

The value of timber, fuelwood, carbon and non-timber forest products in India's forests

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Background : National Accounting for Forests

- Cover 21% of India's geographical area
- Contribute only 1.5% to official GDP in India
- Forest products in national accounts are classified into two major groups:
 - 1) major products comprising industrial wood and fuel wood
 - 2) Minor products - bamboo, fodder, lac, etc (non-timber forest products)
- Most forest goods and services (ecological services, biodiversity benefits, etc) remain unaccounted as national income
- When forests are harvested/ converted to other uses/ harvested unsustainably, the destruction of natural capital that occurs remains unaccounted for
- Majority of India's forest dependent rural population, who are predominantly poor, rely heavily on forests for subsistence
- Significant non market production needs to be recognized & accounted
- Historically, sector is under-represented in national accounts
- Need for incorporating forest resources into national accounts

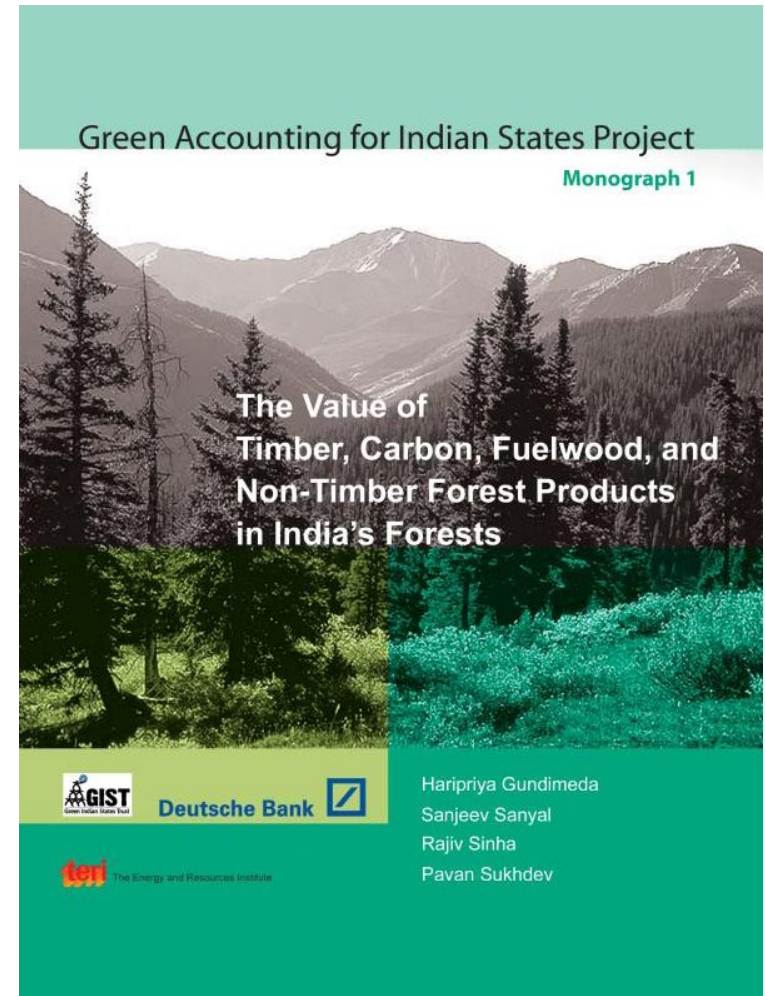
Scope of Studies by the Green Accounting for Indian States Project (“GAISP”) for India’s Forests

The scope of GAISP’s work includes three sets of valuations and accounting adjustments covering various components of the value of **forests**, viz,

- Timber, Fuel wood, Non-timber forest products, and Carbon
 (“GAISP Monograph-1”)
- Biodiversity - bio-prospecting, eco-tourism and non-use value of keynote species
 (“GAISP Monograph-4”)
- Ecological services – augmenting water resources, & mitigating soil erosion and flood damage
 (“GAISP Monograph-7”)

Objectives of GAISP “Monograph 1”

