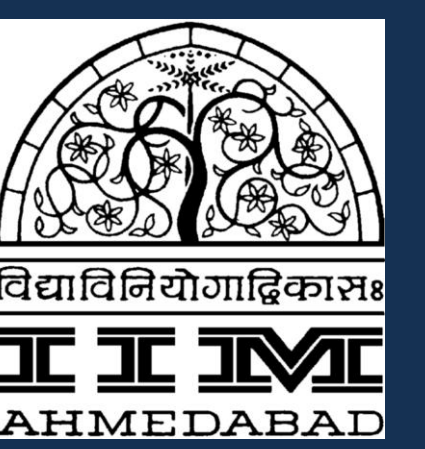


Sustainable Low Carbon Transport: Future Scenarios and Policies for India



Poojan Chokshi
 Doctoral Student, Indian Institute of Management, Ahmedabad
P.R. Shukla
 Professor, Indian Institute of Management, Ahmedabad



Introduction

Transport sector – Accounts for 19% of the energy use and 23% of the total global energy-related CO₂ emissions with its rate of growth highest amongst end-use sectors (IEA, 2009) – contributes significantly towards climate change. Hence, it is important to mitigate emissions from the sector.

Literature emphasizes on **aligning** global climate stabilization target and national sustainable development and sectoral plans to **gain various co-benefits** and move towards sustainable low-carbon pathway in the long run.

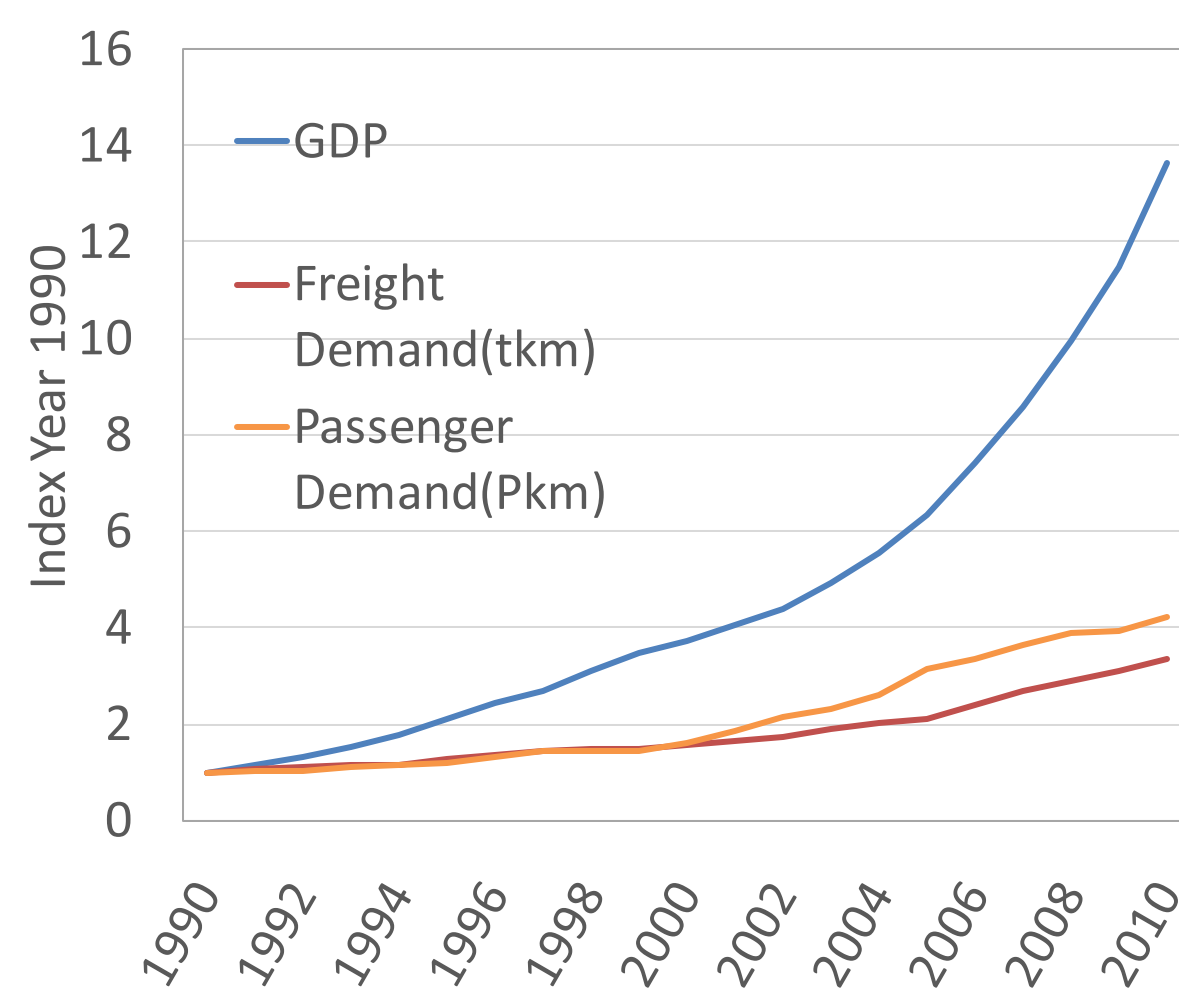
Significant co-benefits (local air quality, energy security and avoid getting locked-in into carbon intensive infrastructures and technology) can be gained by transiting towards sustainable low carbon transport.

Objectives and Methodology: To assess the long-term energy consumption and emissions from passenger transport sector in India. Our analysis uses the AIM Enduse model to explore India's urban transport scenarios till 2050. Two scenarios will be assessed: i) a conventional business as usual (BAU) scenario, and ii) a Sustainable low carbon transport (SLCT) scenario which optimally aligns India's economy to the global climate change stabilization target.

