



## Electric Vehicle Scenarios for India

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# Electric Vehicle Scenarios for India

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**Development and Mitigation Forum**

**27 January 2014**

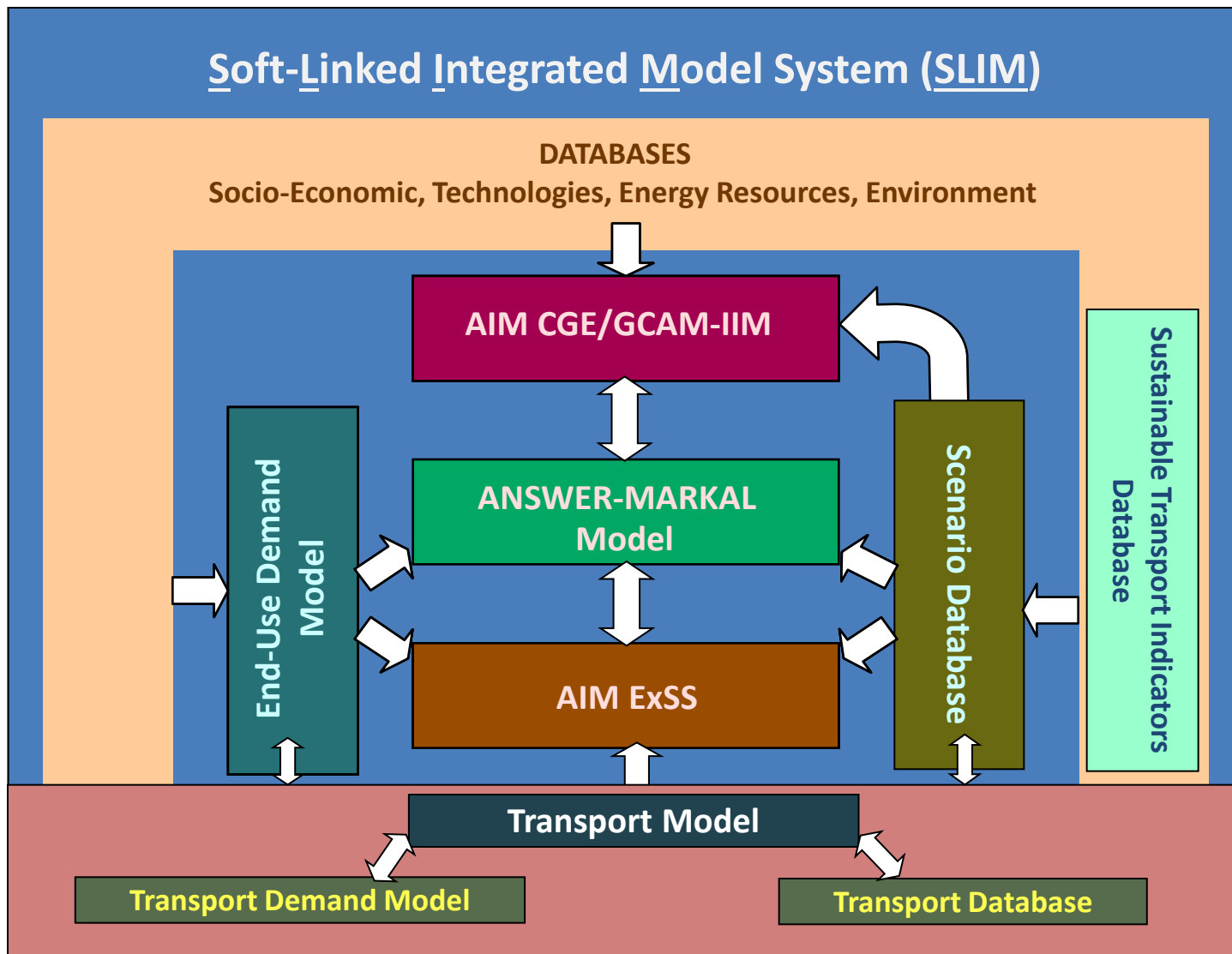
**Cape Town, South Africa**

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# Presentation Agenda

1. Low Carbon National Transport Modeling Assessment
  - *Model System*
  - *Scenarios Architecture*
2. National Passenger Transport Demand
3. Sustainable Low Carbon Transport Scenario
  - *Energy Demand*
  - *CO<sub>2</sub> Emission Mitigation*
  - *Air Quality Co-benefits*
4. Electric Vehicle (EV) Scenarios
5. Conclusions

