

Integrated Assessment of Low Carbon Transport at National Level

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Workshop on Developing Policies and strategies for
Low Carbon Transport in India

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New Delhi

Overview

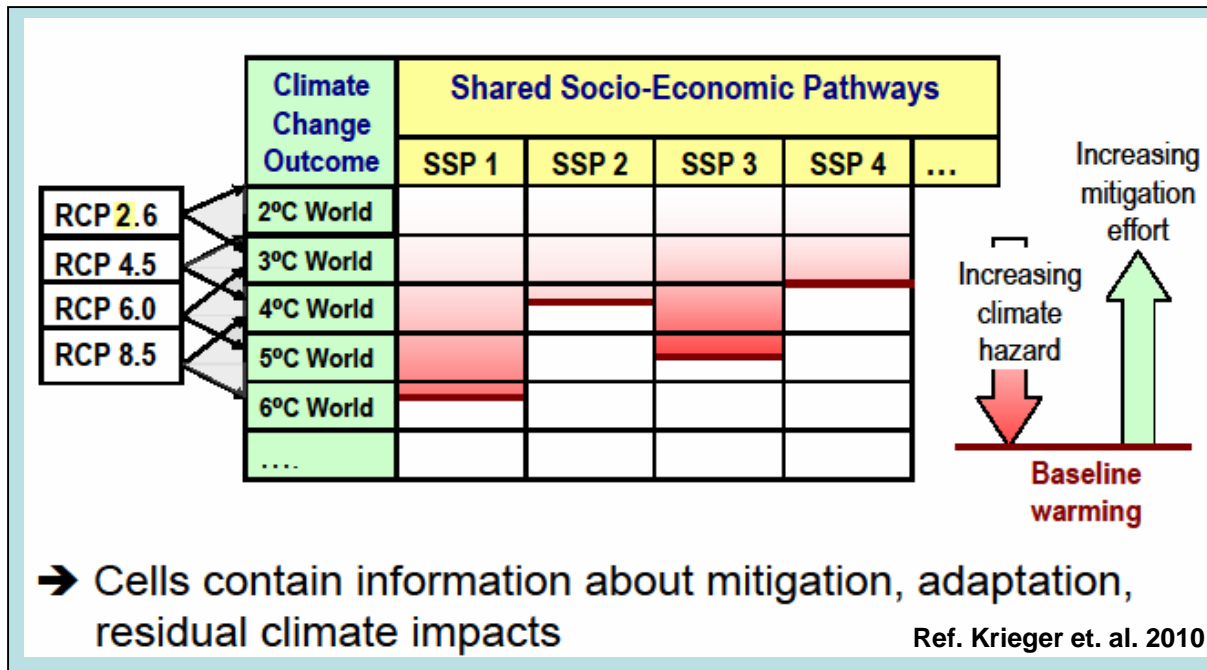
1. Sustainable Low Carbon Transport Assessment
 - a. Concepts
 - b. Assessment
 - c. Model System
2. Scenario storylines
 - a. Business as Usual (BaU) Scenario
 - b. Sustainable Low Carbon (Examples)
 - i. Coal by wire
 - ii. Regional Pipelines
 - iii. Dedicated Freight Corridors
 - iv. Urban Low Carbon Transition
3. Results: Example: CO₂ Mitigation from Freight Sector
(More results in Presentations during Next 3 Sessions)
4. Conclusions

What do we mean by Low Carbon?

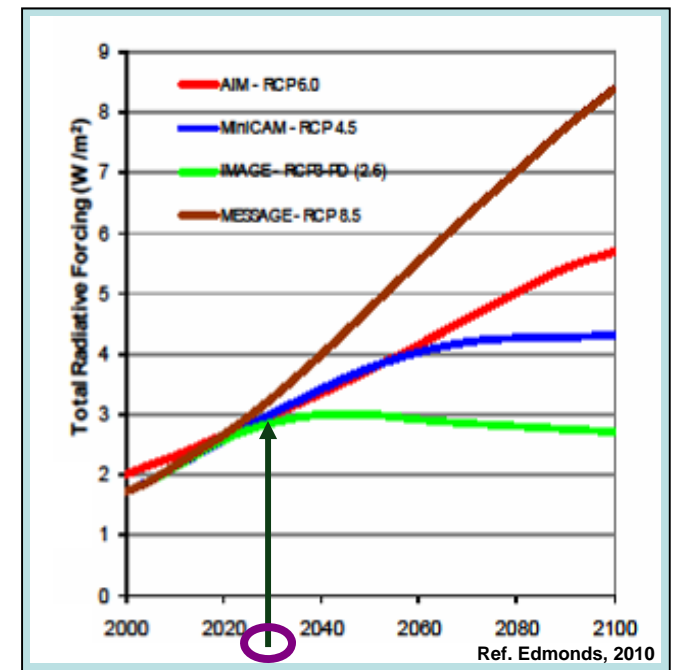
UNFCCC Low Carbon Target

2°C Temperature Stabilization

IPCC Representative Concentration Pathways (RCPs)

