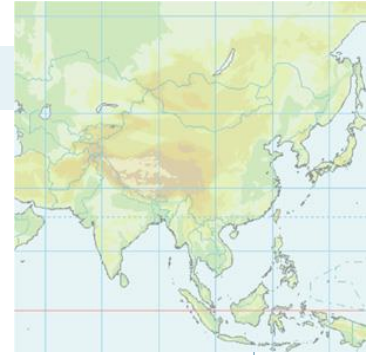


Integrated Assessment Modelling Activities in India in 2014-15




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Presented in
The 20th AIM International Workshop
National Institute for Environment Studies, Tsukuba, Japan
Jan 23-24, 2015

Overview of Activities (2014-15)

1. Research and Dissemination

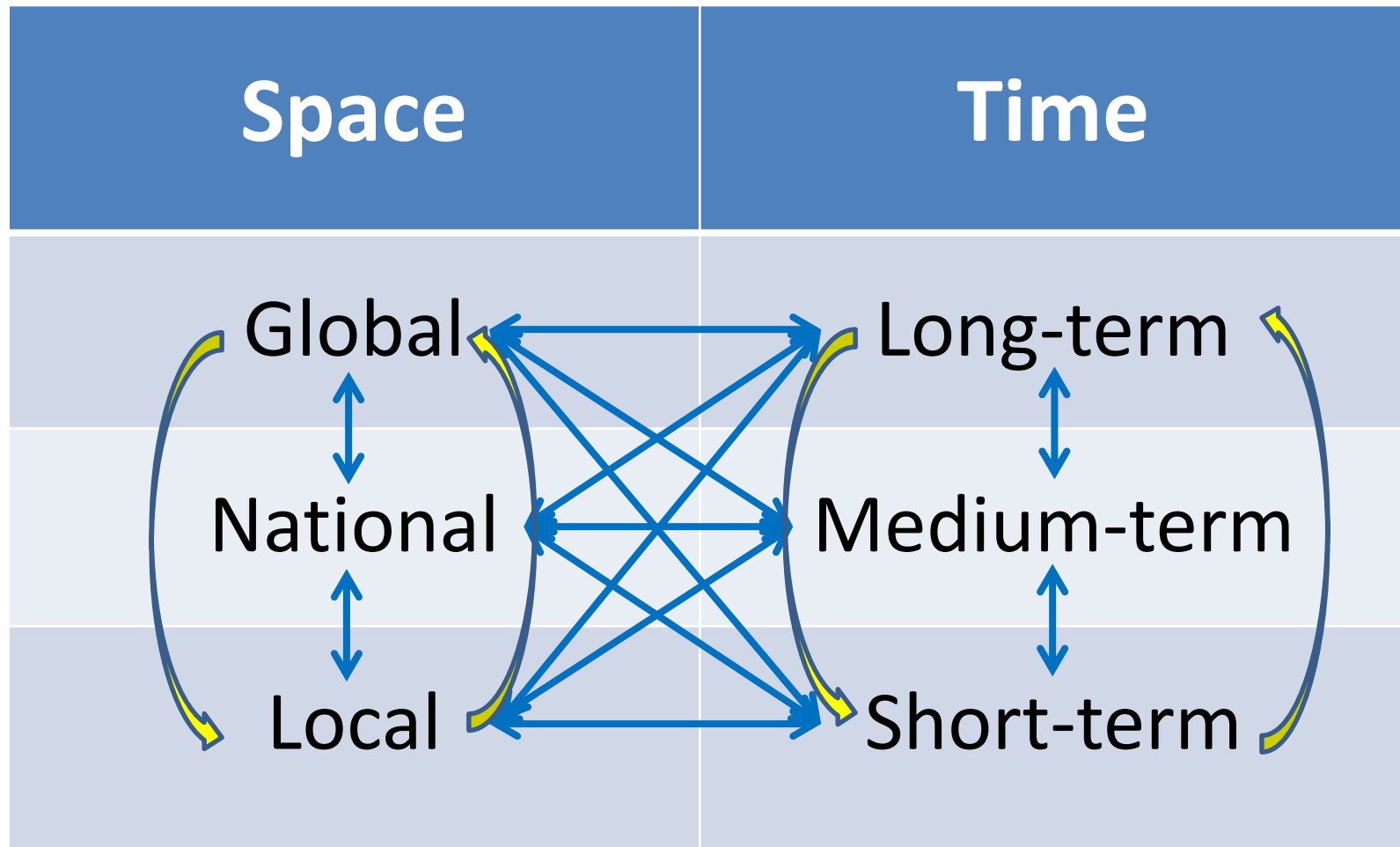
- **Modelling exercises**
 - ✓ National Level
 - ✓ Sub-National Level
 - ✓ City Level
- **LIMITS project**  **LOW CLIMATE IMPACT SCENARIOS AND THE IMPLICATIONS OF REQUIRED TIGHT EMISSION CONTROL STRATEGIES**
- **LCS-RNet and LOCAR-Net: Linking Research & International Policymaking**

2. Year 2015-16: Way Forward

- **Deep Decarbonization Pathways Project (DDPP)**
- **Modelling and informing low emission strategies (MILES)**

GLOBAL LEVEL

Policy and Science Nexus: Where, Who and When?



NATIONAL LEVEL

India is world's second most populous nation and fourth largest economy. India's per-capita GHG emissions have been historically far lower than in developed countries and this shall remain so even under India's high economic growth scenarios. Nonetheless, as a party to the United Nations Framework Convention on Climate Change (UNFCCC), India has voluntarily committed to reduce the emissions intensity of its economy by 20-25 per cent during the period 2005-2020.

This book deploys modelling methodologies to delineate policies that simultaneously address national development goals such as energy security, clean air and environmental integrity while honoring voluntary international climate commitments. The assessment and findings in the book are based on rigorous scientific research. The estimation of historical emissions is done using the contemporary IPCC emissions inventory methodologies. A contribution of the book is the reporting of emissions at sector and locale levels.

The key contribution of the book is the projection of future energy and emissions trends for different scenarios for India using rigorous modeling methodologies. The policy assessment uses a soft-linked integrated modeling system (SLIMS) which maps India's energy and emissions trends till the mid-century (year 2050) and the economic and environmental implications of varied policy interventions on these future trends.

A valuable contribution of the book is the comparative assessment of the trends of energy and GHG emissions indicators for India and China. The analysis shows differences in energy and emissions paths of these two major economies in past and future trends. Evidently, the analysis shows that India needs larger and longer developmental space to provide clean energy, water, health, education and infrastructure as it makes transitions towards medium and high income country through the 21st century. The analysis has followed a development-centric perspective which treats India's development priorities as the propelling force for achieving the climate agenda.

India's energy system has evolved around domestic coal, sizable imports of oil and LNG, moderate contribution of hydro power, declining and yet sizable use of traditional biomass as cooking fuel by rural households and growing attention to modern renewable, nuclear and energy efficient technologies. India's per-capita GHG emissions are below the global average and far below those in the developed countries. Notwithstanding the inherited fossil based energy system and high economic growth expectations, India voluntarily committed to reduce GHG emissions intensity of the economy by 20-25 per cent from 2005 to 2020.

This book details inventory of energy and emissions at national and sector levels. It maps firm and locale level energy use and emissions and their impacts such as on the urban air pollution. The future energy and emissions trends are analyzed following scenario analysis using integrated assessment modelling framework that aligns India's national development goals with global climate change actions. The analysis shows that the global 2°C temperature stabilization target shall require fundamental transformation of India's energy system, both on demand and supply sides.

Such energy-economy transformation would be far from what could be envisaged under a business-as-usual future. It will require sizable up-front investments in infrastructures, efficient devices, low energy intensity materials, low carbon energy and supply technologies, altering consumer behavior, while India is making transition to medium income and ultimately high income society during the current century.