# Soft-Linked Integrated Model System



# Scenario Paradigm

## Transport Scenarios

### Baseline Scenario

GDP Growth rate -8% (2007-2032)

### Sustainable Low Carbon Transport

GDP Growth rate -8% (2007-2032)

#### Avoid

Coal by wire  
Urban Planning  
Penetration of ICT  
technologies

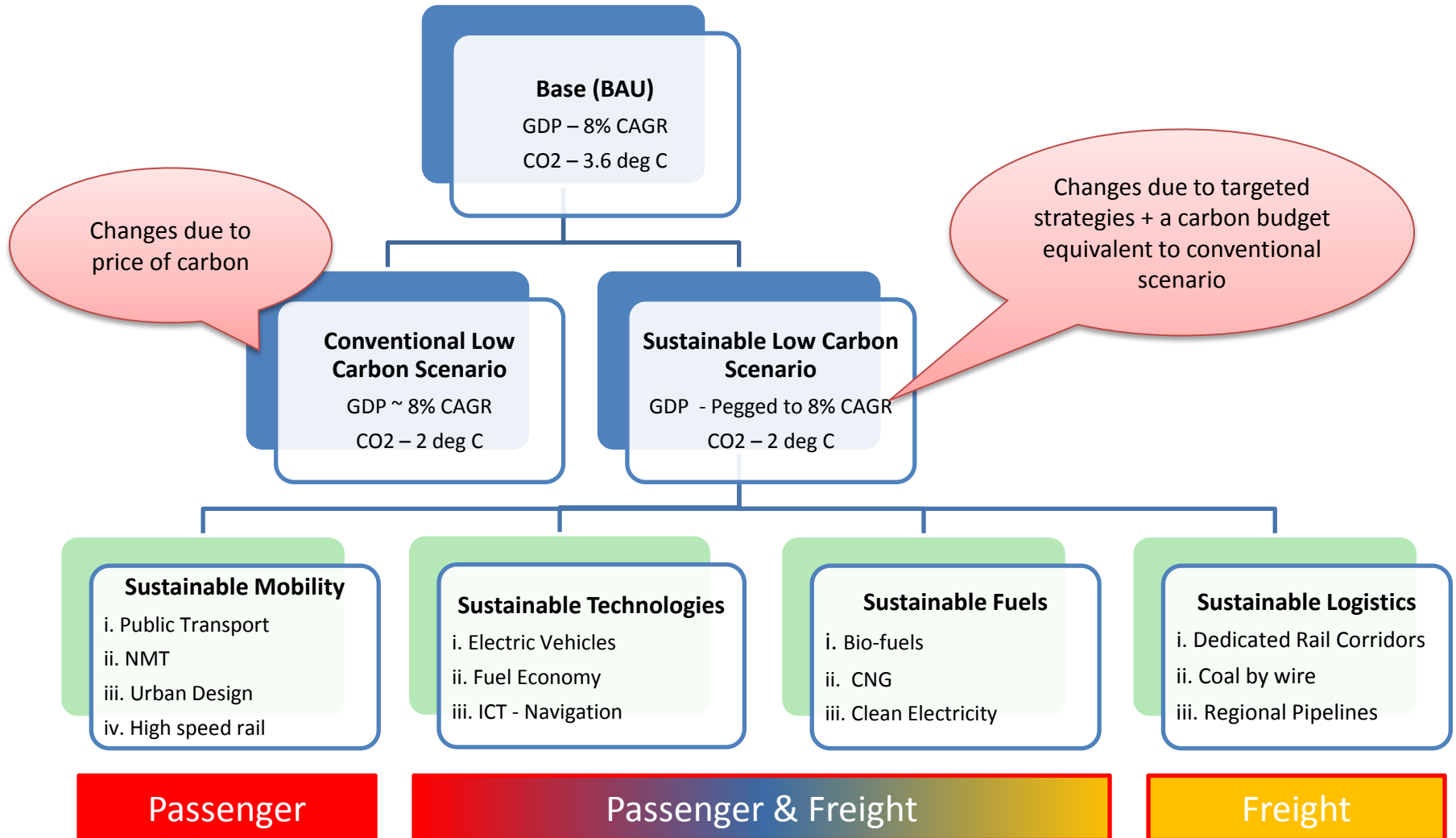
#### Shift

Investment in Mass transit  
Systems  
Greater use of Pipelines

#### Improve

Vehicle Efficiency  
Improvement  
Penetration of Electric  
Vehicles

