Country Presentation: India

Methodological Issues for REDD

Estimation and Monitoring Methodologies for Forest Carbon Stocks

Dr Rekha Pai
Deputy Inspector General of Forest
Ministry of Environment and Forests
Government of India

Tokyo Workshop

Decision 2/CP.13, paragraph 7

- **range of policy approaches and**
- **positive incentives for REDD**

SBSTA 28: (FCCC/SBSTA/2008/L.12)

- **advancing the development of possible methodological approaches under REDD**

Parties Submissions on REDD (21 March 2008)

- **FCCC/SBSTA/2008/MISC.4 and Add.1–3**
- **Most submissions advocate**
  - Use of IPCC GPG (LULUCF) 2003
  - Remote Sensing (RS) based assessment and monitoring
  - Supported by robust sampling and ground truthing
  - Need for continuous data collection
  - Sustainable management of forests and forest conservation
  - Need to define deforestation and degradation

Main Methodological Issues

(SBSTA 28, Bonn June 2008, FCCC/SBSTA/2008/L.12)

Estimation and monitoring

- National monitoring systems to facilitate results-based, demonstrable, transparent and verifiable estimates
- Options for robust, consistent methodologies including forest inventories, ground-based, and remote-sensing approaches, as appropriate;
- Applicability of the considered methodologies, including those in existing good practice guidance of the Intergovernmental Panel on Climate Change (IPCC), to the assessment of reductions in emissions from deforestation; reductions in emissions from degradation, and incremental changes due to sustainable management of the forest.

Indian Submission
(21 March 2008)

Salient Features

- **Policy approach**
  A comprehensive REDD Mechanism

  (Must include all approaches)
  - Conservation, Sustainable Management of Forests and Increase in Forest Cover **(for Carbon added)**
  - Reducing Deforestation **(for Carbon saved)**
- **Incentives**
  - Incremental Carbon stocks
  - Baseline Carbon stocks
  - **Common Methodology based on remote sensing and minimum ground verification**

Sustainable Management of the Forest

- Improvement in existing cover
- Increase in forest/ tree cover

  (harvest< increment) = net addition
- Net GHG removals estimation with reference to starting date (baseline)

Methodology: Main Parameters (India)

- **National Level Accounting Mechanism**
- **Baseline Year** (say 1990)
- **Assessment of Forest Carbon Stocks**
  - Biomass Carbon
  - Soil Organic Carbon (SOC)
- **Assessment at regular intervals** (5 year National Level Forest Carbon Accounts)

Reference Emissions Level

- To be based on availability of reliable historical data
- Allow countries to choose starting date according to their national circumstances (in case of India – 1990)

India initiated policy of participatory approach involving local communities (JFM/PFM) for forest protection and improvement of degraded forest lands in 1990

Assessment of Forest Carbon Stocks: Indian Approach

Forest Cover Mapping Methodology in India

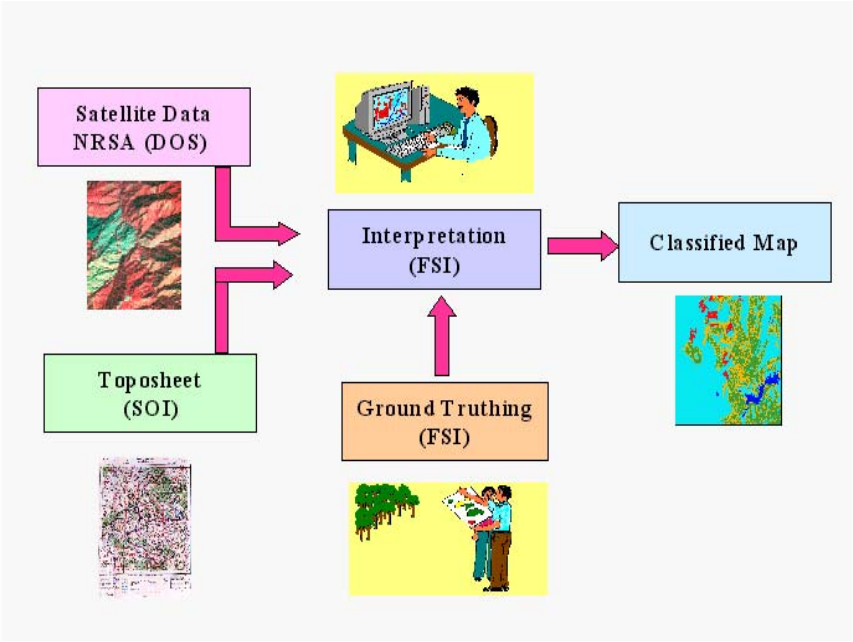
First country in the world to start an operational system for monitoring forest cover