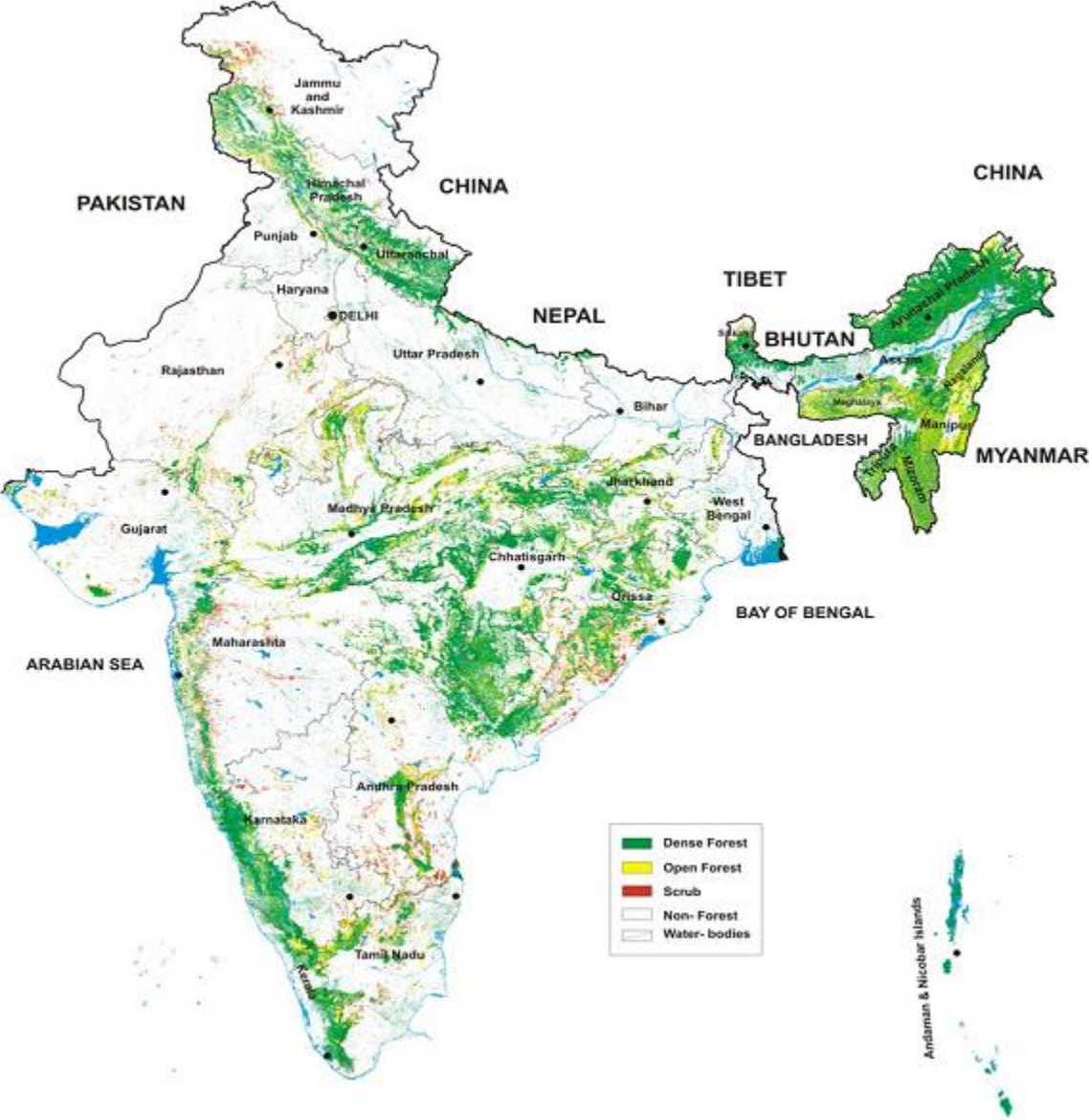
- ❖ Estimate the value of timber, fuelwood, non-timber forest products and carbon sequestration services provided by forests
- ❖ Demonstrate how forest resources can be integrated into the national accounts or all Indian states
- ❖ Illustrate how such a framework can be use in policy analysis



