

IMPACT OF CLIMATE CHANGE ON FOREST ECOSYSTEMS IN INDIA

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Impacts of Climate Change & Vulnerability of Forest Ecosystems – IPCC, 2007 Findings

1. Populations of threatened species are expected to be at greater risk
 - Species that are currently classified as “critically endangered” will become extinct
 - 1/3 to 2/3 species at risk of extinction
 - Loss of biodiversity
2. Species composition and dominance will be altered, resulting in ecosystem changes
3. Shifts in forest types boundary
 - Altitude & Latitude
4. Forest die-back / mortality
 - Climate will change faster than capacity of plants to migrate
5. Increase and later decrease in biomass productivity

Studies by IISc

- Assessed climate impacts on forest ecosystems
 - Area under different forest types – plant functional types
 - Net Primary Productivity
- Emissions Scenarios: SRES A2 and B2
- Climate model projections – HadRM3 (from IITM, Pune)
- Global Vegetation Models used
 - BIOME4 & IBIS (Integrated Biosphere Simulator)
- **Status of work**
 - Preliminary modeling results available at national level for the period 2070 to 2100
 - Awaiting climate projections for 2030 and 2050 to make projections for short and medium term

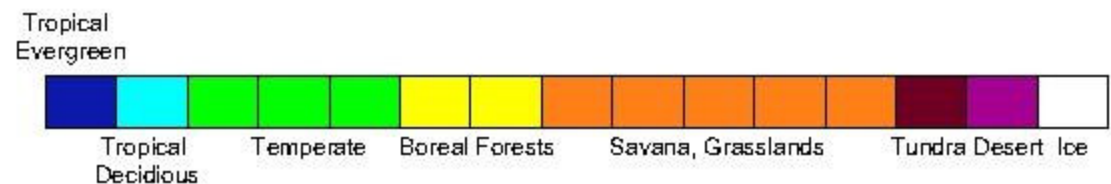
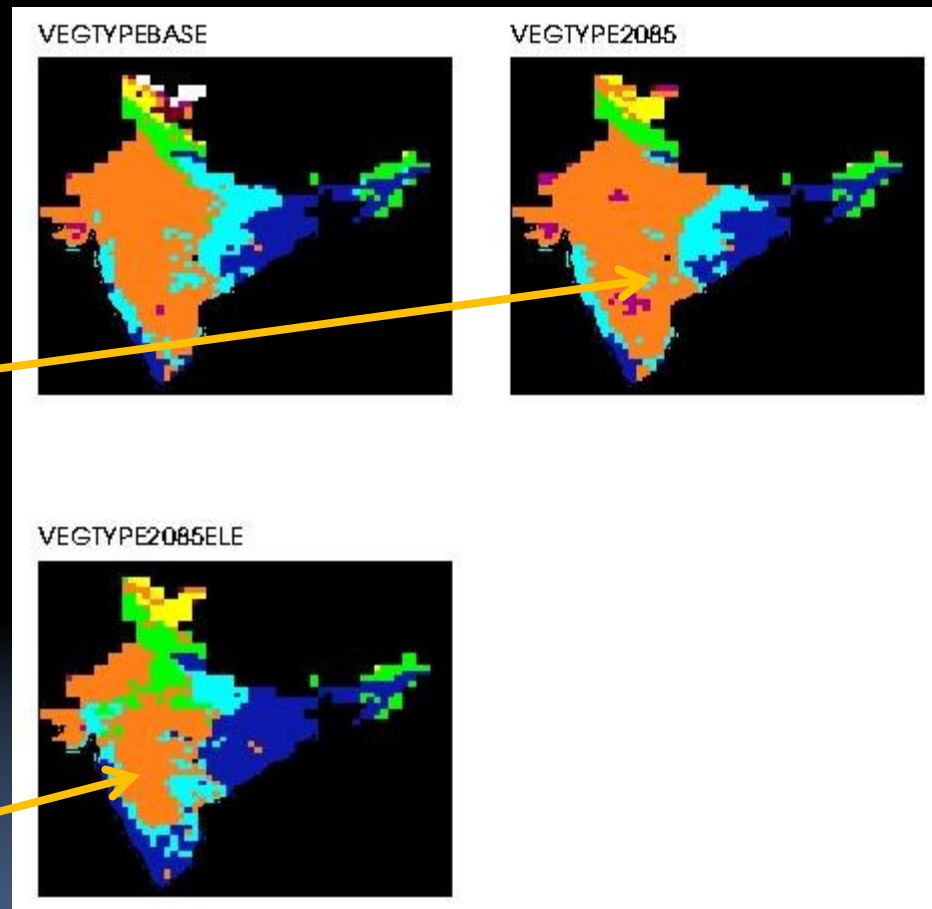
National level results from IBIS modeling