Methodology

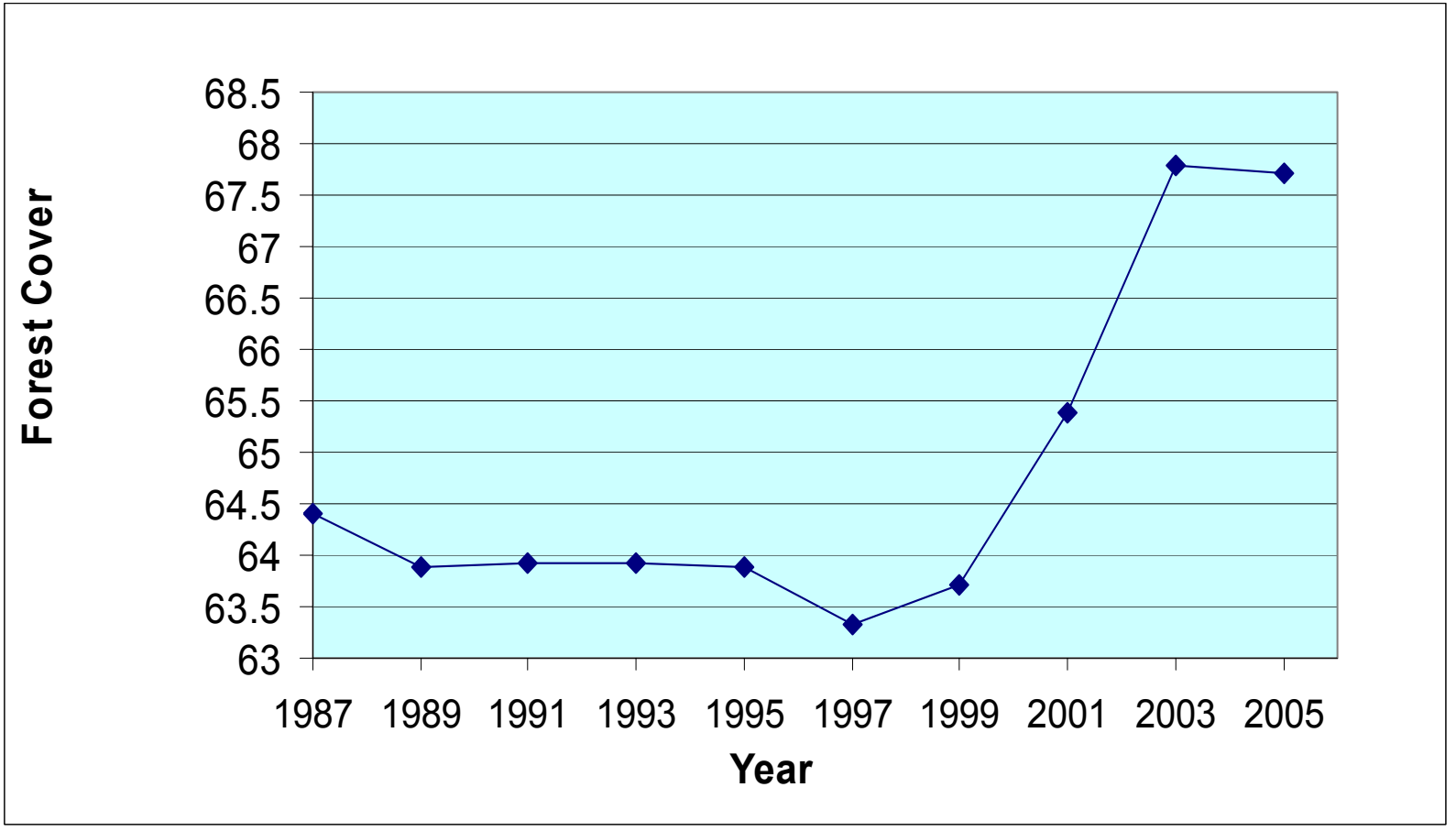
- Forest cover assessment since 1987 on biennial cycle
- digital interpretation of satellite data
- intensive ground truthing
- change maps
- accuracy assessment

