India's Transportation Scenarios: Looking for Synergies

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Decarbonising Transport in India

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Outline

- Background:
  - Sustainable Growth Pillar and India Energy Modeling Forum
- Inter-model decarbonization study: Linkages between CO_2 and PM
- Recent analysis of air pollution and decarbonization mitigation pathways in India
- Linking emissions, air pollution and health impacts: new tools

Background

- PNNL has been collaborating with the Indian government and research institutes to enhance India's modeling capacity

- Modeling activities are performed under the Sustainable Growth Pillar of the U.S.-India Strategic Energy Partnership

- NITI Aayog and USAID coordinate the modeling activities

- Indian government institutions involved in modeling include
  - Ministry of Road Transport & Highways
  - Ministry of Petroleum and Natural Gas
  - Ministry of New and Renewable Energy
  - Ministry of Environment, Forest and Climate Change
  - Ministry of Power
  - Ministry of Housing & Urban Affairs
  - and other institutions.

India Energy Modeling Forum

- It is a platform for leading experts and policymakers to:
  - Study important energy and environmental issues
  - Introduce modelling and analysis in an informed decision-making process
  - Improve cooperation and coordination between modelling teams, the Government of India, knowledge partners and think-tanks
  - Build the capacity of Indian institutions
  - Conduct joint modelling activities and future areas of research

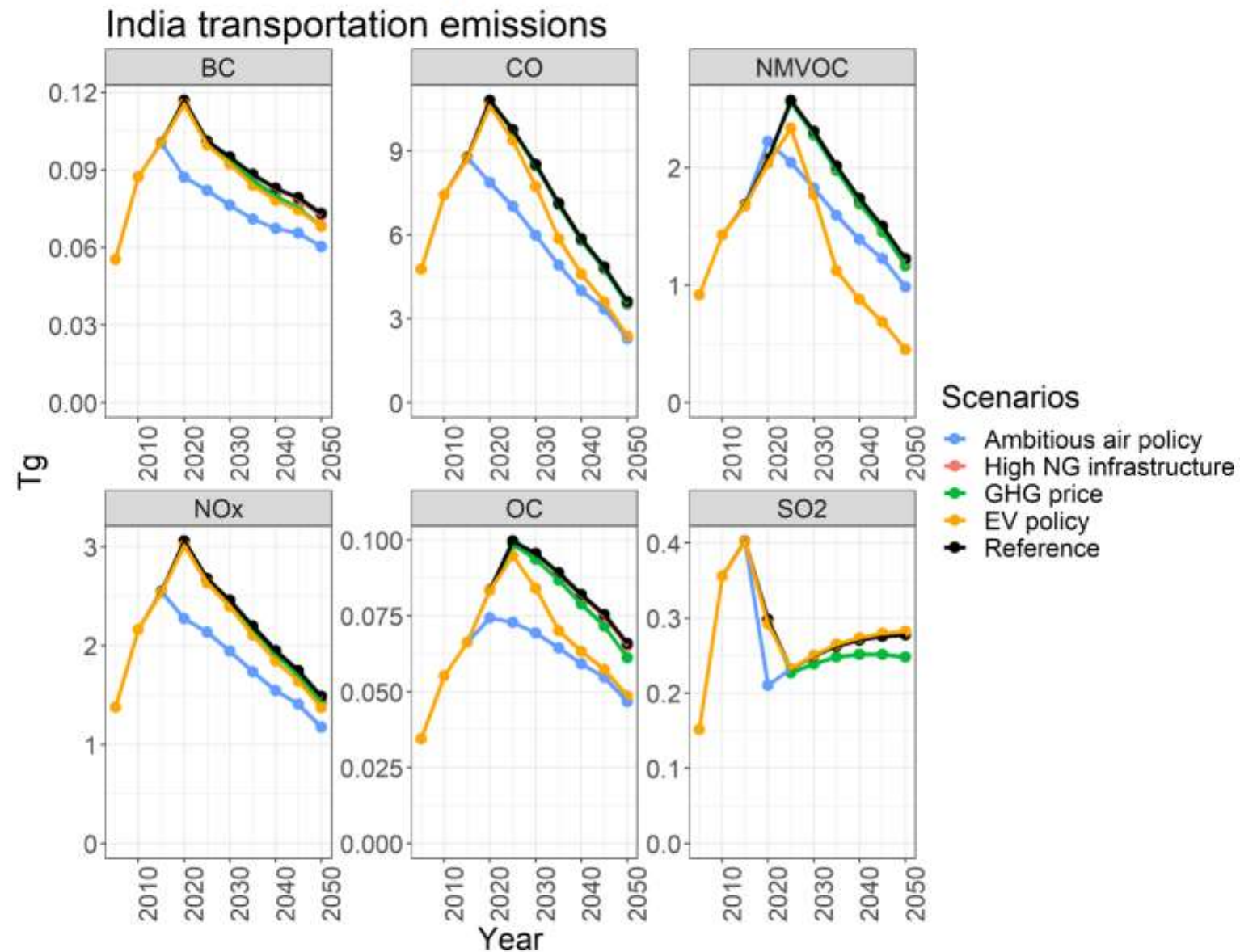- Transportation study presented today helped lead to IEMF

