Main Assets Built by TEEB

TEEB Reports & Databases

Constant review and updates

TEEB Approach

Collaborative stewardship

TEEB Community

Vibrant & expanding

TEEB Brand

Evolving, dynamic, jointly owned

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Key TEEB Recommendations

- **System of National Accounts …**
  Upgrade the SNA to include changes in Natural Capital. Start with physical accounts for forest stocks & carbon storage (>> REDD+ … Urgent)
- **Business…**
  Standardize, measure, disclose, all major "nature" externalities in statutory annual reports
- **Subsidies….**
  Measure & annually disclose environmentally harmful subsidies, manage them down, phase them out
- **Ecological Infrastructure …**
  Evaluate & invest in ecosystem conservation / restoration - for freshwater, soil, mitigation & adaptation.
- **Local and Regional Govt …**
  Build ecosystem service values into Regional Land Plans, Protected Area Budgeting, Eco-Certification, PES...

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Main Demands Made of TEEB Community ..

- TEEB Capacity Building for Developing Countries
- “Country” and “Regional” and “Sectoral” TEEB Analysis
- Green National Accounts (“WAVES” - WB, UNEP,& Others)
- Estimating Business Sector Externalities
- Identifying & closing Ecology & Valuation Knowledge Gaps
- Communicating the Issue to Society at Large

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India TEEB Deliverables & Timelines

(Discussed at Stakeholder Meeting, 10th Feb 2011)

- India TEEB - Interim Report — November 2012 (COP-11)
- India TEEB – Final Report — December 2013
- Green Domestic Product - Model — November 2012 (COP-11)
- Green Domestic Product – Final — December 2015
- Capacity building for state governments to generate similar periodic evaluations in-house on a bi-annual basis …

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India TEEB “Community” …

- Central Govt (Ministries)
- State Govts (States)
- Academic Institutions (Universities, Research NGO’s)
- Civil Society (NGO’s)
- Corporations (LLC’s)
- Financial Institutions (Banks, Insurance Companies)
- Advisory Board (Indian and International Experts)
- Project Coordinators (Overall + each Pilot state)
- Authors (expected 100+)
- Reviewers (expected 100+)

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Green Accounting for India's Forests, Agricultural land, & Pastureland

Pavan Sukhdev, GIST Advisory

Acknowledgements – GAISP authors :-

Haripriya Gundimeda *

Pushpam Kumar **

Sanjeev Sanyal

Rajiv Sinha

Pavan Sukhdev

(*Lead author of GAISP Monographs 1, 2, and 4)

(** Lead author of GAISP Monograph 7)

GIST's "Green Accounting for Indian States Project" (GAISP, 2003 – 2008)

"GAISP" …
Eight Monographs

"GAISP" team

Prof. Rajiv Sinha

Pavan Sukhdev
Sanjeev Sanyal
P. Yesuthasen

Haripriya Gundimeda
Pushpam Kumar

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“Green GDP” Adjustments

GIST Monographs

Stock Adjustments
Flow Adjustments

2002-03 (INR Mio / % of NDP or NSDP)		Assam		Himachal		Bihar		India	
GSDP or GDP		354,314	100.0%	159,460	100.0%	897,150	100.0%	**19,295,454**	**100.0%**
NSDP or NDP		317,208	89.5%	142,024	89.1%	787,033	87.7%	**17,083,824**	**88.5%**
Agriculture Losses - Soil Erosion, Sedimentation, Quantity changes	M2	-4,980	-1.6%	-1,135	-0.8%	-12,054	-1.5%	**-258,605**	**-1.5%**
Agriculture - Subsidies		-9,670	-3.0%	-2,604	-1.8%	-21,457	-2.7%	**-312,634**	**-1.8%**
Forests - Depletion of Timber/Carbon, Fuelwood, NTFP	M1	-663	-0.2%	-51,394	-36.2%	-1,032	-0.1%	**-74,639**	**-0.4%**
Forests - understated services of Timber/carbon, Fuelwood, NTFP		1,703	0.5%	56,539	39.8%	-11,683	-1.5%	**154,524**	**0.9%**
Forests - Ecological Services Lost	M7	-21,624	-6.8%	-10,470	-7.4%	-3,287	-0.4%	**-190,403**	**-1.1%**
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Scope Comparison : GIST (GAISP) vs "Valuation of Ecosystem Services"

