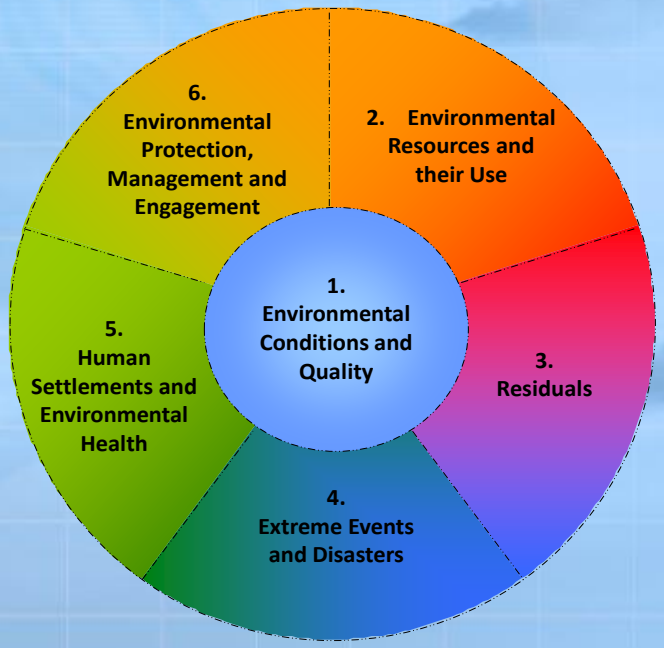
Forest statistics in the FDES

Topics 1.2.3: Forests, 2.3.2: Use of forest land, 2.5.1: Timber resources, and 2.5.5: Other non-cultivated biological resources of the Basic Set of Environment Statistics of the FDES 2013



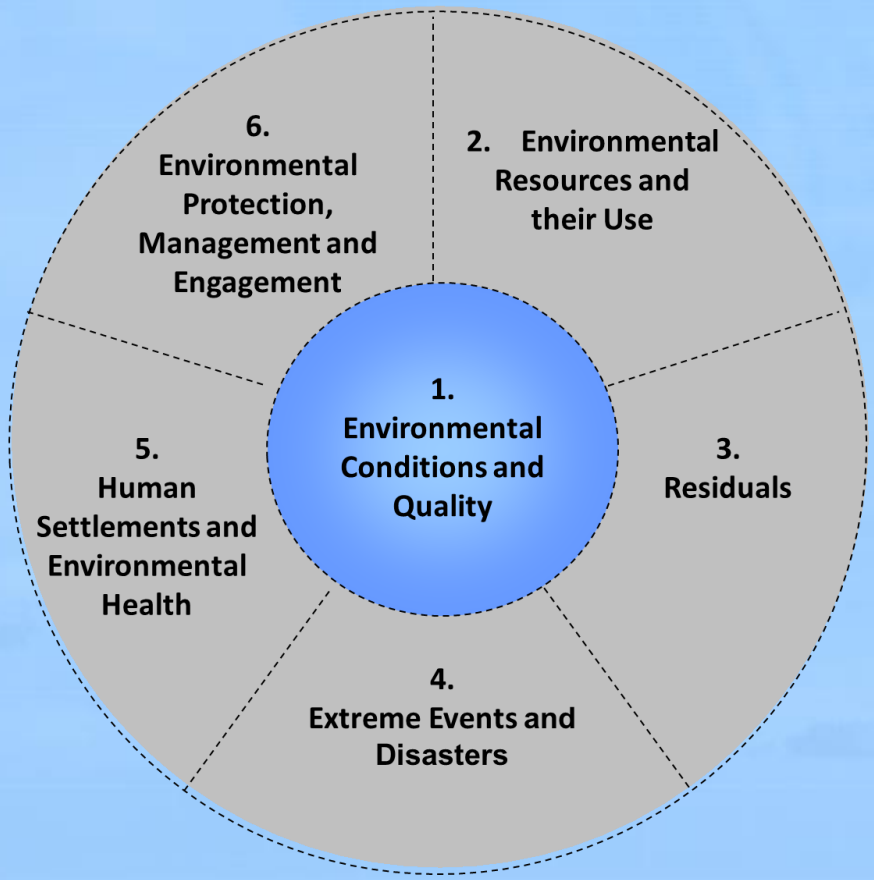
National Technical Training
Workshop on Environment Statistics

Kololi, Banjul, The Gambia

6-8 August 2019

Forest statistics (4 Topic)

1. Learning objectives
2. Review of Level 0
3. Level 1 (Compilers)
   - Key statistical concepts
   - Group exercise & Discussion
4. Level 2 (Data providers)
   - Data options, examples & issues
   - Group exercise & Discussion
5. Closing Discussion



What are forest statistics?

