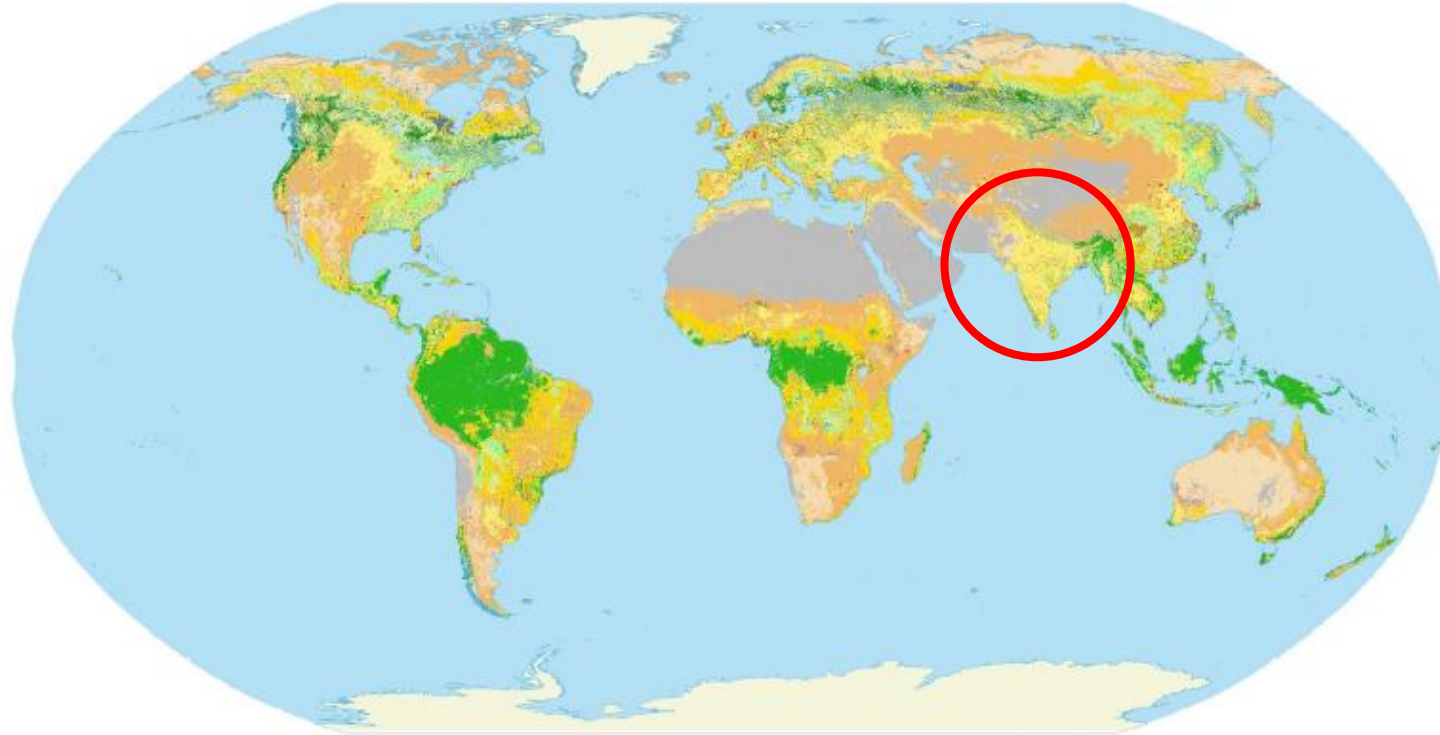


South Asia LCLUC Overview, Trends and Ongoing Issues



Photo from Karen Seto

Land use/cover in South Asia is distinctive: small fields, high population, land *use* change