GAISP Monograph	Unaccounted N/C Stocks & Flows	Unaccounted Ext. N/C Impacts	ESS Val'ns ?
1. Forest Biomass	Timber, Fuelwood, NTFP, Carbon		yes
2. Agriculture & Pasture	Land degradation, soil erosion	Sedimentation of waterways	
3. Sub-soil Assets	FF's, Fe, Al, Cu	Forest ESS loss, water pollution	yes
4. Forest Biodiversity	Eco-tourism, bio-prospecting, Existence value		yes
5. Education	Educational Capital		
6. Health	Pollution Impacts		
7. Forest Ecosystem Services	Regulating services	Flood losses, soil erosion, water augmentation	yes
8. Freshwater	Water quality		

Forests : Background

- 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 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 for, and reflected in development policies

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

Scope of Studies by the Green Accounting for Indian States Project ("GAISP") on 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,

- **Biomass** : Timber, Fuel-wood, Non-timber forest products, and Carbon sequestration ("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 mitigating flood damage ("GAISP Monograph-7")

Framework for Forest Accounting

(consistent with UN's SEEA 2003, Chapters 7 & 8)

- Opening stocks
- ➢ Changes due to economic activities
- ➢ Other Changes
- Closing stocks

- *Area* Accounts for Forest Land
- *Physical* Accounts for Timber (non-PA) and Carbon (PA)
- *Monetary* Accounts

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

Key Challenge : Diverse Data Sources

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

Data and Assumptions – Volume Accounts

- **Opening stocks** (stock of timber at the beginning of 2001)
- Data from : State of Forest Report (SFR), 'Extent composition and density of growing stock'
- Volume of timber harvested/logged (Recorded)- derived from the production statistics of timber and fuel-wood 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 afforestated 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 – Carbon 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 ≈0.5 x 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 – Carbon 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 defined as the present value of (present and future) carbon released arising from disturbance on forested land in the current accounting period
- **Closing stocks** (opening stocks less reductions plus additions)

Valuation

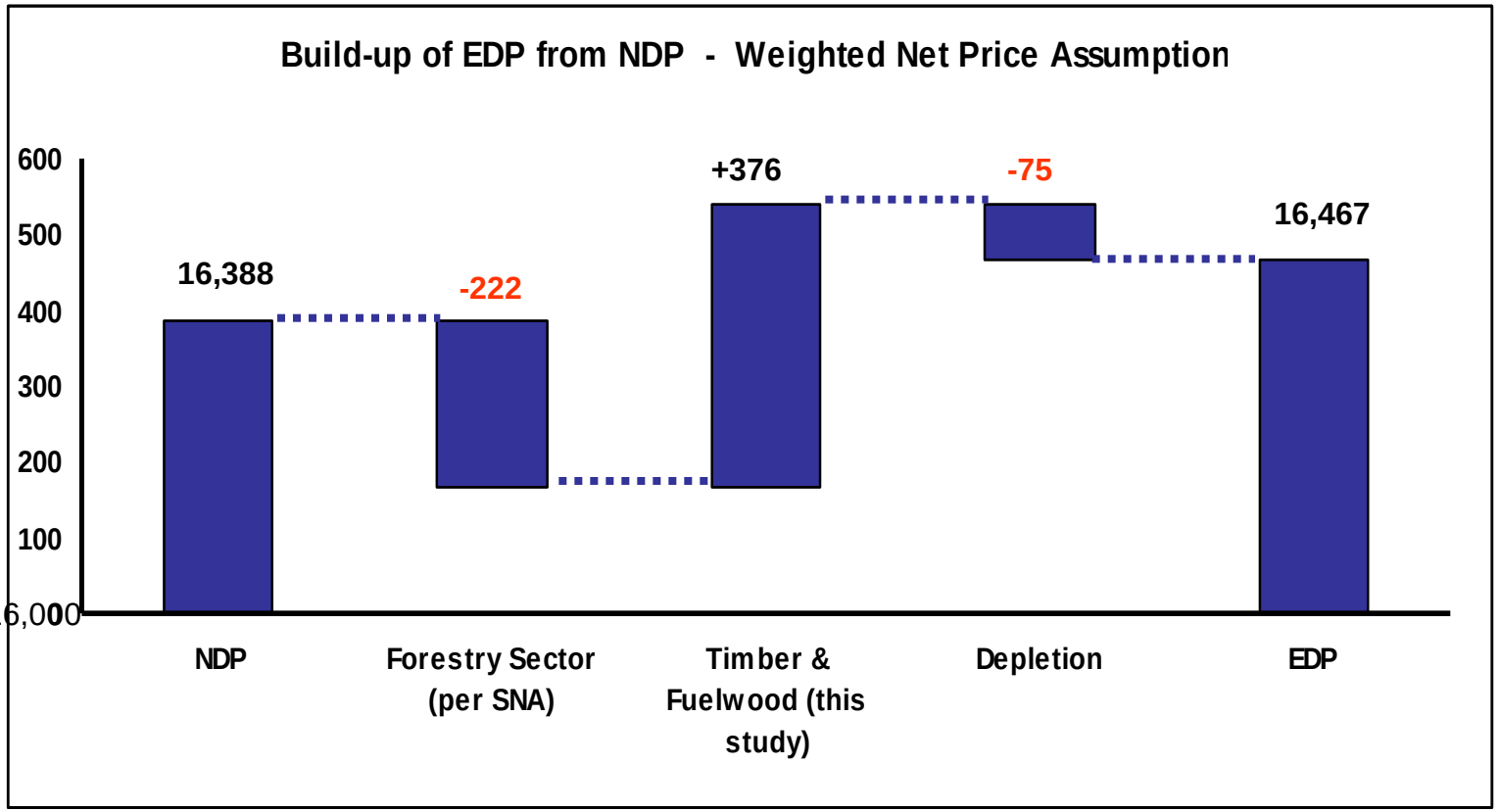
- Timber (Net price method)
- $V_t = (P_t – C_t)R_t = N_tR_t$.
- Market price of the product at factor cost less the cost of harvesting and the margin to the normal return on capital
- Value of the minor forest products (mfps) per hectare - taken from the statistics provided by the SFD.
- Unrecorded 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 national / state accounts

