Future of Electric Vehicles in Road Passenger Mobility of India

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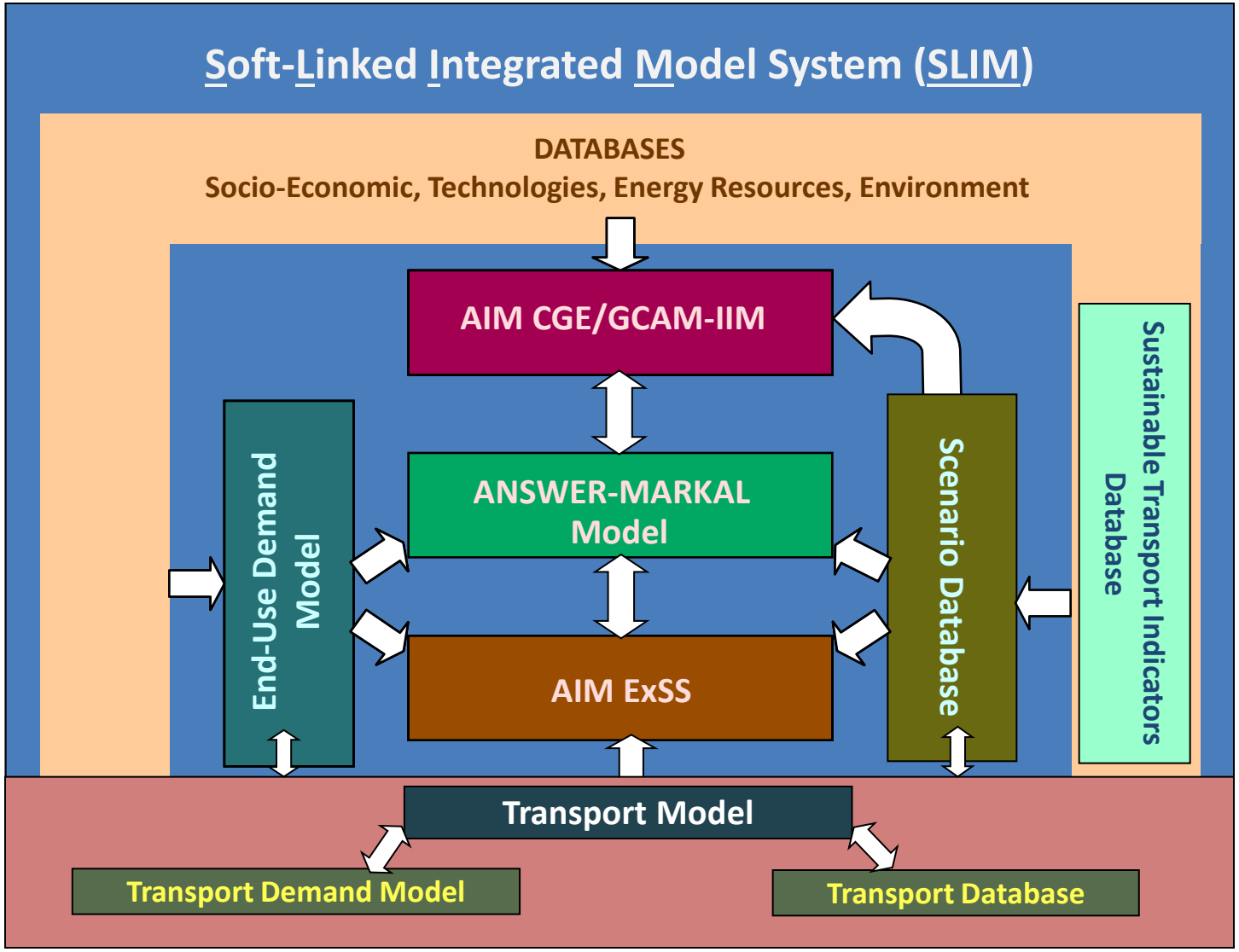
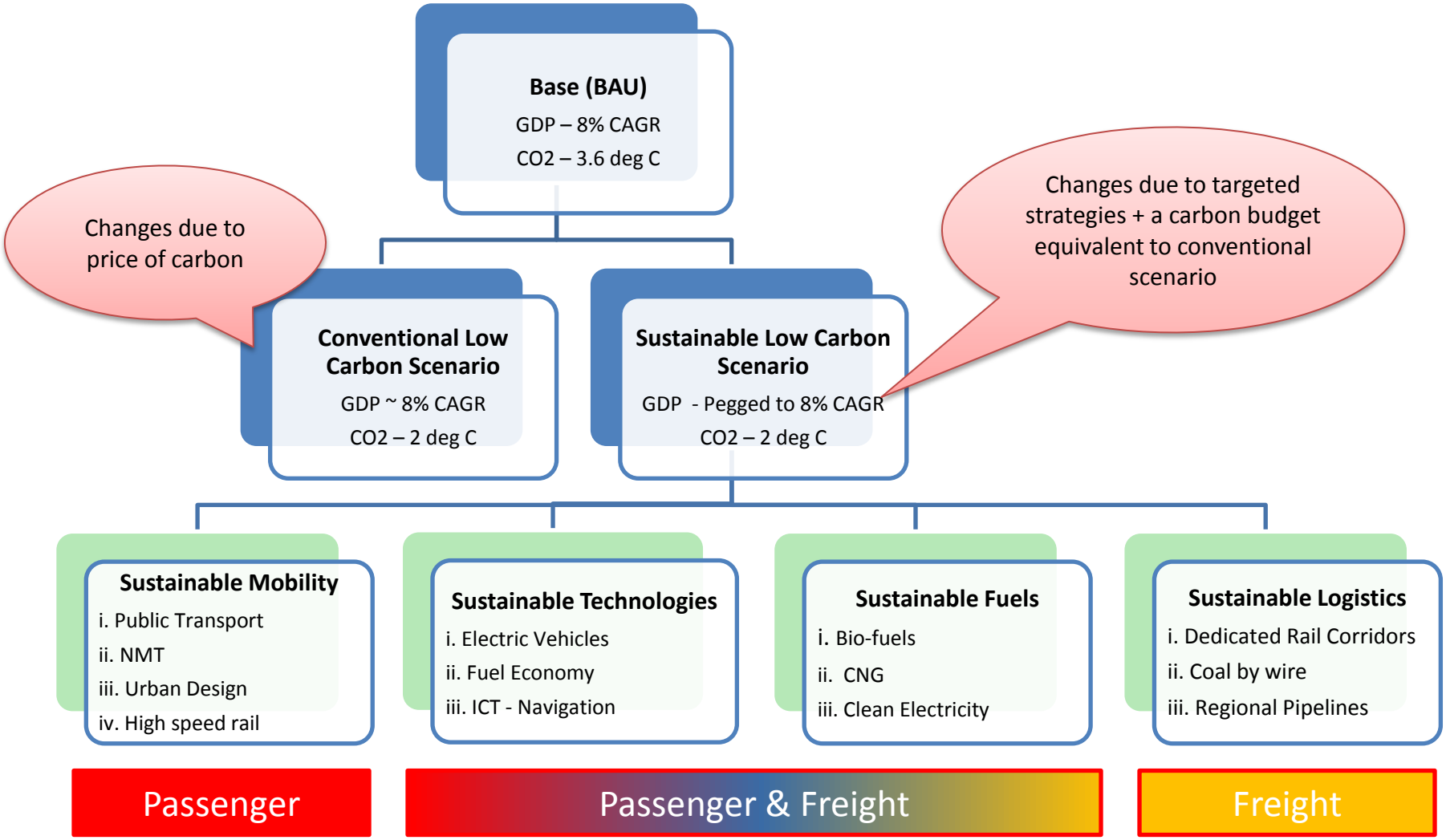
Presentation Agenda