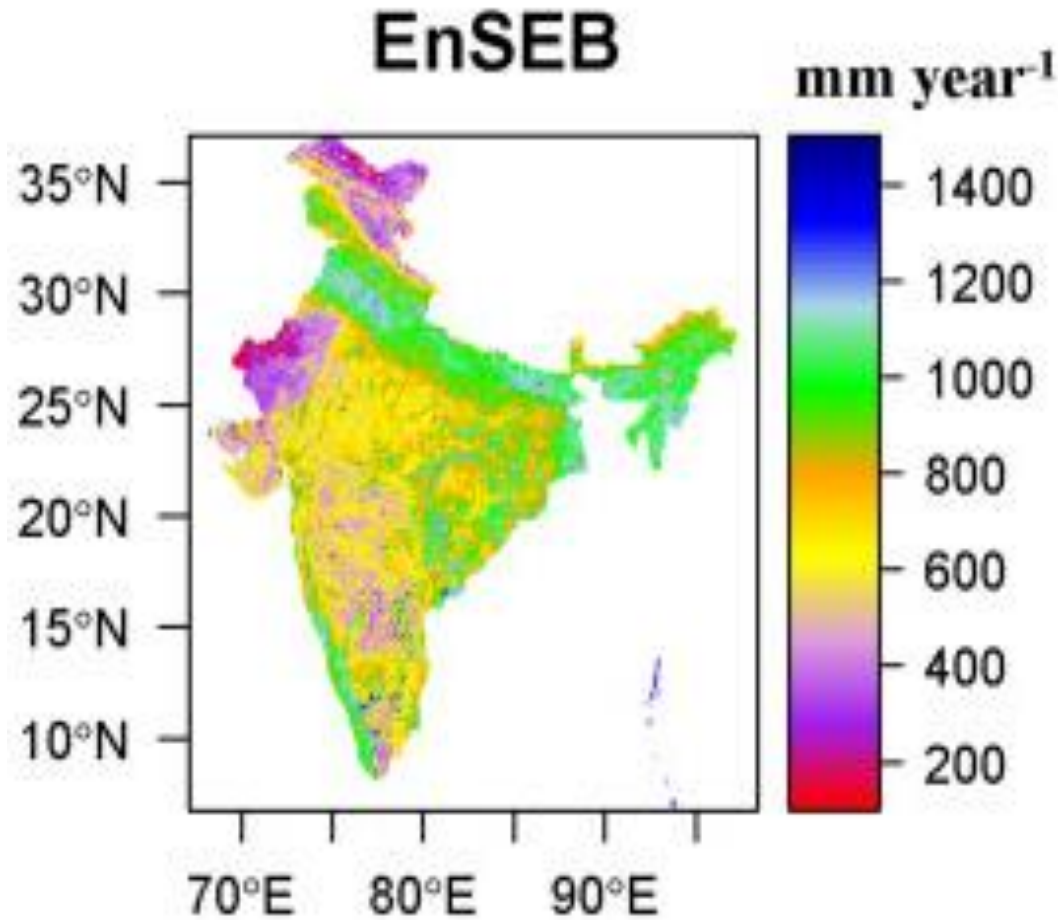
International Geosphere Biosphere Programme (IGBP) Legend

| | | |
|------------------------------|--------------------|---------------------------------------|
| Evergreen Needleleaf Forests | Open Shrublands | Urban and Built-up Lands |
| Evergreen Broadleaf Forests | Woody Savannas | Cropland / Natural Vegetation Mosaics |
| Deciduous Needleleaf Forests | Savannas | Permanent Snow and Ice |
| Deciduous Broadleaf Forests | Grasslands | Barren |
| Mixed Forests | Permanent Wetlands | Water Bodies |
| Closed Shrublands | Croplands | |