The forest accounts developed in our Monograph affect 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 formation to include accumulation in natural forests and net off depletion.
- Consumption of capital to include the cost of depletion of natural forests, which decreases NDP/NSDP.
- The result is the ESDP
- “ESDP = NSDP + (Accumulation - Depletion)”
- accumulation pf natural forests (non-produced assets, Anp) minus depletion (Dnp).

Build-up of Environmentally Adjusted State Domestic Product (ESDP)



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

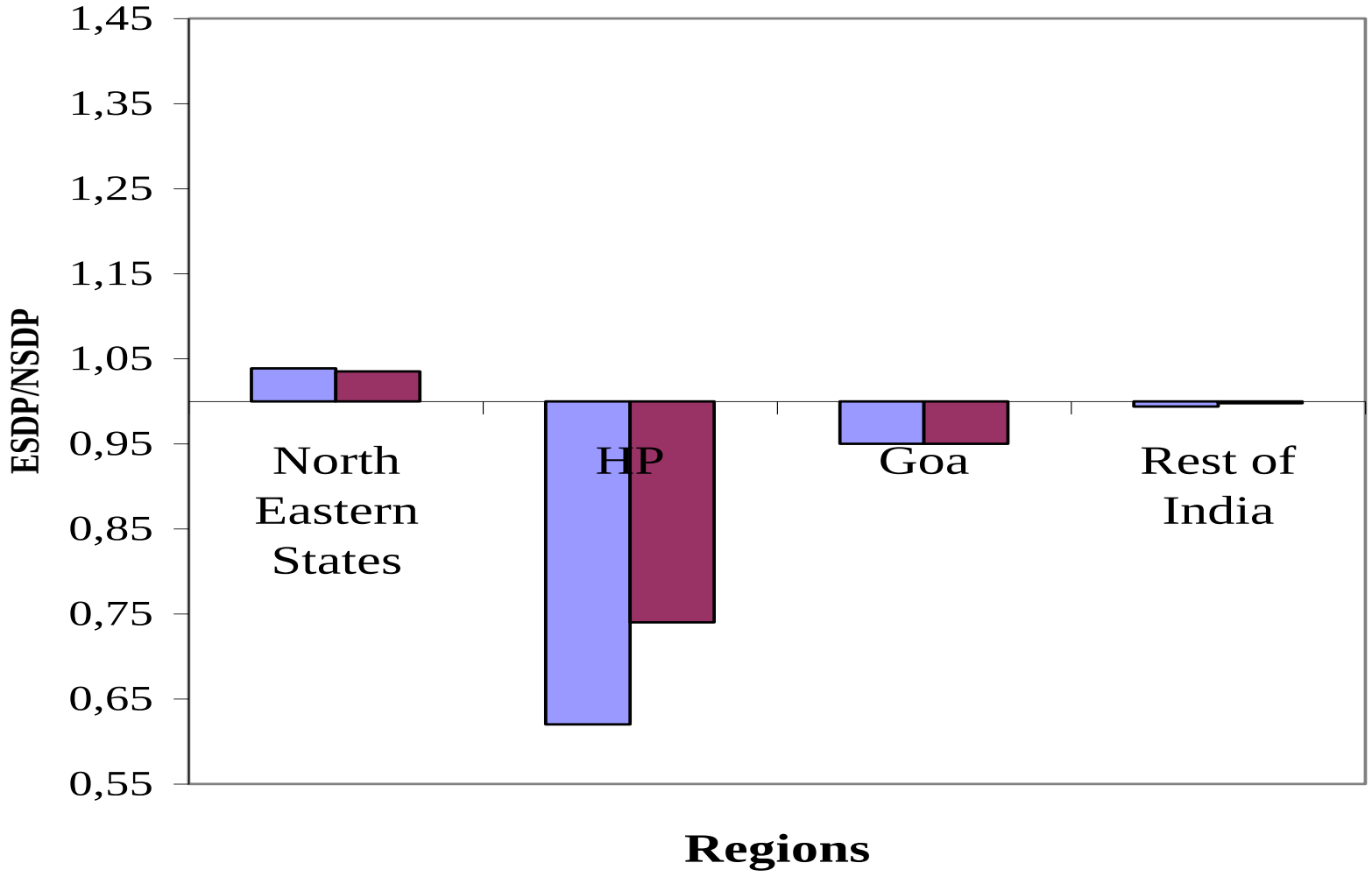
Implications of the results for State accounts