Level 0

‘We can’t live without forests’

Eight thousand years ago, **half of the Earth’s land surface** was covered by forests or wooded areas. Today, these areas represent less than one third. Forests are home to 80% of the world’s land-based biodiversity and billions of dollars worth of medicinal plants are harvested from tropical forests every year. In addition, **1.6 billion people** depend on them to some extent for their livelihoods.

FAO (http://www.fao.org/zhc/detail-events/en/c/262862/)

‘Forest is land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use’

FAO (2018) Global Forest Resources Assessment 2020: Terms and Definitions (FRA 2020) (http://www.fao.org/3/I8661EN/i8661en.pdf)

What are forest statistics?

Level 0

Key global statistics on forests (from latest IPBES report):

- 45%: increase in raw timber production since 1970 (4 billion cubic meters in 2017)
- 50%: agricultural expansion that occurred at the expense of forests
- 50%: decrease in net rate of forest loss since the 1990s (excluding those managed for timber or agricultural extraction)
- 68%: global forest area today compared with the estimated pre-industrial level
- 7%: reduction of intact forests (>500 sq. km with no human pressure) from 2000-2013 in developed and developing countries
- 290 million ha (+/-6%): native forest cover lost from 1990-2015 due to clearing and wood harvesting
- 110 million ha: rise in the area of planted forests from 1990-2015
- 10-15%: global timber supplies provided by illegal forestry (up to 50% in some areas)
- >2 billion: people who rely on wood fuel to meet their primary energy needs

Why are forest statistics needed?

Level 0

- Policy context: global climate regulation, climate change mitigation, multiple ecosystem services, biodiversity, REDD+
- Uses: evidence to support policies, from local to global
- Needs: globally, the extent of the world's forests continues to decline as human populations continue to grow and demand for food and land increases
- Gaps: despite great advance in mapping/inventory technology, uncertainties and data gaps remain: e.g. on biomass, forest composition




SDGs on Forests

Level 0

Indicator 2.3.1: Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size

Indicator 6.6.1: Change in the extent of water-related ecosystems over time

- **Indicator 15.1.1:** Forest area as a proportion of total land area
- **Indicator 15.2.1:** Progress towards sustainable forest management
- **Indicator 15.b.1:** Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems

Level 0

FDES tal

Component 1: E

Sub-component 1.2: La	
Topic 1.2.3: Forests	
Statistics and Related	
(Bold Text - Core Set/T	
- Tier 2; *Italicized Text*	
a.	Forest area
	1. **Total**
	2. Natural
	3. Planted
	4. Protected for 1.2.2.d)
	5. Forest area a
b.	Forest biomass
	1. Total
	2. *Carbon stora biomass*

Compone

Sub-compo	
Topic 2.3.2	
Statistics a	
(Bold Text	
Tier 2; *Italic*	
a.	Use
	1. **Ar**

Component 2: Environmental Resources and their Use

Sub-component 2.5: Biological Resources

Topic 2.5.1: Timber resources

Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
a.	Timber resources		▪ By type (e.g., natural or planted) ▪ National ▪ Sub-national	▪ SEEA Central Framework (2012) ▪ FAO FRA ▪ State of Europe's Forests (Forest Europe/UNECE-FAO Forestry and Timber Section) ▪ UNECE/FAO Joint Working Party on Forest Statistics, Economics and Management ▪ ISIC Rev. 4, Section A, Division 02
	1.**Stocks of timber resources**	Volume		
	2. Natural growth	Volume		
	3. Fellings	Volume		
	4. Removals	Volume		
	5. *Felling residues*	Volume		
	6. *Natural losses*	Volume		
	7. *Catastrophic losses*	Volume		
	8. *Reclassifications*	Volume		
b.	Amount used of:		▪ National ▪ Sub-national	
	1. Fertilizers (also in 3.4.1.a)	Area, Mass, Volume		
	2. Pesticides (also in 3.4.1.b)	Area, Mass, Volume		

Component 2: Environmental Resources and their Use

Sub-component 2.5: Biological Resources

Topic 2.5.5: Other non-cultivated biological resources

Statistics and Related Information		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
f.	*Non-wood forest products and other plants*	Mass, volume	▪ By type of product ▪ National ▪ Sub-national	ISIC Rev. 4, Section A, Class 0230

