

Impacts of afforestation on sustainable livelihoods in rural communities in India

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ISB

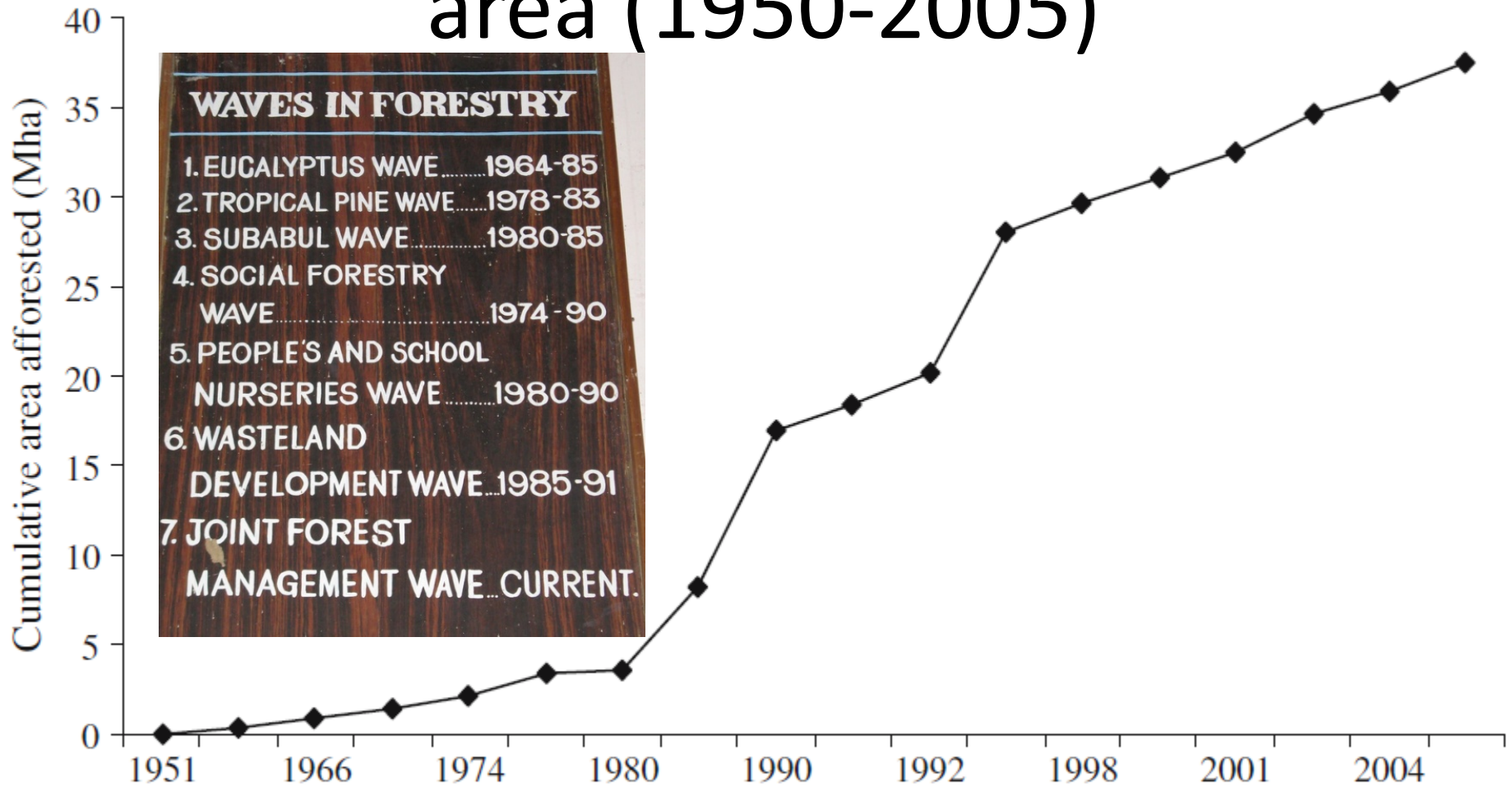


Afforestation plantations in India

- These are plantations on *Government-owned forest land*
 - INDC proposes \$6.2 billion afforestation in coming years
 - 2018 Draft Forest Policy calls for expanding plantations & expanded role for private industry in public lands plantations
- Public Forests are essential life support for hundreds of millions of India's poorest
 - Food, medicines, and shelter
 - Firewood
 - Grazing
 - Commercial NTFPs
 - Ecosystem services (pollination, water, climate regulation, etc.)