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



Species Diversity Profile for India

- India occupies 2.4% of world's area , but hosts 7% of global biodiversity
- One of the 12 mega-diversity hot-spot regions of the world
- 150,000 endemic plants species (50% of the world's total)
- Contains globally important populations of some of Asia's rarest animals, such as the Asiatic Lion, Snow Leopard, Bengal Florican
- 3120 species endangered under different threat categories.
- 39 species of mammal, 72 species of birds and
- 1336 plant species are vulnerable and endangered
- 20 species of higher plants - "possibly extinct"

Contribution of National Parks to Eco-Tourism

- From existing studies which use Travel Costs or CVM…
- We used a **benefits transfer method** based on valuation studies of 8 National Parks across India
- We used a meta regression analysis (instead of transferring demand curve).
- For Consumer Surplus, the following functional form was postulated
- CS/ha/tourist = α + β1*density of fauna + β2*dummy for CVM/TCM + ε
- CS/ha/tourist for different national parks in different states in India is obtained using above relationship
- CS/ha/tourist is multiplied with the total tourists and area of the parks to get the total consumer surplus.
- Amount of expenditure incurred to protect, maintain and upkeep the Protected areas deducted from total consumer surplus to get the net benefit from ecotourism

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Contribution of National Parks to Eco-Tourism

- Statistics available on the number of foreign and domestic tourists visiting each state
- Tourists visit different places mainly for recreational, religious or business purposes
- We need to know exactly how much national parks contribute to the tourist activity
- This enables to divide the expenditures incurred for different sites
- We fit a regression between number of tourists in a particular state and the variables influencing the tourism for domestic and foreign tourists.
- $ldomestic = \alpha + \beta 1 * area_np + \beta 2 * numberofattractions + \beta 3 * connectivitydummy + \varepsilon$
- $lforeign = \alpha + \beta 1 * area_np + \beta 2 * business + \beta 3 * dummy_popular + \beta 4 * dummy_connectivity + \varepsilon$

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Eco-Tourism Values - Results

- Correlation coefficients of areas of national parks and tourist visits positive and significant
- Lesser the “connectivity”, lower the number of tourists
- Tourist visitation rate higher in states which are popular destinations – irrespective of Bio-diversity
- A prime business centre attracts higher foreign tourists
- From the regression equation we estimated the amount of consumer surplus *attributable* to visitors *visiting national parks* alone

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Implied US $value CS/ domestic & foreign tourists

States	Foreign tourist	Domestic tourist
Andhra Pradesh	1 118	178
Arunachal Pradesh	5 002	798
Assam	7 288	1,162
Bihar and Jharkhand	1 493	238
Goa, Daman and Diu	679	108
Gujarat	2 415	385
Haryana	351	56
Himachal Pradesh	11 139	1,776
Jammu and Kashmir	2 651	423
Karnataka	5 430	866
Kerala	4 130	659
MP & Chhattisgarh	1 943	310
Maharashtra	2 079	332
Manipur	3 573	570
Meghalaya	4 001	638
Mizoram	1 722	275
Nagaland	2 401	383
Orissa	3 994	637
Punjab	347	55
Rajasthan	3 430	547
Sikkim	4 244	677
Tamil Nadu	3 215	513
Tripura	1 715	273
UP & Uttaranchal	5 223	833
West Bengal	5 980	954
A&N Islands	2 151	343
All-India	3 638	558

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Agricultural & Pasture Land : Scope & Objectives

- **Scope** : Impact of agricultural production on **land degradation, soil erosion, and sedimentation of water ways** (Note : Impacts of fertilizers and pesticides were dropped from GAISP 2003 scope)

❖ **Overall Objective** : Develop & demonstrate an accounting framework that reflects the real contribution of agricultural and pasturelands' contribution to society.