Analysis and output

- district-wise area figures
- change matrix
- area figures for hill and tribal districts
- maps available on 1:50,000 scale
- capturing forest cover down to 1 ha (Resolution of 23.5 m), using IRS-1D LISS III sensor



India's Forest Cover (Million Ha)



Tree cover (TOF): High resolution data; Field inventory 2.8%

Assessment of Forest Carbon Stocks

–Biomass Carbon

–Soil Organic Carbon (SOC)

Biomass Carbon

- Forest Type Mapping

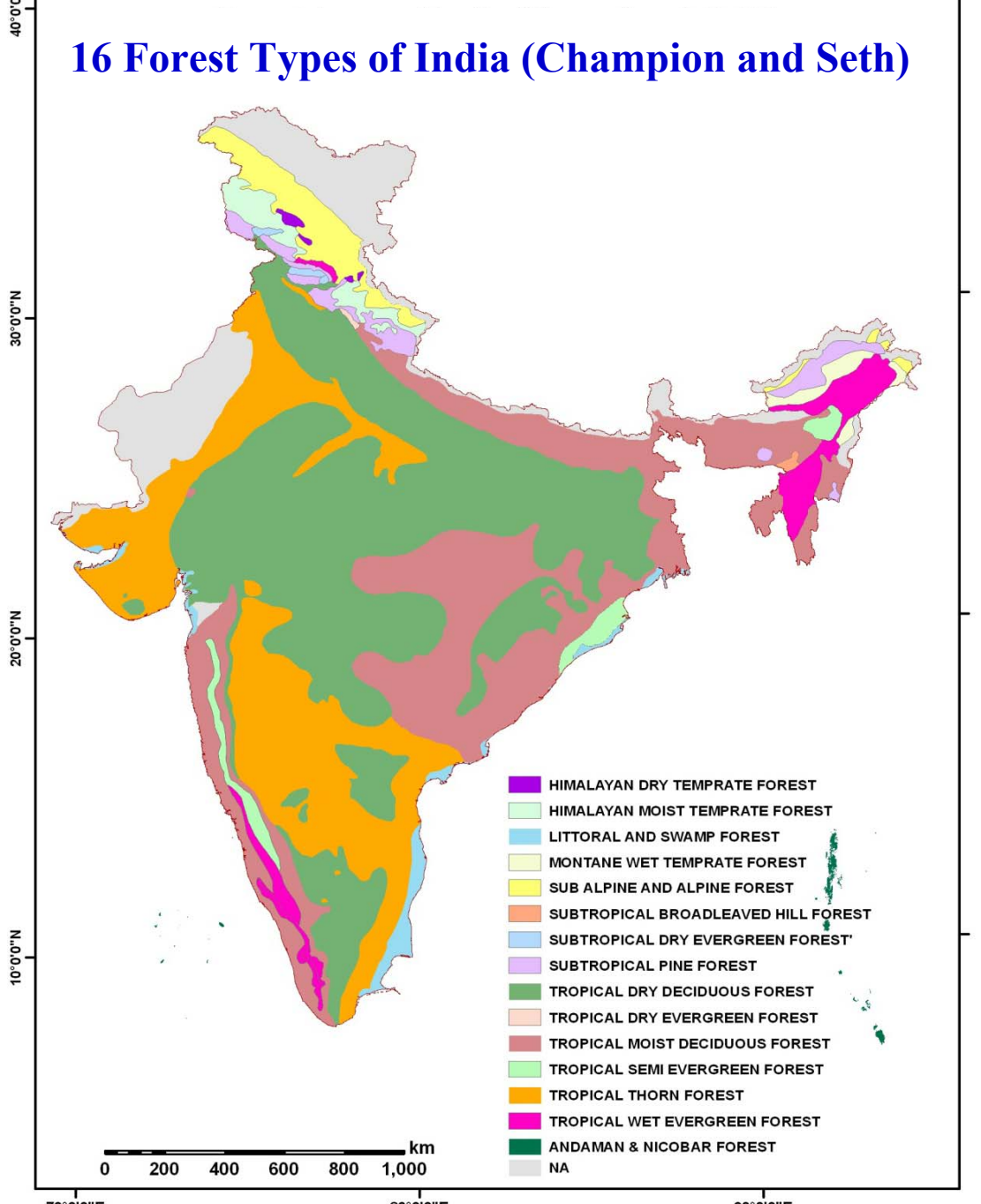
–Scale 1:50,000 (providing minimum mappable area as 1 ha)