The book demonstrates the necessity and validity of following a long-term development-centric perspective; even while delineating near-term energy and emissions policies, programs and targets such as those needed to delineate the intended nationally determined contributions (INDCs). The book, while illustrating the best practice modeling, scenario development and policy assessment for India, provides insights into the mode and means of navigating the energy and emissions policy landscape for India.

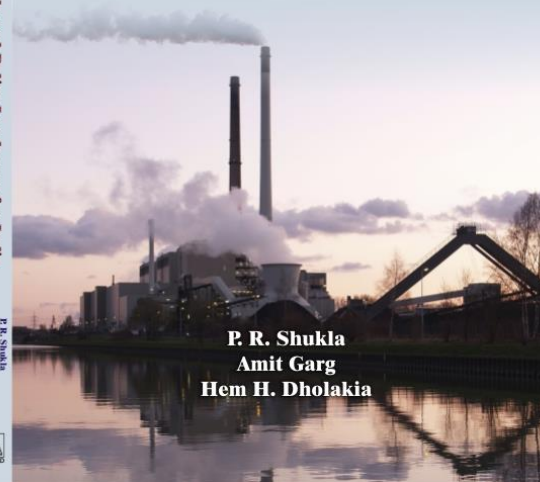
The complexity of the policymaking notwithstanding, the book is intended to demystify the methods and means for delineating the policies. The book, we hope demonstrates the need to use best practice methodologies for national assessments and also the existence of the scientific capacity in the country to carry out such assessments.

Energy-Emissions Trends and Policy Landscape for India

P. R. Shukla
Amit Garg
Hem H. Dholakia



Energy-Emissions Trends and Policy Landscape for India



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About the Authors



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Hem H. Dholakia is a Research Associate, Environment and Health with the Council for Energy, Environment and Water, New Delhi. His research addresses the linkages between energy, environment, human health and public policy in India. He was a recipient of the Young Scientist Summer Award in 2012 at the International Institute of Applied Systems Analysis (Austria). He has published six papers in international peer reviewed journals and a co-authored book. He holds a PhD from IIMA and a Masters from Brighton University (U.K.).

Shukla, P. R, Garg, A., & Dholakia, H.H. (2014). *Energy-Emissions Trends and Policy Landscape for India*. Allied Publishers

Energy Policy Paper

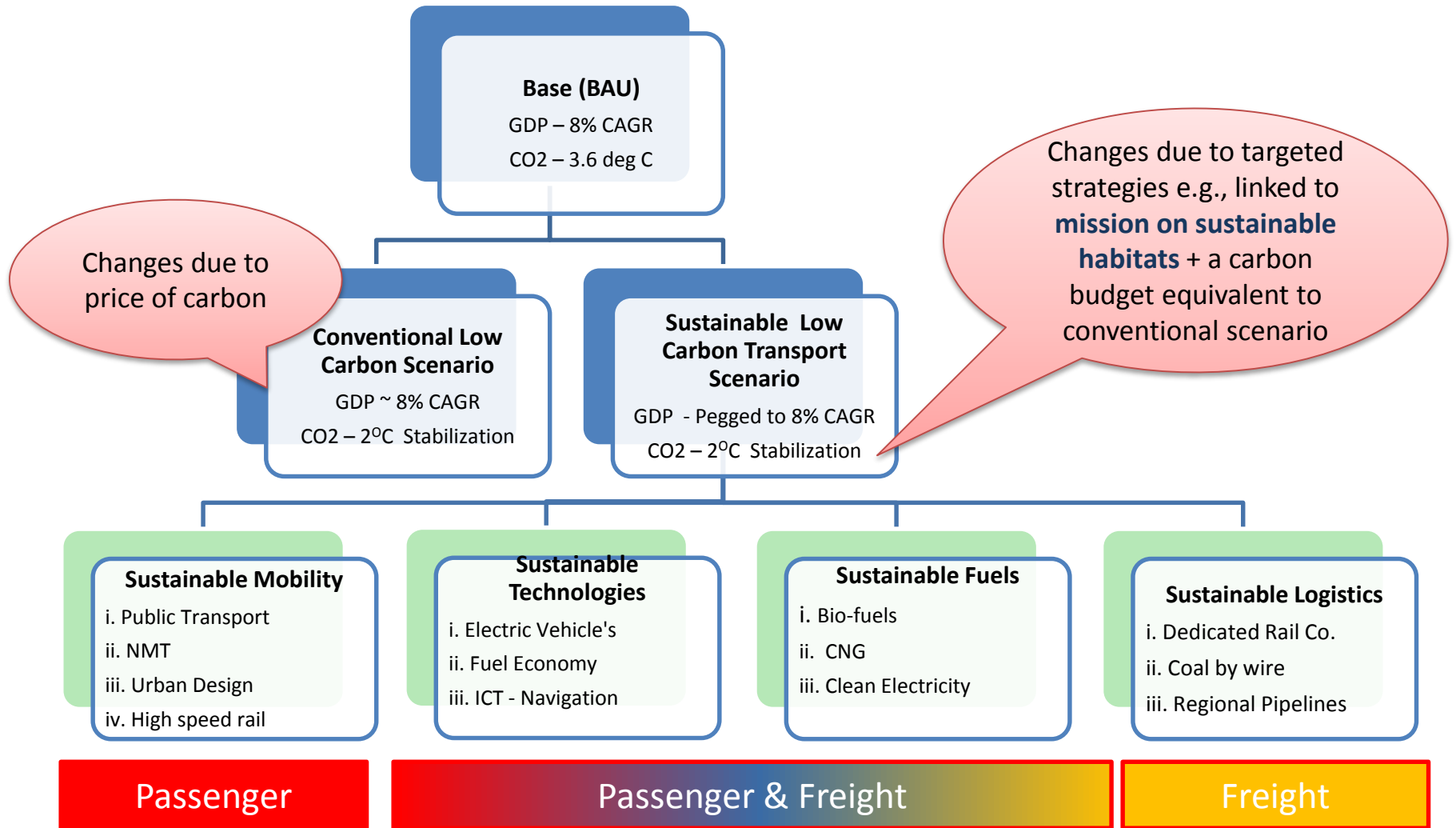
Low carbon scenarios for transport in India: Co-benefits analysis

Dhar S. and Shukla P.R.