1. Low Carbon National Transport Modeling Assessment
   - *Model System*
   - *Scenarios Architecture*
2. National Passenger Transport Demand
3. Electric Vehicle (EV) Scenarios
4. Conclusions

Soft-Linked Integrated Model System



Transport Scenarios Architecture

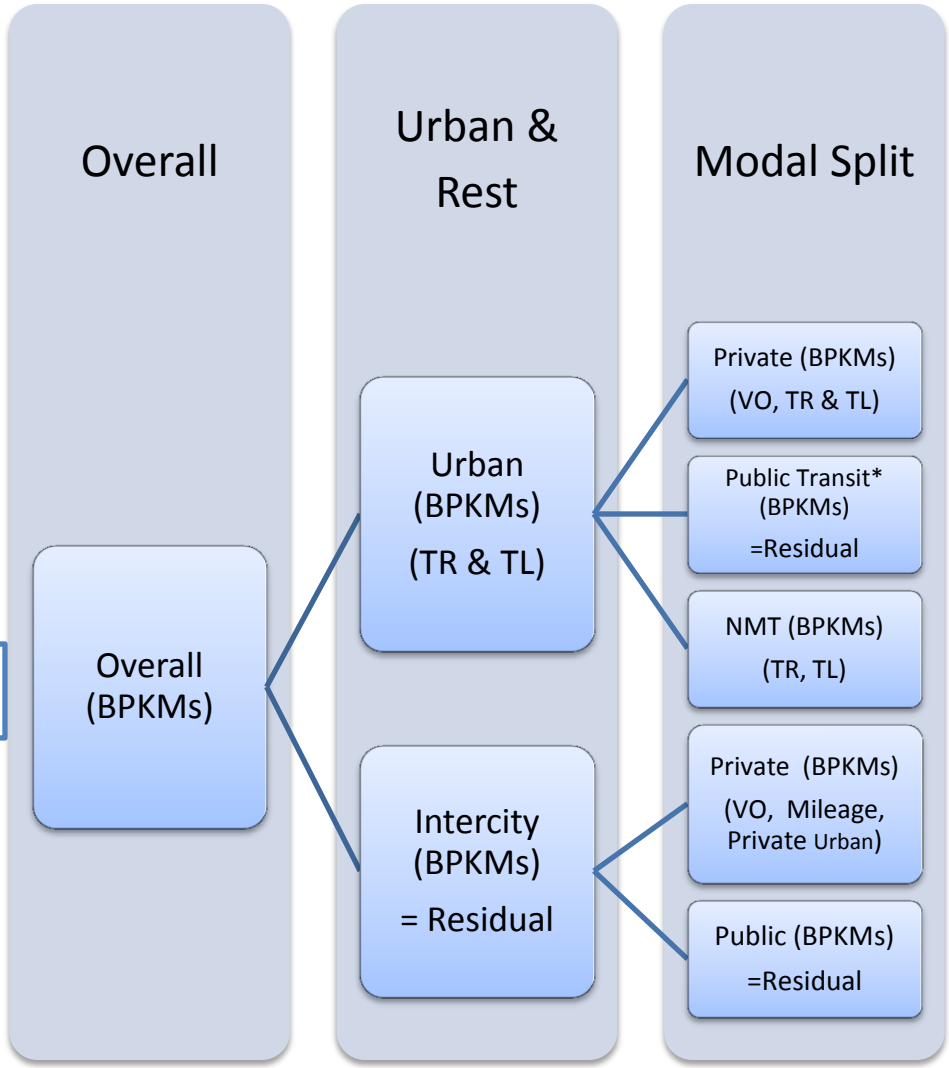


National Passenger Transport Demand in Scenarios

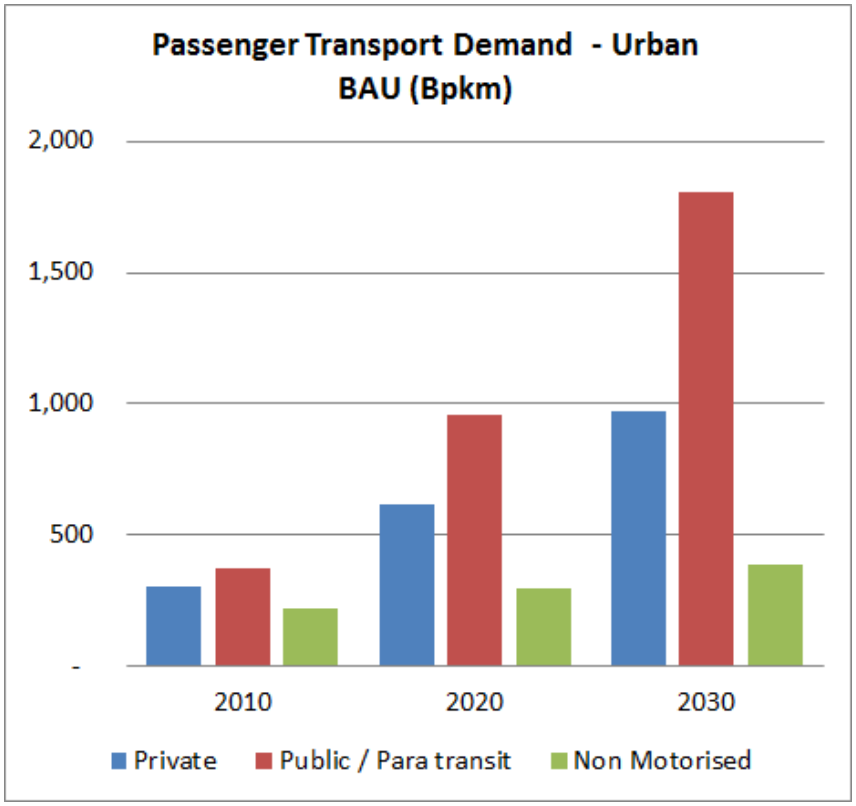
Passenger Demand Estimation

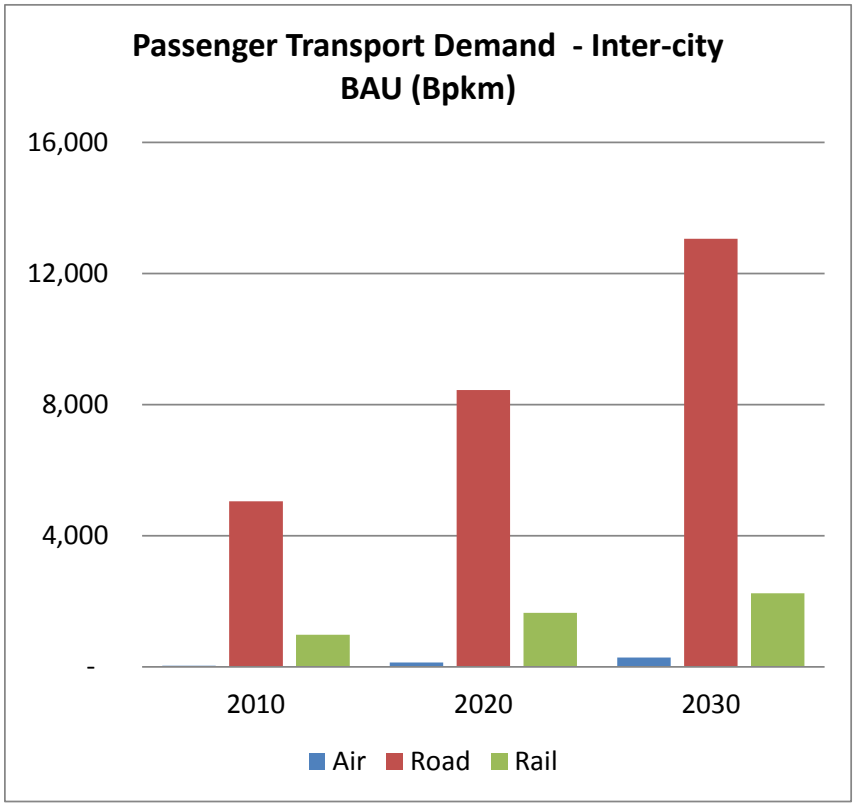
$$TD_{urban} = \sum_{i=1}^{4} TR_i \times TL_i \times Pop_i \times 365$$