Profile of Forests in India

- Geographical area - 329 million ha
- 21% - classified as “forest land”
- Of this 58% - dense forests, 42% open
- Total growing stock of trees inside forests : 4,829 M cum
- Average growing stock - 72cum/ha (i.e. below world average)
- Largest bamboo resources in the world
- 5% of total mangrove resources in the world
- Wide variation in forest cover across states (3% - 87%)
- States have diverse track-records of forest management, compliance with conservation laws, community involvement
- Hence it is important to track these resources at the *State* level, but in a consistent and holistic manner

FOREST COVER OF INDIA



Framework for Forest Accounting

From UN's SEEA 2003 (Chapters 7,8)

- Opening stocks
 - Changes due to economic activities
 - Other Changes
 - Closing stocks
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- *Area* Accounts for Forest Land
 - *Physical* Accounts for Timber and Carbon
 - *Monetary* Accounts

Area accounts for forested land	Data sources and assumptions
Opening stock	Year 2001 from SFR (2001)
+ Changes in forest land	
+Natural expansion Afforestation	ICFRE (2000) Various forest statistical reports
- Net transfer of forest land to non-forest uses (through deforestation and degradation)	Compiled from forestland use change matrix between the years 2001-03.
Loss of forest land due to shifting cultivation	Shifting cultivation (ICFRE 2000, FSI, 1999) – average values taken
+Net reclassification and other changes	
= Closing stocks	Opening stocks less reductions plus additions and reconciled with the FSI (2003) estimates

Physical accounting framework for timber and carbon

Opening stocks

+ Changes due to economic activities

-Logging and logging damage

-Forest encroachment and shifting cultivation

+Afforestation

-Loss due to livestock grazing

+ Other accumulations

+ Changes due to natural causes

+ Natural growth

+ Natural regeneration

+Changes due to reclassification

+net transfer of land

+Other Volume changes

-Stand mortality

-Forest fires and pest damage

= Closing stocks

Data and Assumptions – Volume Accounts

- Opening stocks (stock of timber at the beginning of 2001)
- Data - State of Forest Report, 'Extent composition and density of growing stock
- Volume of timber harvested/logged (Recorded)- derived from the production statistics of timber and Fw obtained from CSO
- Unrecorded production – estimated balance – actual balance (i.e. the missing growing stock)
- Logging damage – 10% of the volume of timber logged from both recorded and unrecorded production
- Volume additions due to afforestation - area afforested with the mean annual increment per sq. km (derived)
- Volume lost due to grazing - naturally regenerated volume and afforested volume x the percentage of area subject to heavy grazing.

Data and Assumptions – Volume Accounts

- Mean annual increment of different species taken from “Extent composition and Density of Growing Stock”
- Volume regenerated = area regenerated X MAI.
- Timber lost due to forest fire = naturally regenerated volume and the afforested volume X percentage area affected by the forest fire
- The volume reduction due to transfer of land for nonforest purposes - area transferred X the growing stock per ha
- Volume lost due to shifting cultivation = area subject to shifting cultivation X the growing stock per hectare.
- **Closing stocks** (opening stocks less reductions plus additions)

Data and Assumptions – Volume Accounts

- Opening stock of carbon - computed by converting the growing stock to biomass
- Biomass/cum of growing stock from Haripriya, 2000
- Haripriya (2000) – estimated from volume inventory data
- Carbon $\approx 0.5 \times$ biomass (Haripriya 2001, 2002).
- No carbon loss assumed because of grazing
- Gundimeda (2003) estimated that
 - when forests are affected by fires –
 - 20% of the stem biomass remains,
 - 50% is burnt and carbon is transferred to the soils and
 - 30% is released into the atmosphere
 - In case of shifting cultivation - 80% is transferred to wood products.