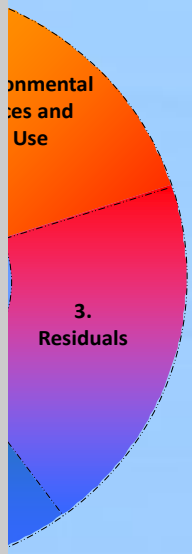
				▪ UNECE/FAO Joint Working Party on Forest Statistics, Economics and Management ▪ ISIC Rev. 4, Section A, Division 02 ▪ FAOSTAT database
b.	Fore func	d. Fuelwood production	Volume	▪ National
		e. Imports of forest products	Currency, Mass, Volume	▪ By type of product
		f. Exports of forest products	Currency, Mass, Volume	▪ FAO/ITTO/ UNECE/Eurostat Inter-secretariat Working Group on Forest Sector Statistics ▪ State of Europe's Forests (Forest Europe/UNECE-FAO Forestry and Timber Section) ▪ HS 2012, Sections IX and X

Methodological Guidance

FAO FRA
UNSD: SDG

State of Europe's orests (Forest urope/UNECE-FAO orestry and Timber ection)

FAO FRA



How do forest statistics look like?

Level 0

Basic table template

Topic 1.2.3: Forests						
	a.	Forest area (also in 1.2.1.a and 1.2.2.a)		2005	2010	2015
		1	Total	Area	Area	Area
		2	Natural	Area	Area	Area
		3	Planted	Area	Area	Area
		4	Protected forest area (also in 1.2.3.c)	Area	Area	Area
		5	Forest area affected by fire	Area	Area	Area
	b.	Forest biomass				
		1	Total	Volume	Volume	Volume
		2	Carbon storage in living forest biomass	Mass	Mass	Mass

How do forest statistics look like?

Level 0

Examples SEEA CF

Table 5.15
Physical asset account for forest and other wooded land (*hectares*)

	Type of forest and other wooded land				
	Primary forest	Other naturally regenerated forest	Planted forest	Other wooded land	Total
Opening stock of forest and other wooded land	20	100	150	130	400
Additions to stock					
Afforestation		2	5		7
Natural expansion		3			3
Total additions to stock		5	5		10
Reductions in stock					
Deforestation	2	10		5	17
Natural regression				3	3
Total reductions in stock	2	10	0	8	20
Closing stock of forest and other wooded land	18	95	155	122	390

Level 0

What do you need to compile forest statistics?

1. NSDI, GIS platform
2. Expertise (EO, forests inventories)
3. Forest inventories data (from network of plots)
4. Classification(s) and units
5. Compilation templates

Welcome to
Level 1: Forest statistics

Level 1: learning objectives

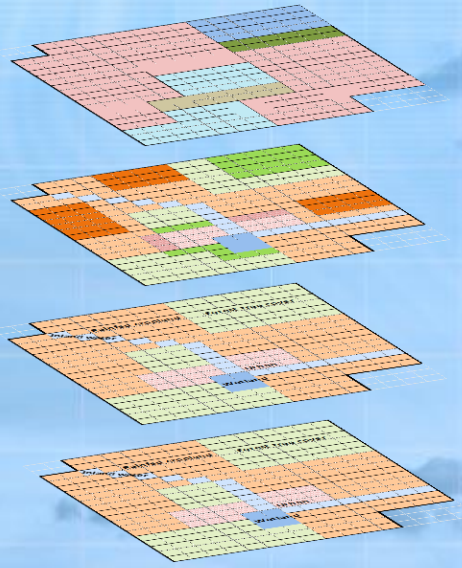
Get familiar with:

- Key concepts on producing basic forest statistics
- Key definitions and classifications (from MS)
- Data needs and sources (Department of Forestry)
- Aggregation and disaggregation
- Data quality and validating statistics

Input data on forest

Level 1

1. GIS platform: ArcGIS, qGIS, R, Python
2. EO instruments: ESA Sentinels, NASA MODIS, Landsat
3. Maps



Forest cover, forest composition, at least 2 points in time

Forest use and ownership

Admin. units, boundaries

Other helpful spatial data: deforestation, protected areas, infrastructure

4. Ground data and statistics: forest plots

Definitions

Level 1

- Total (forest area) (FDES 1.2.3.a.1): The total area of forest
- Natural (forest area) (FDES 1.2.3.a.2): Forest predominantly composed of trees established through natural regeneration
- Planted (forest area) (FDES 1.2.3.a.3): The area of forest predominantly composed of trees established through planting and/or deliberate seeding
- Total (forest biomass) (FDES 1.2.3.b.1): .. composed of above-ground, below-ground and dead wood biomass = Carbon storage
- Area deforested (FDES 2.3.2.a.1): conversion of forest to other land use
- Area reforested (FDES 2.3.2.a.2): Area of re-establishment of forest through planting and/or deliberate seeding on land classified as forest
- Area afforested (FDES 2.3.2.a.3): Area of establishment of forest through planting and/or deliberate seeding on land that, until then, was under a different land use, implies a transformation of land use from non-forest to forest