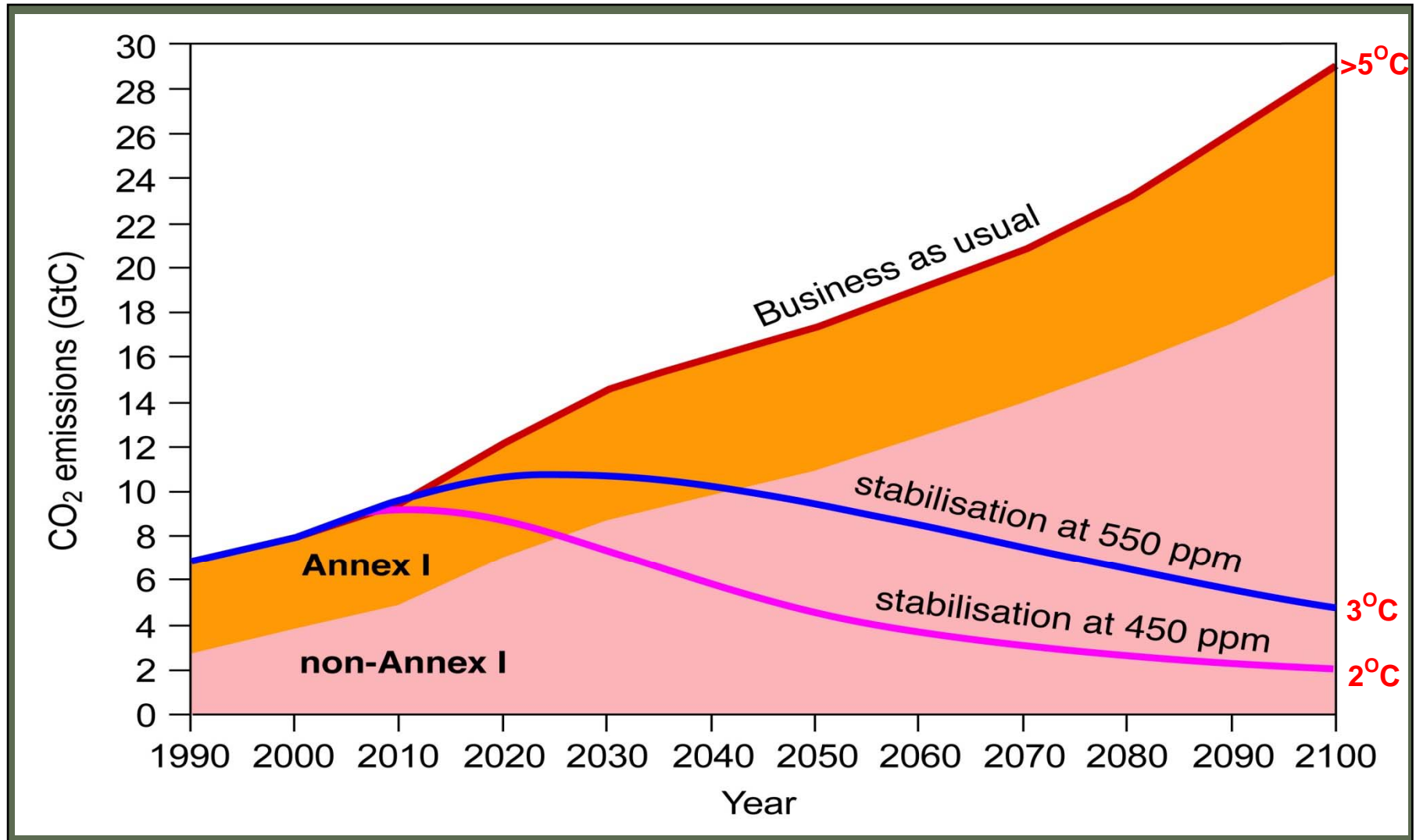


Emission Paths for RCPs



Papers Available online (August 2011)
in 'Climatic Change', Springer

Global Emissions Pathways



Sustainable LC Society: Framing

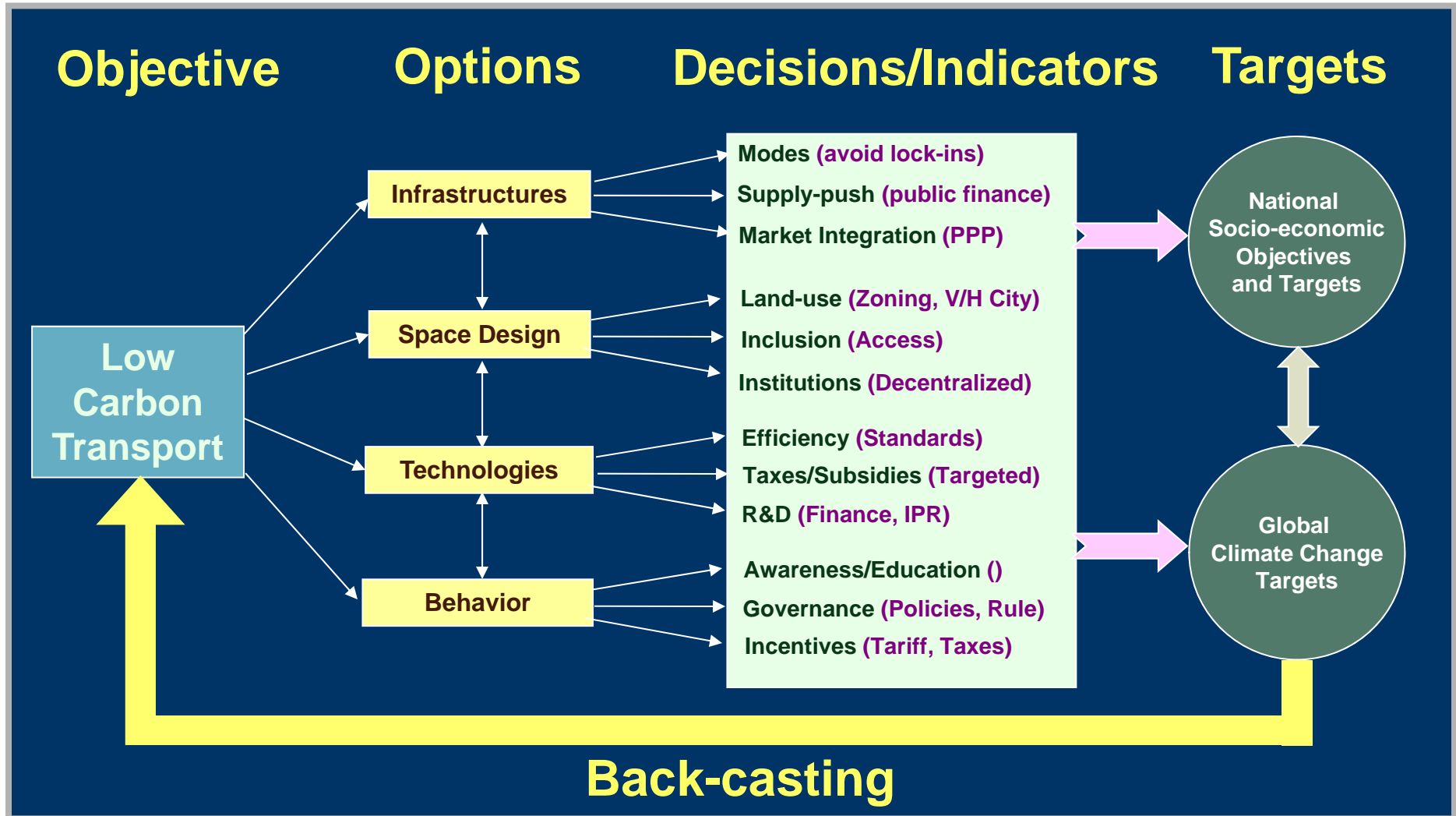
Low Carbon and Inclusive Development

- **Mapping Transitions**
 - i. Demographic (Gender/Age Profiles, Urban/Rural)
 - ii. Income (Growth, Distribution)
 - iii. Behavior (e.g. Consumption, Conservation)
 - iv. Governance/Institutions (Conventional/Green)

- **Economics: Paradigm Shift**
 - i. Cooperation & Co-benefits (e.g. energy security, AQ)
 - ii. Finance (e.g. discount rates)

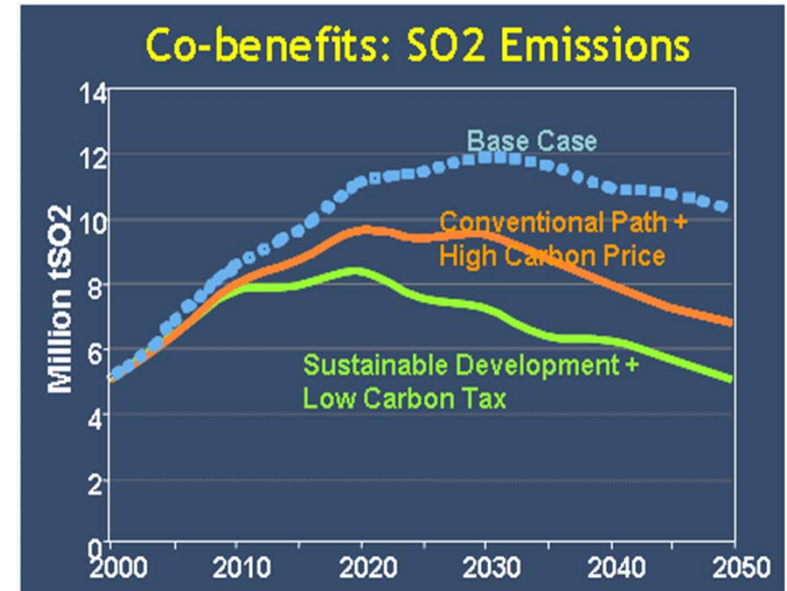
- **Policies**
 - i. Technology (Avoid Lock-ins): Infrastructures; Targeted R&D; IPR
 - ii. Coordinated policies to gain co-benefits (e.g. CO2 & Local Pollution)
 - iii. Global carbon price/tax

Sustainable Low Carbon Mobility Framework



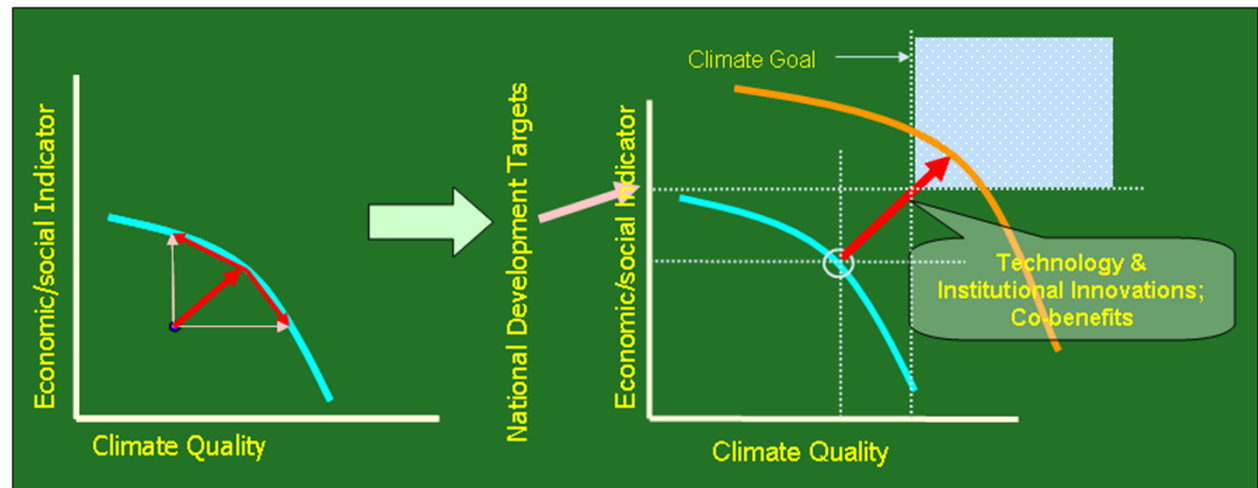
Technologies delivers multiple dividends

- In developing countries, significant opportunities exist for gaining co-benefits
- Technology Assessment should consider all costs and benefits