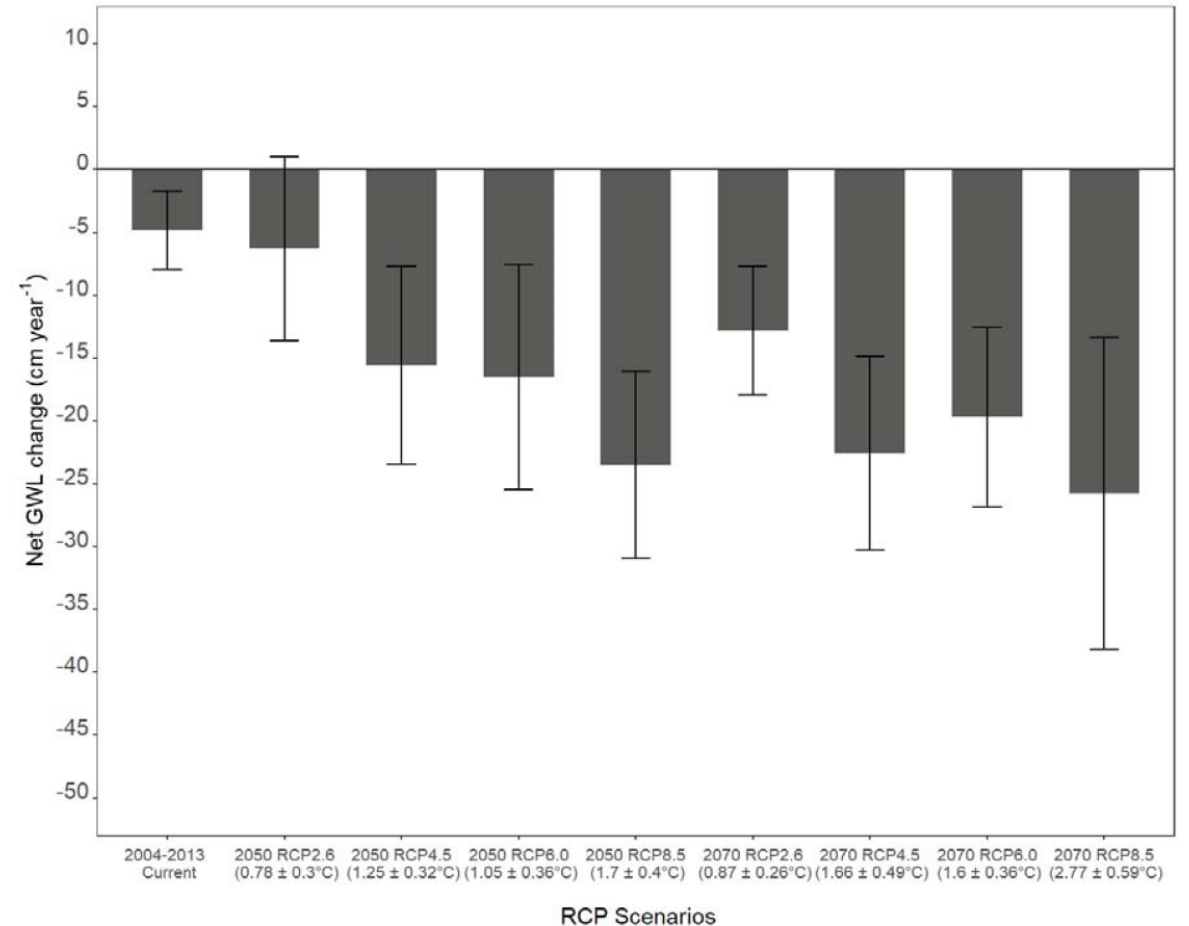
SARI projects on AGRICULTURE AND FOOD SECURITY

- New Transitions in Smallholder Agricultural Systems that Promote Increased Tree Cover Outside of Forests (Skole)
- Sowtime: Climate Adaptive Agriculture in the Eastern Gangetic Plains (Gray)
- Landscape in Flux: The Influence of Demographic Change and Institutional Mechanisms on Land Cover Change, Climate Adaptability and Food Security in Rural India (Singh)
- The Future of Food Security in India: Can Farmers Adapt to Environmental Change? (Jain)
- Understanding Changes in Agricultural Land Use and Land Cover in the Breadbasket Area of the Ganges Basin 2000-2015: A Socioeconomic-Ecological Analysis (Di)

The Future of Food Security in India: Can Farmers Adapt to Environmental Change? (Jain)