Definitions

Level 1

- Stocks of timber resources (FDES 2.5.1.a.1): The stock of timber resources is defined by the volume of trees, living or dead, and include all trees regardless of diameter, tops of stems, large branches and dead trees lying on the ground that can still be used for timber or fuel
- Forest production (FDES 2.5.1.c) and Fuelwood production (FDES 2.5.1.d): Wood forestry products cover removals of roundwood (including wood fuel and industrial roundwood) and production of wood products (e.g., sawnwood, wood pulp, veneer sheets etc.).
- Imports of forest products (FDES 2.5.1.e)
- Exports of forest products (FDES 2.5.1.f)
- Non-wood forest products and other plants (FDES 2.5.5.f): Goods derived from forests that are tangible and physical objects of biological origin other than wood

Level 1

Classifications

- Forest products (FAO/UNECE)

Group 1: Wood in the rough
Group 2: Residues of wood processing; recoverable wood products
Group 3: Wood chips and particles
Group 4: Wood simply worked or processed
Group 5: Wood sawn lengthwise: veneer sheets
Group 6: Wood-based panels (including similar par
Group 7: Pulp of wood or other ligna-cellulosic ma
Group 8: Paper and paperboard
Group 9: Waste paper
Group 10: Raw, semi-processed and worked cork

- Forest composition:
- Example India

(Champion and Seth (1968)

Table 11.1. Relative extents of different types of Indian forest.

Forest type	*Area (in million hectare)*	*Percent of total forest area*
Tropical moist evergreen	4.5	5.8
Tropical moist semievergreen	1.9	2.5
Tropical moist deciduous	23.3	30.3
Littoral and Swamp	0.7	0.9
Tropical dry evergreen	0.1	0.1
Tropical dry deciduous	29.4	38.2
Tropical Thorn	05.2	6.7
Subtropical broad leaved montane wet forest	0.3	0.4
Subtropical dry evergreen	0.2	0.2
Subtropical pine	3.7	5.0
Montane wet temperate	1.6	2.6
Himalayan moist temperate	2.6	3.4
Himalayan dry temperate	0.2	0.2
Subalpine	3.3	4.3
Moist alpine	—	—
Dry alpine	—	—

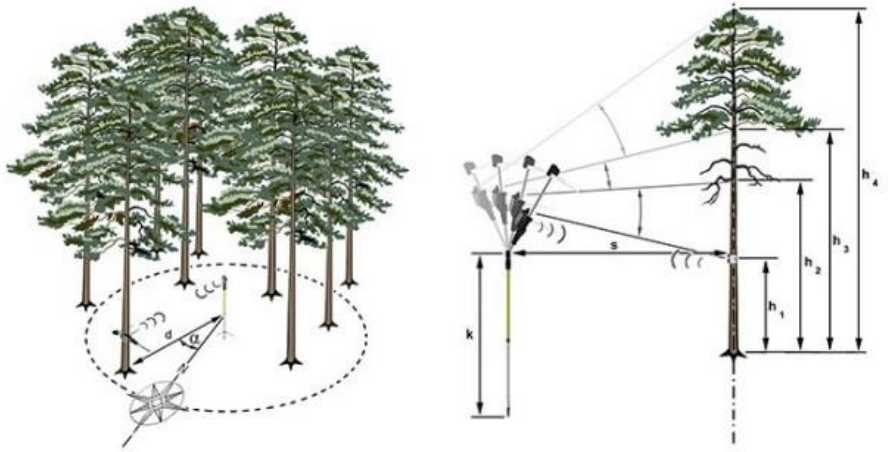
Level 1

From data to statistics

- Forest statistics are usually well developed, by respective National agencies/departments
- Additional data processing may be needed to produce forest statistics/accounts using multiple inputs (from different departments)
  - Review and harmonizing definitions and classifications on forest
  - Spatial data corrections and harmonization of input data (common projections, extents, spatial resolution)
  - Conversions for biomass