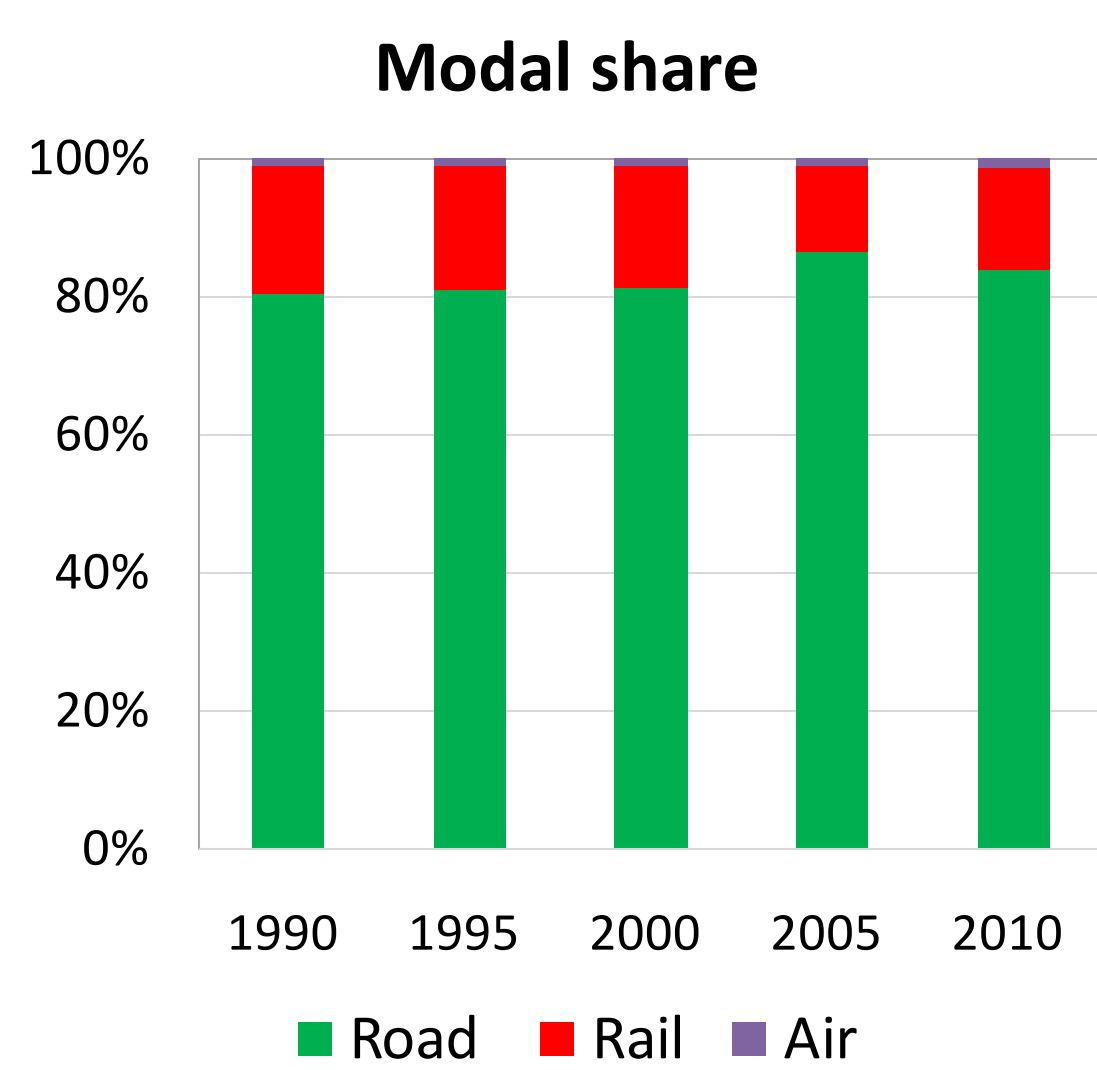
Trends

Four indicators are used to assess the **key trends** in the transport sector:

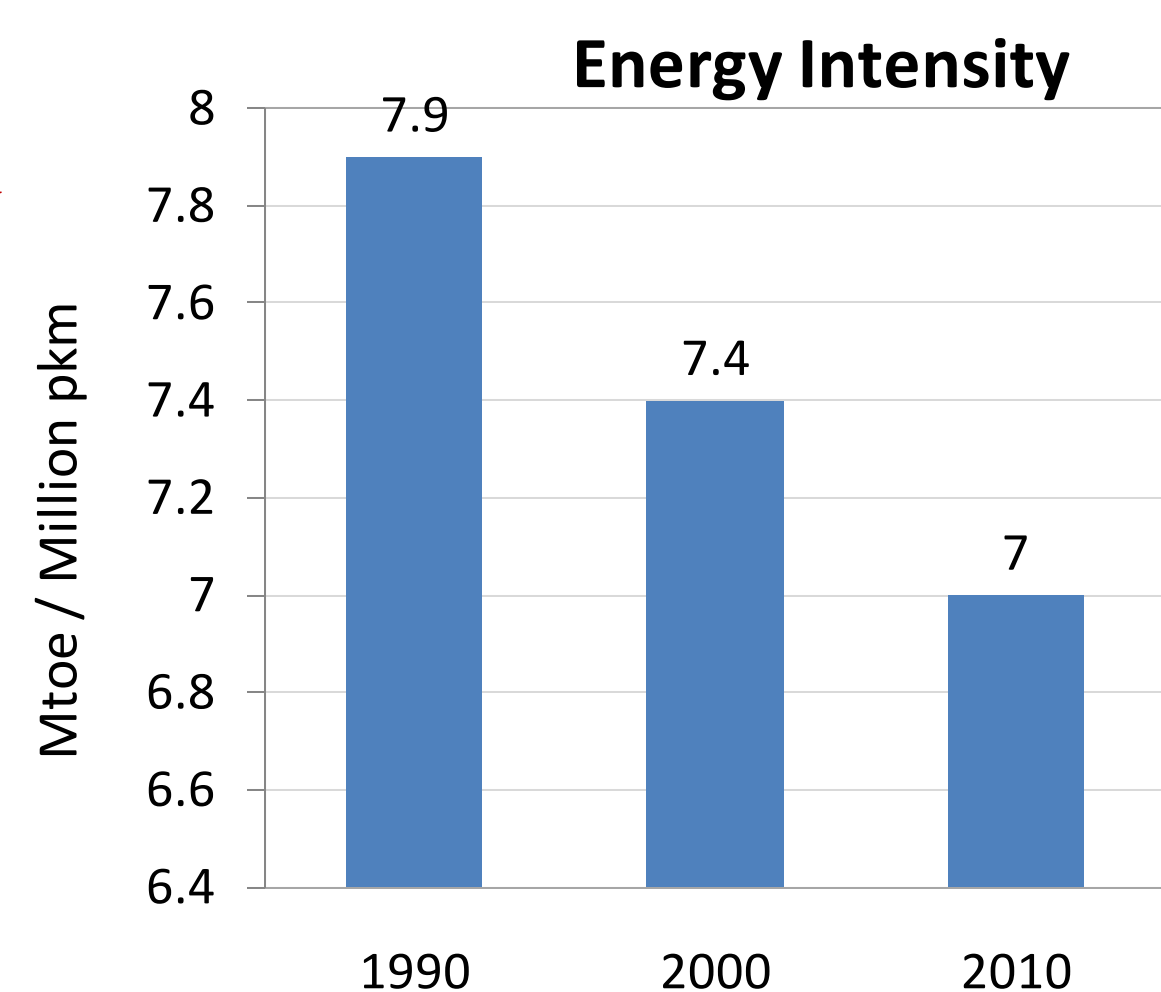
Passenger demand is not highly coupled with **economic growth**. That has implications on energy consumption.



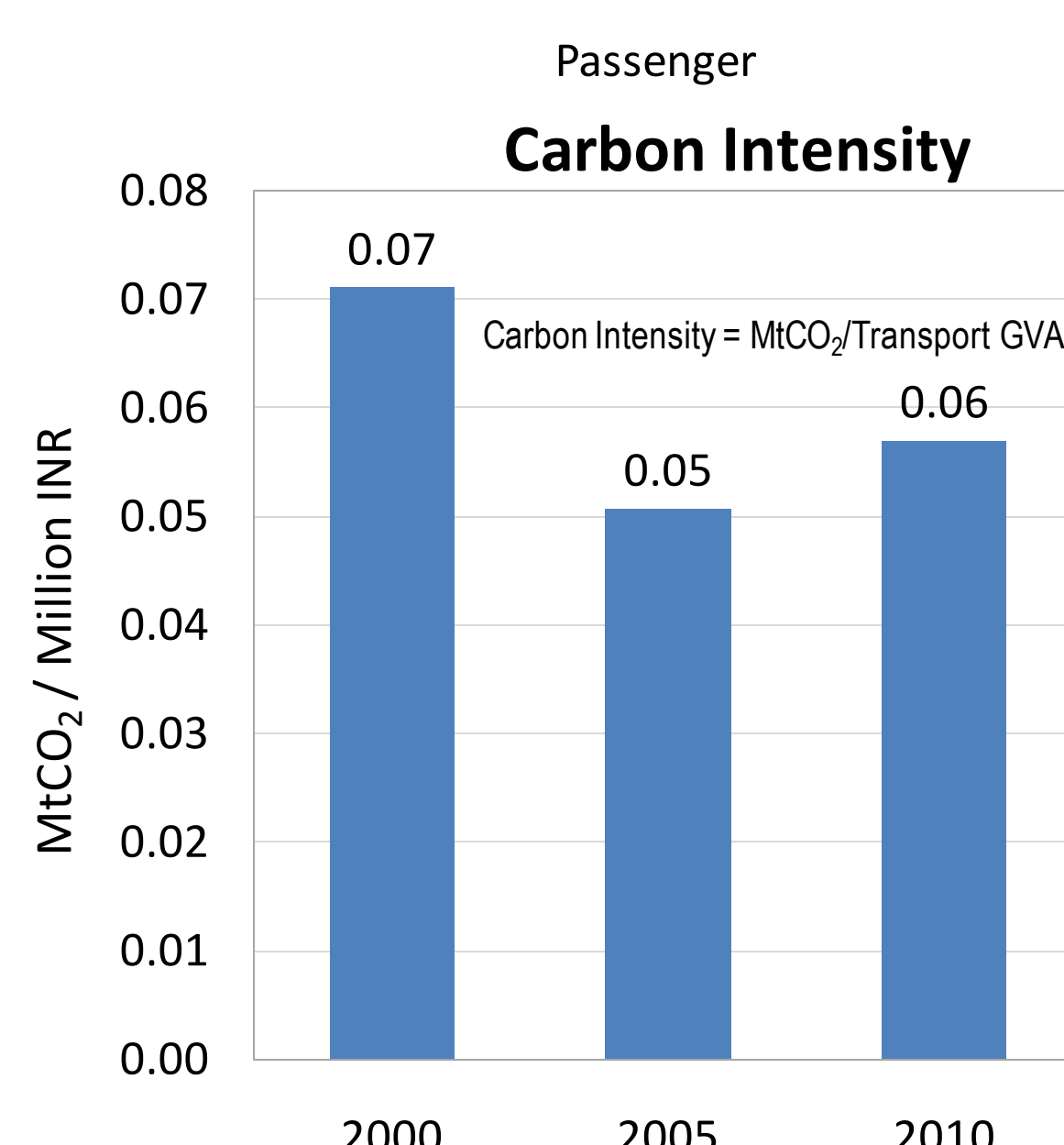
The **share** of road transport that had been on the rise up until 2005 has witnessed a decrease. However, it still forms about 80% of the total modal share