# Transport Scenarios Architecture



# Sustainable Mobility Storyline

## Non-Motorized Transport

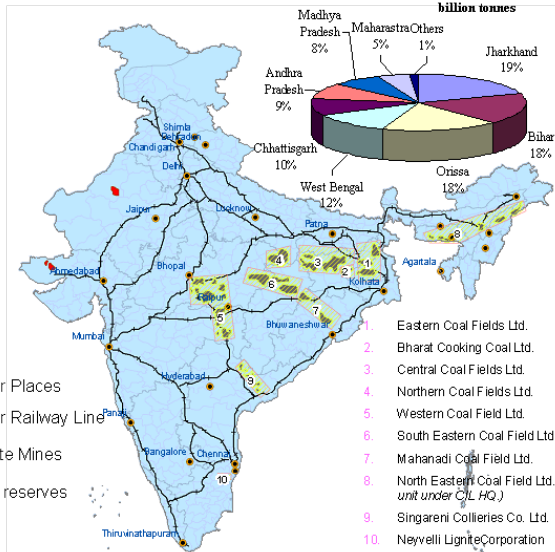


## Pipe Transport

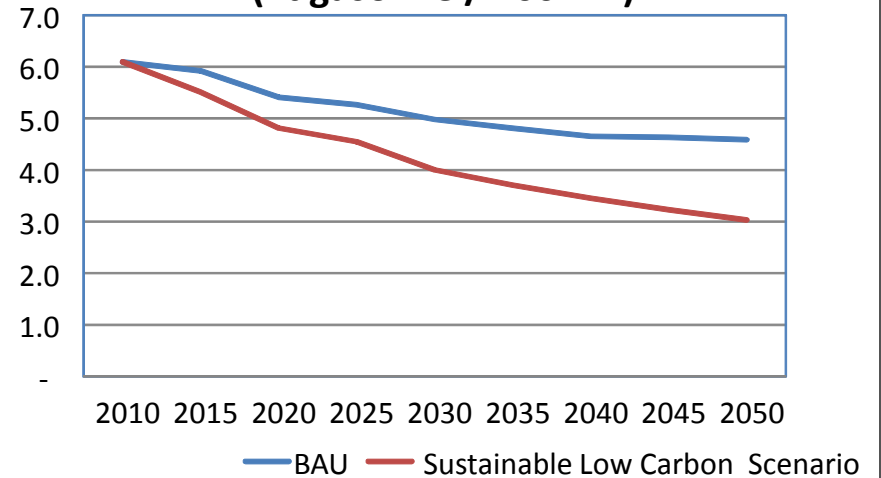


## Coal-by-wire

**State Wise Coal Reserves**  
Total