Forest types (Champion and Seth Classification- 16 forest types, 46 sub groups, 221 subgroup types)

- Forest Cover Mapping

Forest density (3 classes: Very dense >70%, Moderately dense 40-70%, Open 10-40%)

16 Forest Types of India (Champion and Seth)



Forest Cover Map

10-40%

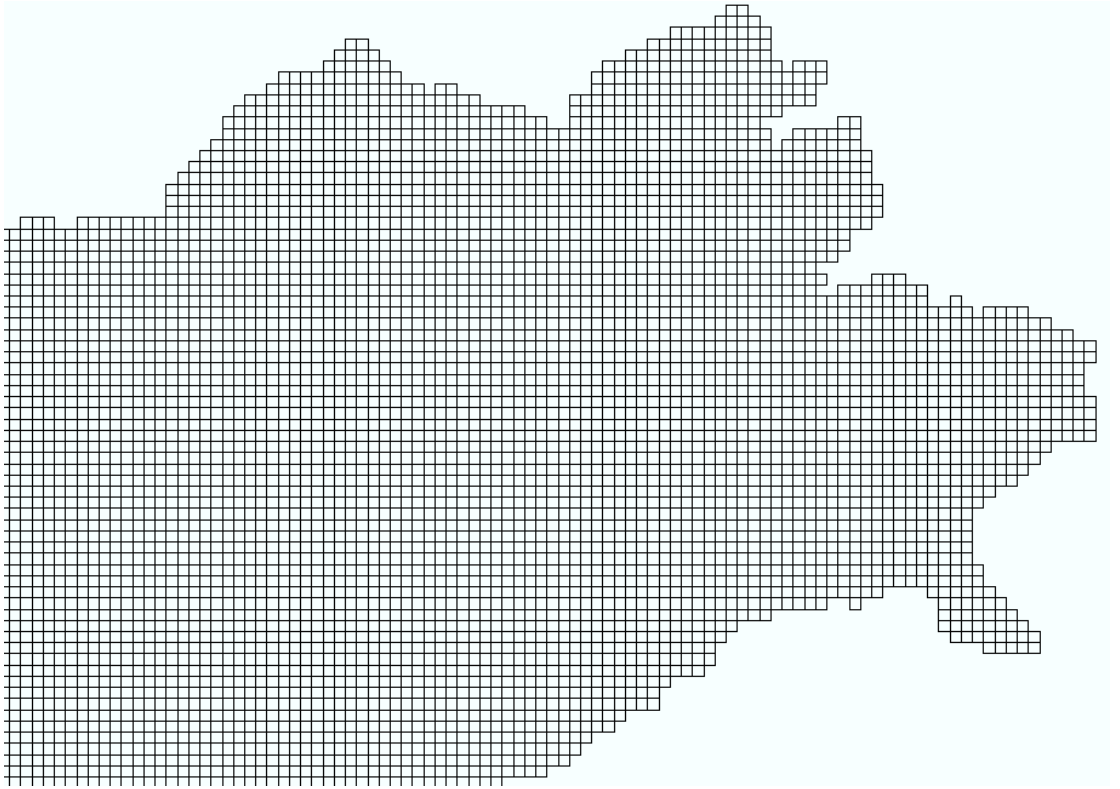
40-70%

>70%

Estimation of Growing Stocks at National Level

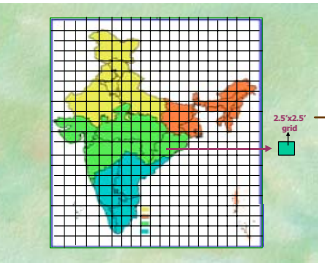
- Spatial data base in GIS comprising of 171,028 grid polygons of 2 ½'x 2½' size (approximate area 18 km^2)
- Polygon-wise estimation of growing stock using volume estimates for all the forested grids in the country

Nation –Wide Vector Coverage of Polygons (of extent 2.5’ x 2.5’)



- Total number of polygons – 171,028
- Attribute data has been linked to the polygons

ASSESSMENT OF GROWING STOCK, BIOMASS CARBON IN INDIA'S FORESTS



Divided into Grids of 2½'x2½'

2.5'x2.5'

Selection of Forested Grids

2.5'x2.5'

Density

Forest type/strata 2.1½'x2.1½'

Volume

Forest Cover Maps based on Satellite data

Aerial Photograph, Stock maps, Inventory forms

Location specific Inventory data

Forest

Non forest

Calculation of volume in the Grid

Map sheets

State/UT wise

Stratum wise

Growing Stock Assessment for the Entire country

20,000 sample plots – Volume –Biomass (V*D)-- Biomass Expansion factor -AGB) -- root shoot ratio - carbon factor (Estimated or IPCC default)