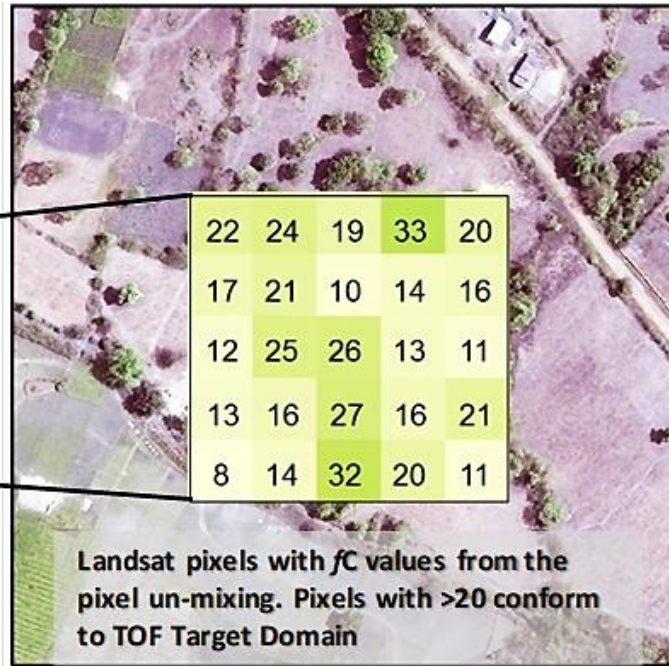
Bhattarai et al. (2019). Remote Sensing of Environment



Bhattarai et al. (in review)

We linked evapotranspiration data that we produced across India with climate and groundwater data to examine the impact of climate change on crop water stress and groundwater depletion. We find that warming temperatures will more than triple groundwater depletion rates as farmers irrigate more to reduce crop water stress.

New Transitions in Smallholder Agricultural Systems that Promote Increased Tree Cover Outside of Forests (Skole)



SARI projects on URBANIZATION

- Urban Growth, Land-Use Change, and Growing Vulnerability in the Greater Himalaya Mountain Range Across India, Nepal, and Bhutan (Seto)



FORESTS and TREES

- Consequences of Changing Mangrove Forests in South Asia on the Provision of Global Ecosystem Goods and Services (Vincent)
- Spatiotemporal Drivers of Fine-Scale Forest Plantation Establishment in Village-Based Economies of Andhra Pradesh (Wynn)
- Tropical Deciduous Forests of South Asia: Monitoring Degradation and Assessing Impacts of Urbanization (DeFries)
- Impacts of Afforestation on Sustainable Livelihoods in Rural Communities in India (Fleischman)
- Twenty-five years of community forestry: Mapping forest dynamics in Nepal (Jeff Fox)

Spatiotemporal Drivers of Fine-Scale Forest Plantation Establishment in Village-Based Economies of Andhra Pradesh (Wynn)