Data and Assumptions – Volume Accounts

- Total volume of carbon lost includes
 - carbon transferred to forest products ,
 - releases of C from forests biomass into atmosphere,
 - releases to soil pool
- Change in carbon is defined as the present value (future) carbon released arising from disturbances
- Change in carbon defined as the present value of carbon released arising from disturbance on forested land in the current accounting period
- **Closing stocks** (opening stocks less reductions plus additions)

Valuation

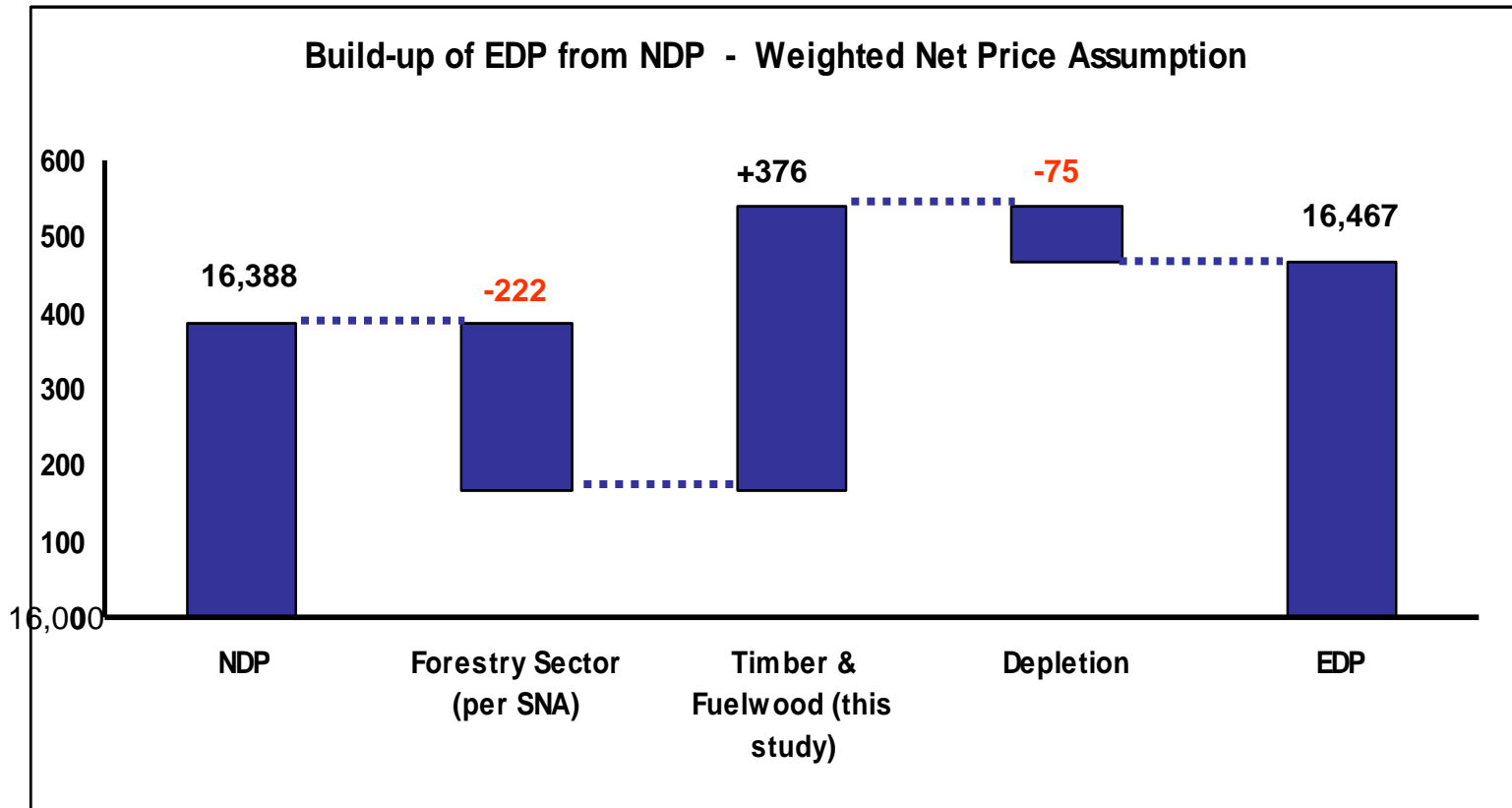
- Timber (Net price method)
- $V_t = (P_t - C_t)R_t = N_tR_t$.
- Market price of the product at factor cost less the cost of harvesting and the margin to the normal return on capital
- Value of the mfps per hectare - taken from the statistics provided by the SFD.
- Unrecorded production - the value of the mfps is taken to be 10 times the value recorded by the SFD
- Fodder obtained from the forests is valued using the cost of alternate acreage.
- For carbon we used an estimate of \$20/tC as an estimate of Carbon