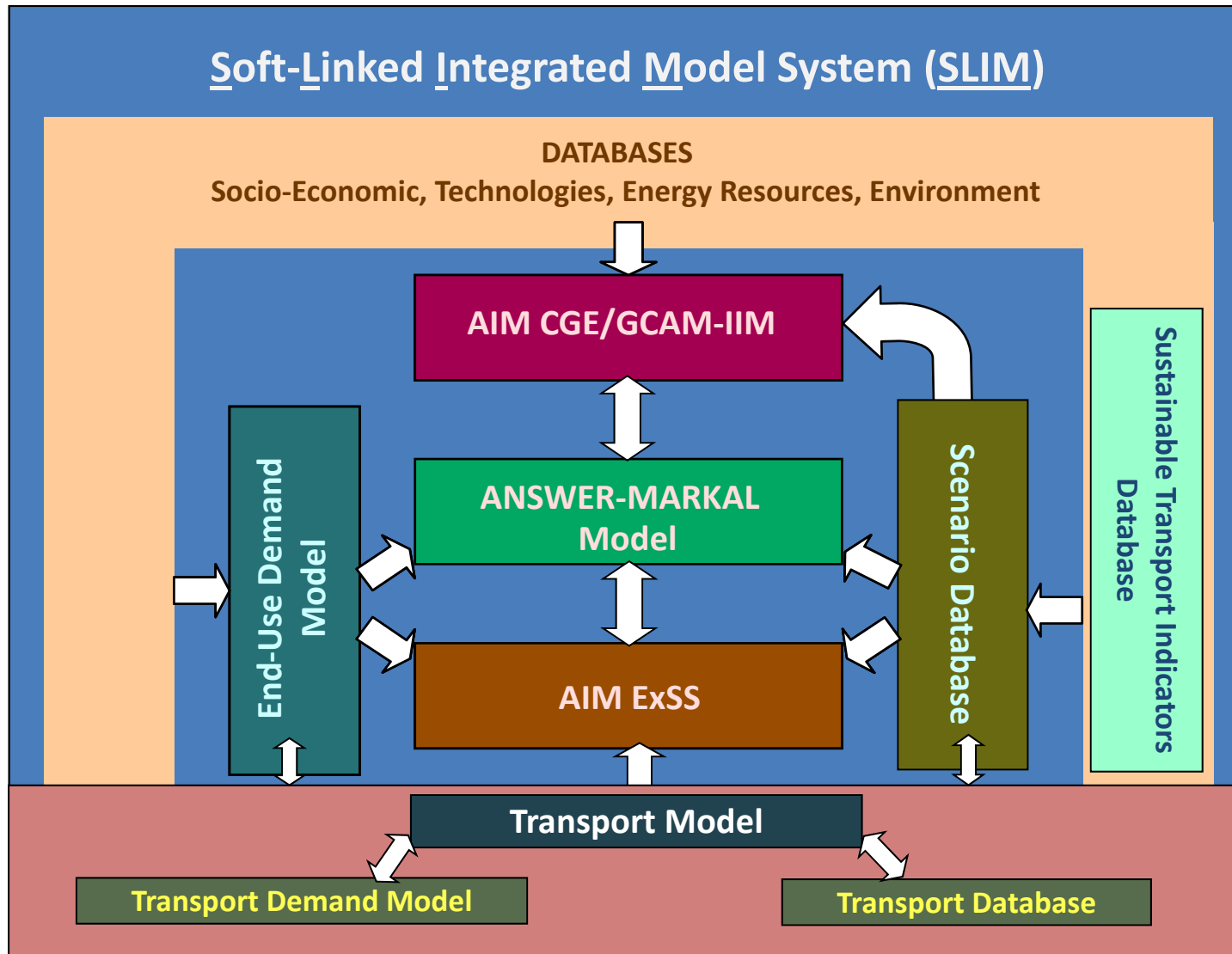


“For developing countries, the ‘good news’ is that their environment and natural resources policies are often so bad that there are reforms which would be both good for the economy and good for the environment.”

Joseph Stiglitz



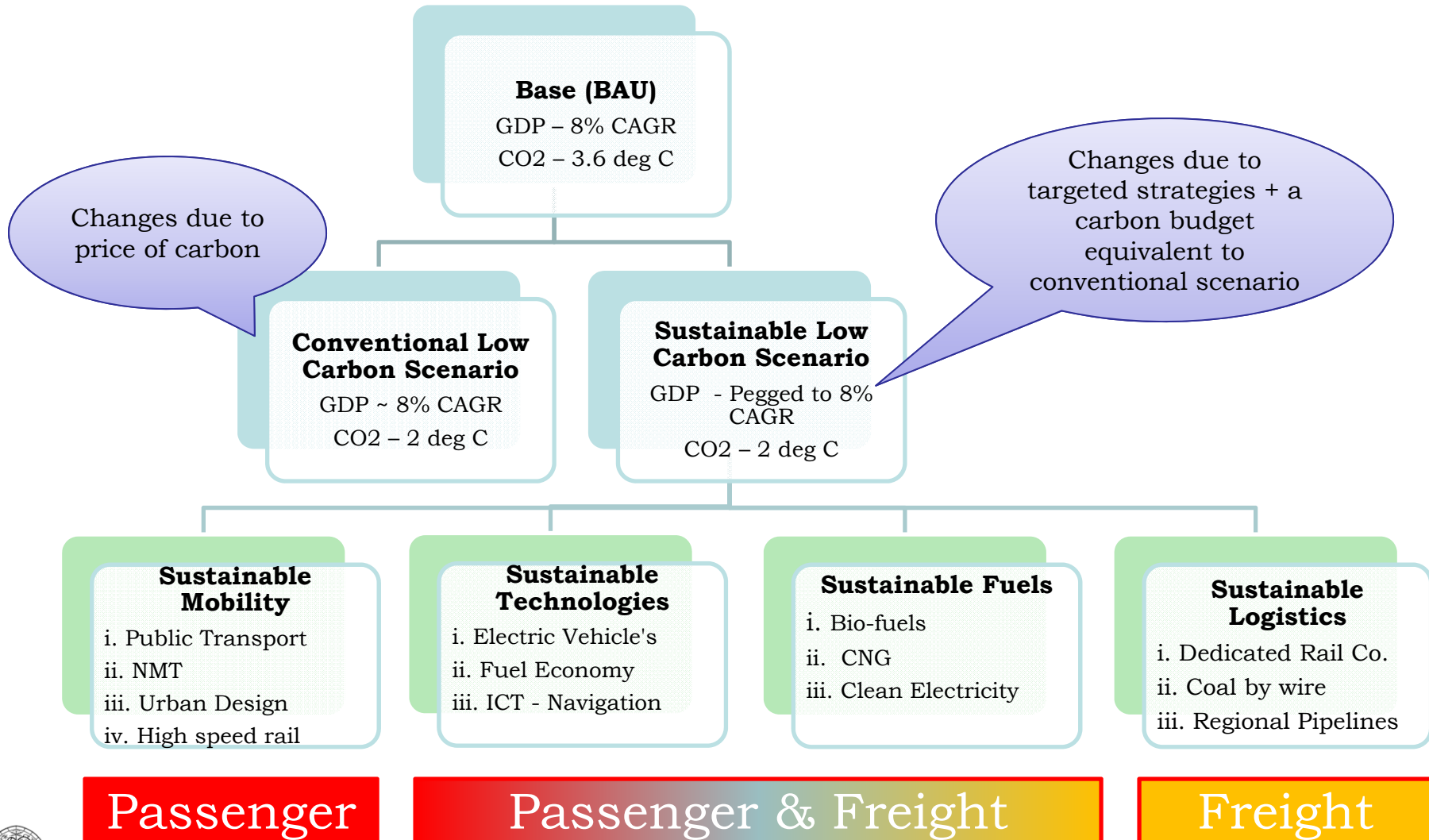
Soft-Linked Integrated Model



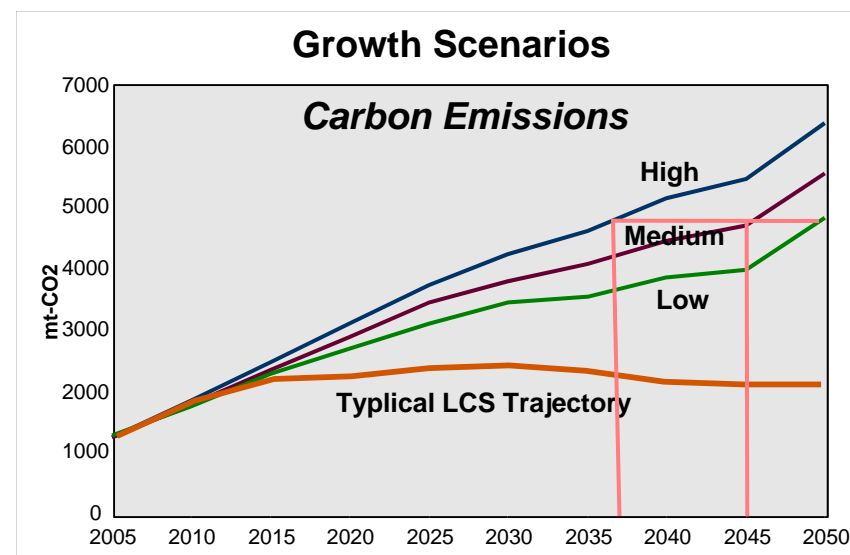
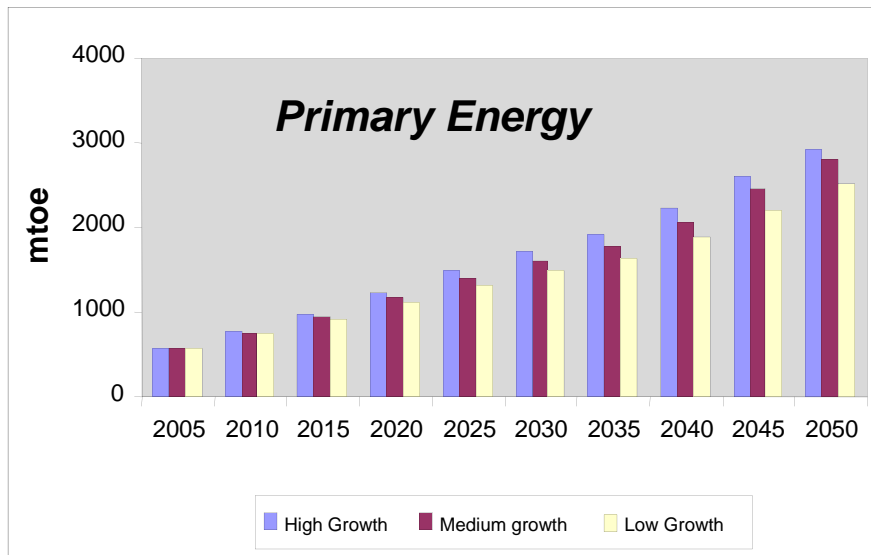
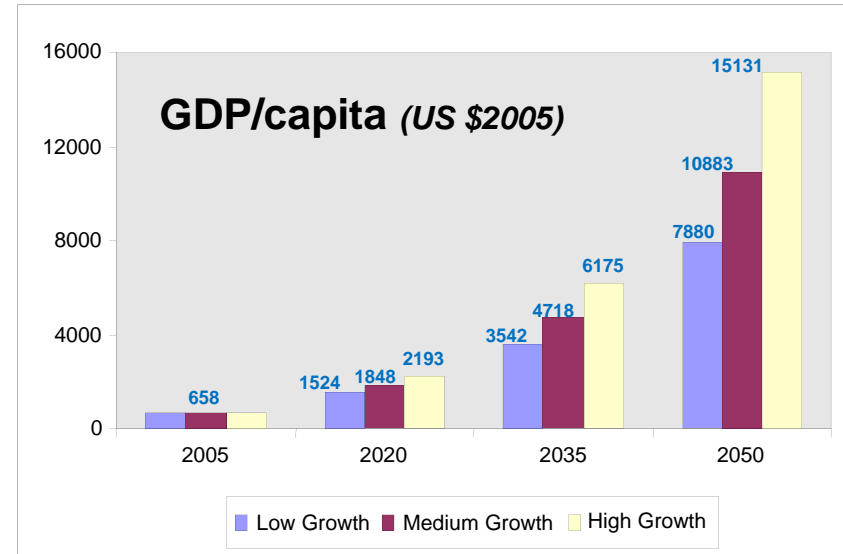
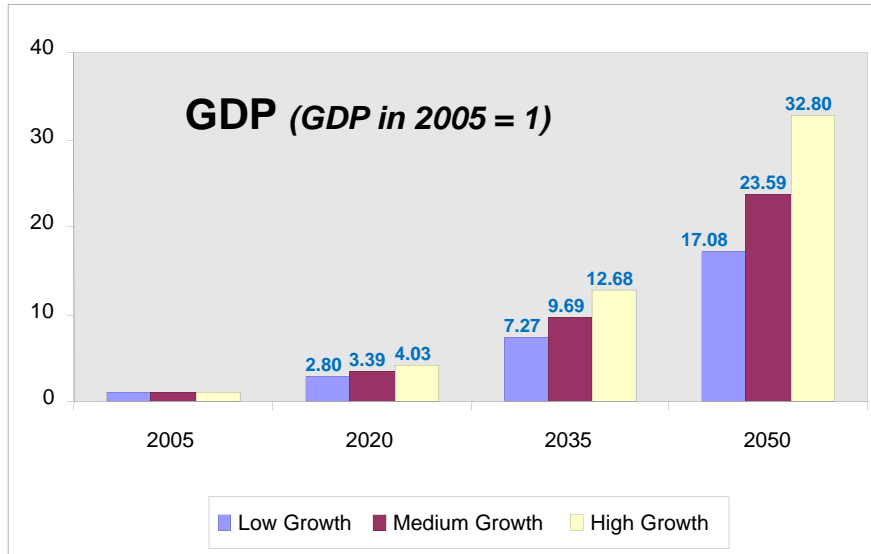
Scenario storylines