- For A2 scenario, Indian terrestrial ecosystems take up about 15 Gt-C by the end of the century
- **Natural potential vegetation map** shows 35 % increase in forest cover primarily because of CO₂-fertilization (In the absence of CO₂-fertilization forest cover decreases by 15%)
- **Indian terrestrial ecosystem will take up 16 % of the total emissions (94 Gt-C) from India projected for A2 scenario**

Impact on Forest cover (1975 - 2085) – IBIS (A2 scenario) Model outputs

Climatic effect (warming) decreases the forest cover by 15%

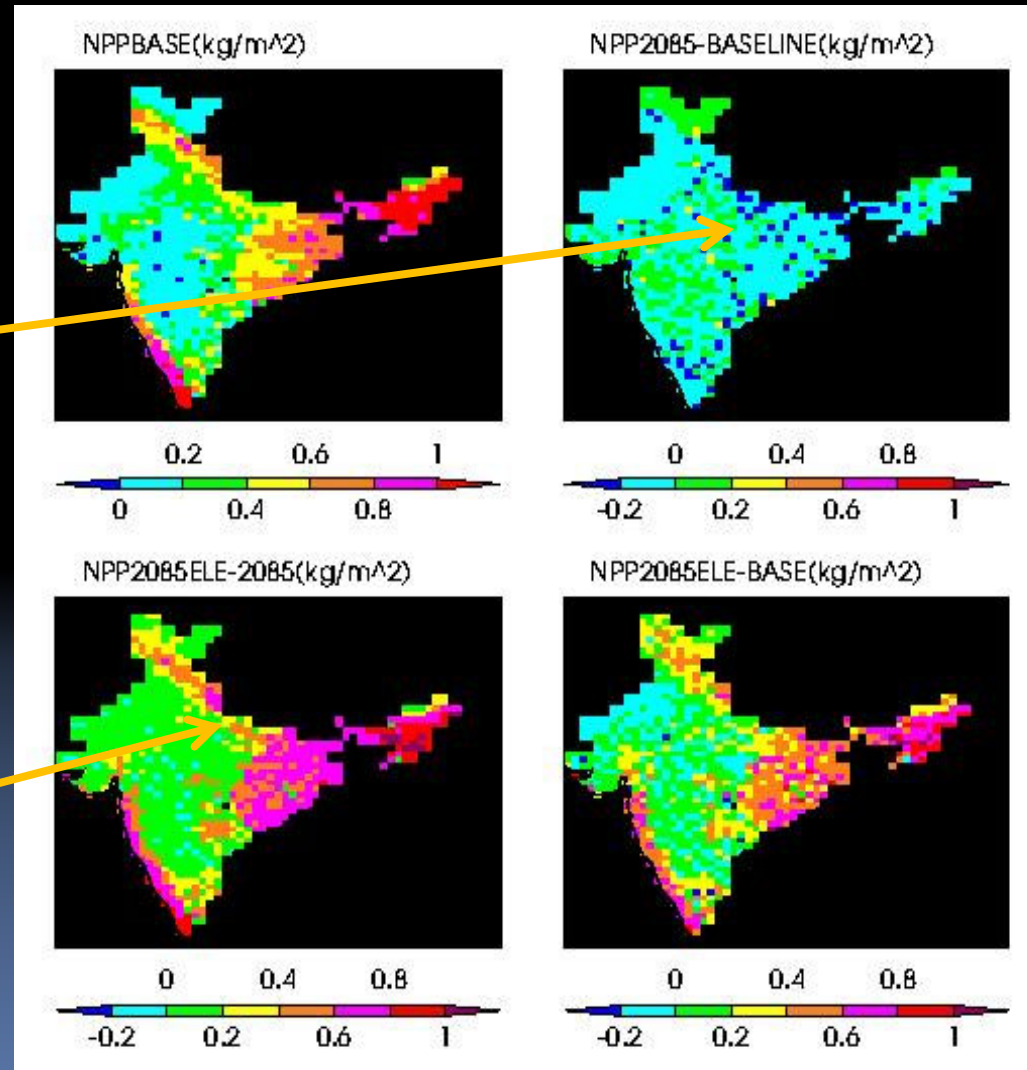
Climate effect plus CO₂-fertilization enhances the forest cover by 35%