PM Emission Reductions in the Comprehensive Scenario compared to Reference
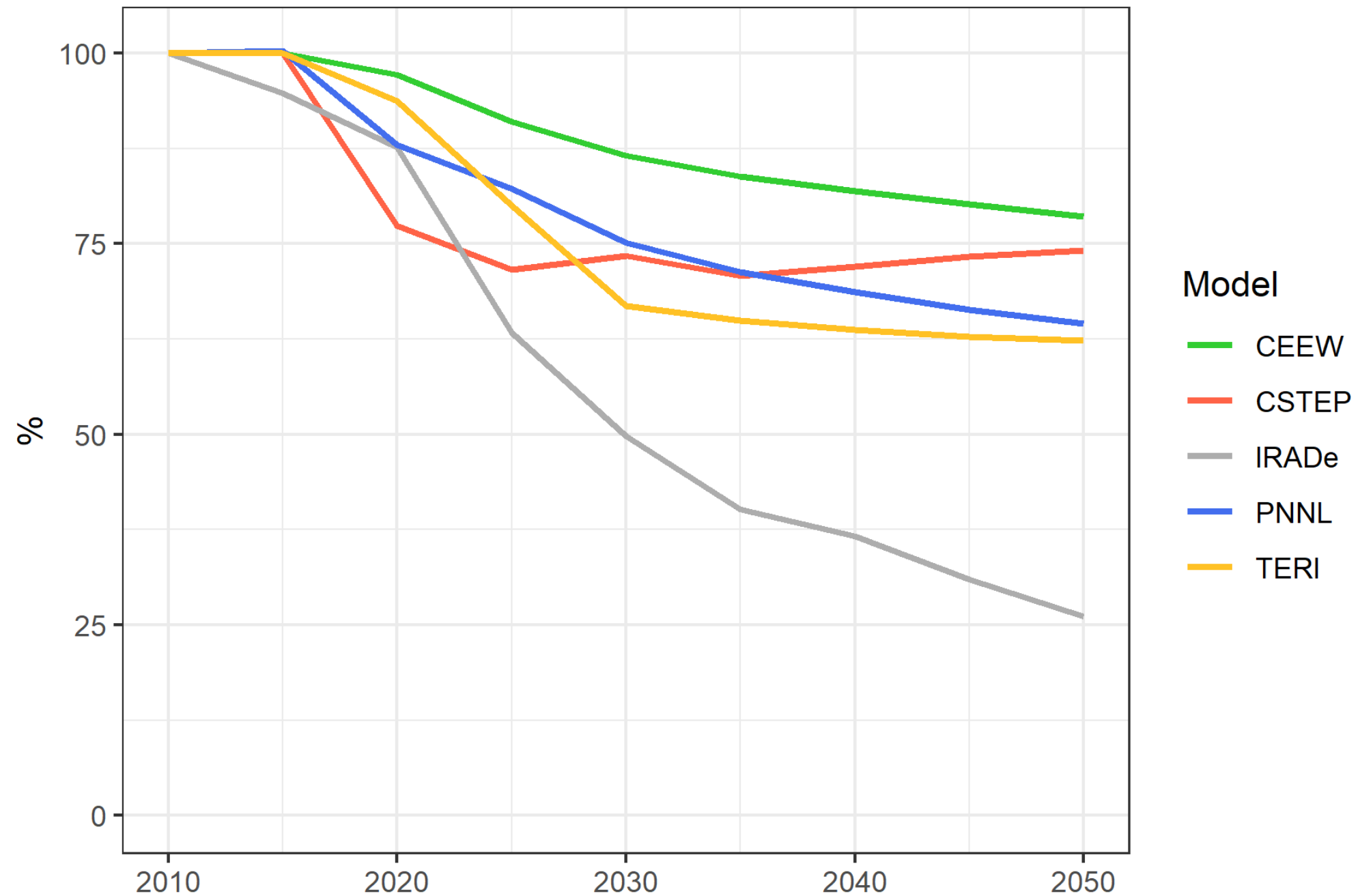
All mitigation policies show air pollution