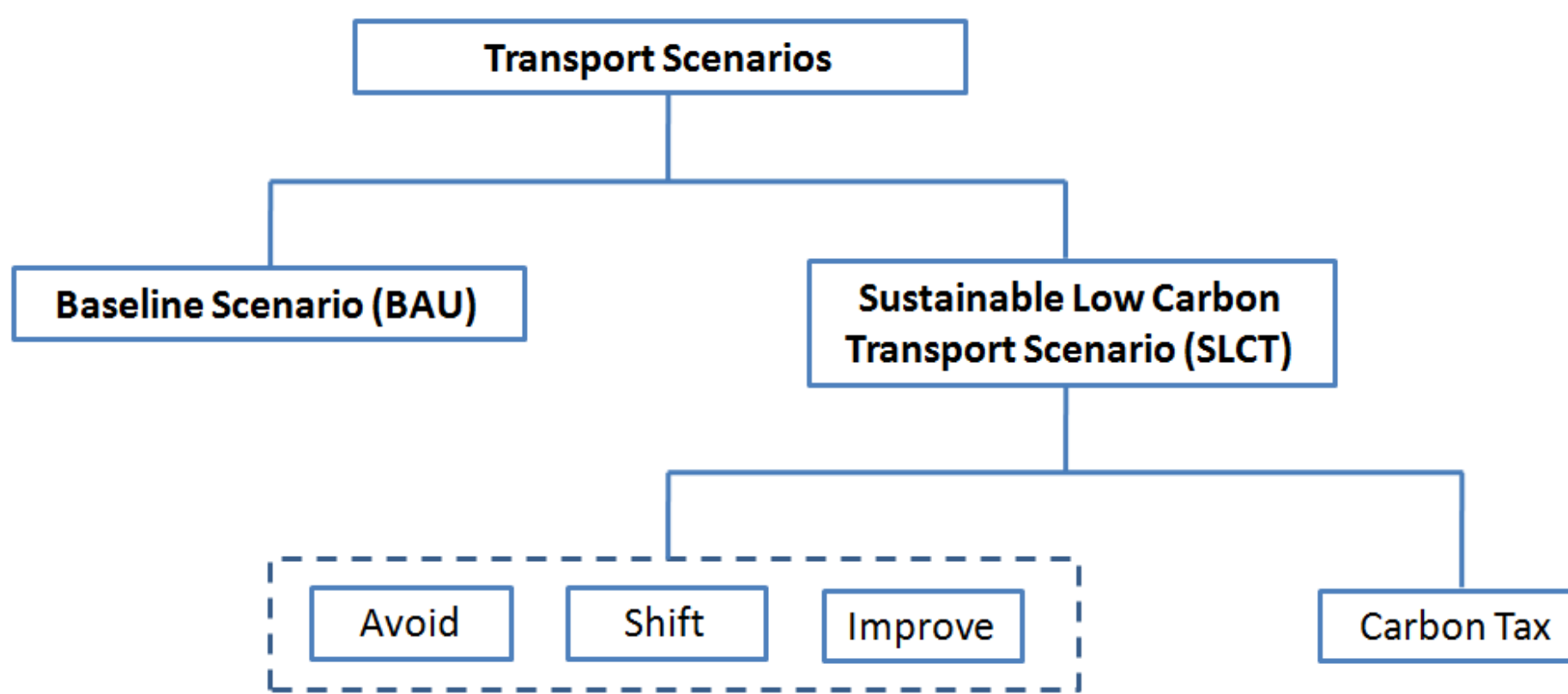
The **energy intensity** has been decreasing over the years which implies an improvement in vehicle efficiencies and technologies



The **carbon intensity** has decreased over the last decade due to efficiency improvements