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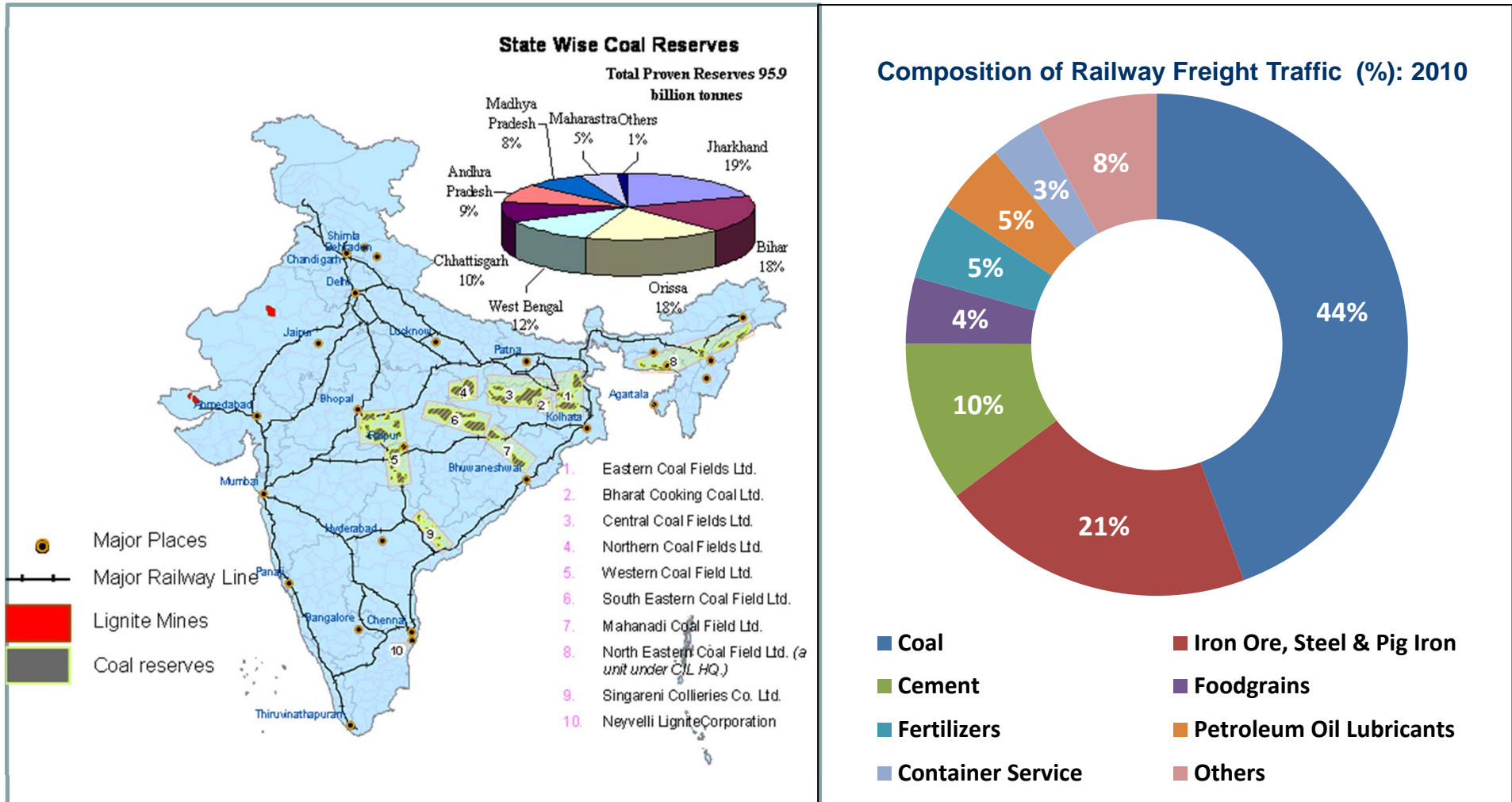
Architecture for Transport Scenarios



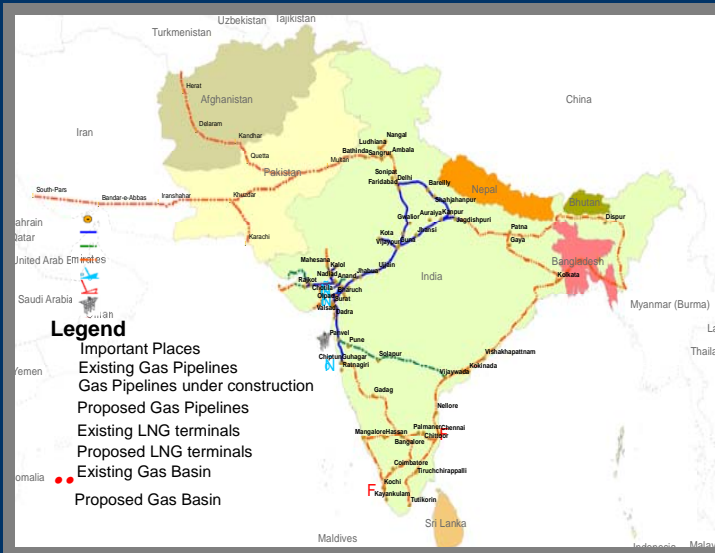
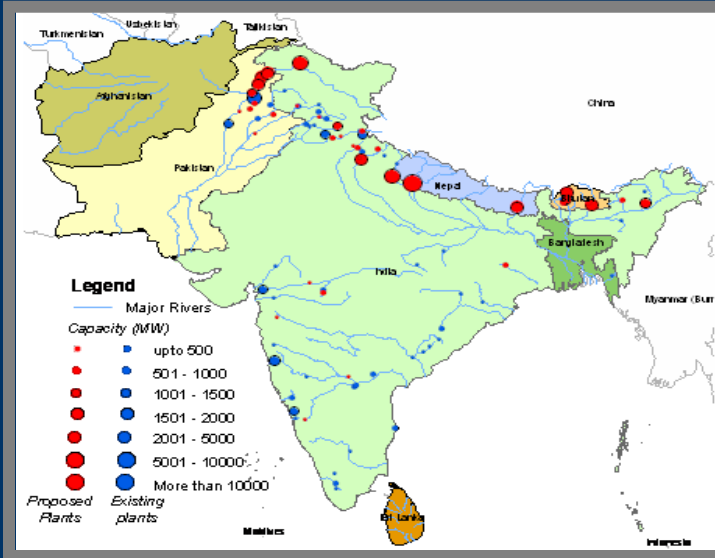
GDP, Energy, Emissions: BaU Growth Scenarios