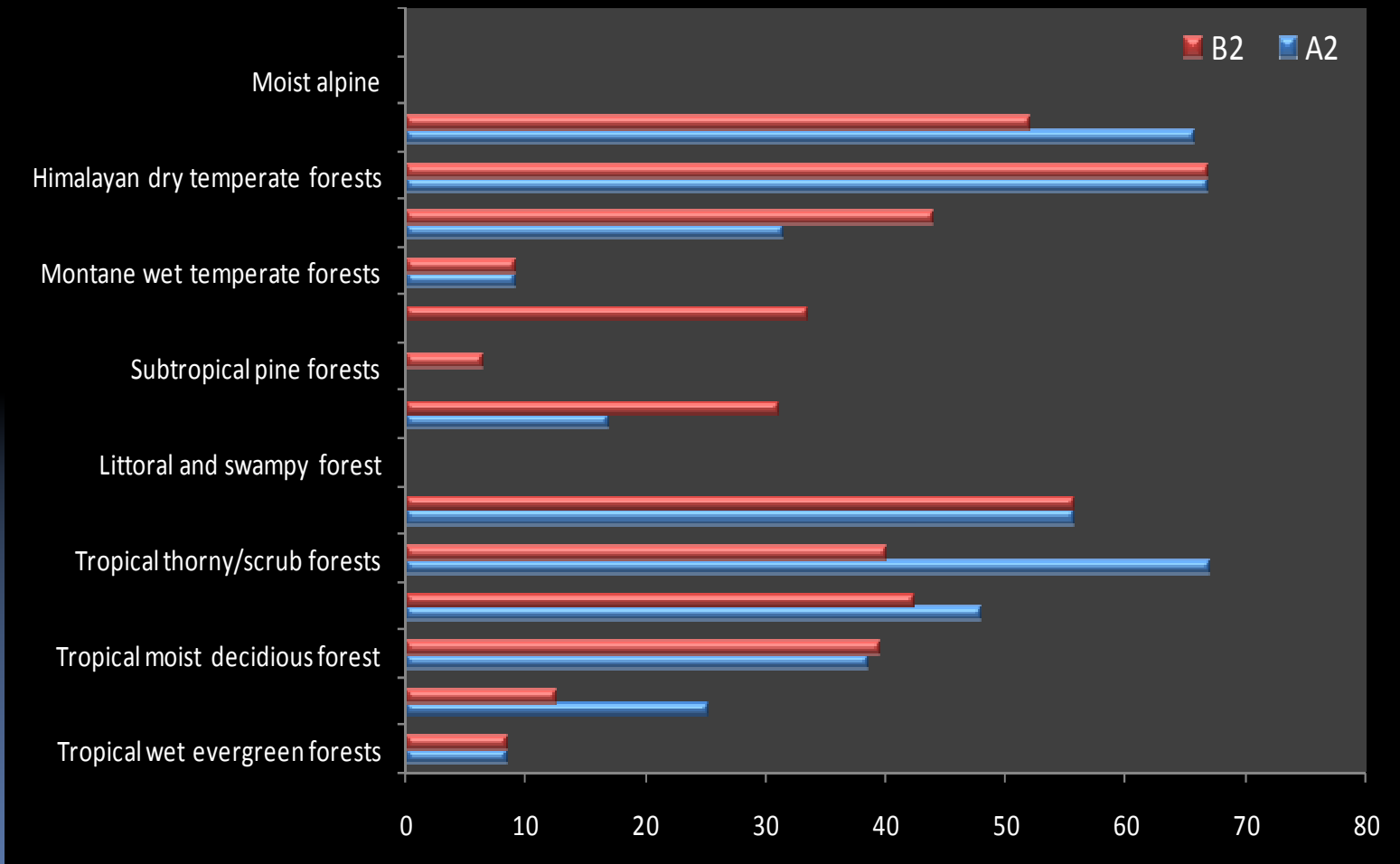
Impact on NPP (1975 - 2085) - IBIS (A2 scenario) Model outputs