Level 1

Forest inventory data



1 Land Measurements

- selecting plots

2 Measuring Standing Trees

- tree diameters at breast height
- tree heights
- tree age

3 Volume Calculations

- using yield and volume tables

4 Estimating Site Stocking and Density

Study plot	N (Trees ha^{-1})				$\bar{D}$ (m)			$\bar{H}$ (m)			Basal area (m^2 ha^{-1})		
	Beech	Others	Total	Understory all species	Beech	Others	Total	Beech	Others	Total	Beech	Others	Total
Lang-I[1]	312	17	329	323	0.240	0.536	0.255	20.5	32.6	21.2	21.01	3.97	24.99
Lang-II[1]	246	17	263	414	0.296	0.357	0.301	22.9	27.9	23.3	23.07	1.93	25.00
Lang-III	212	4	216	56	0.366	0.307	0.365	26.3	25.7	26.3	31.49	0.30	31.79
Average "Lanugla"		269				0.307			23.6			27.26	
Hai-I	150	37	187	373	0.442	0.368	0.427	28.0	29.1	28.2	29.94	4.06	34.00
Hai-II	220	88	308	440	0.274	0.428	0.318	19.3	27.3	21.6	21.31	13.62	34.94
Hai-III	257	87	344	150	0.288	0.512	0.345	22.2	33.2	25.0	24.39	19.28	43.67
Hai-T[2]	271	63	334	189	0.272	0.461	0.308	21.4*	30.3*	23.1*	22.46	11.70	34.15
Average "Hainich NP"		293				0.350			24.5			36.69	

Source: https://forestrypedia.com/what-is-forest-inventory/

Mund, M. (2004). Carbon pools of European beech forests (Fagus sylvatica) under different silvicultural management, Citeseer.

Level 1

Aggregation and disaggregation

- Units: parcels (properties); natural communities
- Spatial aspects: forest cover in spatially explicit way, products - national
- Temporal aspects: FRA every 5 years

Timeseries – forest basic statistics

Level 1

Forest biomass in The Gambia, from FAO-FRA

Forest	Biomass in tonnes			
	1990	**2000**	**2005**	**2010**
Aboveground biomass	49 907 540	52 027 586	53 087 891	54 147 970
Belowground biomass	11 977 810	12 486 621	12 741 094	12 995 513
Living biomass	61 885 350	64 514 207	65 828 985	67 143 483

Carbon stock

A/- Carbon stock is calculated by multiplying the biomass by 0.47. Carbon stocks of litter and soil have not been estimated.

B/- Carbon in the litter has been estimated, based on the standard factor of 2.1 (Tropical, broadleaves), and Soil carbon has been estimated, based on the factor of 31 (Tropical, dry with sandy soils).

Timeseries forests – SDGs

Level 1

SDGs metadata source: https://unstats.un.org/sdgs/metadata/

Ex Indicator 15.1.1: Forest area as a proportion of total land area

*Forest area (reference year) / Land area (2015) * 100*

SDG 15.1.1(Tier 1) Forest area as a proportion of total land area (%)				
	2000	2005	2010	2015
Percentage	45.5	46.5	47.4	48.2

Source of data: United Nations Global SDG Database, FAO, Global Forest Resources Assessment and FAOSTAT

https://unstats.un.org/sdgs/indicators/database/

Welcome to
Level 2: Forest statistics

Level 2: Learning objectives

1. More conceptual issues:
   - Role of statistics in rapidly growing environmental challenges linked to forests: e.g. ecosystem services versus development policies
   - Integration, impartiality and quality standards
   - one official set of statistics, for multiple uses
2. Examples from other countries
3. Input data options and sources
   - International data
   - Multiple sources, new methods
   - Metadata
4. Data quality and uncertainty

Level 2

How do forest statistics look like?