Modelling Framework

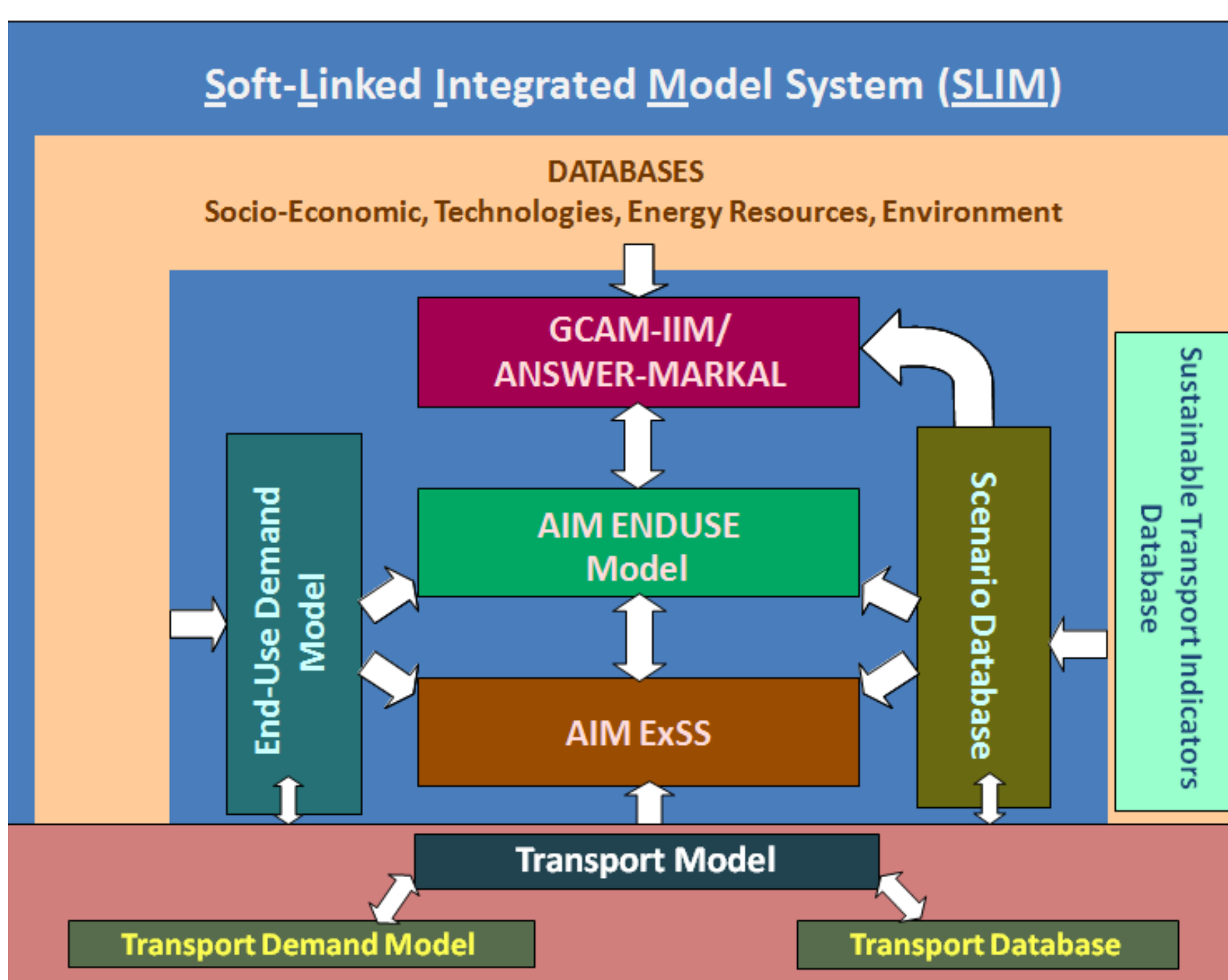


Scenario Description:

BAU Scenario: The BAU scenario assumes an average GDP growth rate of 8% between 2010-2035 benchmarking with Planning Commission Integrated Energy Policy report. Existing policies (such as fuel policy, JNNURM) and projects (like high speed rail, metro) under construction or planned in future are taken into account.

SLCT Scenario: Here, environmental concerns gain higher importance on global, national and local policy agenda. Various demand and supply side sustainable measures are categorized into: Avoid (lessen demand), shift (investment in mass transit systems) and improve (vehicle efficiencies, penetration of electric vehicles) framework. A carbon tax pegged with 2 degree stabilization target is used in addition to above mentioned measures.