$$TD_{overall} = Population \times Per\ Capita\ Mobility$$

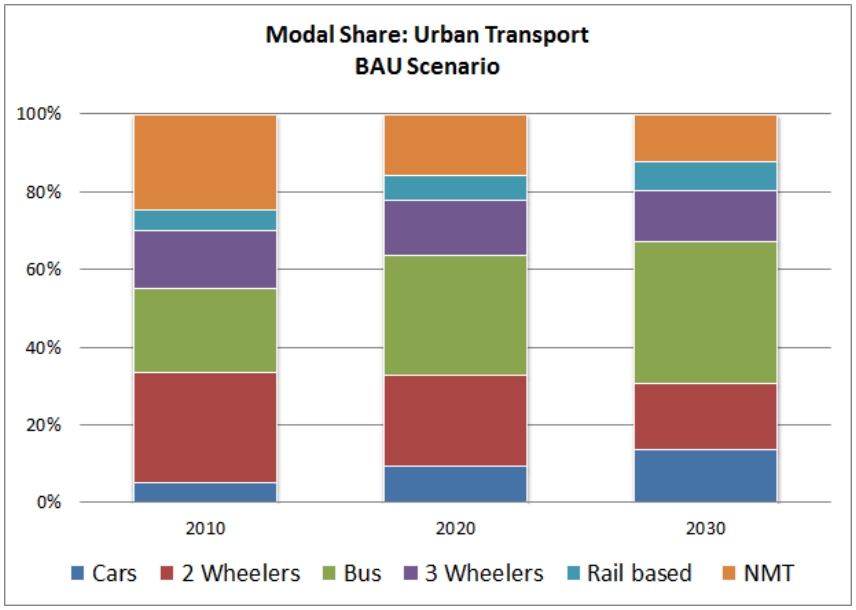


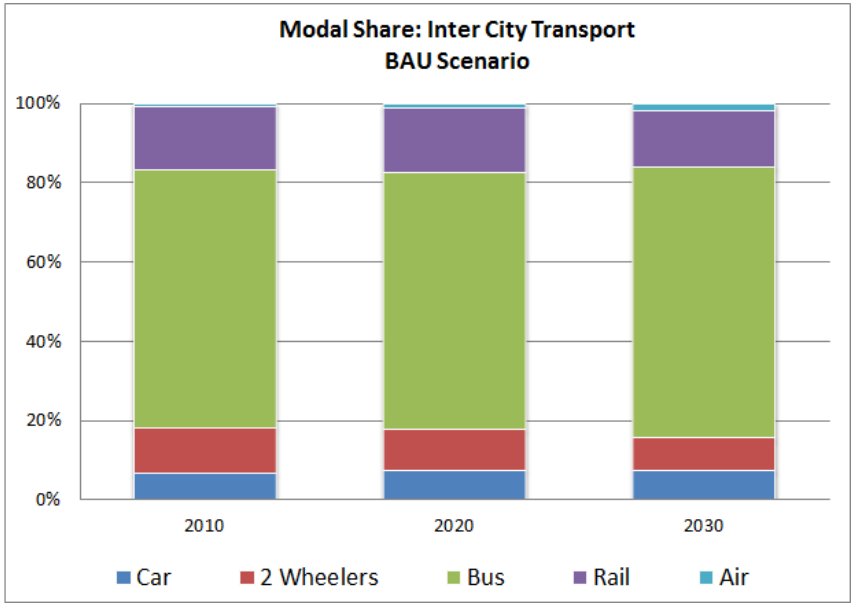
Passenger Transport Demand





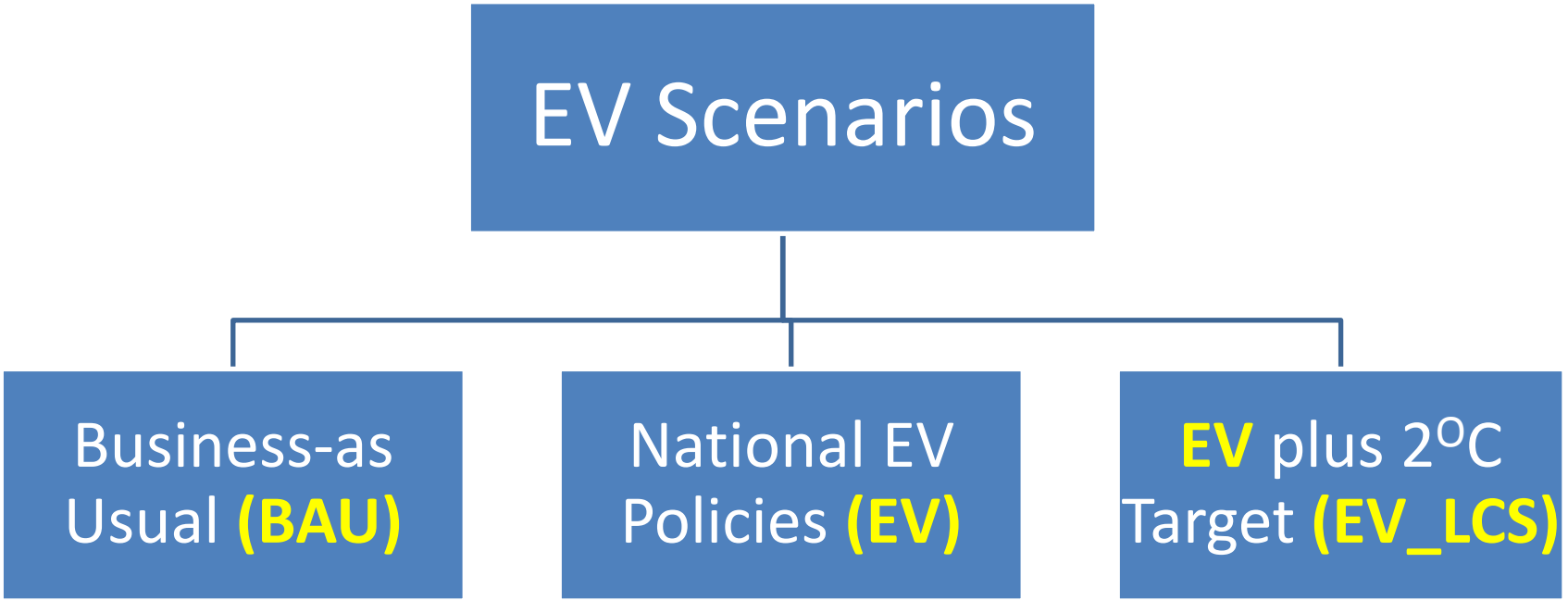
Mode Share of Passenger Transport





Electric Vehicle Scenarios

Electric Vehicles (EV) Scenarios



Future socio economic development along the conventional path: mirrors resource intensive path of developed countries