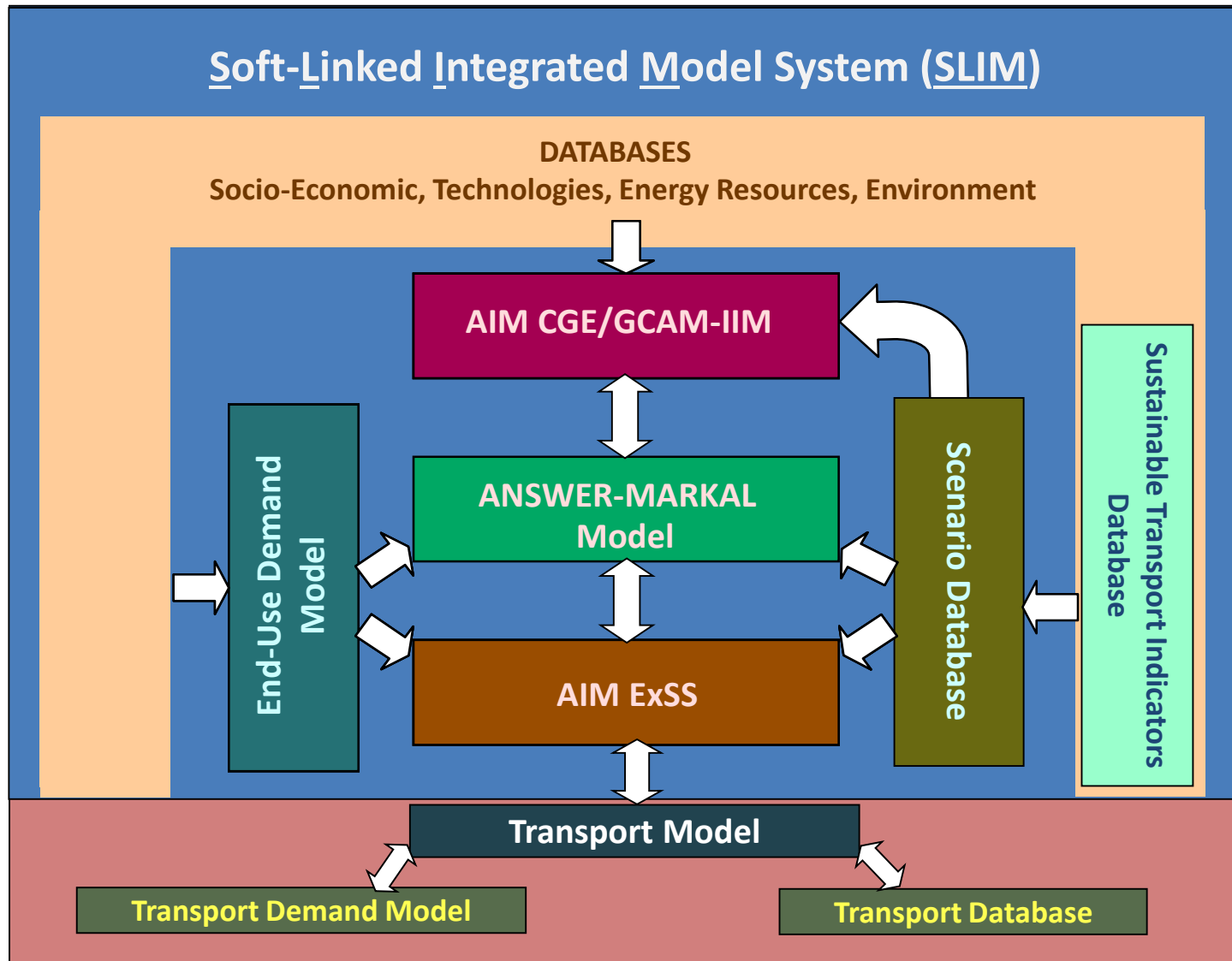
Accepted and available on the Energy Policy Website

Dhar, S., & Shukla, P. R. (2014). Low carbon scenarios for transport in India: Co-benefits analysis. Energy Policy. doi: 10.1016/j.enpol.2014.11.026

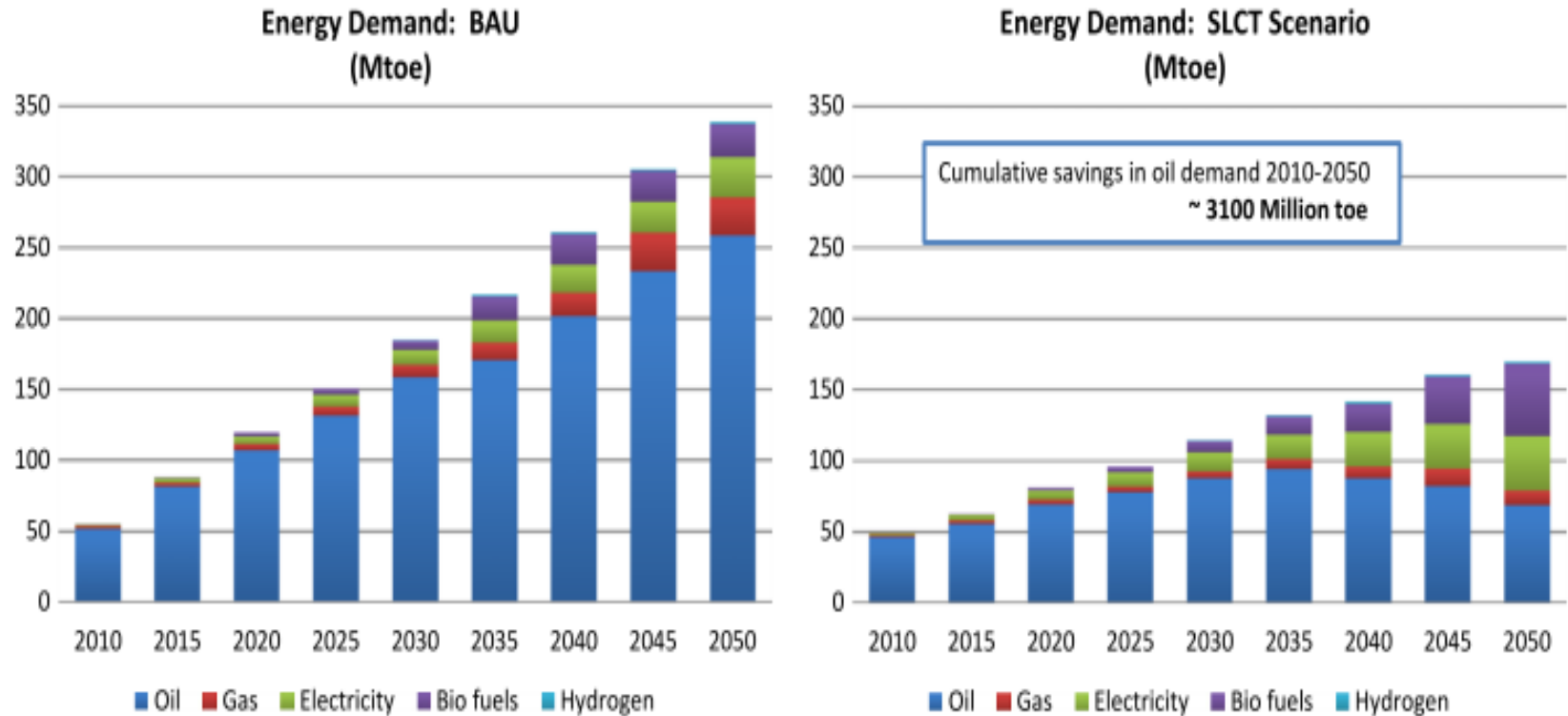
Scenario Architecture Transport: National