Infrastructure Alternatives: Coal by Wire



Integrated Regional Energy Market: Co-benefits



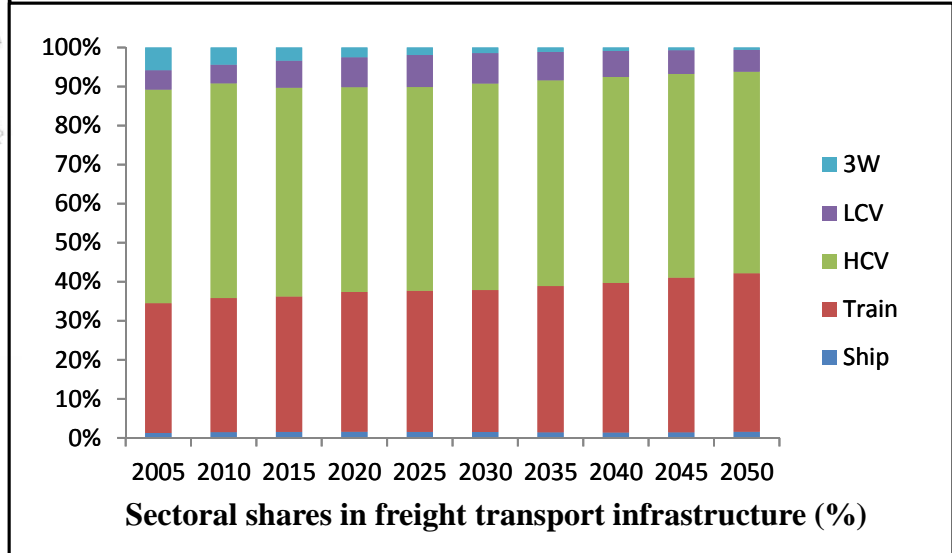
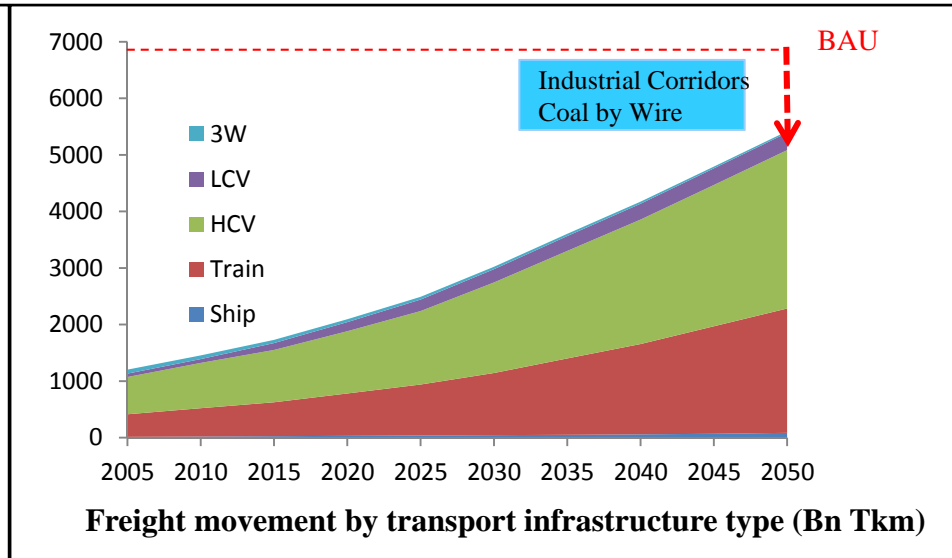
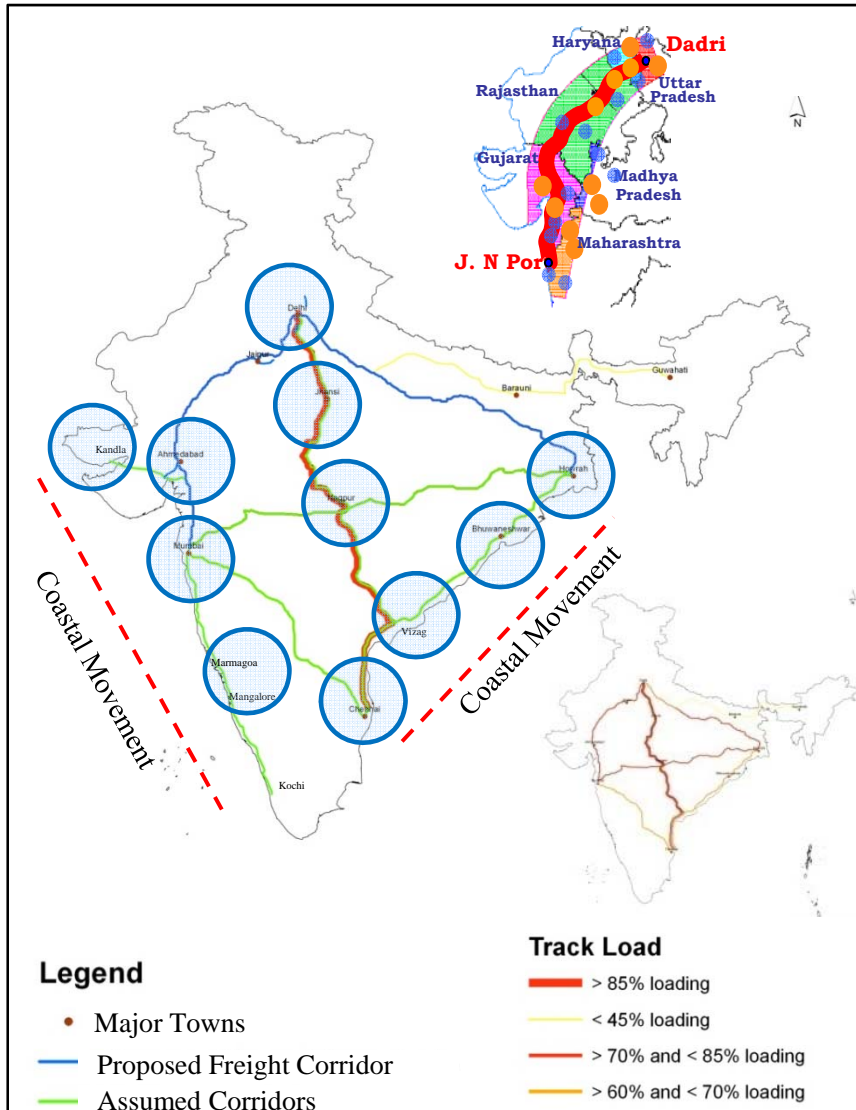
Co-benefits of South-Asia Integrated Energy-Water Market

Benefit (Saving) Cumulative from 2010 to 2030		\$ Billion	% GDP
Energy	60 Exa Joule	321	0.87
CO ₂ Equiv.	5.1 Billion Ton	28	0.08
SO ₂	50 Million Ton	10	0.03
Total		359	0.98

Spill-over Benefits / Co-Benefits

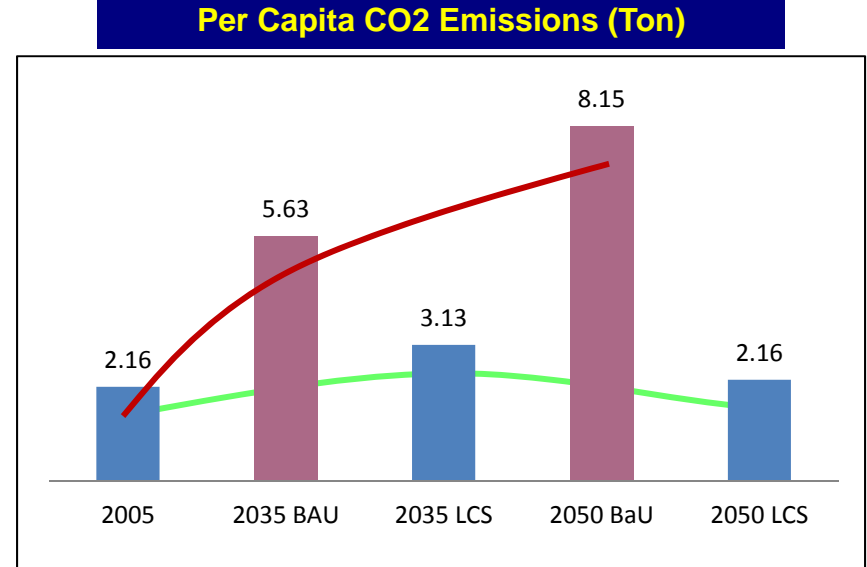
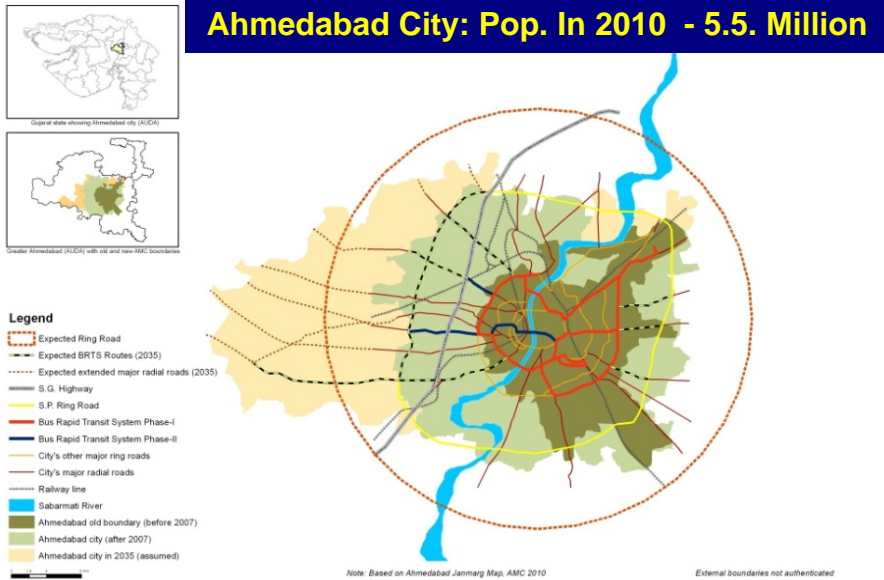
- More Water for Food Production (MDG1)
- 16 GW additional Hydropower (MDG1&7)
- Flood control (MDG1&7)
- Lower energy prices enhances competitiveness of regional industries (MDG1)