Examples from compendia: India

Statement 1.46 : State-wise Forest Area

ENVIR

Statement 1.47 : Forest cover in India - classwise

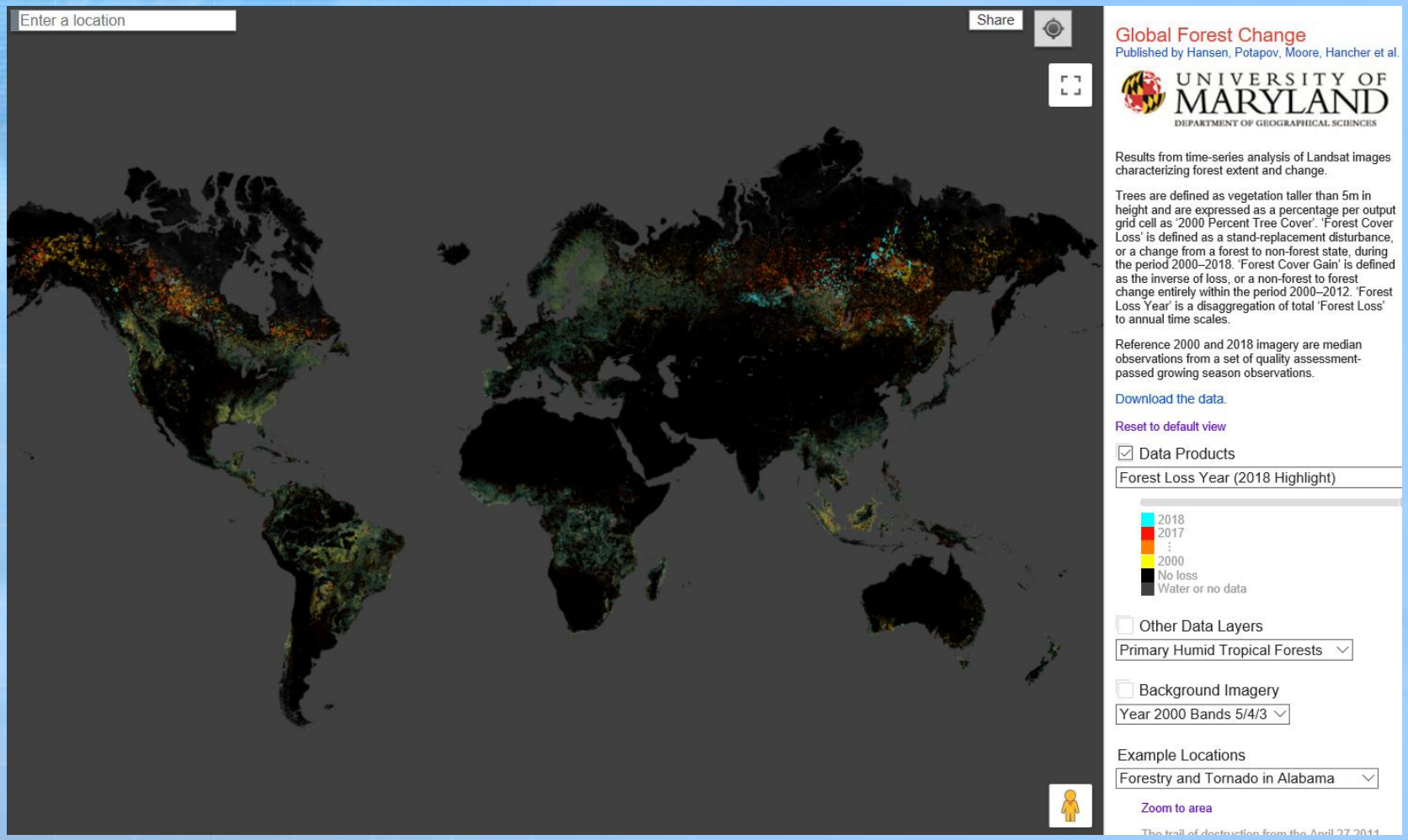
Class	2005		2011		2013		2015		2017	
	Area (Sq. Km)	Percentage of Geographic Area	Area (Sq. Km)	Percentage of Geographic Area	Area (Sq. Km)	Percentage of Geographic Area	Area (Sq. Km)	Percentage of Geographic Area	Area (Sq. Km)	Percentage of Geographic Area
Forest Cover										
Very Dense Forest	54,569	1.66	83,471	2.54	83,502	2.54	85,904	2.61	98,158	2.99
Moderately Dense Forest	332,647	10.12	320,736	9.76	318,745	9.7	315,374	9.59	308,318	9.38
Open Forest	289,872	8.82	287,820	8.75	295,651	8.99	300,395	9.14	301,797	9.18
Total Forest Cover*	677,088	20.6	692,027	21.05	697,898	21.23	701,673	21.34	**708,273**	**21.54**
Scrub	38,475	1.17	42,176	1.28	41,383	1.26	41,362	1.26	45,979	1.4
Non-forest	2,571,700	78.23	2,553,060	77.67	2,547,982	77.51	2,544,228	77.4	2,533,217	77.06
Total Geographic Area	**3,287,263**	**100**	**3,287,263**	**100**	**3,287,263**	**100**	**3,287,263**	**100**	**3,287,469**	**100**