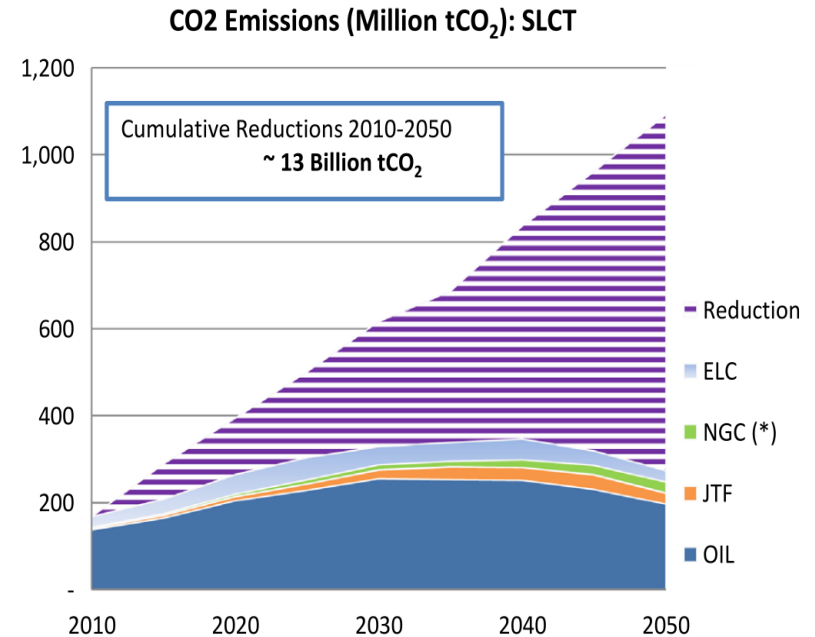
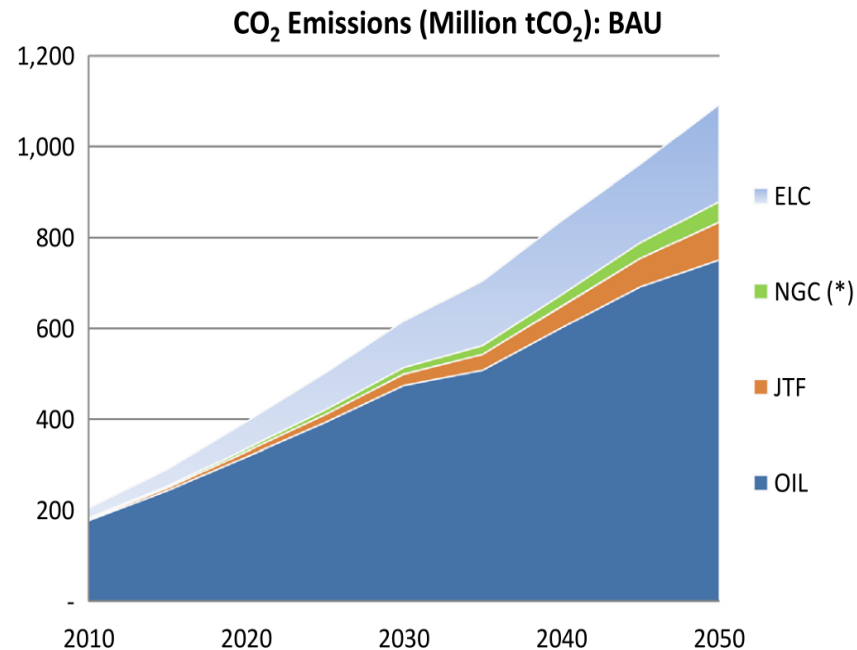
Soft-Linked Integrated Model



Energy Mix for Transport



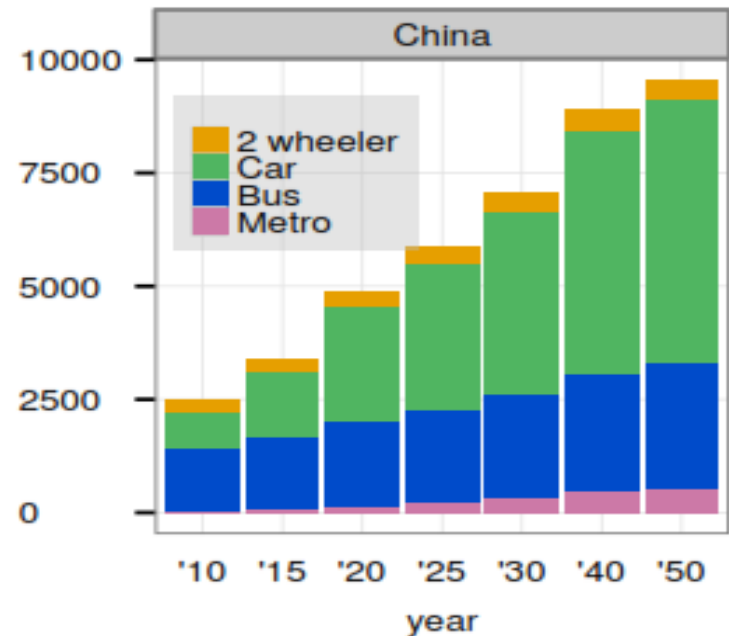
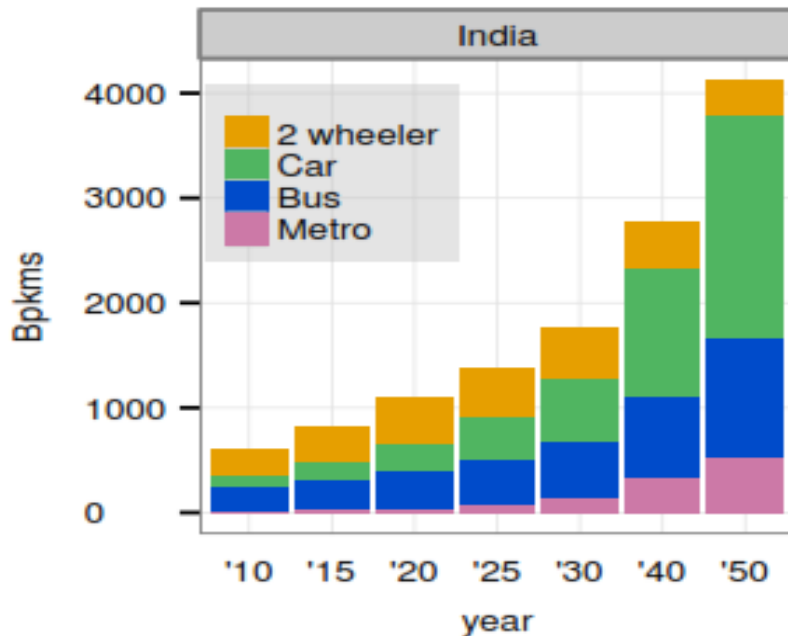
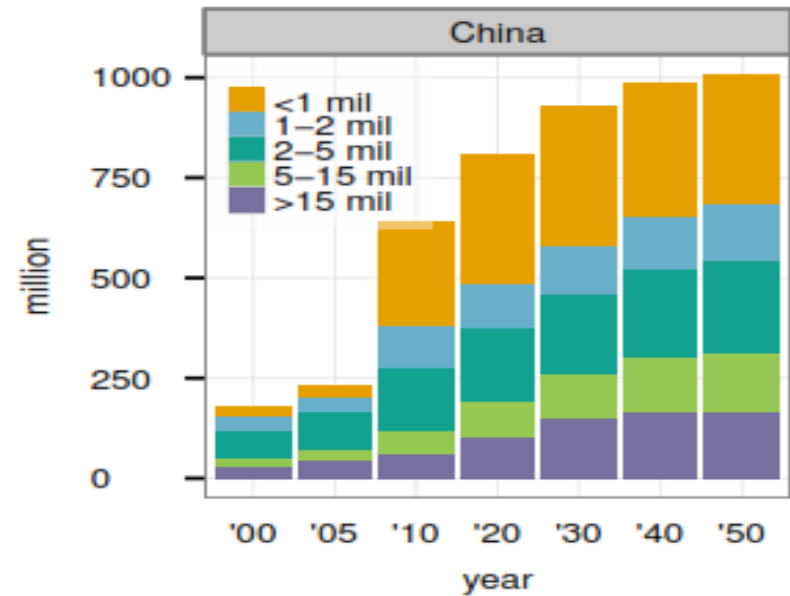
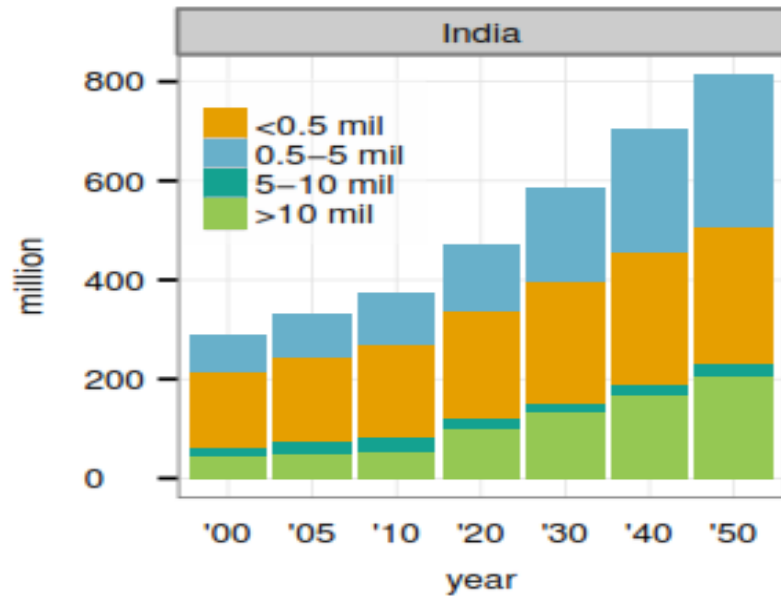
CO₂ Emissions from Transport Sector



