.29***
Labor share	39.16***	25.50*
Household asset value	11.71**	2.14
Non-farm income share	-32.37*	-12.11
Permanent non-farm income dummy	19.08*	-19.23*
Land title dummy	35.93***	24.24***
Extension visits	8.09**	14.38***

PES for forest hydrological services in Vietnam



The longevity of the hydroelectric plant can be prolonged by ca. 35 to 80 years, depending on the state of forest cover in the watershed (Nguyen et al., 2013)

PES for forest hydrological services in Vietnam

Total monetary value of these services with changes of electricity prices and payment proportions

Electricity price (VND/kWh)	$\eta = 40\%$ and $\gamma = 10\%$			$\eta = 50\%$ and $\gamma = 20\%$		
	Water provision (million VND/year)	Sediment prevention (million VND/year)	Total (million VND/year)	Water provision (million VND/year)	Sediment prevention (million VND/year)	Total (million VND/year)
1000	127100	451300	578400	317750	1128250	1446000
1180	149978	532534	682512	374945	1331335	1706280
1300	165230	586690	751920	413075	1466725	1879800

26.3 million USD to 85.5 million USD per year (Nguyen et al., 2013)

Research interests

- Economics of afforestation, reforestation, deforestation, and agroforestry (local livelihoods and sustainable resource management),
- New forest policy instruments (PES) and impact evaluation (community based forest management),
- Forest ecosystem service synergies and tradeoffs,
- Efficiency of resource use.