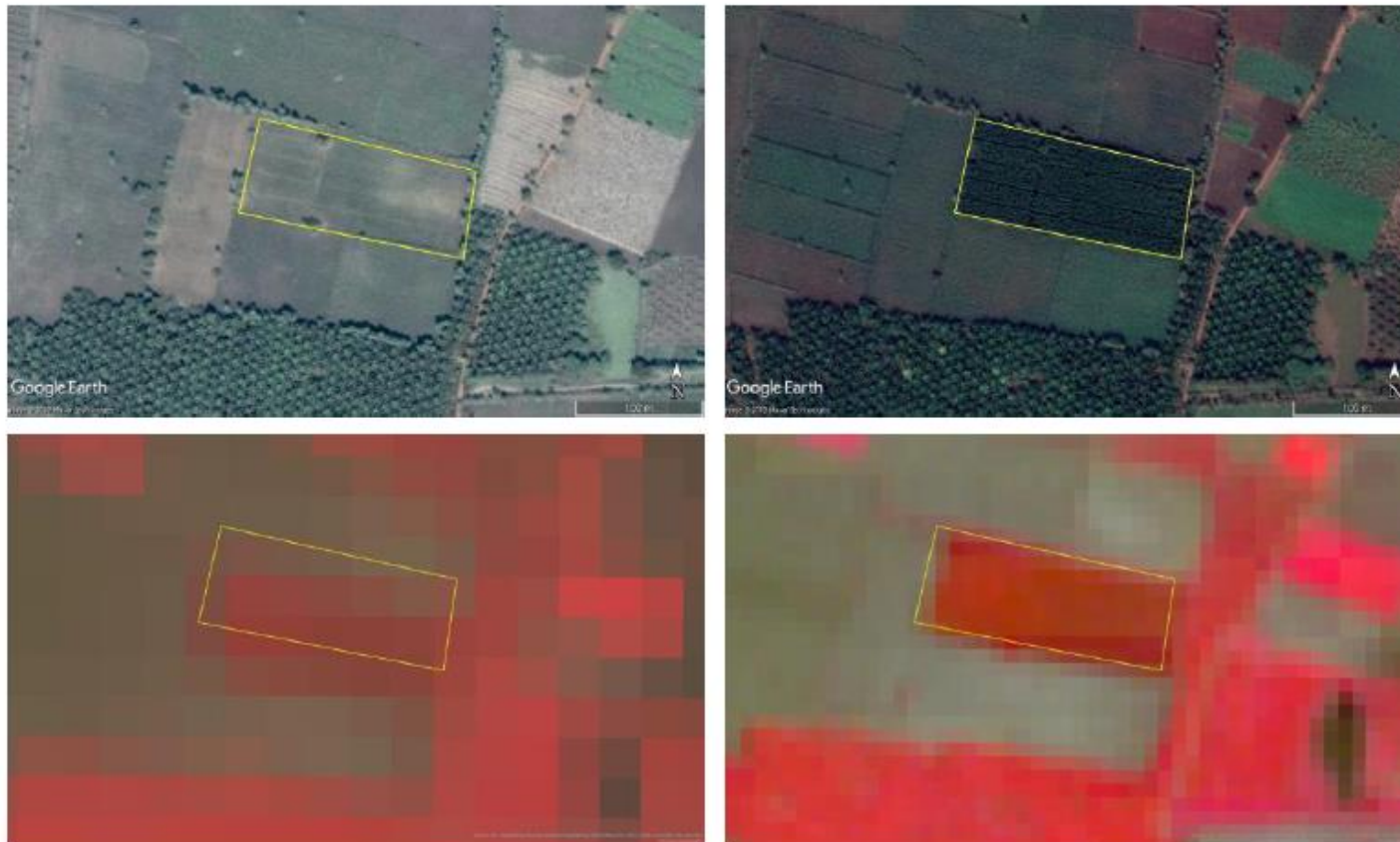
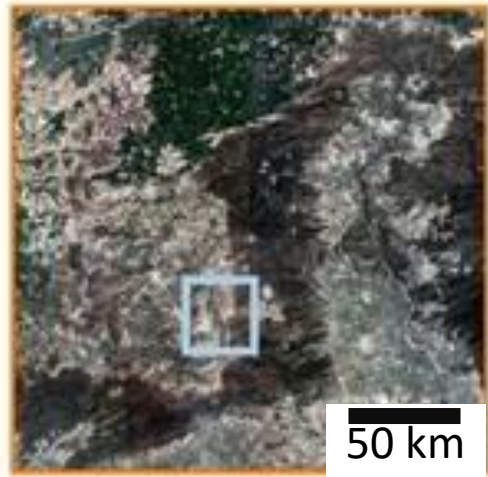


Figure 3. Sample of forest plantation plot (2 ha). First row: Google Earth images from February 2016 (left) with little vegetation and January 2018 (right) with a plantation. Second row: Landsat (30m, left) and Sentinel-2 (10m, right) from June 2018 showing the advantages of the higher-resolution Sentinel-2 for the detection of smallholder plantations. Scaled to 1:2,500.

Tropical Deciduous Forests of South Asia: Monitoring Degradation and Assessing Impacts of Urbanization (DeFries)