Governments recognize multiple co-benefits of EVs (urban air quality; energy security etc.) and push their penetration

Global 2°C climate stabilization target leads to high carbon price; this lowers carbon content of generated electricity

Scenarios Description: EV & EV_LCS

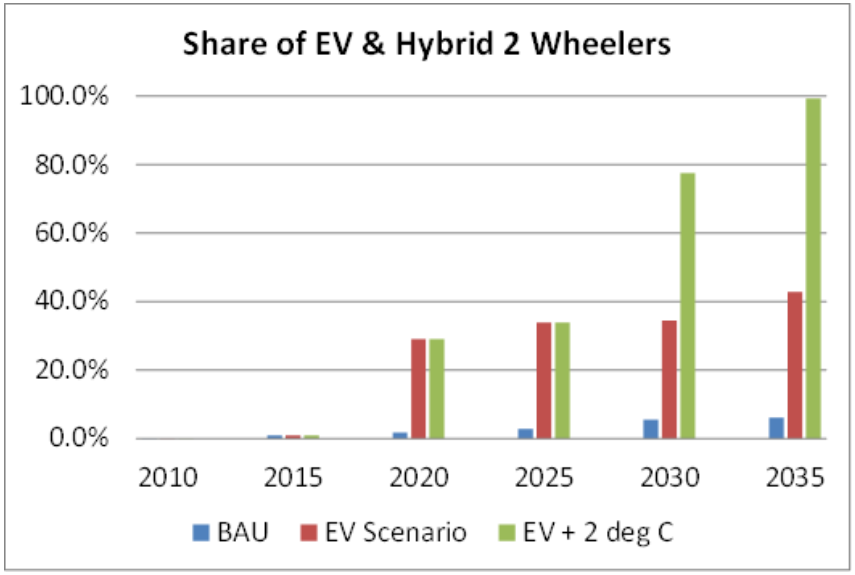
Electric Vehicle Scenario (EV): Assumptions