co-benefits from decarbonization
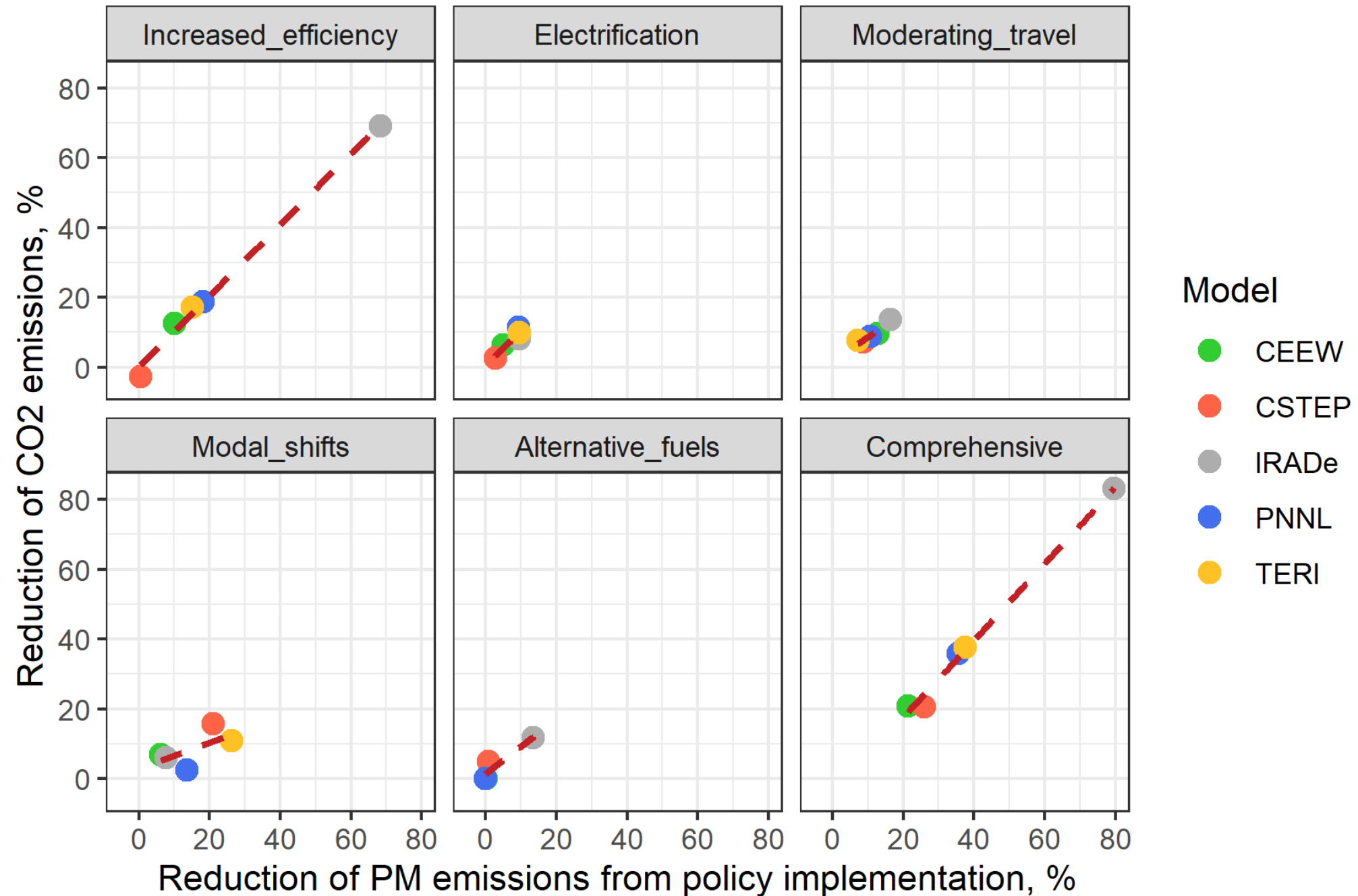
Policy can significantly reduce transportation air pollutants and health impacts