Scenario Architecture

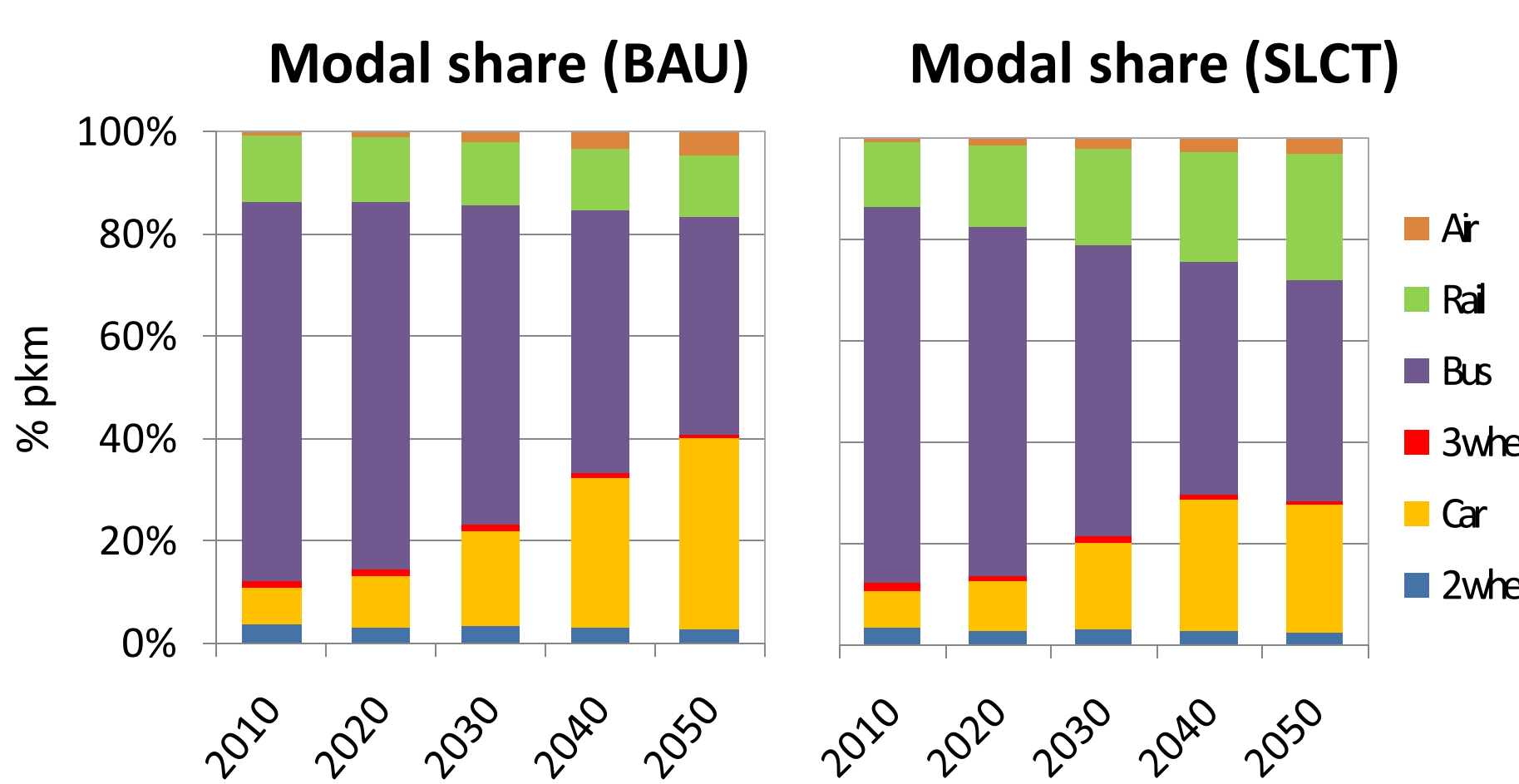


Drivers

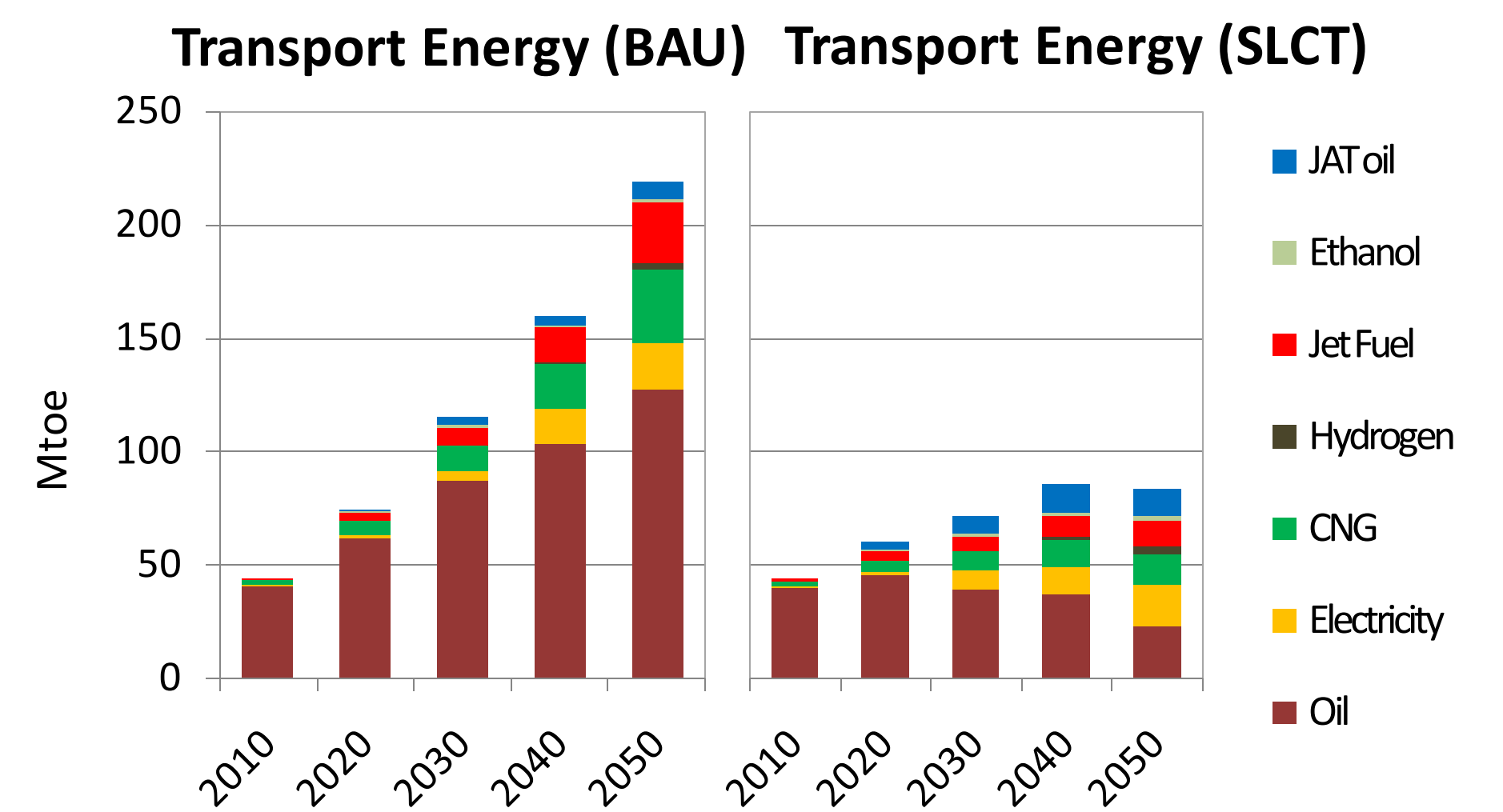
Parameter	BAU Scenario	SLCT Scenario
GDP growth rate	8% (2010-2035)	8% (2010-2035)
Passenger transport demand	Increases at the rate of 2.56%	Increases at the rate of 1.89%
Emission tax	Low carbon tax	Moderate carbon tax consistent with 2 degree stabilization target
Modal Shift	Towards motorized personalised transport	Towards mass transportation
Technology penetration	Moderate penetration of electric vehicles	High penetration of electric vehicles
Fuel mix	Moderate penetration of biofuels and CNG	High penetration of biofuels, CNG and low carbon electricity
Fuel economy	Fuel economy improves moderately	Fuel economy improves by 61%