Afforestation of 10% of India's land area (1950-2005)



Ravindranath, N. H., I. K. Murthy, R. K. Chaturvedi, K. Andrasko, and J. A. Sathaye. 2007. "Carbon forestry economic mitigation potential in India, by land classification." *Mitigation and Adaptation Strategies for Global Change* 12 (6):1027-50. P. 1029

There are no evaluations of the impact of plantations in India

- And very little literature looking at the impact of plantations on livelihoods anywhere

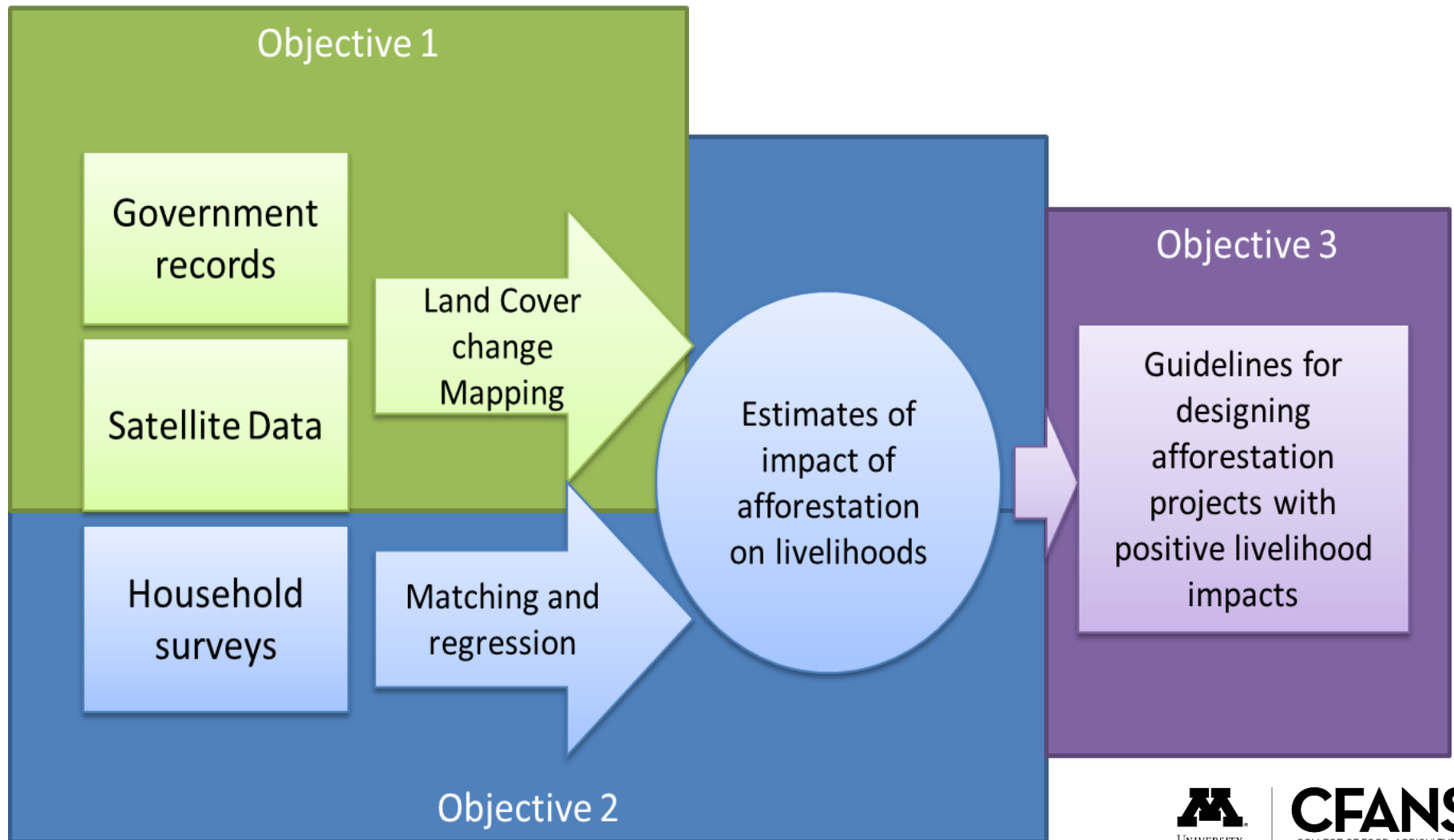


What impacts might we expect?

- Increased forest cover?
 - only if the trees survive
- Increased timber production?
 - Many parts of India have green felling bans
- Improved provision of ecosystem services?
 - what if plantations replace forests or savannas?
- Increased supply of timber, firewood, and NTFPs?
 - Depends on species, age
- Increased forest work opportunities?
 - Depends on property & management rights