Biomass

Carbon

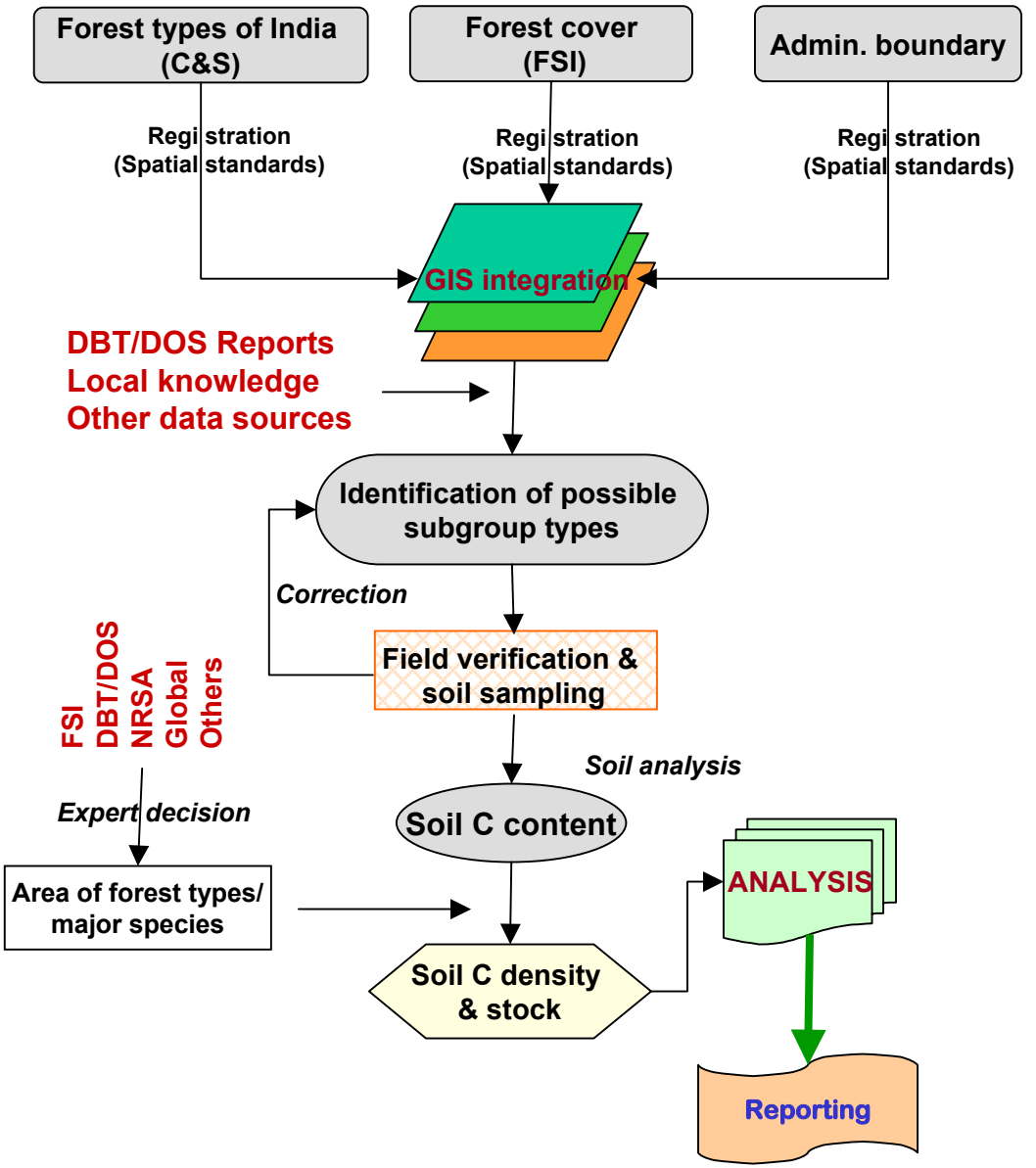
Accuracy

- Forest cover assessment accuracies >92 percent
- National level assessment of growing stock: sampling error of <3 per cent
- Development of biomass expansion factors and root: shoot ratio for more accurate estimates