❖ **Specific objectives:**

- 1) Estimate the values of the stocks and changes of agricultural land and pastureland.
- 2) Incorporate the loss in value caused due to depletion of agricultural and pastoral resources into national & state accounts
- 3) Estimate the impact of the sector on environmental degradation in other sectors (eg: freshwater) thereby estimate the sector's real contribution to the economy.

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Accounting Framework : Agricultural & Pasture Land

Opening stock	Land under cultivation and pastures in the opening year
Changes in quantity	Asset increase due to land reclamation/improvement Transfer of land from economic use to environment
Other accumulation	Changes in land use Transfer of land from environment to economic use
Other volume changes	Changes due to natural, political or non economic causes
Closing stock	Land under cultivation and pastures in the closing year
Changes in quality of land	**Soil erosion & nutrient loss (in tonnes)** **Land/soil contamination including soil salinization and other changes in soil quality**
Impact on other sectors of the economy	**Extent of sedimentation in waterways**

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Key Challenge : Diverse Data Sources

- Agricultural Statistics published by the **Ministry of Agriculture** (Agricultural and pasture land area)
- **Statistical Abstract of India** (land use change matrix)

Changes in quality of Land

- Wasteland data available from different sources – **UNEP, Ministry for agriculture, NRSA (2000, 1989), SPWD (1984).** We took data from **NRSA (2000)** and adjusted for already existing degraded lands.
- ***"What is Degraded Land ?"*** : We included data on gullied/ravenous lands, upland with/ without scrub, water logged and marshy land, land affected by salinity and alkalinity, shifting cultivation, degraded pasture and grazing land as "degraded land" in our Monograph.

“Green GDP” Adjustments

GIST Monographs

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India's Natural Resource Losses, measured in GDP terms

(Net Resource Loss Adjustments as % of Gross State Domestic Product ; 2002-03 ; "Floor value

Natural Resource / State	Fresh-water	Forest Biomass	Forest Bio-diversity ('use values' only)	Forest Eco-Services	Capital Loss (as % of GSDP)
	Freshwater Quality	Timber, Fuel-wood, Carbon storage, NTFP	Eco-Tourism, Bio-prospecting	Water storage, Flood control, Topsoil retention	
Bihar	**- 5.4 %**	**- 4.7 %**	**- 0.0 %**	**- 0.4 %**	**- 10.5 %**
Himachal	**- 9.7 %**	**- 2.0 %**	**- 7.8 %**	**- 7.4 %**	**- 26.9 %**
Goa	**-17.6 %**	**+0.4 %**	**-1.7 %**	**- 5.1 %**	**-24.0 %**
Uttar Pradesh	**- 17.5 %**	**- 0.1 %**	**-1.4 %**	**- 1.8 %**	**-20.8 %**
India	**-3.4 %**	**+0.4 %**	**-1.7 %**	**+0.5 %**	**- 4.2 %**

Source : GIST's "Green Accounting for Indian States Project" (GAISP) Monographs # 1, 4, 7, & 8.

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Note : for forest services, these are **net** 2002/03 GSDP adjustments, i.e. **after positive adjustments** for unaccounted service flows… i.e. stock losses from deforestation (**net** of re-growth) exceed unaccounted benefit flows

Key Learnings from GAISP Experience…

1.Imperfect Data : Optimize…. **data** availability, **data** quality, diverse **data** sources

2.Transparency : Spreadsheets with Transparent Assumptions are better than Black Boxes without

3.Comparability : Comparability of results is key for Impact. Comparisons Communicate, & bring debate back from Methodology to Policy

4.Policy Relevance : Pick sectors (eg: freshwater) and issues (eg: GDP of rural poor) that have to use green acctg

5.Inclusive Wealth : People *believe* they understand GDP, so adjusted GDP's move them. People don't yet *believe* they understand Inclusive Wealth

6.Recruiting : Macroeconomists are many, National Accountants few !