- Decreased fodder availability?
- Changes in de facto and de jure property rights?



Research Strategy



Kangra District as a focus

- Similar to other Himalayan foothill areas in Himachal, Uttarkhand
- Our collaborator, Dr. Pushpendra Rana, IFS, is a forest official from this area, helping us work closely with the government in evaluating the impact of plantations.



Pilot study (2015-16)

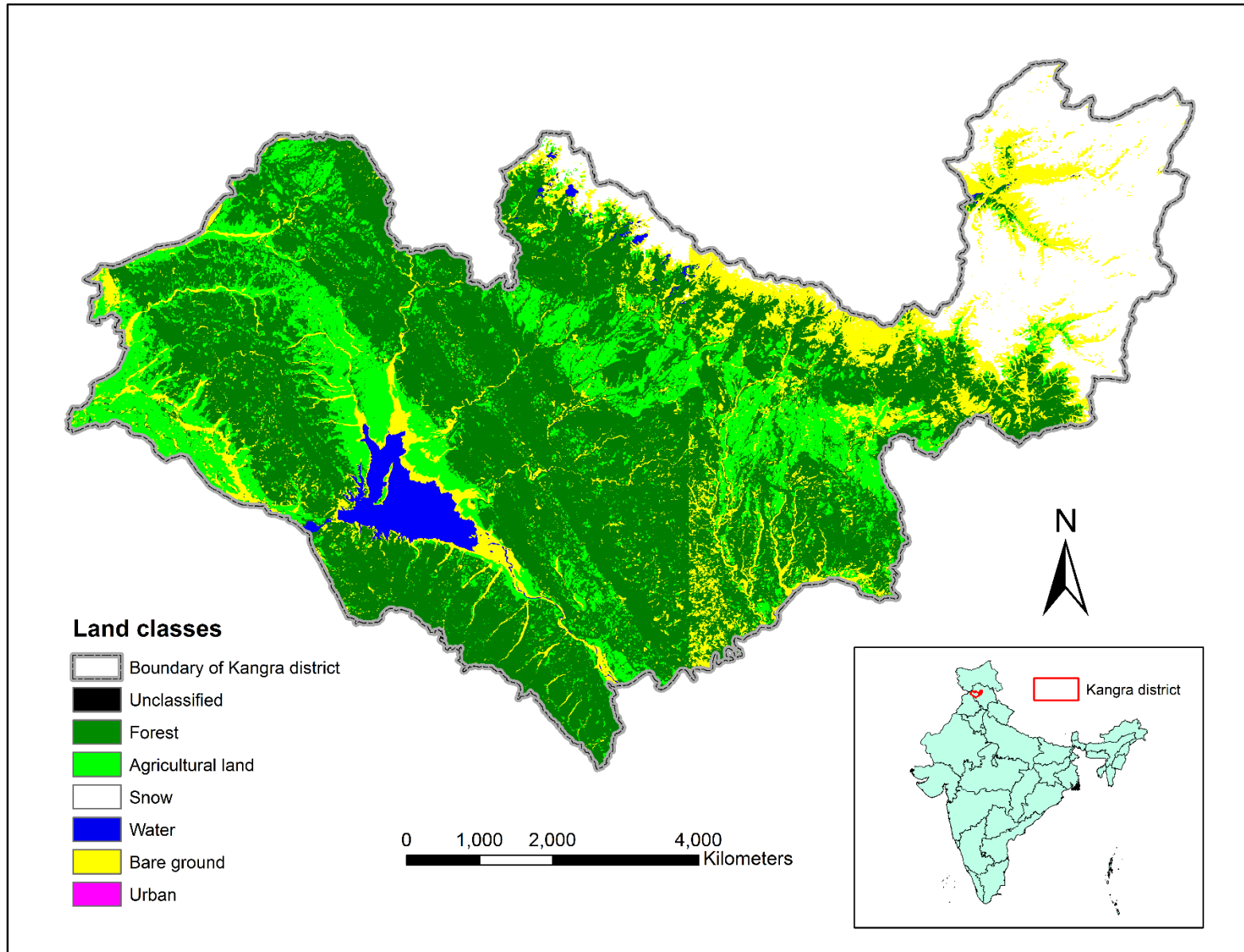
- Livelihood benefits are higher for broadleaf plantations than for pine plantations
 - Major livelihood uses are firewood and forage
 - Pine is unpalatable & produces less/poorer quality firewood
 - Pine also associated with invasive *Lantana* and *Eupatorium*, fire
 - Broadleaf forests also support minor uses – e.g. medicinal plants
 - Benefits and costs very unequal
 - Wealthy households may benefit from timber smuggling
 - Livestock owning households negatively affected by plantation enclosures