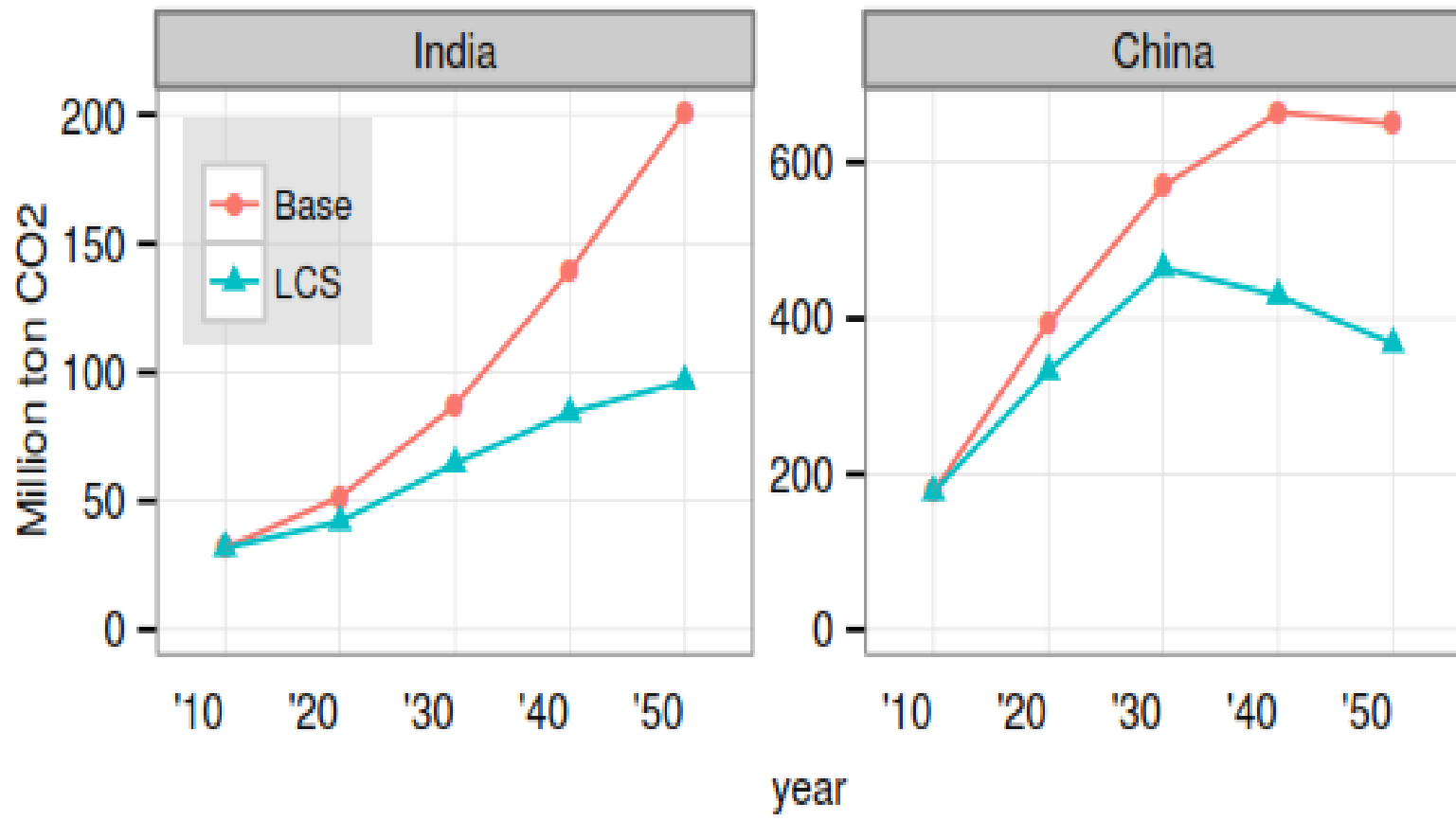
Low carbon urban transport scenarios for China and India: A Comparative Assessment

Submitted to Journal Transport Research D:
Transport and Environment
Under Review

Demographic Transitions

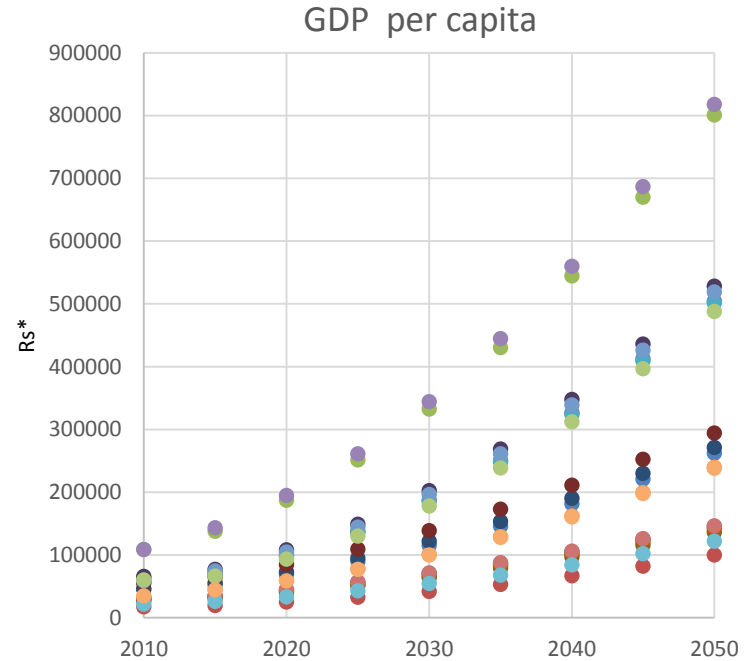
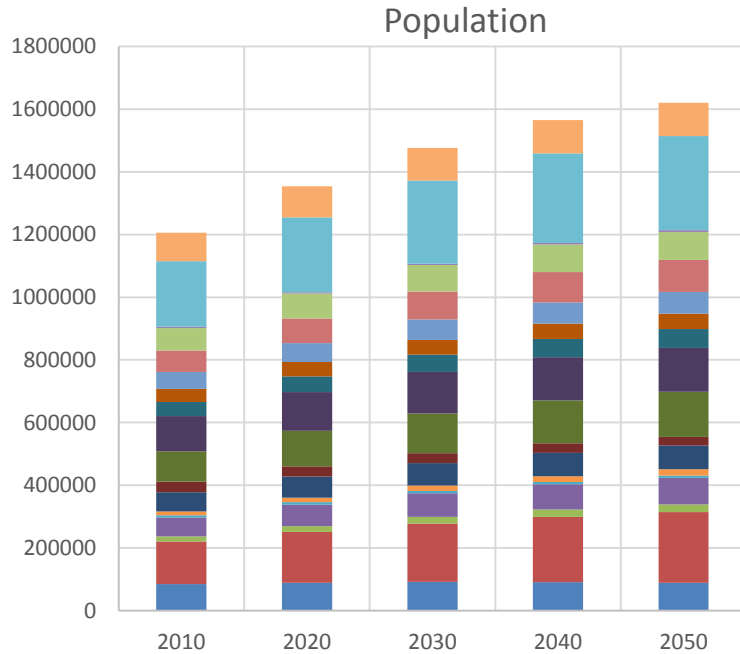