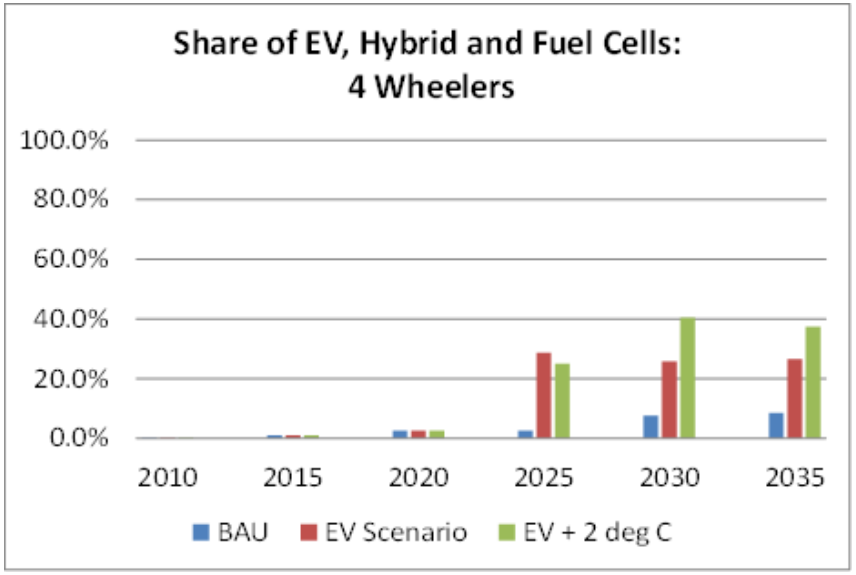
- **Domestic policy supports**: Direct capital subsidy, improved charging infrastructure, dedicated lanes, incentives for R&D in power train, batteries and smart grid technologies, quotas for EVs in urban public & goods transport
- **Battery costs** comes down to half of current costs in next 10-15 years: driven by advancements in battery technologies, improvements in battery capacities, declining component costs, and economies of scale in production
- Improved batteries with higher energy density will also help reduce weight of batteries: further pushing down EVs costs
- Limited range per charge put constraints on penetration of cheaper EVs for urban transportation

Electric Vehicle plus $2^{O}C$ Scenario (EV_LCS): Assumptions

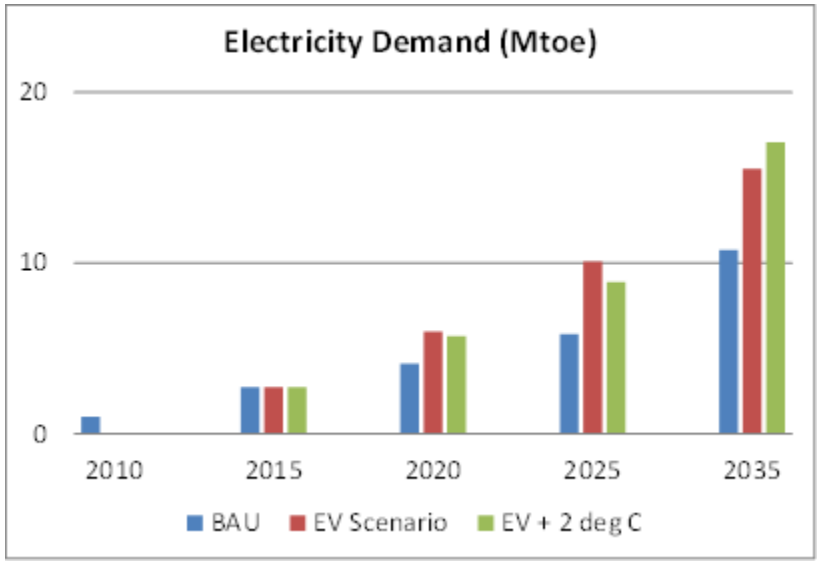
- Global 450 ppmv CO_2 equivalent concentration stabilization target
- Carbon Price rise: from US$ 14/tonne CO_2 in 2020 to US$ 200/tonne CO_2 in 2045 (based on outputs from Lucas et. al., 2013)

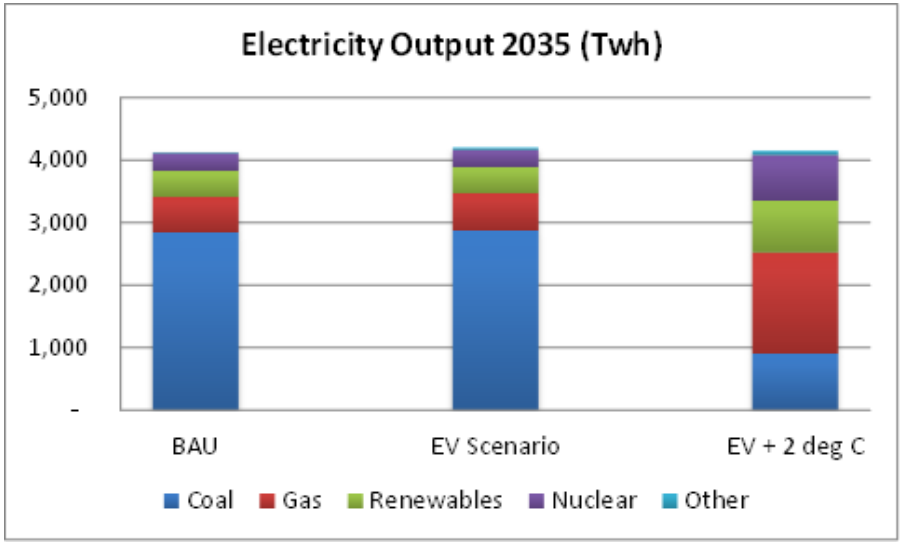
EV Share in Personal Motorised Transport