Current activities

- Processing government data on plantations in Himachal Pradesh & Kangra District over 70 years
 - Also analysis of *what* and *why*
- Image processing to develop time series of land cover change
 - Looking for signatures of plantation establishment, growth, failure
 - Will combine with ethnographic work to tie government data on plantations to land cover change
- Household surveys to identify livelihood impacts

Preliminary Classification



Govt records of plantations in Himachal Pradesh

| Period | Area (HA) | # of Trees Planted |
|--------------|-----------------|--------------------|
| 1980-89 | 223,086 | 241,913,772 |
| 1990-99 | 201,512 | 210,451,600 |
| 2000-09 | 143,343 | 136,096,521 |
| 2010-17 | 43,669 | 54,415,271 |
| Total | 611,609* | 642,877,164 |

* 2013 FSI report indicates
1,468,300 HA of forest cover

There are an increasing # of motivations for tree planting

| period | farm and social forestry | plantations of quick growing species | introductory plantation of deodar, fir, spruce and bamboos | fuelwood and fodder programme | river valley project scheme | enrichment plantation scheme | fda samridhi yojna | afforestation in blank area | plantation under kandi project | imp. of tree cover afforestation (normal and scsp) | national afforestation program (fda) | compensatory plantation scheme | enrichment plantation scheme | cumulative % of #4 |
|---------|--------------------------|--------------------------------------|--|-------------------------------|-----------------------------|------------------------------|--------------------|-----------------------------|--------------------------------|--|--------------------------------------|--------------------------------|------------------------------|--------------------|
| 1980-89 | 18.59 | 12.77 | 10.93 | 8.93 | | | | | | | | | | 51.23 |
| 1990-99 | 20.15 | 7.80 | | 8.50 | 10.80 | | | | | | | | | 47.24 |
| 2000-09 | | | | | | 11.30 | 11.02 | 10.29 | 8.05 | | | | | 40.66 |
| 2010-17 | | | | | | | | | | 9.97 | 8.78 | 7.68 | 7.19 | 33.63 |

Next steps

- Household & community survey is ongoing
 - Expect to complete approx. December & begin matching/statistical analysis
- Ground-truthing for remote sensing work is in May-June
- Complete preprocessing of Landsat time-series imagery and embark on land-change analysis