Integration with the national accounts

The forest accounts developed in this paper affects three components of the national accounts

- Figures for the production of timber that adjust unreported production - will increase/decrease both GDP and NDP by the amount of the 'missing' timber.
- Capital accounts that expand
- capital formation to include accumulation in natural forests and depletion.
- Consumption of capital to include the cost of depletion of natural forests, which decreases NDP/NSDP.
- The result is the ESDP
- $ESDP = NSDP + (Anp - Dnp)$
- accumulation natural forests (non-produced assets, Anp) minus depletion (Dnp).

Build-up of Environmentally Adjusted Domestic Product



Results

- Appears that the country's forest cover ↑ by 272,200 ha
- In reality open forests have ↑ and dense forests ↓
- Largest ↓ is due to logging and associate damage
- Natural growth is the largest source of ↑
- Overall ↓ of 168 Mcum of timber
- Accompanied by a net carbon release of roughly 58 MtC
- ↓ in stock of timber - wealth depletion of over INR 380 billion (1% of GDP) – highly material unrecorded capital loss
- The actual value of ntfps recorded can be higher than that recorded now (Rs 305/ha)
- Significant unrecorded harvest of ntfps
- Subsidized prices used by Forest Departments
- Social security benefits of avoided migration to urban areas
- Not enough data to support quantification and inclusion

	VOLUME ACCOUNT		VALUE ACCOUNT					
	Timber	Carbon	Timber	Carbon	Ntfp	Timber ^a	Carbon ^a	NTFP ^a
	000. Cum	000 tonnes	Million. Rupees	Million. Rupees	Million Rupees	% of GDP	% of GDP	% of GDP
<i>Opening Stocks</i>	5068313	3558126	10318016	3202313	825069	55.65	17.27	4.45
<i>Changes due to econ. Activity</i>	-409263	-236280	-819963	-212652	-	-2.21	-0.57	
<i>Logging/harvest/Logging damage</i>	355469	229034	752652	206131	-	2.03	0.56	
<i>Afforestation</i>	10786	5152	31615	4637	-	0.09	0.01	
<i>Shifting cultivation</i>	14002	6883	20449	6194	-	0.06	0.02	
<i>Forest encroachments</i>	41672	5515	59642	4963	-	0.16	0.01	
<i>Grazing</i>	8905	0	18836	0	-	0.05	0.00	
<i>Other volume changes</i>	843	785.0	1649	6238	-	0.004	0.02	
<i>Forest fires</i>	158	45	292	40	-	0.001	0.0001	
<i>Stand mortality</i>	685	3	1357	3	-	0.004	0.00	
<i>Other accum</i>	242260	1778920	432230	161028	-	1.17	0.43	
<i>Natural growth</i>	182239	130865	355909	117779	-	0.96	0.32	
<i>Regeneration</i>	91990	48983	153824	44084	-	0.41	0.12	
<i>Transfer of land</i>	-31969	-928	155701	-835	-	0.42	-0.002	
<i>Omissions and errors</i>	4772	0	8489	0		0.02	0.00	
<i>Net Changes</i>	-167845	-58145.4	-380803	-115968	4152	-1.03	-0.31	0.01
<i>Closing Stocks</i>	4905240	3499981	9937213	3086346	829221	53.60	16.65	4.47