CO₂ Emissions



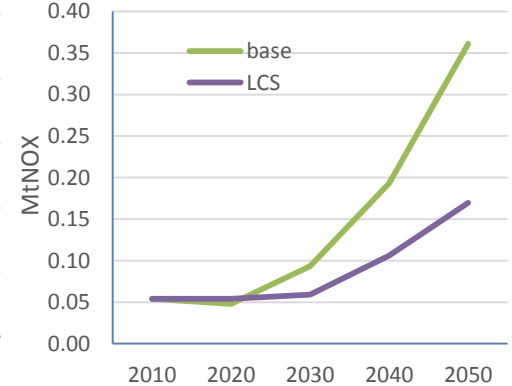
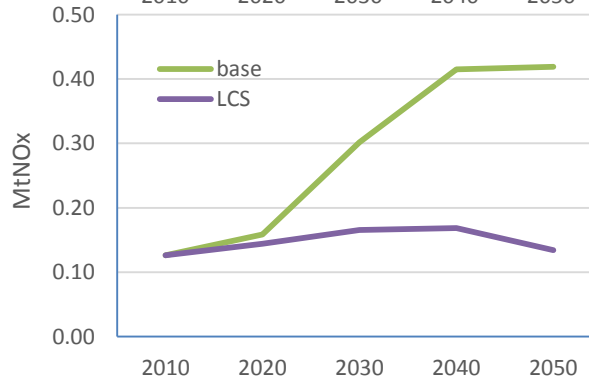
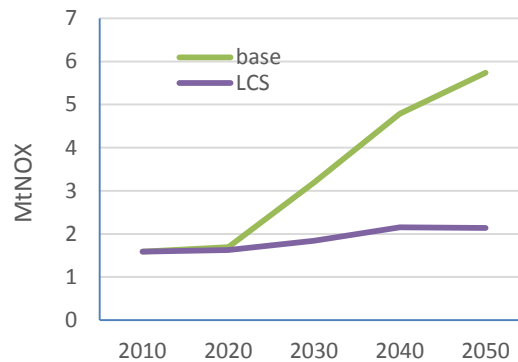
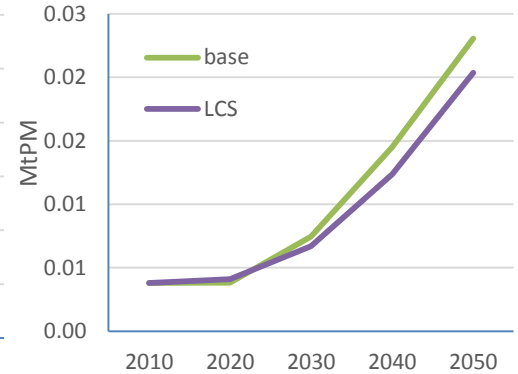
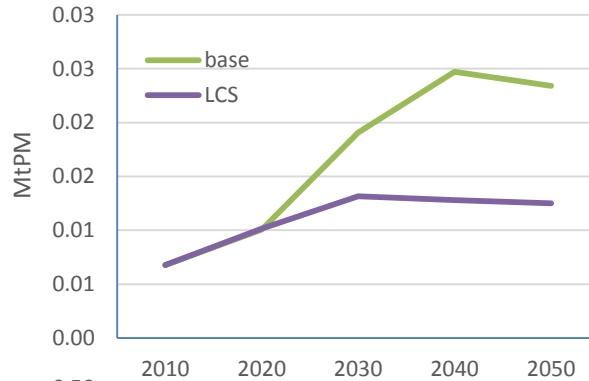
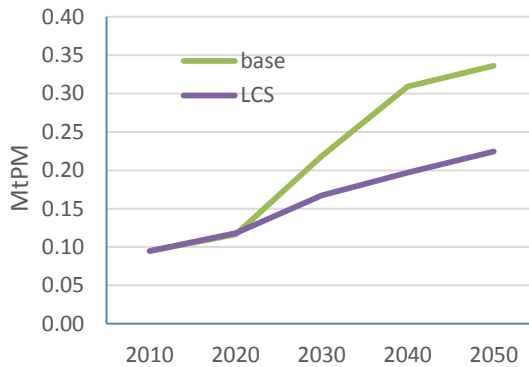
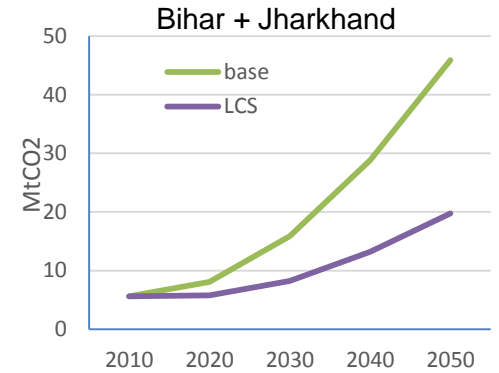
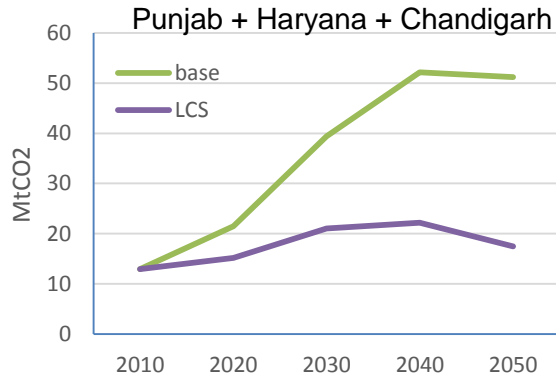
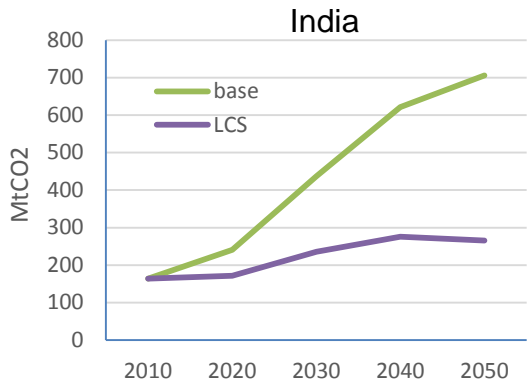
SUB-NATIONAL LEVEL