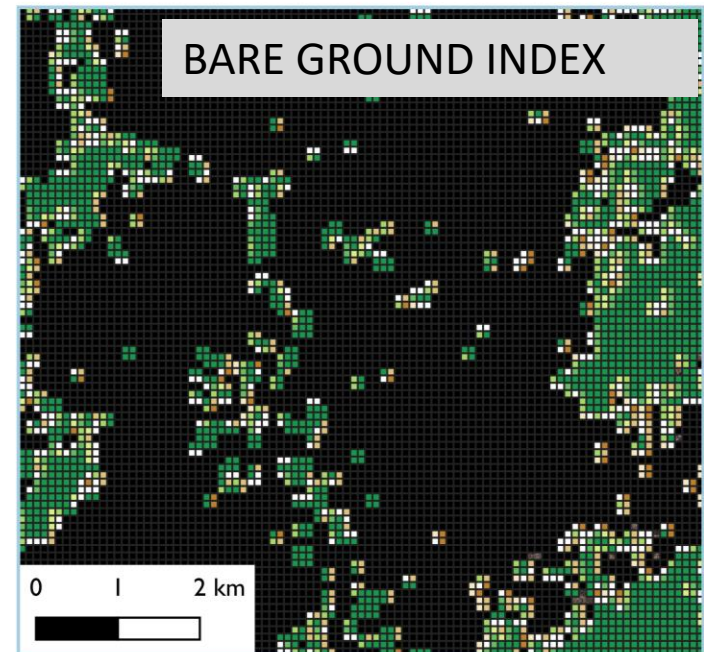
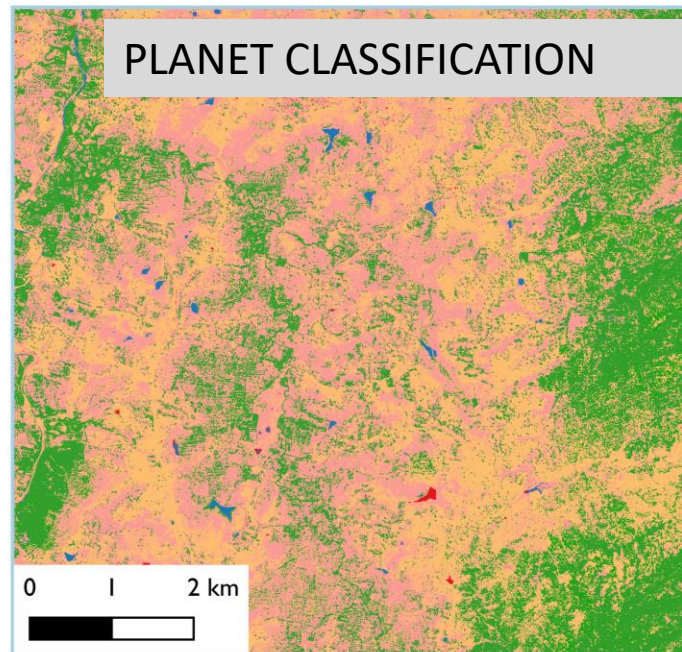
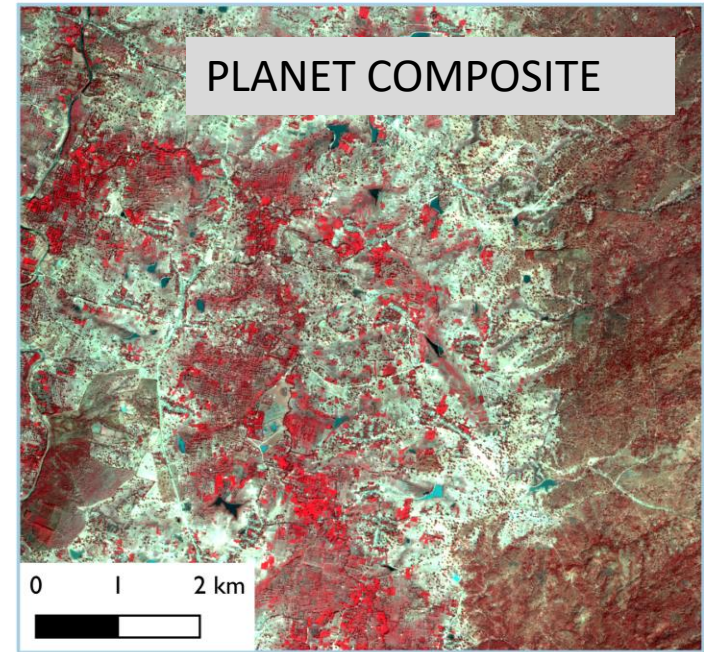


**HOW TO MEASURE FOREST
DEGRADATION?**



Legend

- Study area
- Kanha-Pench corridor
- Classification
 - Water
 - Trees
 - Cropland (active and fallow)
 - Bare ground
 - Built environment
- Bare Ground Index
 - <10% tree cover
 - 1
 - 0
 - 1



Future needs for land use/land cover research in South Asia

EMERGING LAND USE ISSUES:

Infrastructure and landscape connectivity

Competition for land for
restoration/climate mitigation

Urban-rural interactions

Climate resilient /low emission agriculture

.....