Transport Infrastructure: Avoiding Lock-ins

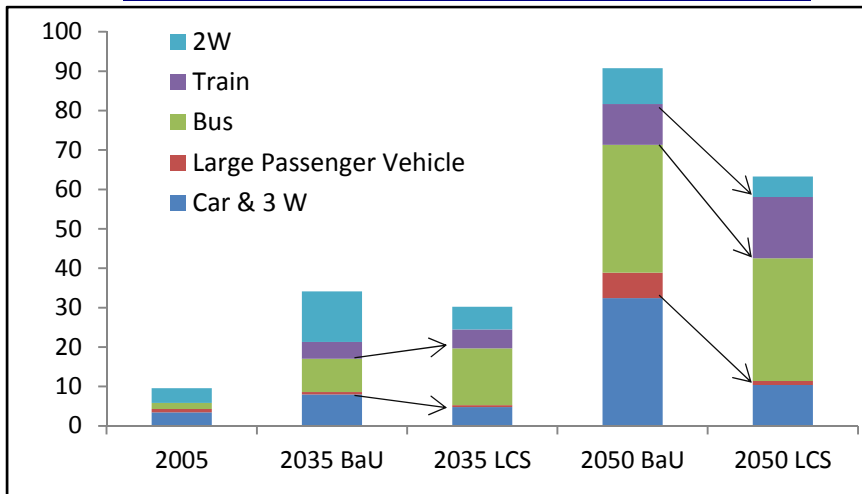


City Planning (Example: Ahmedabad)

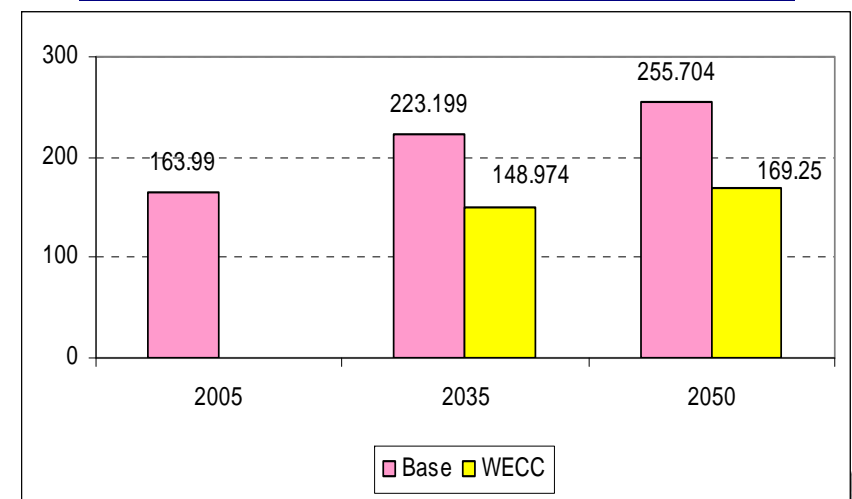
Carbon and Other Co-benefits



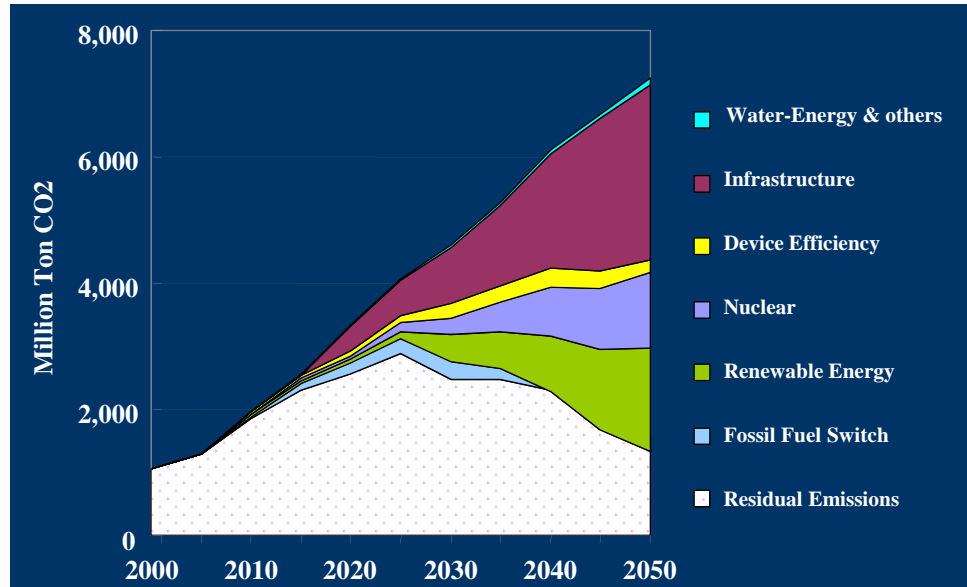
Co-benefits: Transport Transitions



Co-benefits: Water per capita (ML/million)



2°C Stabilization (E.g. All Sectors) Mitigation Options at National Level



Conventional Approach: transition with conventional path and carbon price

- High Carbon Price
- Climate Focused Technology Push
- Top-down/Supply-side actions

Technology Co-operation Areas

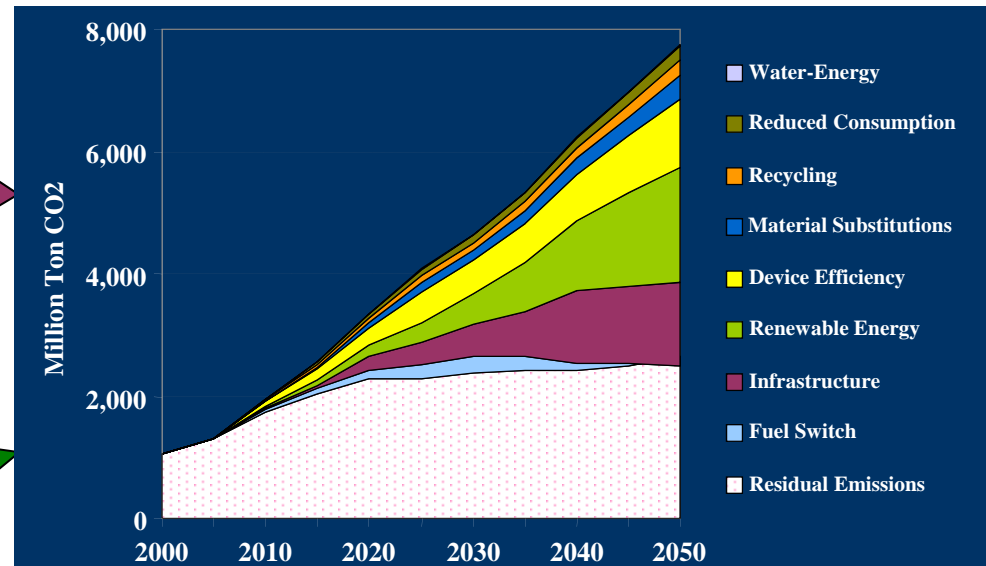
- Energy Efficiency
- Wind/Solar/Biomass/Small Hydro
- Nuclear/Low Carbon Infrastructure

Sustainability Approach: aligning climate and sustainable development actions

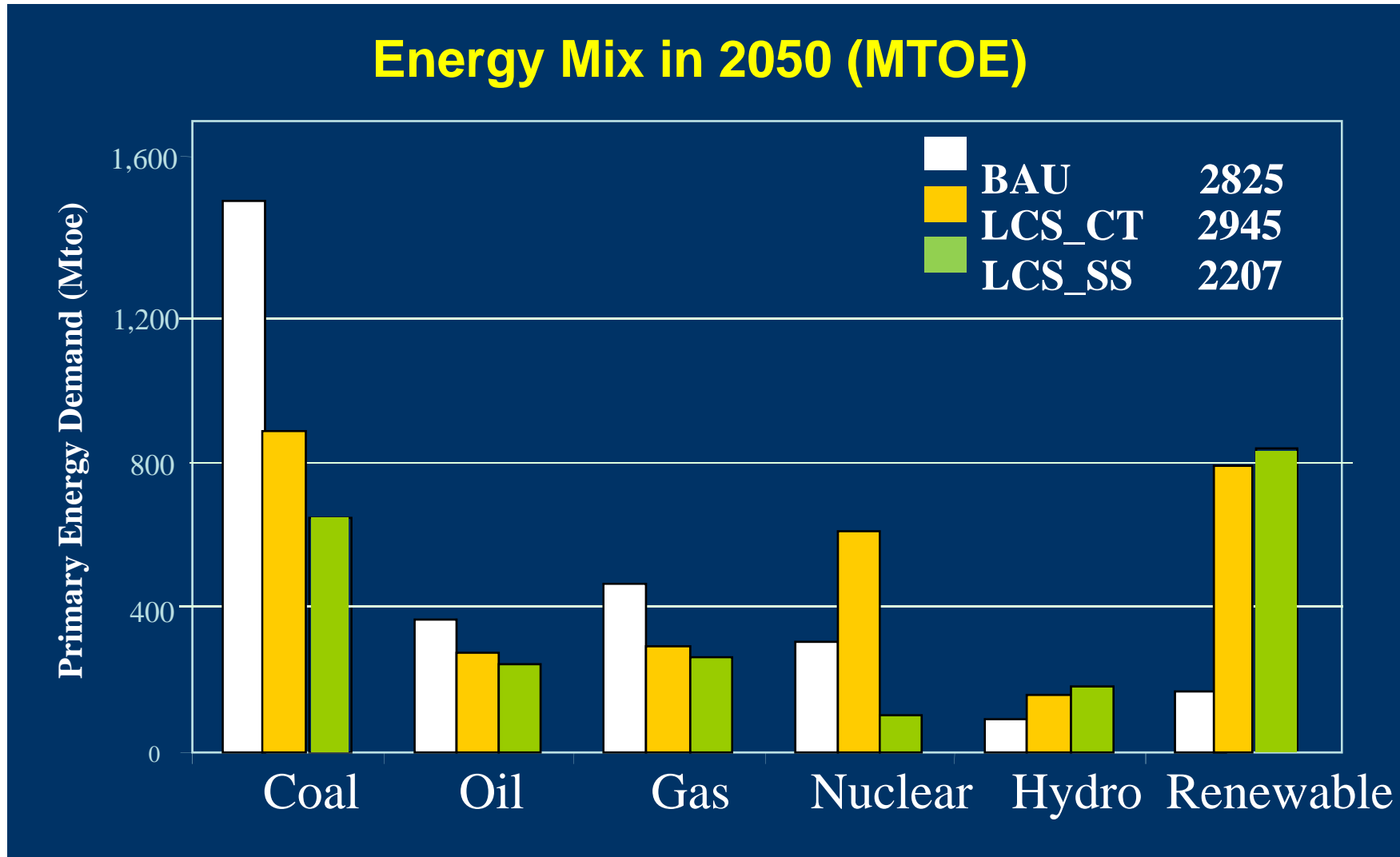
- Low Carbon Price
- Bottom-up/Demand-side actions
- Behavioural change
- Diverse Technology portfolio