Proven Reserves 95.9 billion tonnes



## Fuel Economy (Cars) (lit gasoline / 100 km)

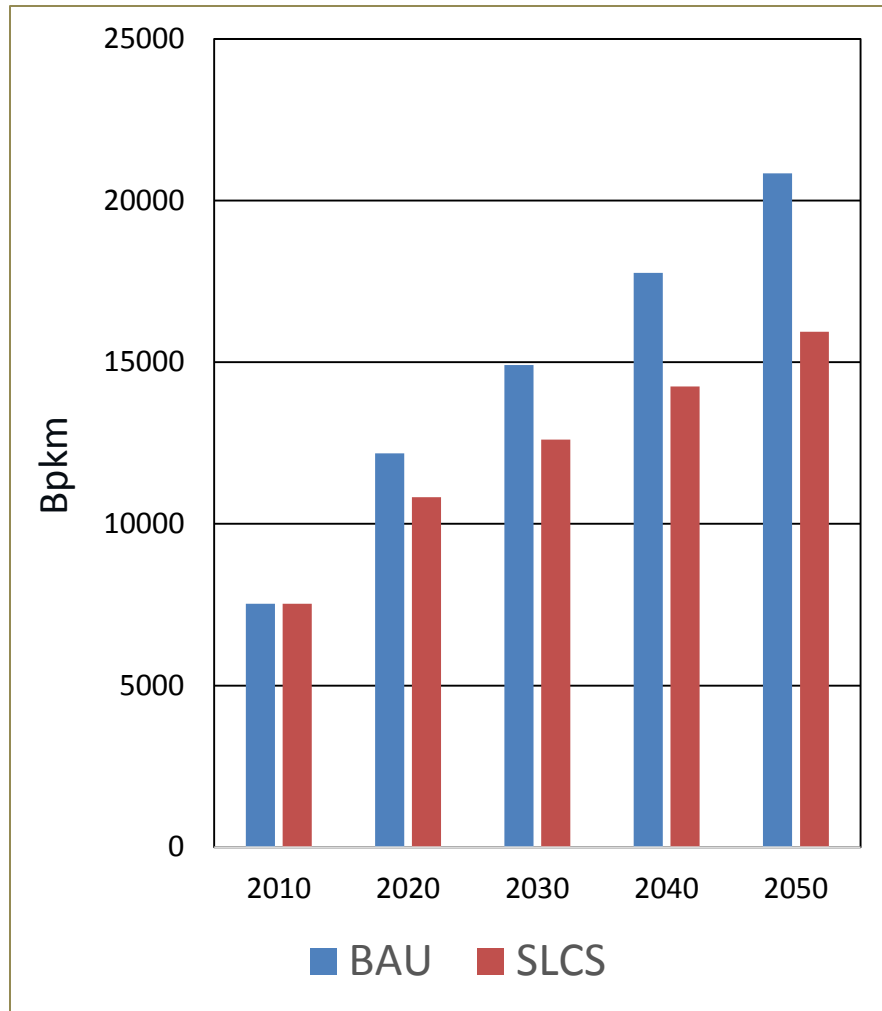


# **National Passenger Transport Demand in Scenarios**

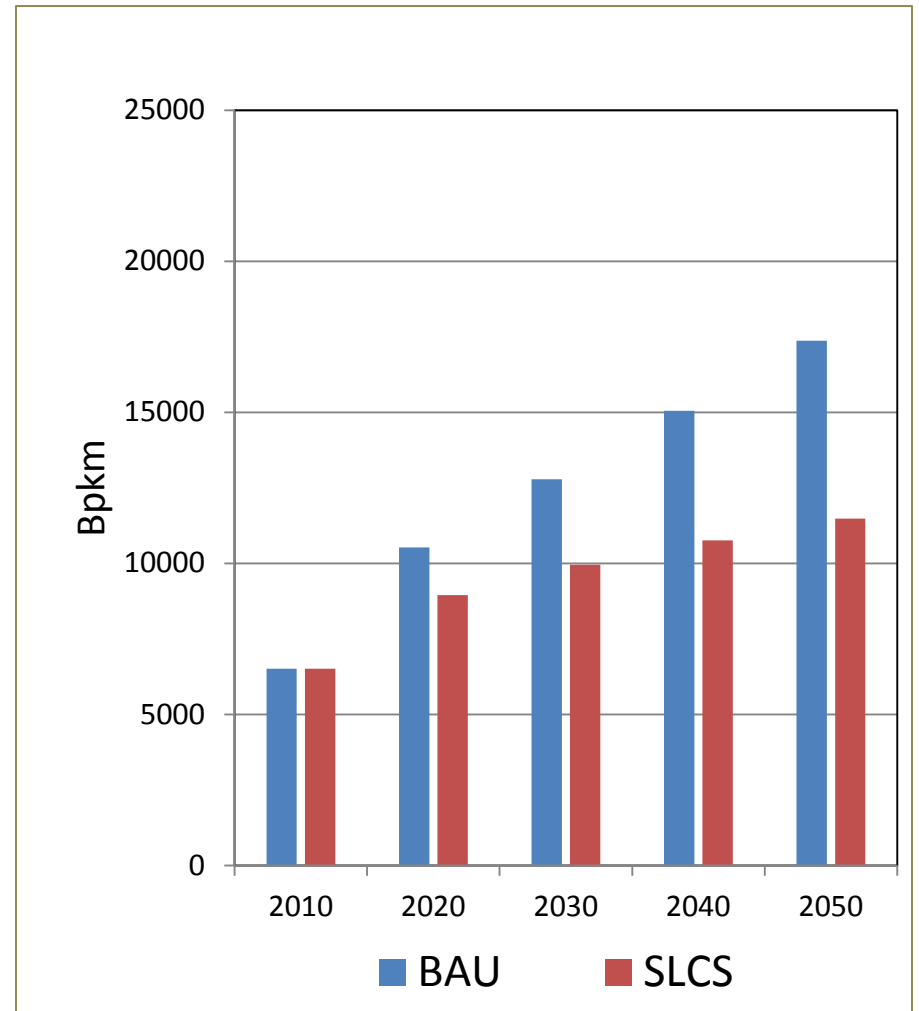