Source : India State of Forest Report 2005-2017, FSI

*Includes 4,921 sq km under Mangrove Cover

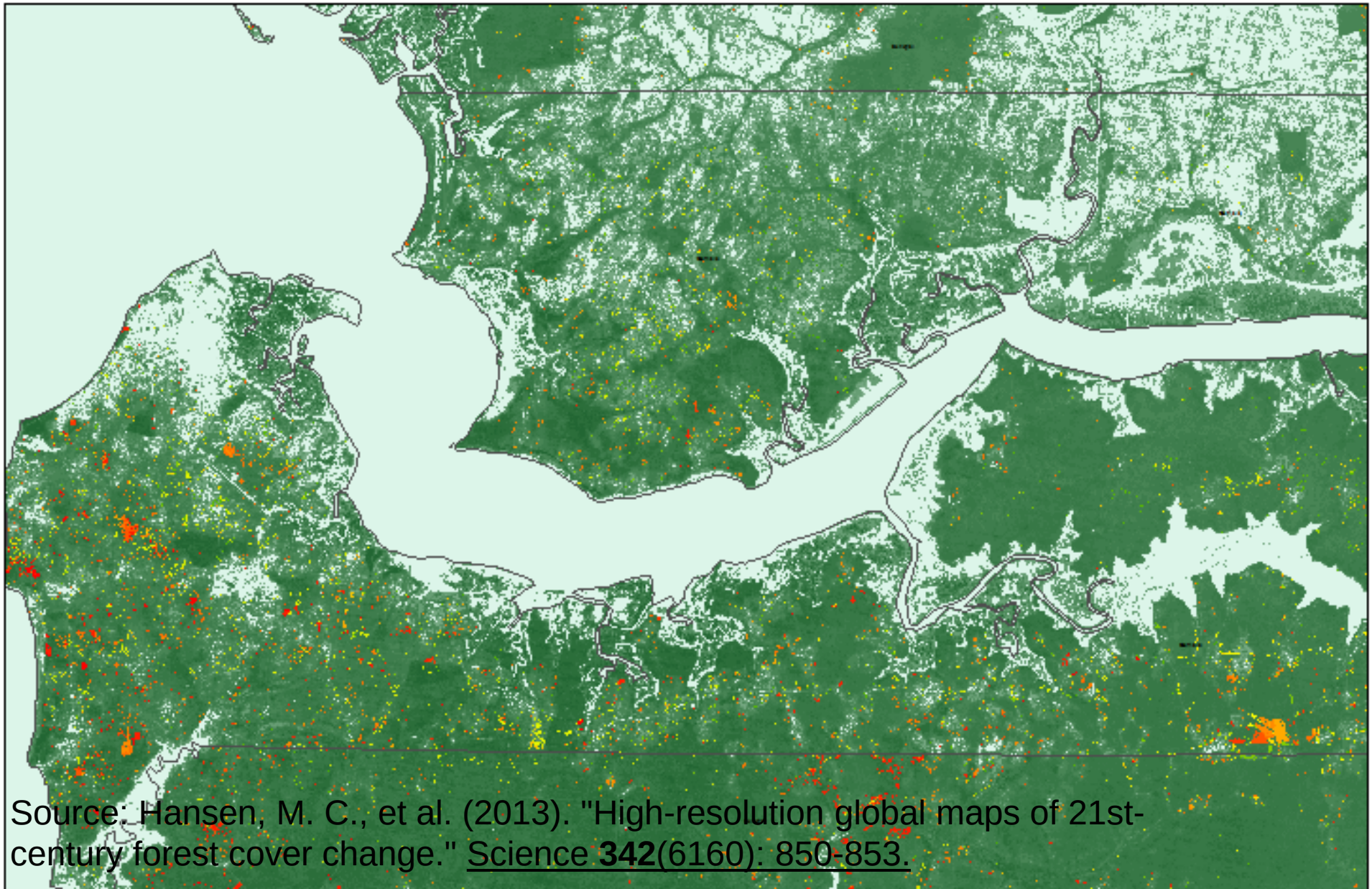
International data sources

High-resolution global maps of 21st-century forest cover change



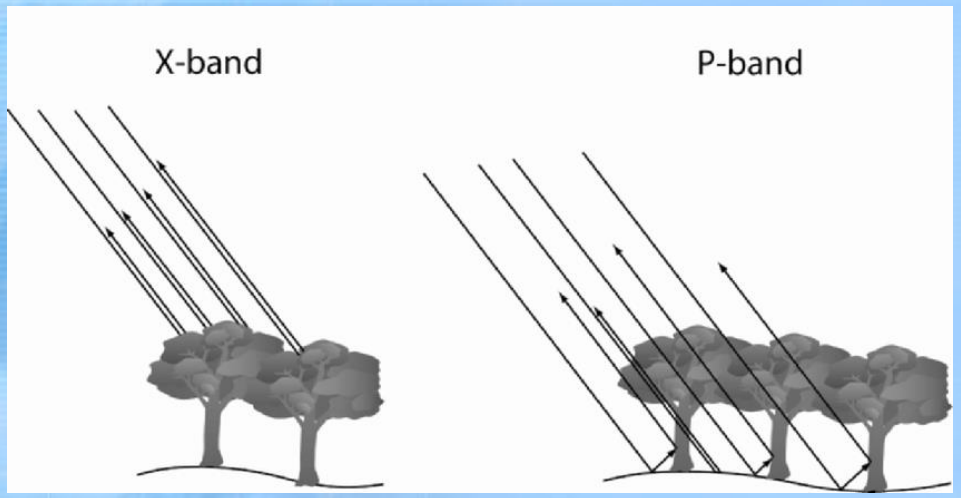
Source: Hansen, M. C., et al. (2013). "High-resolution global maps of 21st-century forest cover change." Science **342**(6160): 850-853.