Model Results

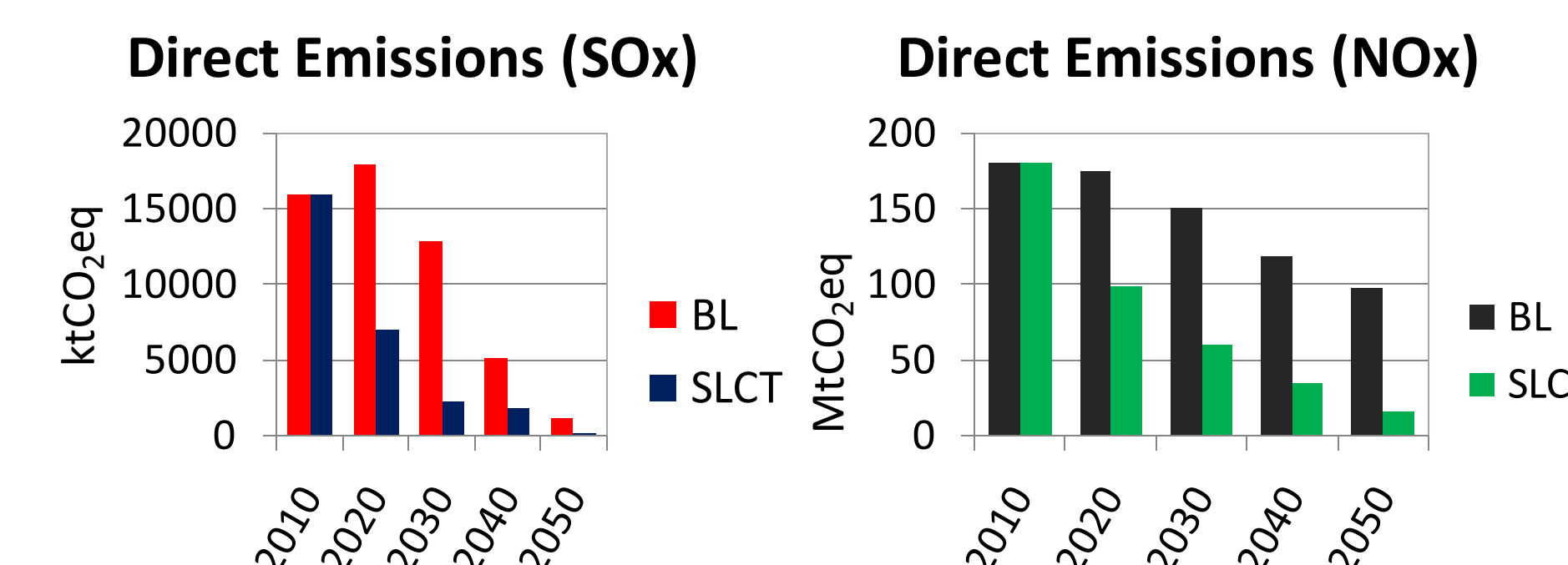
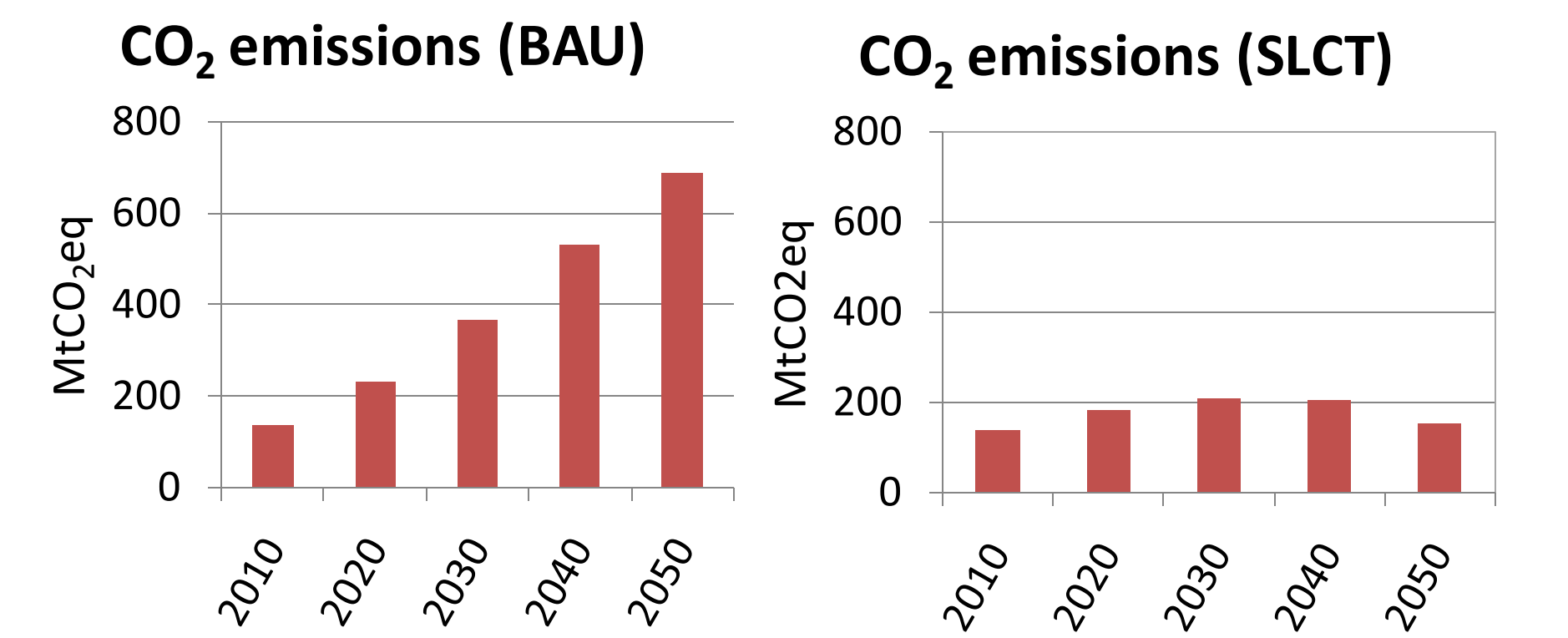
Modal share: There would be shift towards mass transit mode (like rail) in SLCT compared to BAU