# Passenger Transport Demand

## BAU - Passenger Transport Demand

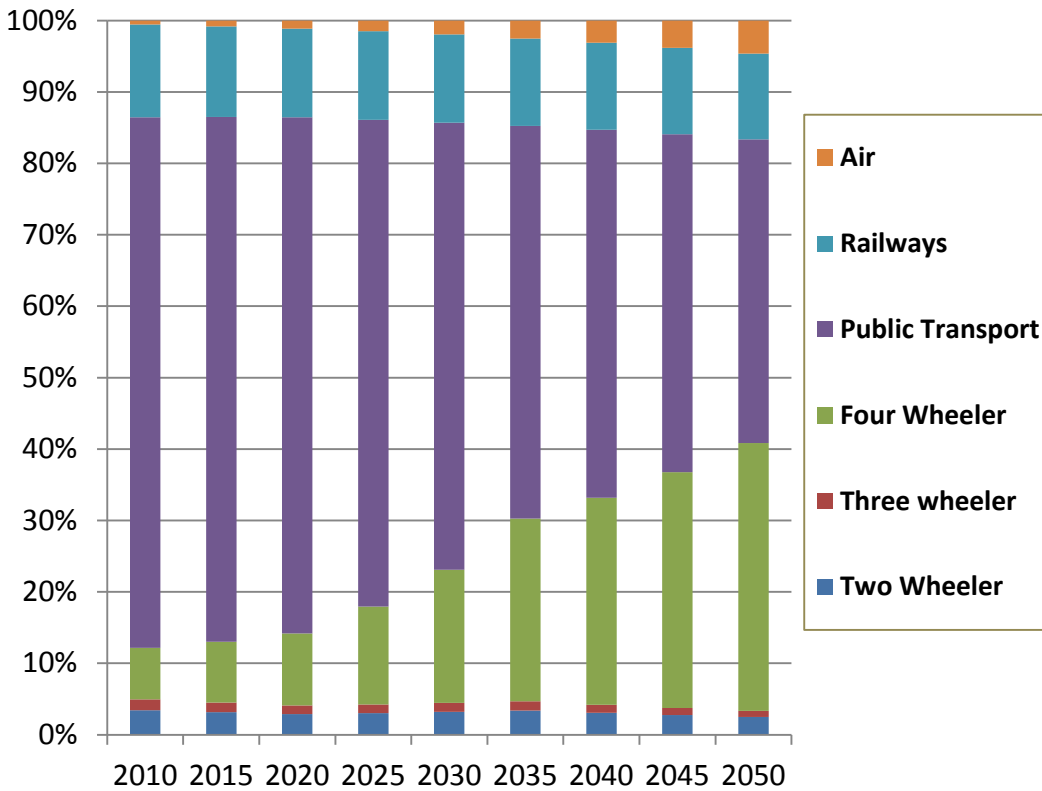


## BAU - Road Passenger Transport Demand

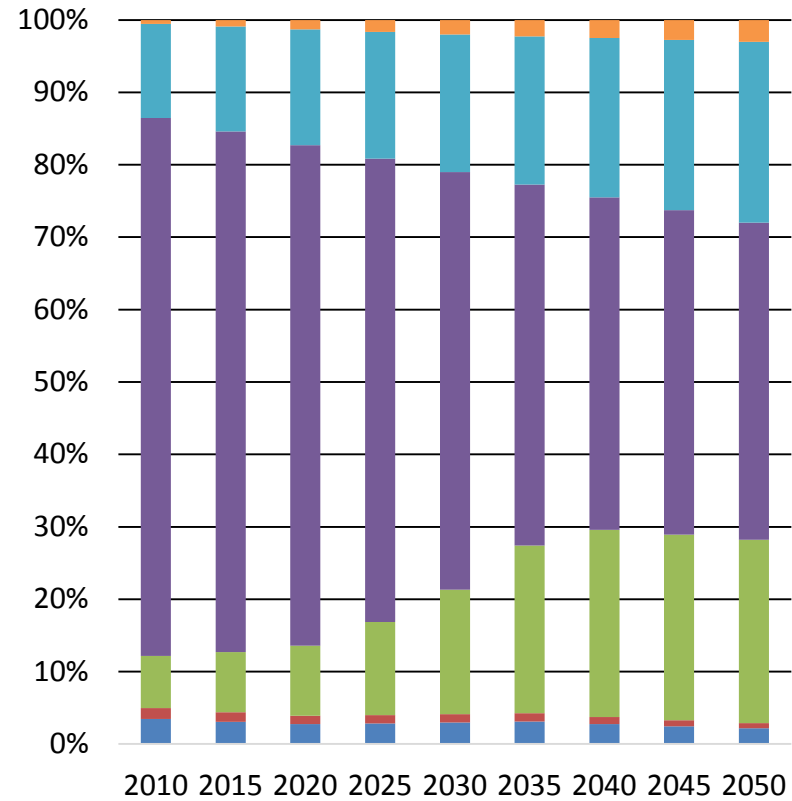


# Modal Share of Passenger Transport

## BAU Modal Share



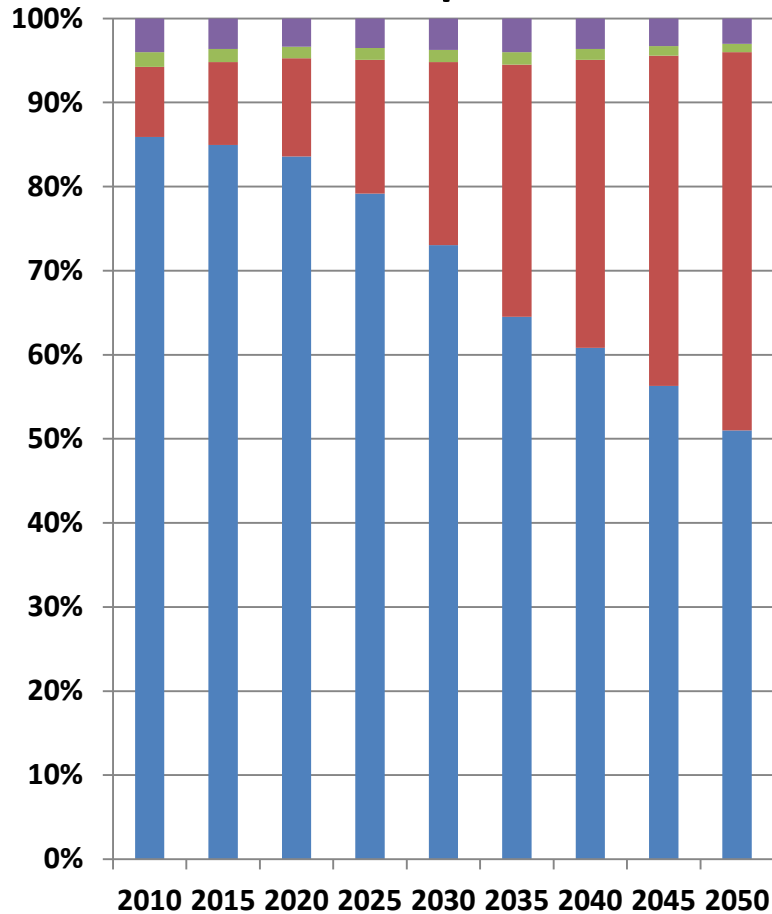