Demographics Transitions



*2004-05 constant prices

Air Quality Co-benefits

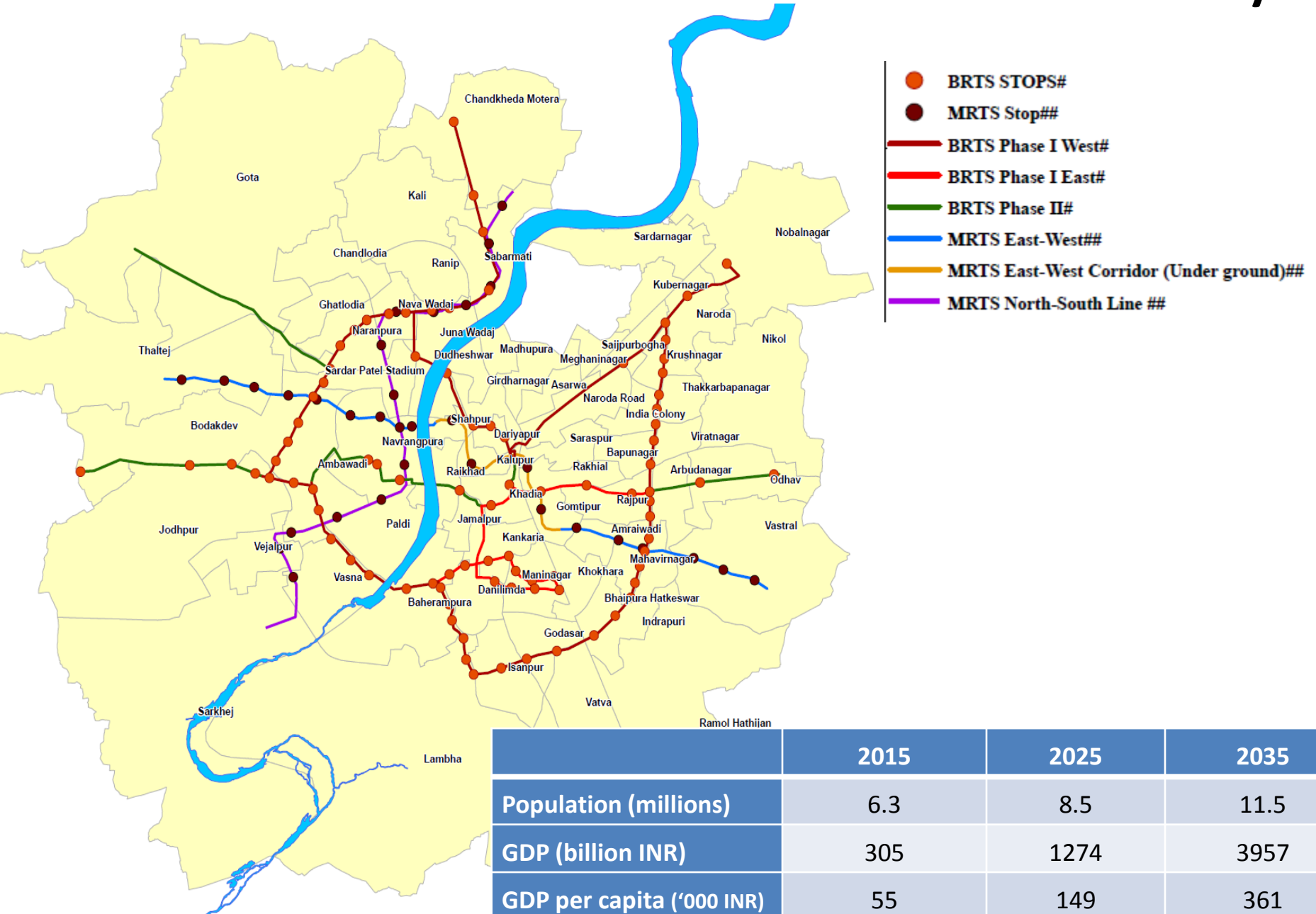


CITY LEVEL

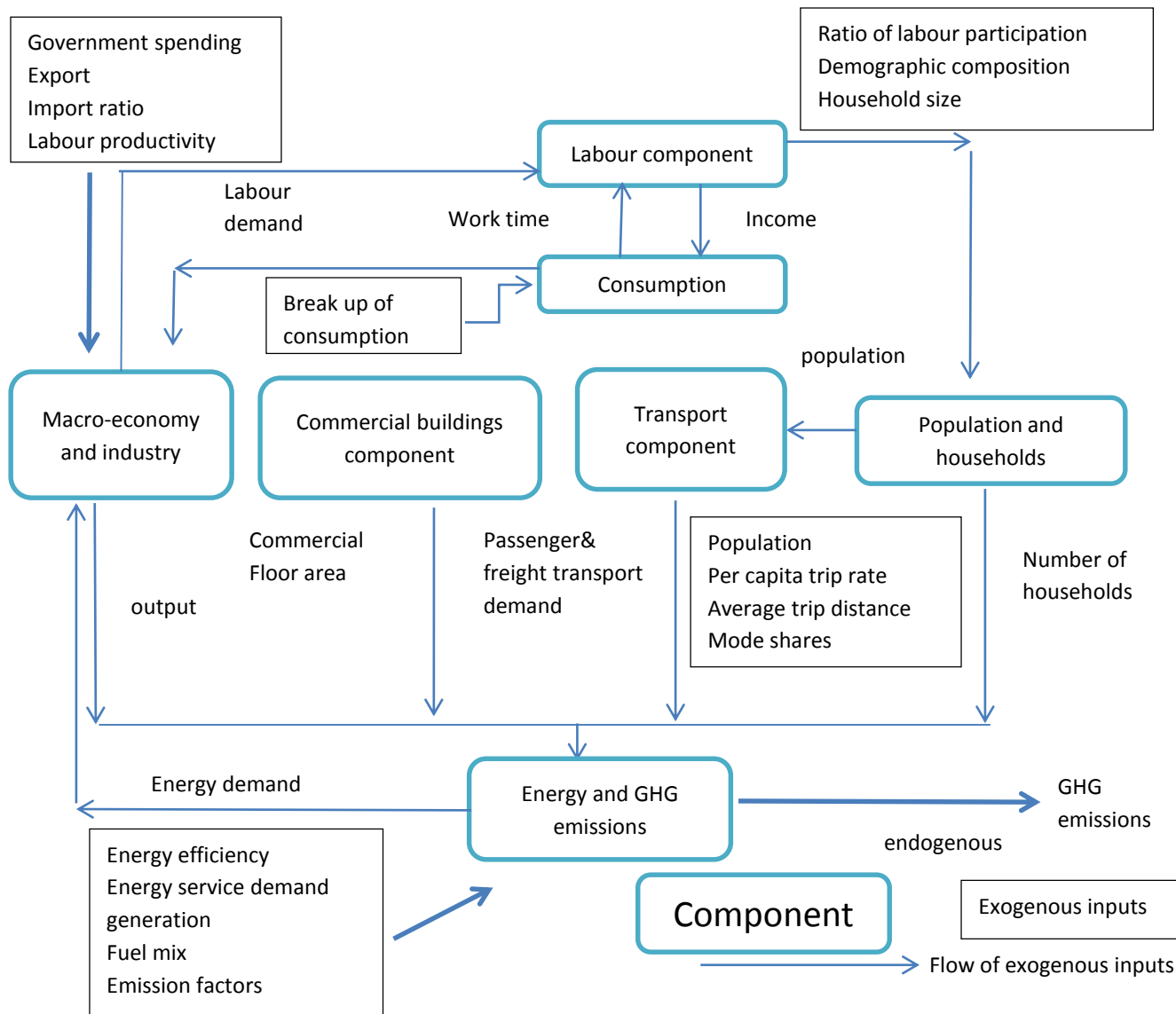
Mainstreaming low carbon transport in urban development planning