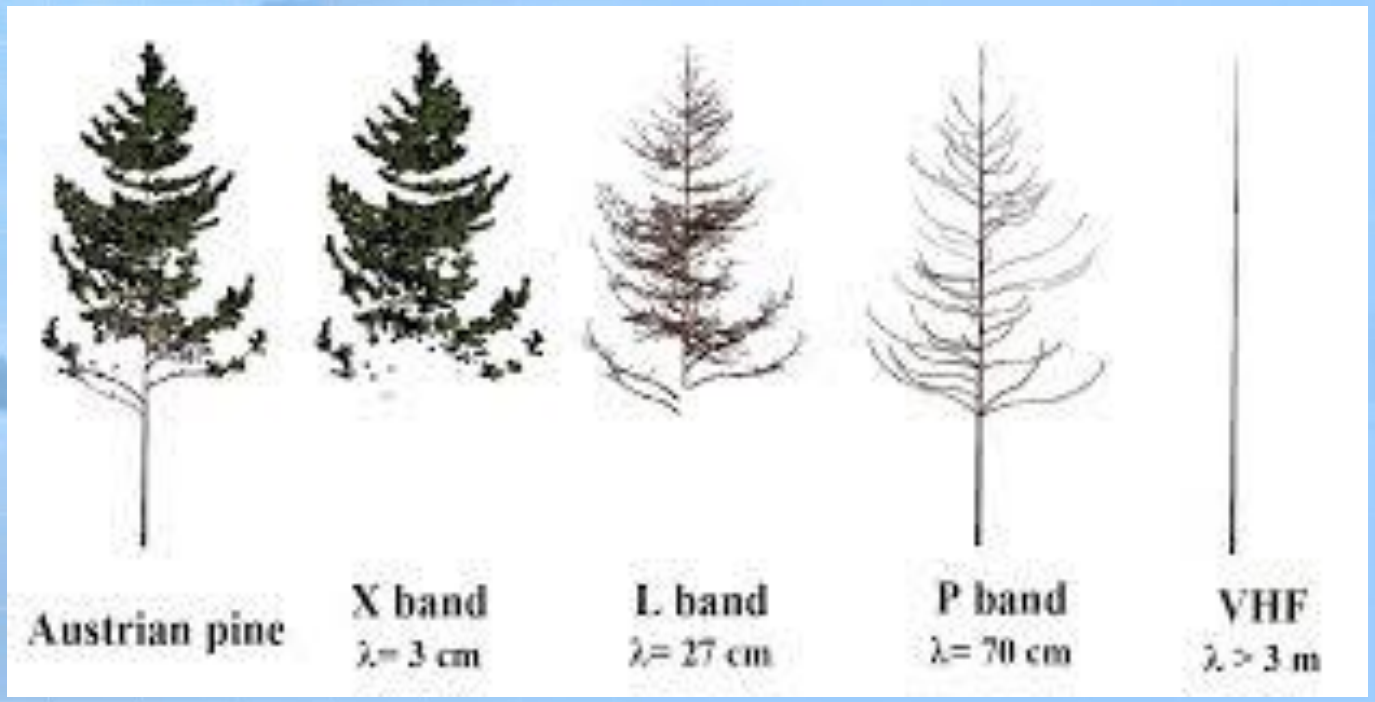
International data sources



Source: Hansen, M. C., et al. (2013). "High-resolution global maps of 21st-century forest cover change." Science **342**(6160): 850-853.

New data sources: SAR





Level 2

Discussion points

1. What national data and classifications for forests are available for your country?
2. What data could you use to create forest statistics?
3. What would be the priorities?
4. Discuss and report your results

Questions and comments?

Thank you for your attention!

For more information please contact the Environment Statistics Section at the UN Statistics Division:

E-mail: envstats@un.org
website: http://unstats.un.org/unsd/ENVIRONMENT/