NEW OBSERVATIONS:

High resolution data

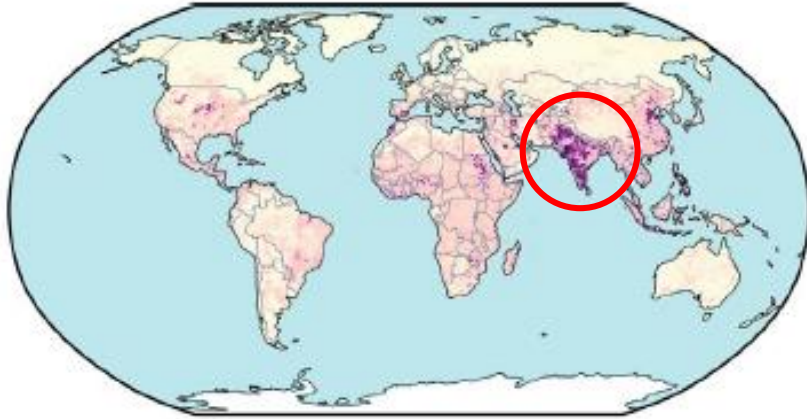
GEDI

...

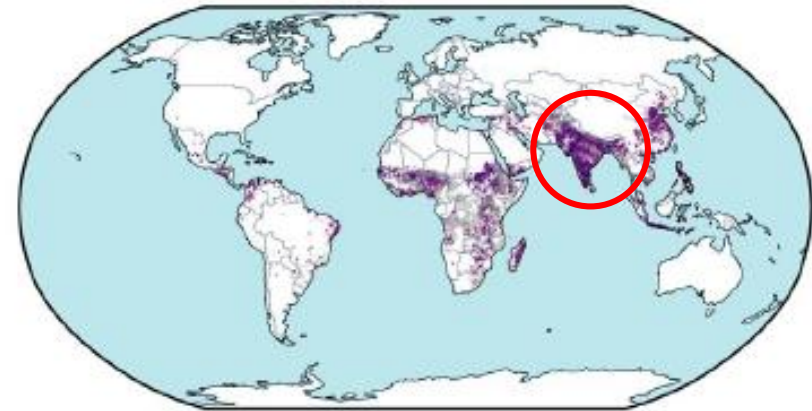
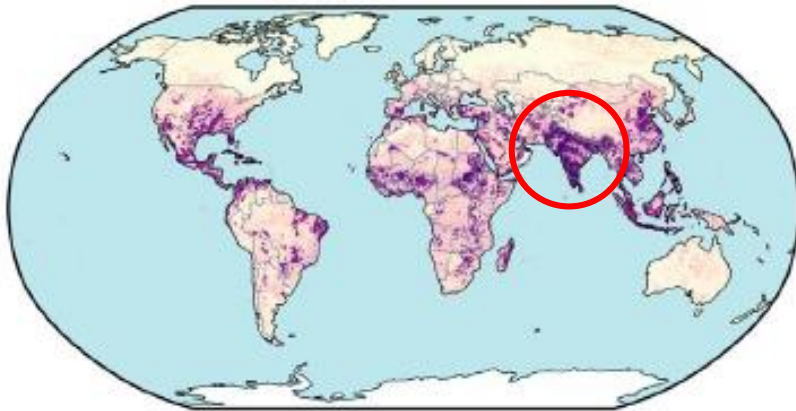
SARI PARTNERSHIPS AND COLLABORATIONS

South Asia: the first line of defense for climate change impacts

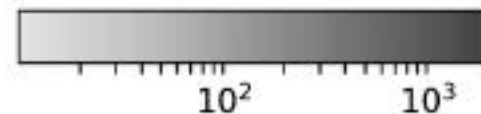
1.5°C



3.0°C



Multi-sector risk score



Vulnerable population per km²

THANKS