SOC Estimation

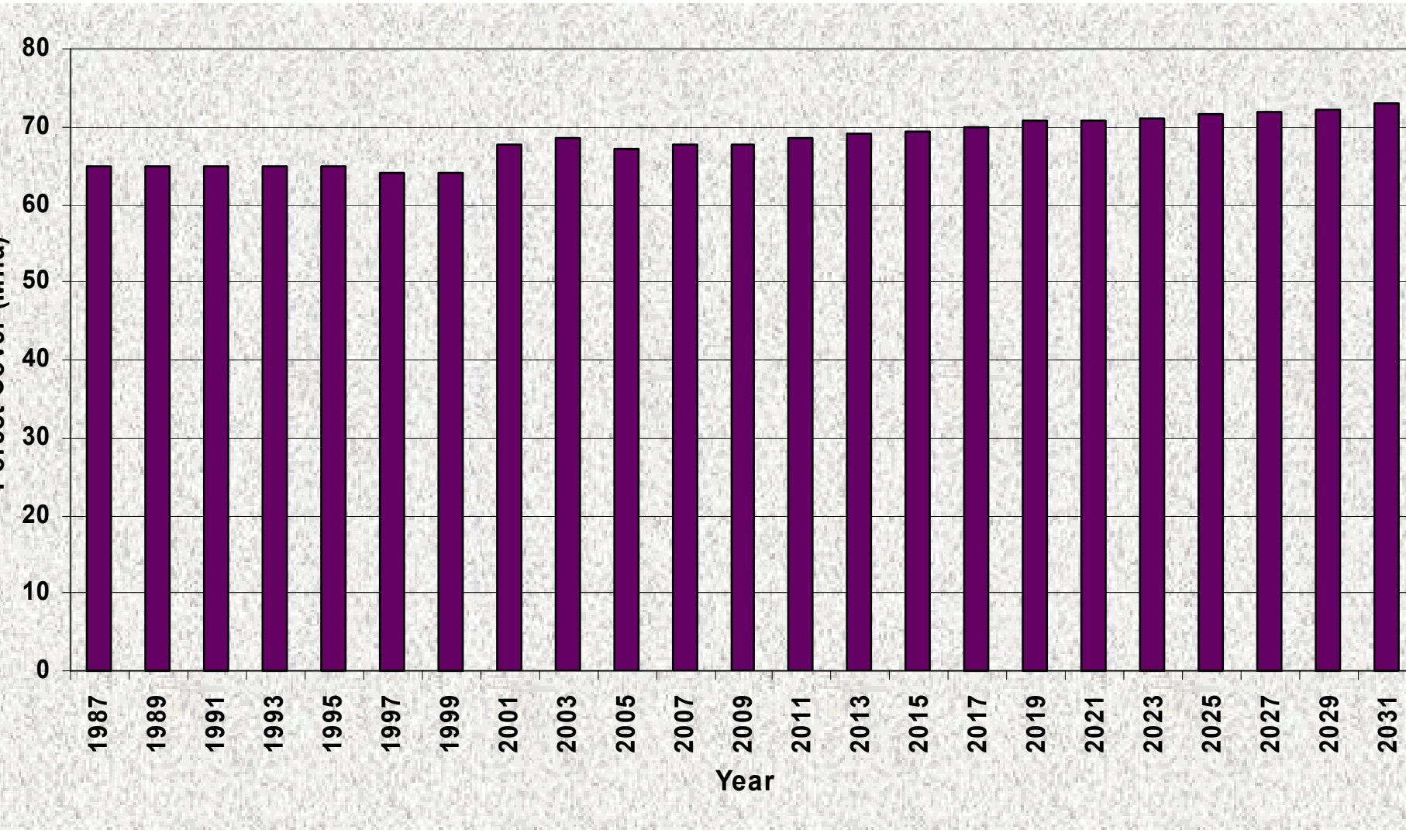
- ✓ Forest Groups/major types : 16
- ✓ Sub-groups : 46
- ✓ Sub-group types : 221
- ✓ No of replications : 3
- ✓ Total samples : 660
- ✓ Depth of sampling : 0-30 cm
- ✓ Standard & uniform sampling and estimation procedure
- ✓ Area coverage of each subgroup types (221)
- ✓ Aggregation and upscaling to forest types (16)
- ✓ Estimation of variability and uncertainty