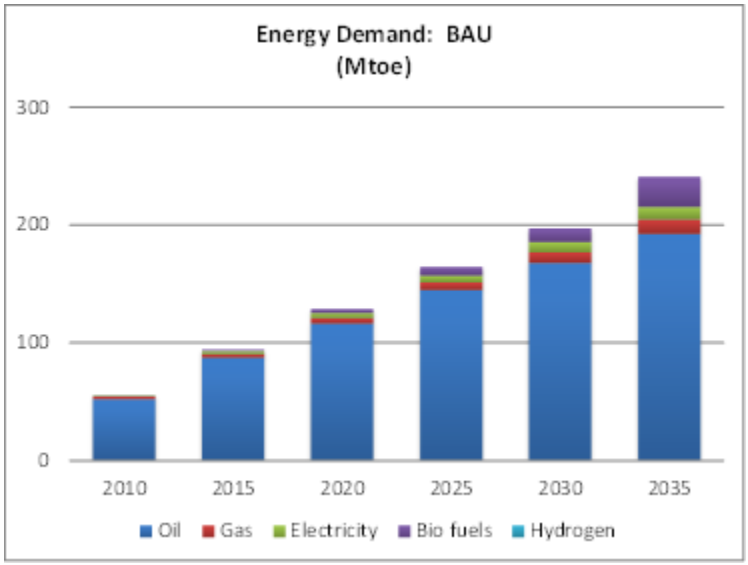


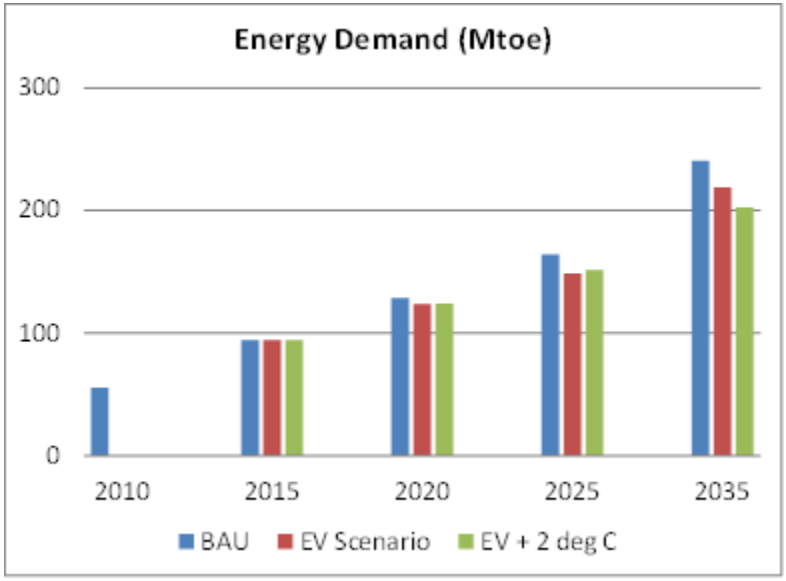
Electricity Demand and Supply



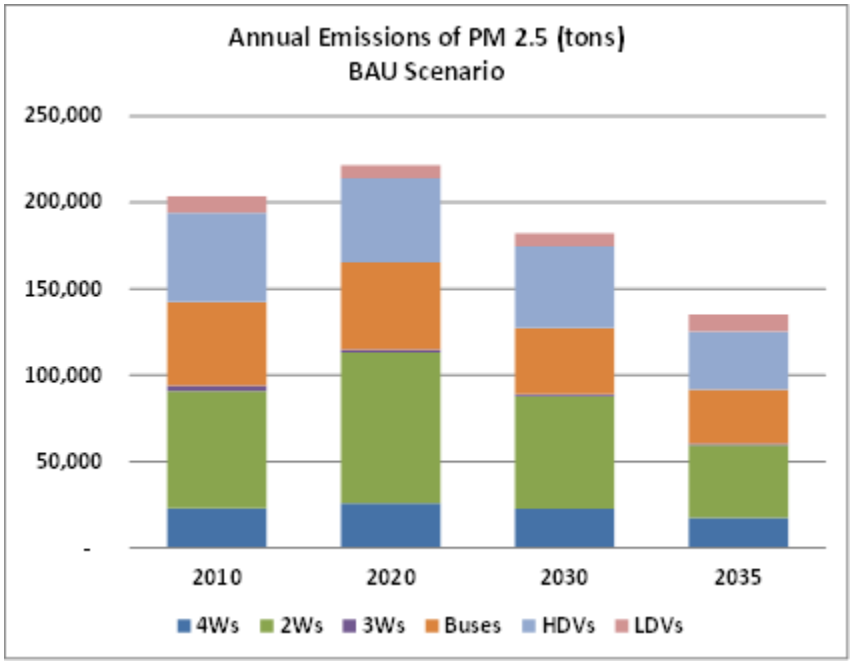


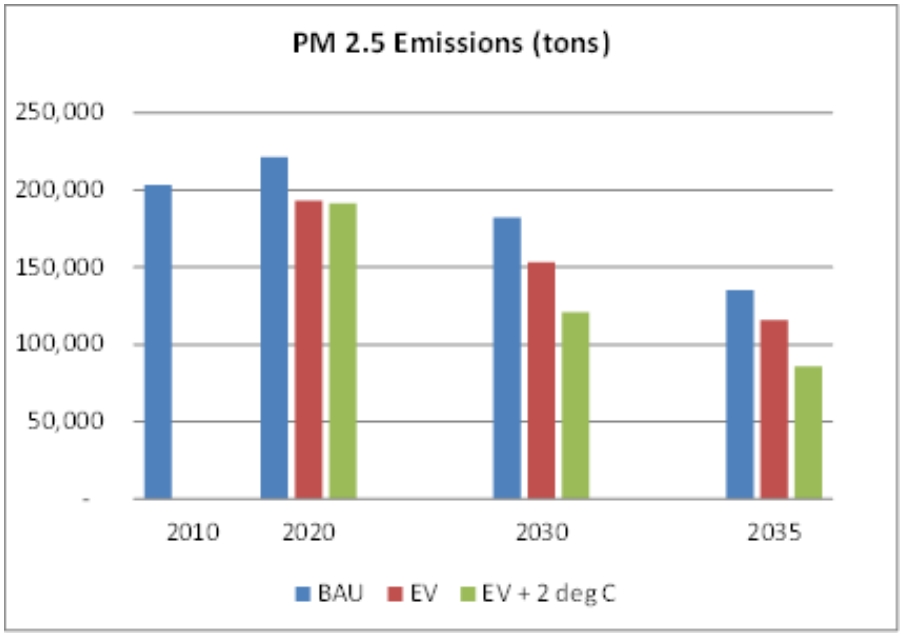
Energy Demand : Transport



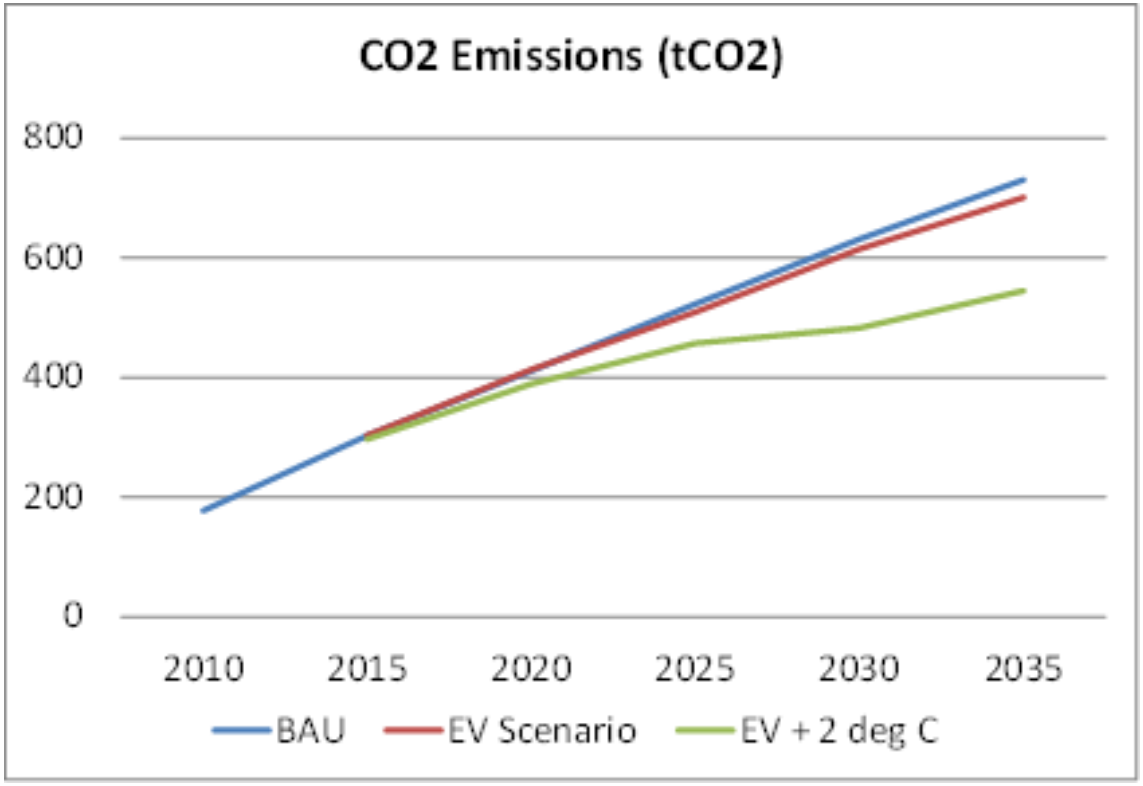


PM 2.5 Emissions





CO_2 Emissions



Conclusions

- Early penetration of EV in India would come through 2-wheelers; this would create infrastructures that would facilitate larger vehicles.
- Low carbon transport transition shall deliver *Air Quality* and *Energy Security* co-benefits
- Electric Vehicles (EV) by themselves do not contribute to CO_2 mitigation; they may even increase emissions
- Under global $2^{O}C$ stabilization policy, in India, EV contribute sizable mitigation however emissions would be much higher than in 2010

Thank You

Low Carbon Transport Project Website :

www.unep.org/transport/lowcarbon