Technology Co-operation Areas

- Transport Infrastructure Technologies
- 3R, Material Substitutes, Renewable Energy
- Process Technologies
- Urban Planning, Behavioral Changes



Energy Security Co-benefits



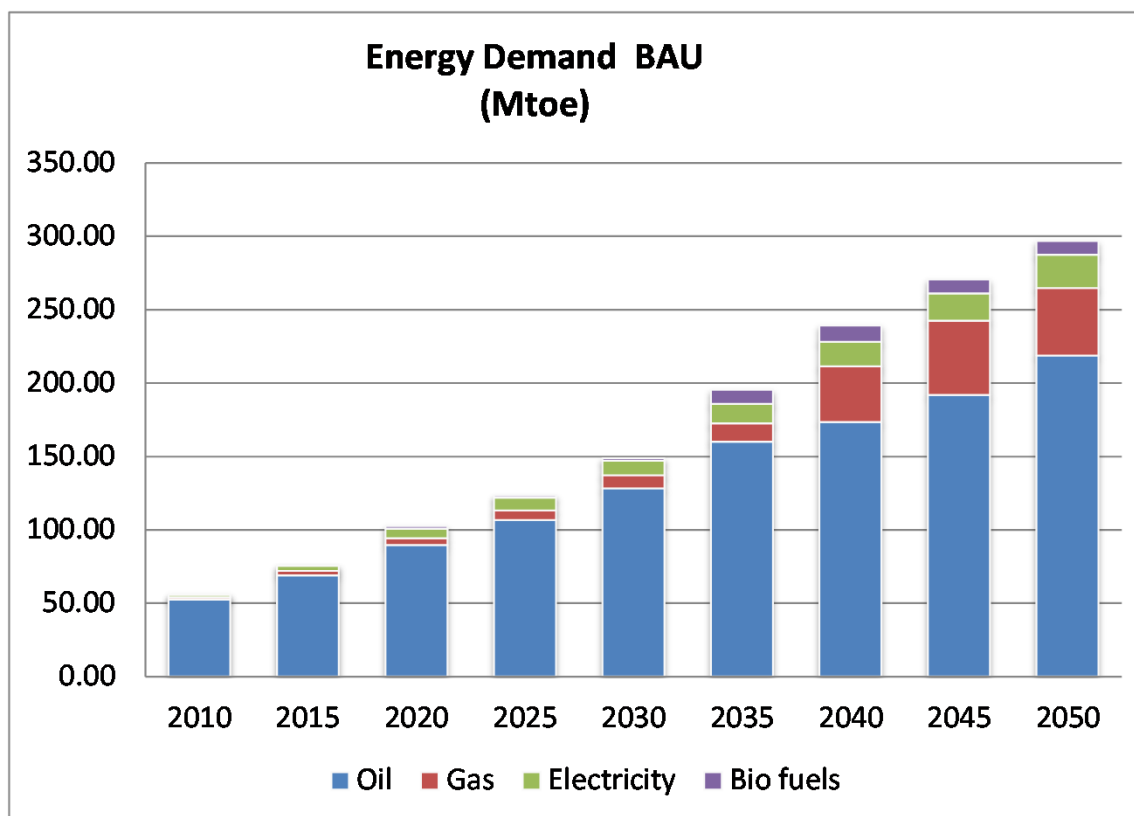
Analysis with ANSWER-MARKAL Model

Results:

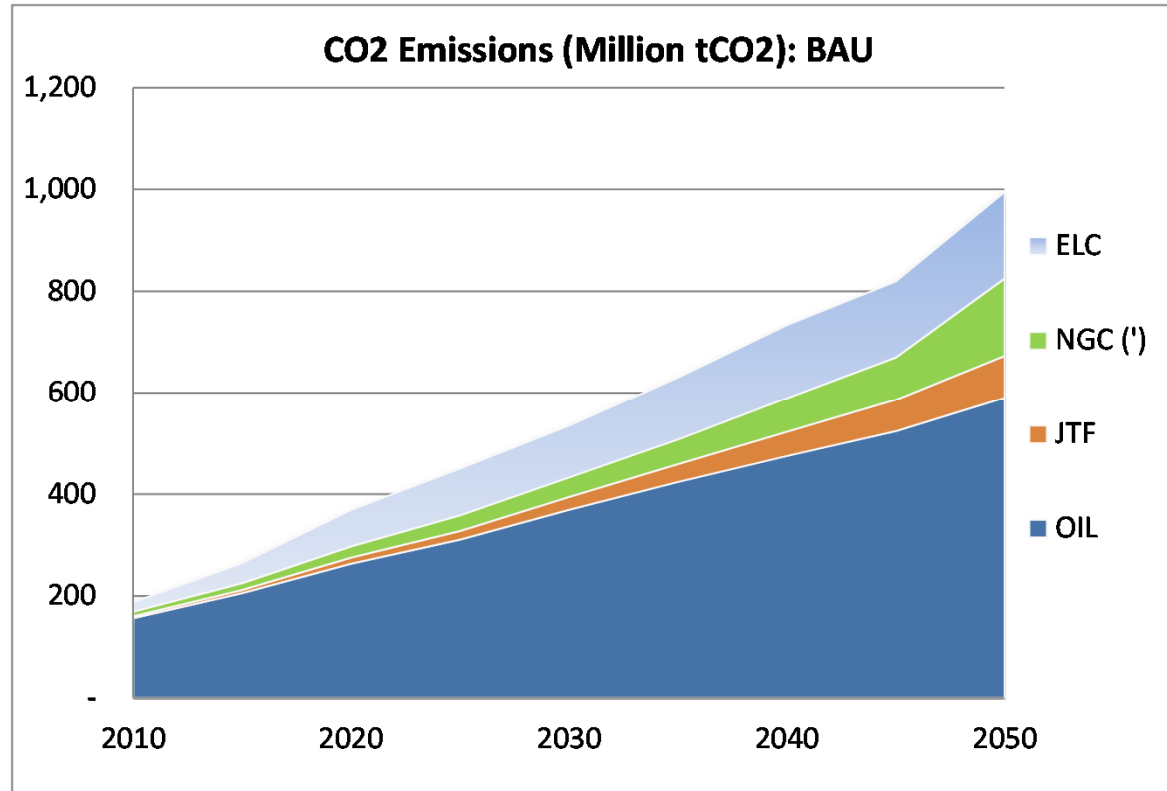
Example: CO₂ Mitigation from Freight Sector

(More results in Presentations during Next 3 Sessions)

Overall Energy Demand: Transport



CO₂ Emissions: Transport BAU

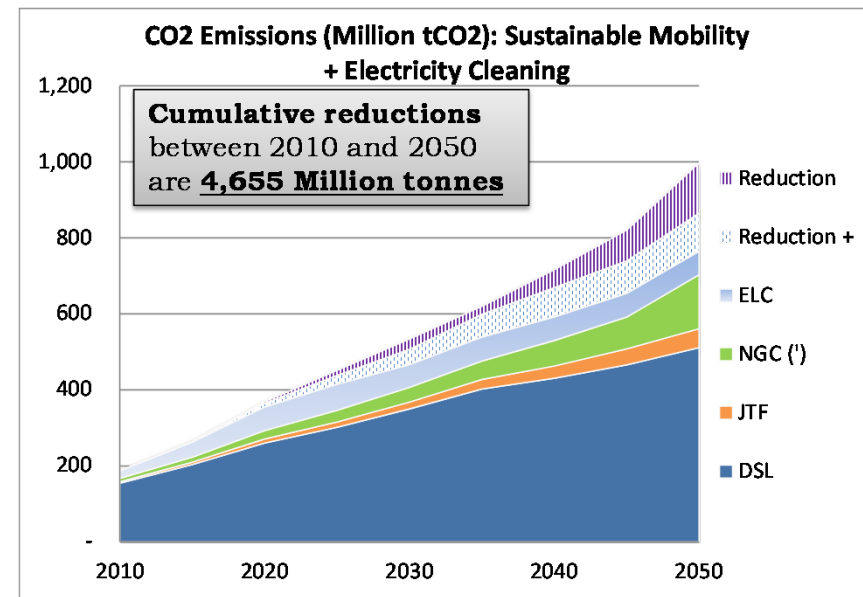
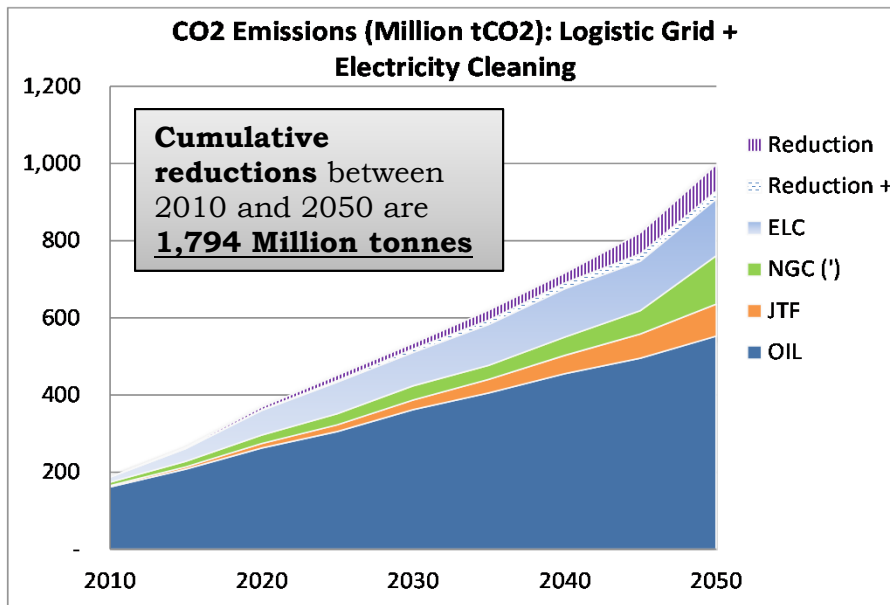