Implications of the results for National accounts

- Important to know the effect of the depletion or accumulation of forest capital on these direct and indirect stake holders .
- Answer not easy – has to be considered from an intergenerational and intragenerational perspective.
- Analysis shows - India overall and many of its states are liquidating natural capital to pay for current consumption.
- For intragenerational equity, the distribution of benefits to different social groups and beneficiaries should be even.
- The poor subsistence users very often gain much less than the commercial users and equity is not satisfied.
- Though Indian forests emit carbon – still small in comparison to emissions from other sources
- However, if forests accumulate carbon, global communities benefit far more than local communities.

Implications of the results for National accounts

- The current measures of national income in India underestimates the contribution of forests because of under-reporting and market failures.
- Significant rent can be generated using forest resources
- The real gains accrue to the private parties to whom the forest dependent communities sell their products.
- Inappropriate signal for sustainable forest management.
- consumption levels can sustained only if the accumulated stocks of forest capital match the economic depreciation of natural capital.
- Government policy might accept the loss of renewable resource for the sake of economic development,
- The rents captured by fees or taxation should be reinvested in natural capital (maintain ecological functions of the original asset).

Implications of the results for State accounts

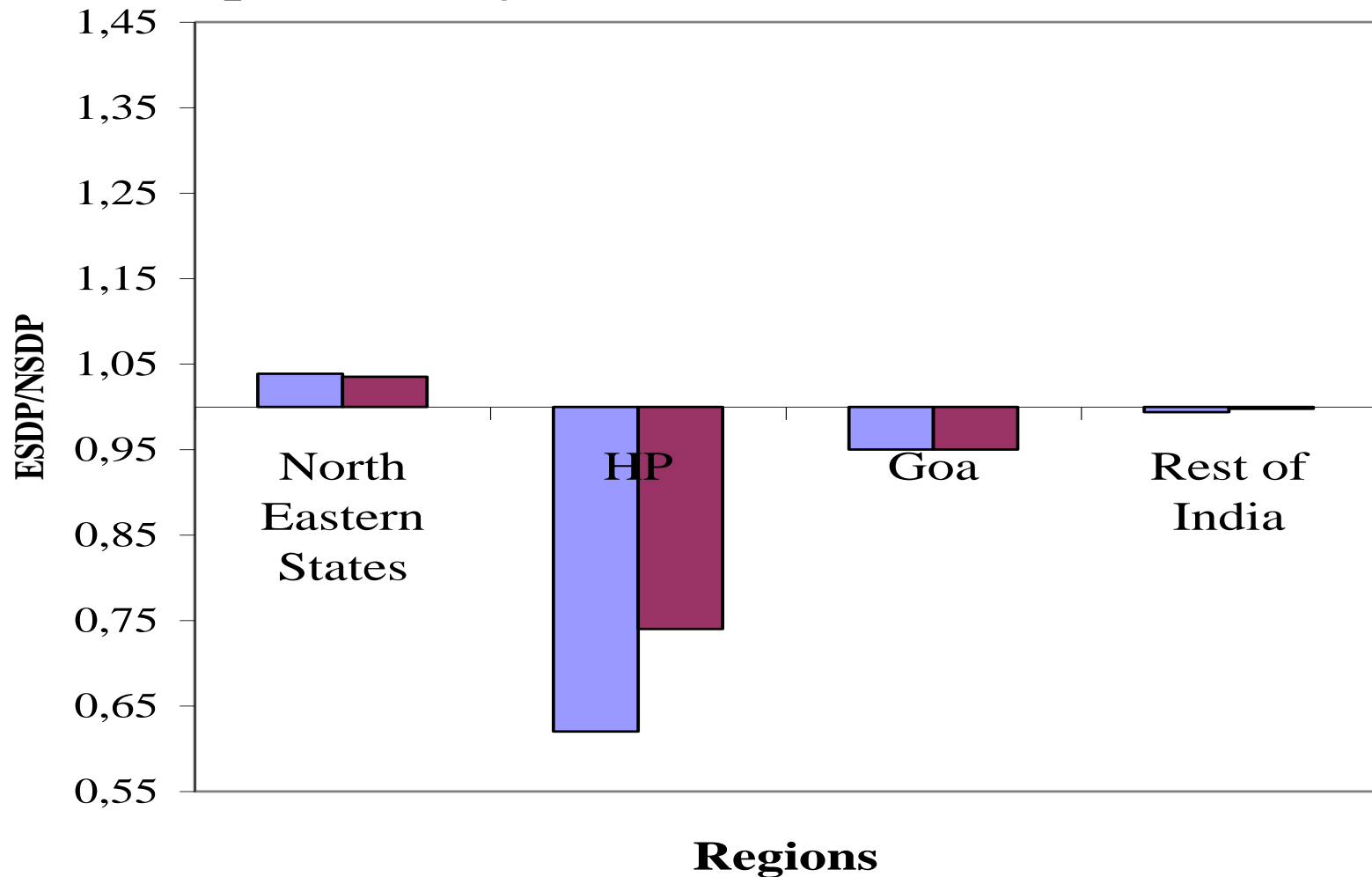
- Northeastern states are the most significantly understated in terms of the true economic size of their forest sectors, in the absence of any 'Green Accounting' adjustments.
- In most cases their net increases in natural capital escapes notice as well, an environmental 'double-whammy'.
- Existing national and state accounts do not factor in changes in value due to additions and reductions in forest stock
- This is an essential data point to assess whether a state economy is sustainable after accounting for forest losses.