India transportation emissions

Yarlagadda, B., S.J. Smith, B.K. Mignone, D. Mallapragada, C.A. Randes, and J. Sampedro (under review). Climate and air pollution implications of potential energy infrastructure and policy measures in India.

Electric and industrial air pollution controls largely reduce SO$_2$ and NO$_x$

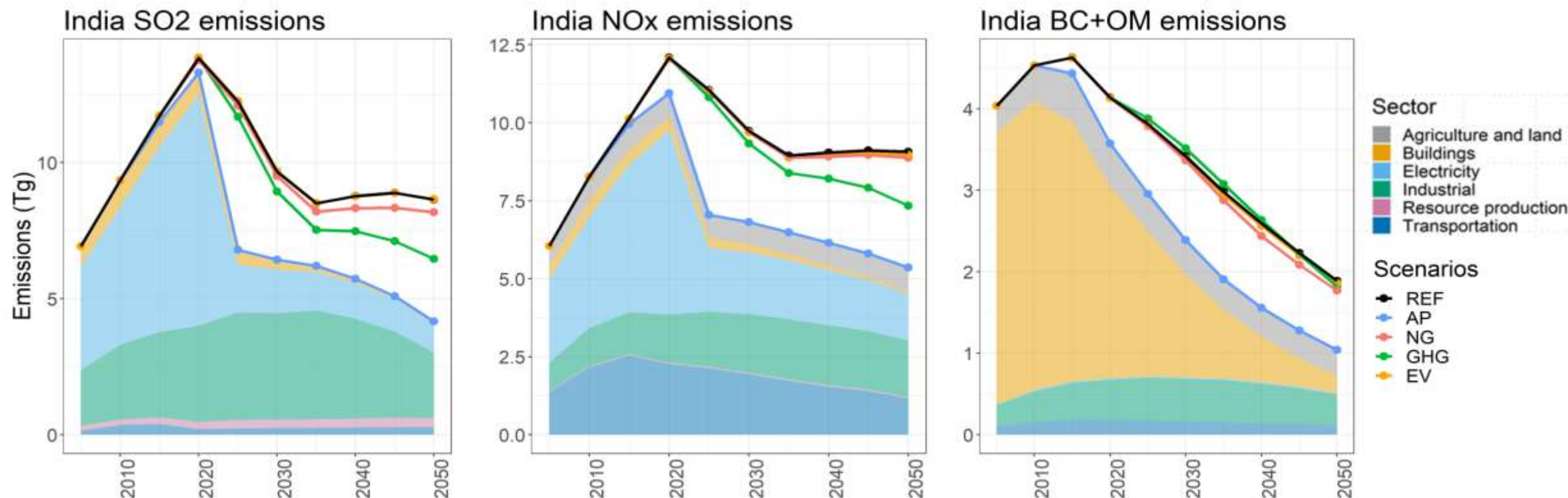# Fuel switching from traditional biofuels largely reduces BC+OM

Figure 2: Panels show, from left-to-right, SO2, NOx, and BC+OM emissions for the reference case and single-policy impact scenarios AP, NG, GHG, and EV from 2005 to 2050. Shaded area shows the sectoral breakdown of emissions in the AP case. BC+OM is calculated as BC + 1.3*non-biomass OC + 1.8*biomass OC, in line with the definition in (Klimont et al., 2017. doi: 10.5194/acp-17-8681-2017).

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Linking Emissions with Air Quality and Health Impacts

- Two new tools might be of interest
- TM5-FASST
    - Uses energy model output regarding emissions
    - Produces pollutant concentrations and their impact on human health (mortality, years of lost life)
    - New linking tools to easily link with GCAM and other models (including R-GCAM-FASST)
- New air pollution concentration module being integrated into the Global Change Analysis Model
    - Likely will be released this fall

Conclusions

- India has a significant potential to reduce emissions from road transportation.

- Decarbonization policies also reduce PM emissions, providing multiple motivations, though pollution mitigation policies may have the strongest impact on PM.

- Better data and ongoing collaboration on modeling can further refine results.

Thank you