Climatic effect
(warming) decreases
Net Primary
Productivity (NPP)
by 13 %

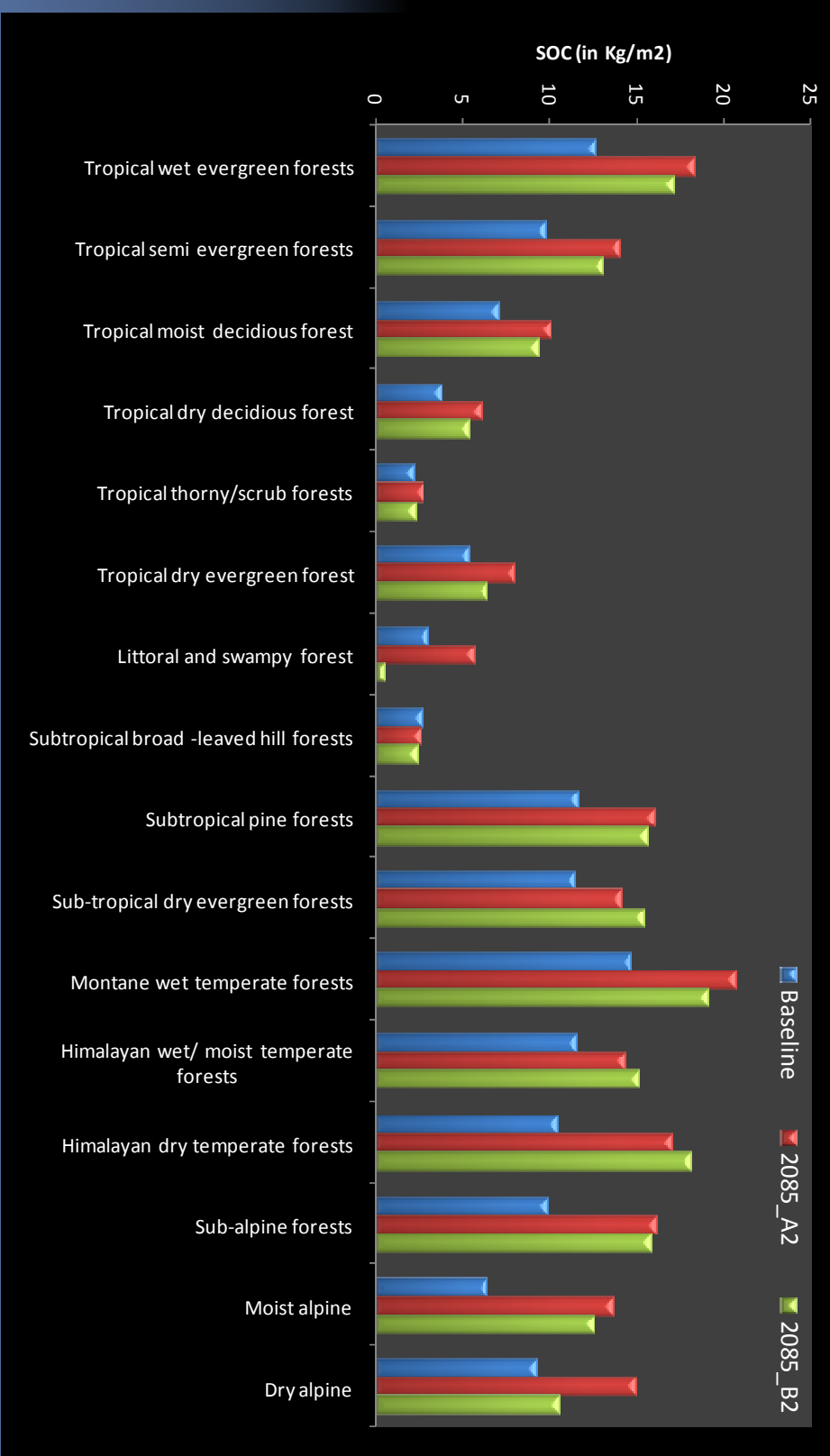
CO₂-fertilization
enhances NPP by
82%