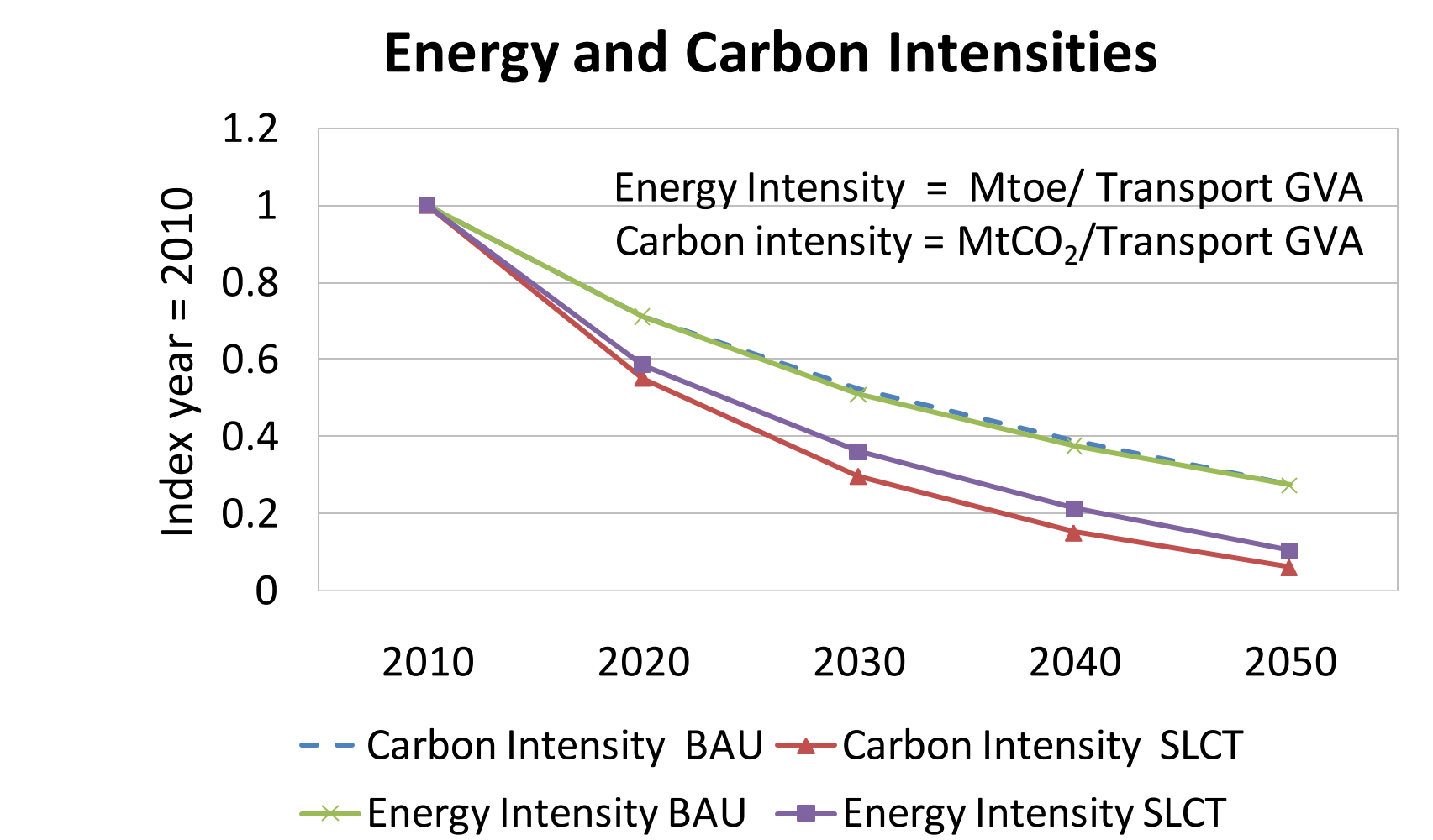
Fuel mix: Energy demand reduces by 61% compared to BAU scenario. There would be diversification towards cleaner fuels such as biofuels, CNG and electricity in the SLCT scenario compared to BAU where fuel mix is highly oil dominated



Emissions: Compared to BAU, CO₂ emissions reduce by 77% in 2050 under SLCT. There are also significant co-benefits due to improvement in air quality as SO_x and NO_x emissions reduce by 84% and 83% respectively in 2050 compared to BAU levels



Energy and carbon intensities: The energy intensity and carbon intensity both reduces in BAU as well as SLCT scenario, but there would be significant decoupling between energy and carbon emissions in SLCT scenario compared to BAU scenario



Results and Discussion

Owing to various SLCT measures, there is a shift from 4-wheeler towards rail, the energy and carbon intensities decrease, which result in provision of several co-benefits such as energy security, improvement in air quality, etc.

Decarbonization happens as the energy and carbon intensities decline over time due to efficiency and technological improvements, penetration of cleaner vehicle technologies, diversification into cleaner fuels and other SLCT measures.

This, in turn, results in decoupling of economic growth with energy consumption and emissions.

References:
 IEA (2009). Transport, Energy and CO₂: Moving towards Sustainability. Paris.
 Planning Commission.(2006). Integrated Energy Policy: Report of the Expert Committee. Planning Commission, Government of India.