North-Eastern State	Unadjusted 2003 GSDP* (INR Mio)	Unadjusted 2003 NSDP (INR Mio)*	2003 Adjusted NSDP (INR Mio)**	Adjustment as % of GSDP	Depletion and Degradation (INR Mio)	2003 ESDP (INR Mio)	ESDP/adjusted NSDP
ArP	19,451	17,395	32361	77%	390	31169	1.01
Assam	354,314	317,208	318911	0.5%	-663	318070	1.00
Mani	35,313	32,048	33217	3.3%	11,325	44433	1.34
Megh	43,429	38,423	40774	5.4%	2,532	43034	1.06
Mizo	17,687	16,346	18894	14.4%	- 647	18054	0.97
Nagaland	36,794	34,272	3392	-0.9%	1,649	35596	1.05
Tripura	60,617	56,603	55950	-1.1%	4,208	60202	1.08
Sikkim	11,527	10,387	10886	4.3%	296	11131	1.03
Total: North-East	579,132	522,682	544915	3.84%	19,090	561689	1.04
% of total	3.1%	3.2%	3.3%		-25.6%	3.4%	
Total: INDIA	18,539,943	16,387,846	16542370	0.1%	- 74,639	16449724	0.99
	(GDP)	(NDP)				(EDP)	

Implications of the results for State accounts

- The states Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Kerala and TN the ratio of ESDP/NSDP > 1 – for others ≤ 1 .
- Some of the states Goa and HP are experiencing great stress on their forests due to dependence on tourism
- Goa and Himachal Pradesh fare poorly by our sustainability yardstick when compared to other States.
- For Goa - significant depletion of 5% of adjusted NSDP.
- In HP depletion as per cent of adjusted NSDP 26%
- Others due to very state-specific factors.
- HP – TDS (Tree Distribution Scheme), Perverse incentives, unplanned removals
- Highly valuable deodar tree given away for just Rs 5 per cum as against a market price of Rs 9000

Depletion Adjusted NSDP (ESDP) to NSDP



■ ESDP/NSDP using net price method

■ ESDP/NSDP using weighted net price method

- Thank you !
- Over to Dr Pushpam Kumar, IEG, for
“Ecological Services of Forests”