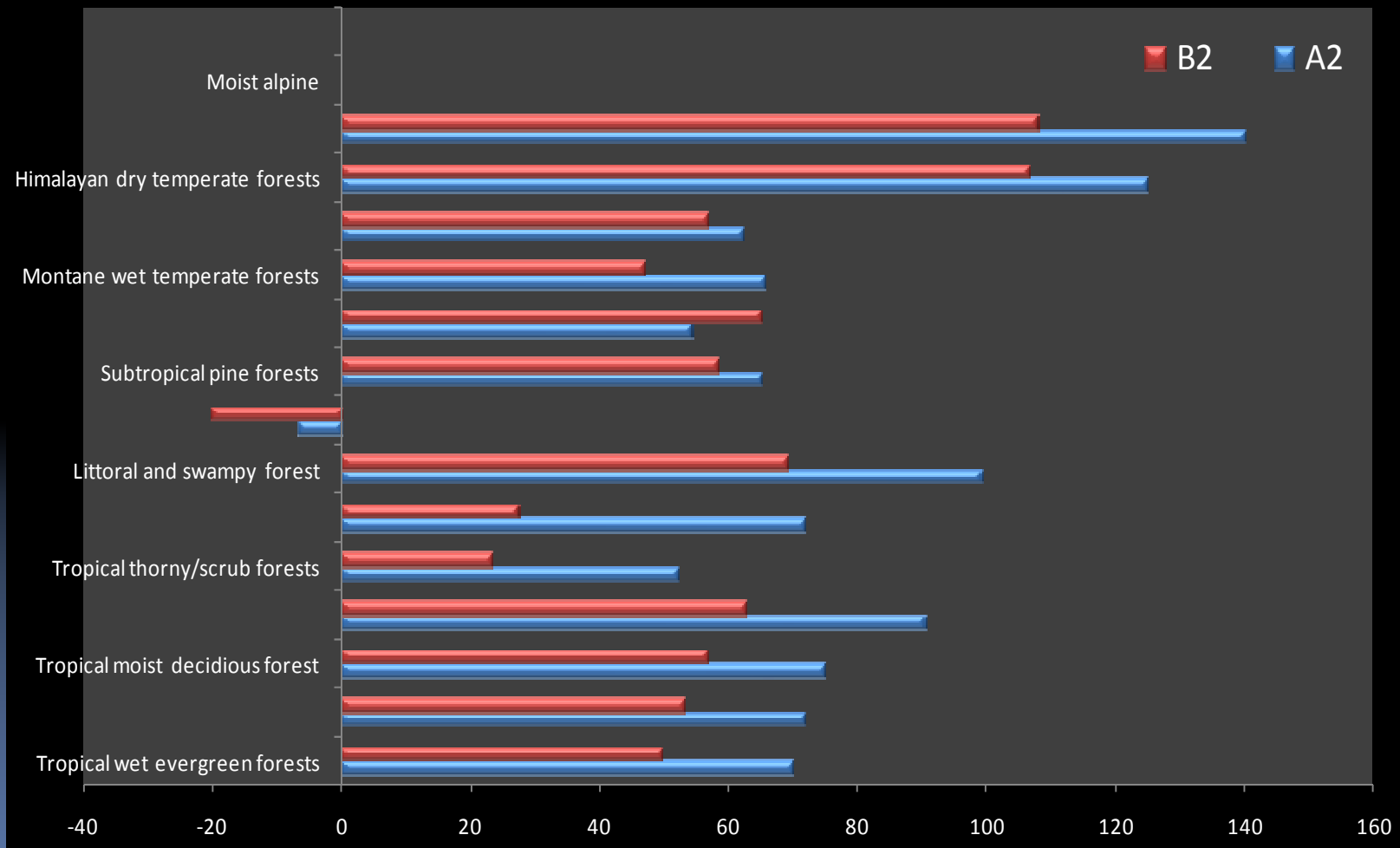
Impact on vegetation type (% change) according to Champion and Seth classification during the period 1960-1990 to 2070-2100 (A2 Scenario)