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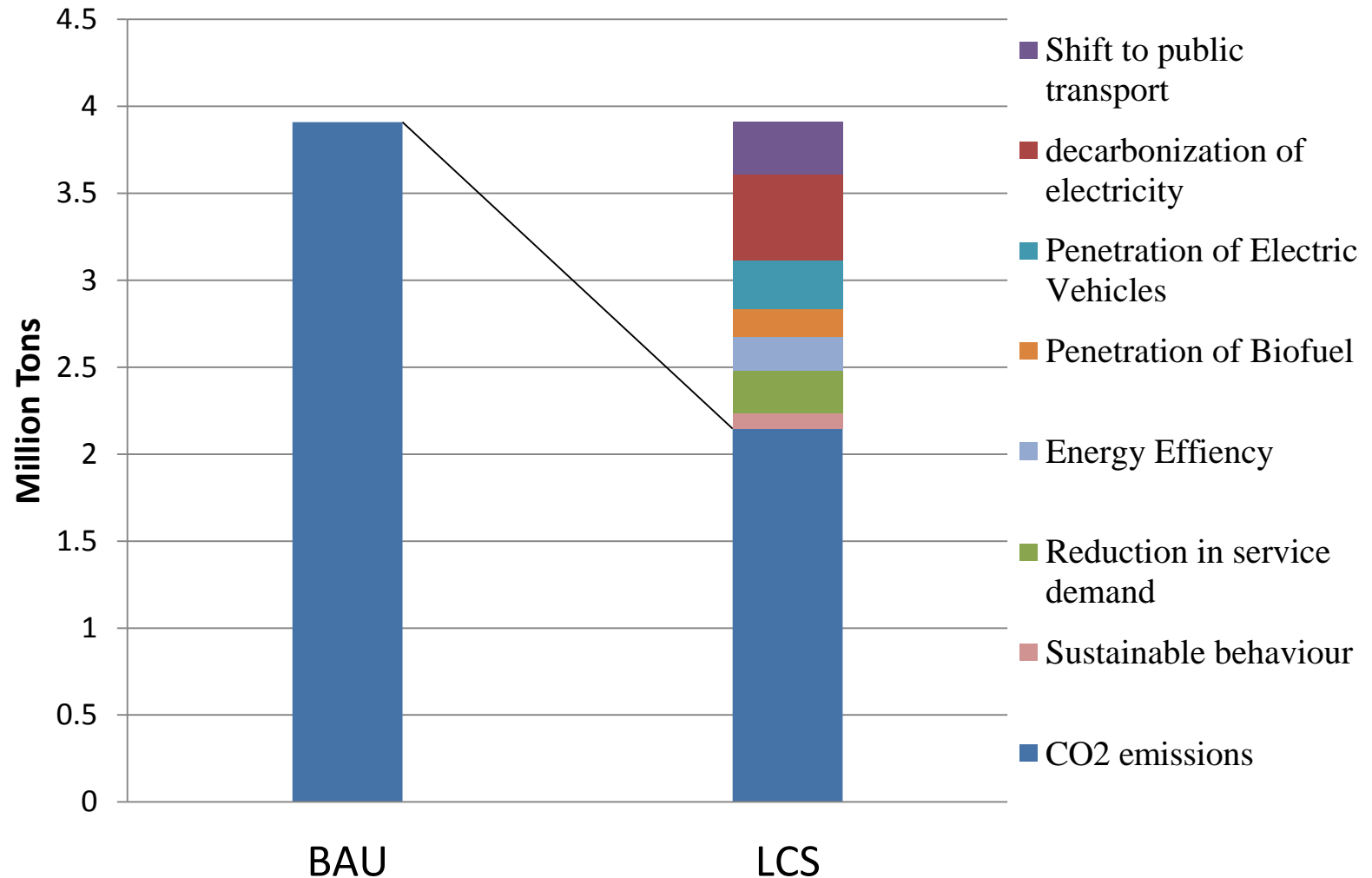


ExSS framework



Adapted from Gomi et al., (2010)

Mitigation Potential in 2035



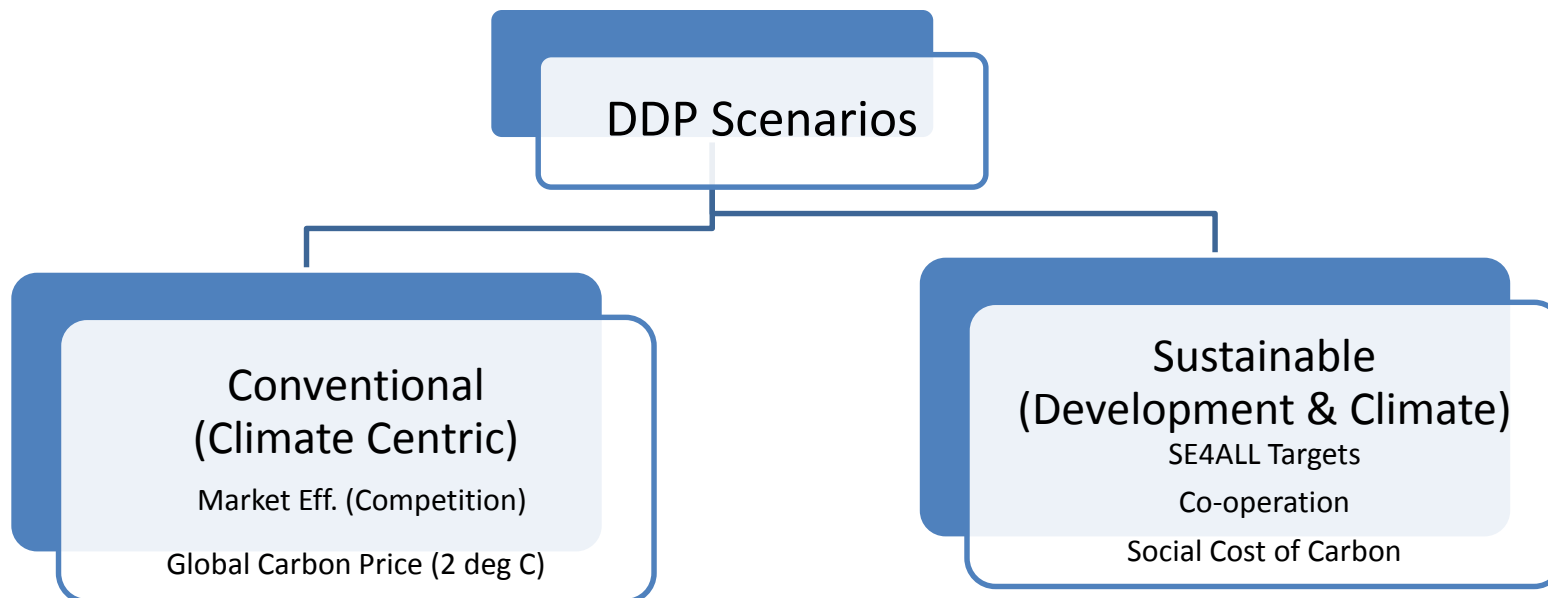
Year 2015-16: Way Forward

Research Plan 2015-16

1. **India national and subnational Low Carbon Scenarios and Plans to align with Global Stabilization Target**
2. **State-level Low Carbon Scenarios in India**
 - **GHGs (including Short-lived GHGs)**
 - **State-level Low Carbon Roadmap**
3. **Integrated and Down-scaled Model Development**
4. **Participation in International Projects**
 - **MILES Project**
 - **Deep Decarbonization Pathways Project (DDPP)**
5. **Participation in UNEP Low Carbon Transport in India Project**
6. **Publish reports/papers/documents to support India's INDCs**
7. **Capacity Building and Dissemination**

Deep Decarbonization Pathways Project

Scenarios Framework



Indicators for Scenario Analysis



LCS Scenarios with Sustainability

- **Focus on:**
 - Mainstreaming climate actions in development plans/policies/processes
 - Behavioral Changes, Innovations, Co-benefits and Co-operation
 - Up-front decisions to avoid long-term lock-ins
- **Sustaining Capital Stocks**
 - Natural, Man-made, Human & Social
- **Use Systems Approach for Analysis**
 - Integration, Holistic/Long-term Vision, Dynamic Assessment
- **Interventions to influence Drivers of Change**
 - Assess and influence Processes
 - Institutions (to reduce transaction costs/risks and to sustain change)
- **Shaping Stakeholder and Societal Preferences**
 - Information, Awareness, Debates to arrived at informed choices

Co-benefits and Social Cost of Carbon

Focus on Co-benefits & Lock-ins

- Many hard and soft planning options are not yet exhausted
- Right choices can generate huge benefits of development and environment in the long-run
- Similarly, wrong choices would result in costly “lock-ins”
- Window of opportunity of 10 to 20 years exists to align policies and strategies for energy, climate change and sustainable development

Social Value of Carbon



Key Sectors and Strategies

Sustainable Habitats

Sectors	Strategy
Building	Affordable housing + Building Codes, Materials
Transport	Avoid, Shift, Improve, Switch
Lighting	CFL /LEDs
Cooking	Access to clean fuels
Cooling /Heating	Labelling, Building Codes
Waste	National Mission on Waste
....	

Sustainable Production

Sectors	Strategy
Steel	Plant Benchmarking, PAT, Energy saving Cert., Recycle
Cement	Plant Benchmarking, PAT, Energy saving Cert., Materials (Fly Ash)
Aluminium	Plant Benchmarking, PAT, Energy saving Cert., Recycle
...	

Sustainable Electricity

Sectors	Strategy
Renewable	National Mission on Solar, Wind Tariff
Coal	Clean Coal Technologies, Coal by Wire
....	

Thank You