Assessment of Soil Organic Carbon



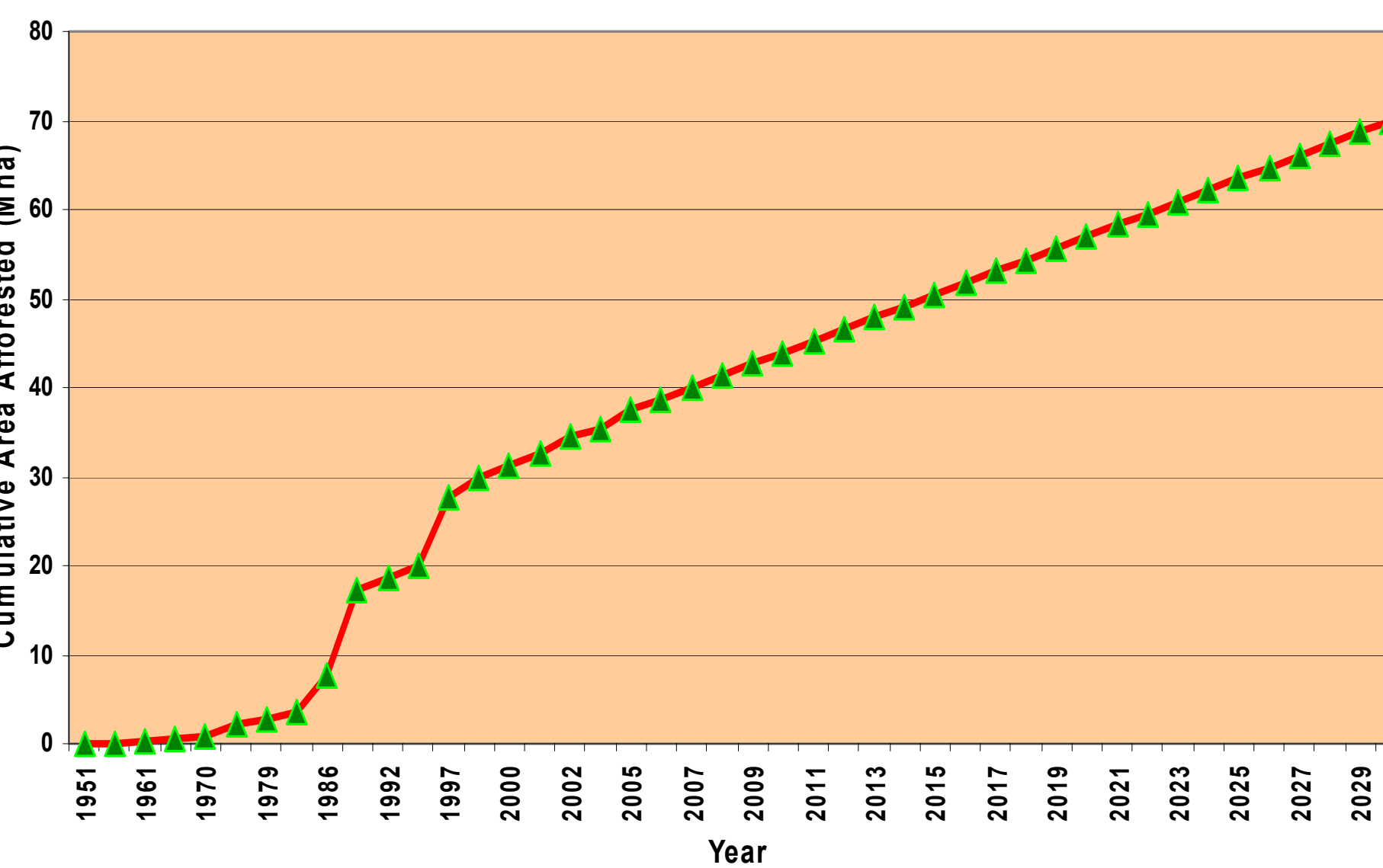
Carbon Stock Projection: Indian Scenario

Model based projection of carbon stocks in India's forests and tree cover, as per studies of Indian Institute of Science, Bangalore (2006), estimates increase in carbon stocks as contained in the country's forests from **8.79 GtC in 2005 to 9.75 GtC in 2030**



rojected trend in forest cover under the current trend scenari

(Source: Indian Institute of Science, 2006)



Projected Afforestation under current trend scenario

(Source: Indian Institute of Science, 2006)


Thank You