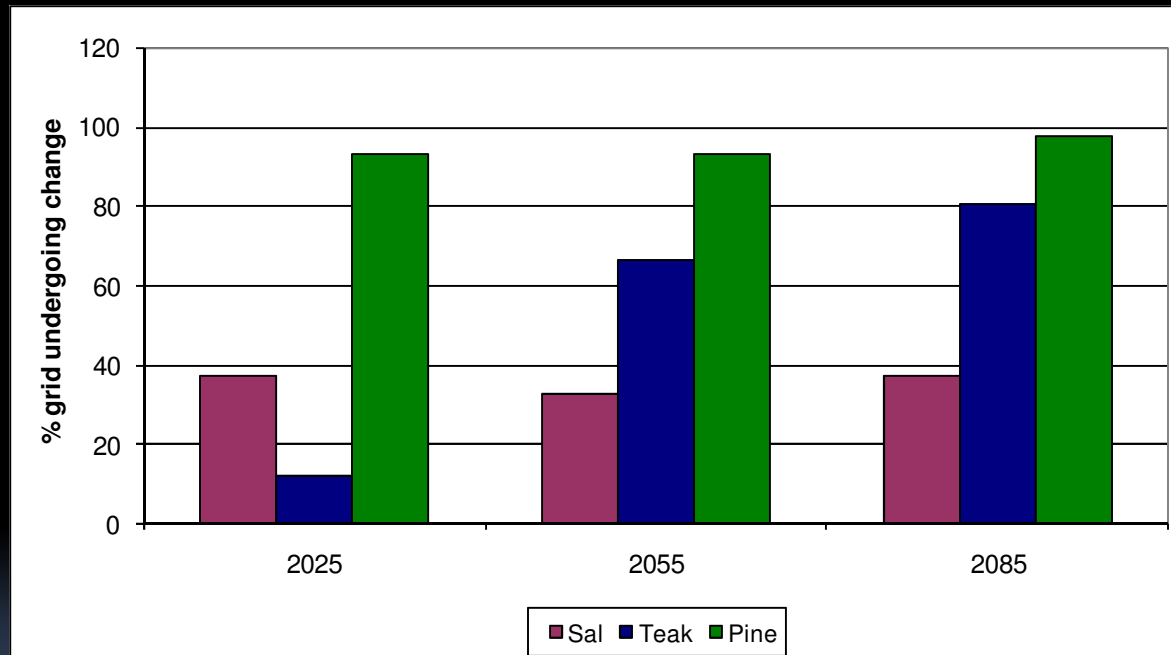
Impact of climate change on soil carbon stock (A2 and B2 scenarios)



Impact on NPP (% change) according to Champion and Seth classification during the period 1960-1990 to 2070-2100 (A2 and B2 scenarios)



Impact of Climate Change on Pine, Teak and Sal (A2 scenario)



Sal forests are relatively resilient compared to Teak and Pine; Thus a good candidate for forest Conservation and natural Regeneration projects.

Biodiversity and NPP Implications

- IBIS model outputs indicate 52% forested grids will be impacted
 - Future climate is not optimal for the existing forest types or species assemblage or biodiversity
- Though models indicate forests benefiting from CO₂ elevation (due to CO₂ fertilization)
 - Tropical forests are generally poor in nitrogen and other nutrients - thus may not benefit from elevated CO₂
 - Biodiversity likely to be adversely impacted since the future climate may not be suitable for existing vegetation types

Future plans

- **Climate change in near term**
 - Preliminary modeling results available at national level for the period 2070 to 2100
 - Awaiting climate projections for 2030 and 2050 to make projections for short and medium term
- **Vulnerability index maps (based on veg change, type and thickness of veg)**