(*) Natural Gas emissions include both emissions from energy and fugitive emissions

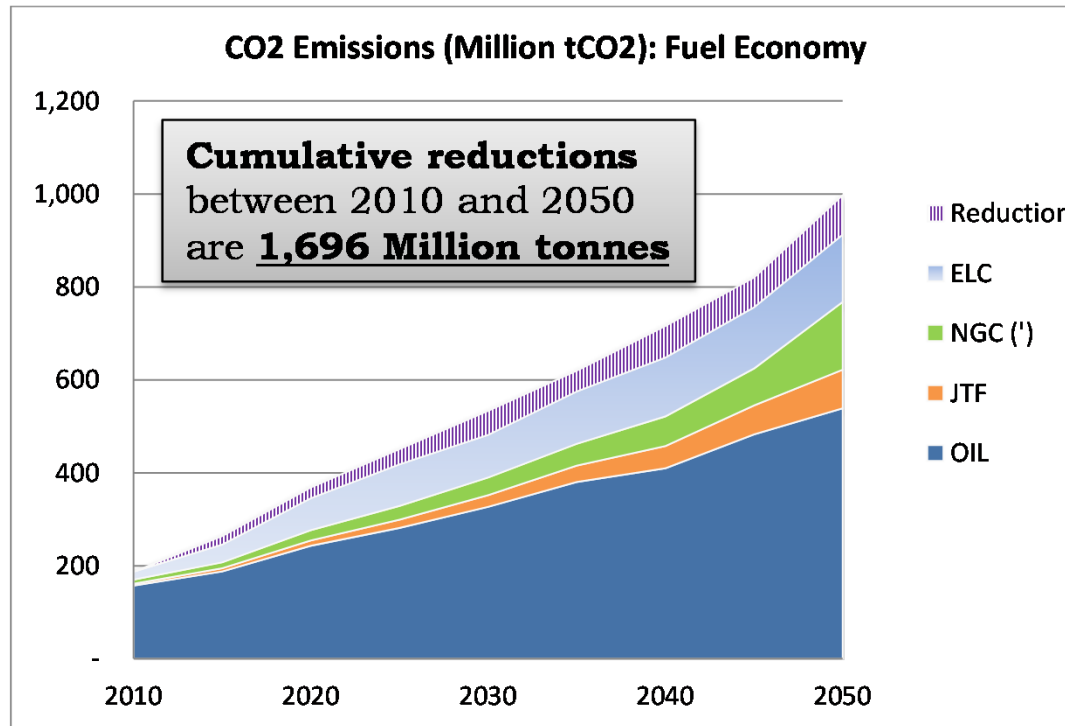
**Emission Intensity of Grid
(Million tCO₂/GWh)**

Scenario	2010	2020	2030	2040	2050
Base Case	0.99	0.94	0.86	0.74	0.69

CO₂ Reductions: Demand Strategies

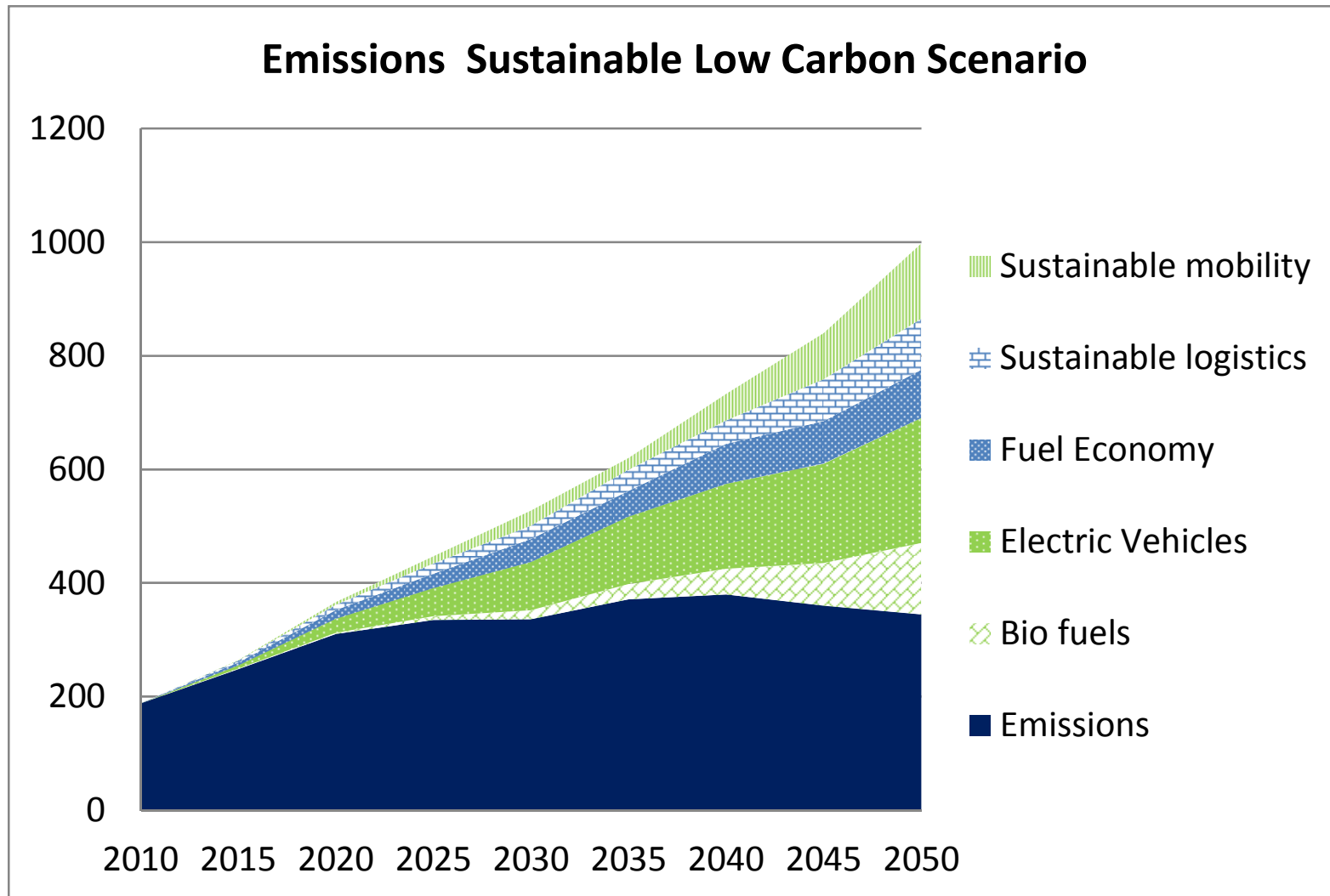


CO₂ Reductions: Supply-side Strategies



- Other supply strategies
 - Electric Vehicles
 - Bio fuels
 - Natural Gas

Overall CO₂ Reductions



Conclusions: Framework and Method

1. **Transformation Pathway matters to Low Carbon Transition**
2. **Linking Low Carbon Actions and Development Targets**
 - Avoid technology & policy lock-ins into high emissions
3. **Co-ordinate Bottom-up & Short-term Actions under Top-down and Long-term Vision and Policies**
4. **‘Sustainability: ‘Co-operation’ and ‘Co-benefits’**
 - Cooperation delivers co-benefits
 - Co-benefits:
 - i. reduces welfare losses
 - ii. Delivers Low Social Cost of Carbon
5. **LCS would still need adaptation actions, but adaptation costs and risks shall be much lower**

Conclusions: Results

1. **Passenger transport:** Sustainable urban design, modal shift can contribute nearly a quarter of emissions reduction in freight transport, Facilitate non-motorized transport
2. **Freight transport:** Location decisions, Modal shift and regional energy market development can contribute nearly a quarter of emissions reduction in freight transport.
3. **Vehicle Technologies:** Fuel-Efficiency Standards, Remove fuel-subsidies, Environmental taxes,
4. **Fuel Mix:** Low carbon transition due to global carbon price will influence significant change in the transport fuel mix including decarbonisation of electricity
5. **Co-benefits:** Sustainable low carbon transitions will deliver significant co benefits, e.g., reduced air pollution, energy security, energy access, etc.



Thank You

Questions / Suggestions