## Sustainable Low Carbon Scenario Modal Share



# Share in Road Passenger Transport

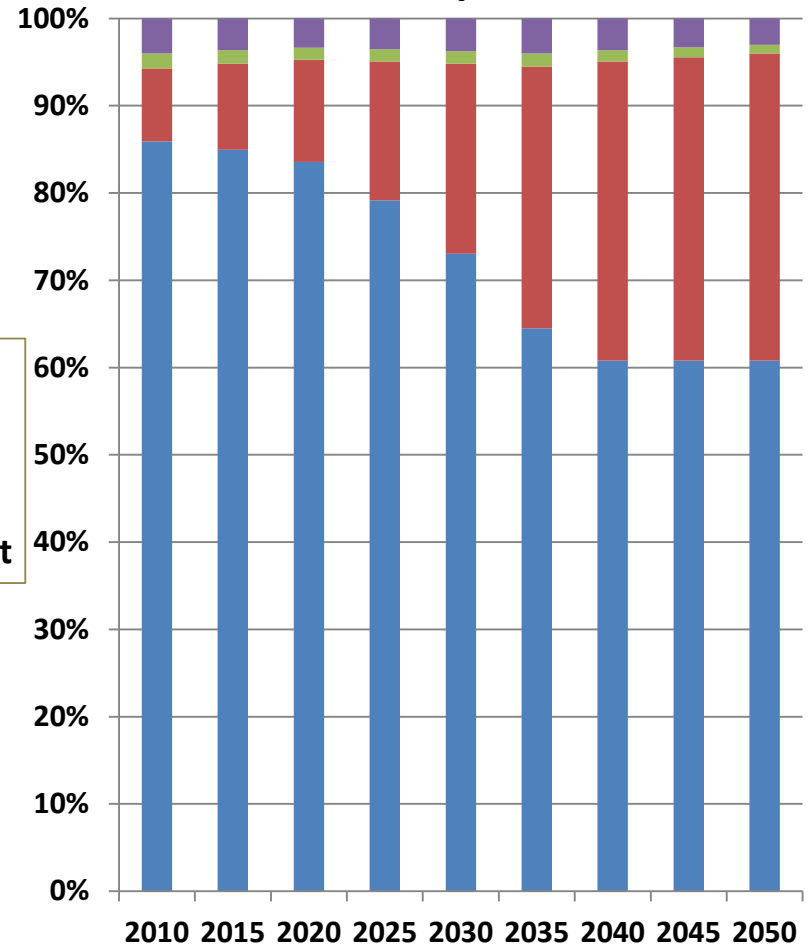
## BAU

### Road Transport Share



## Sustainable Low Carbon Scenario

### Road Transport Share

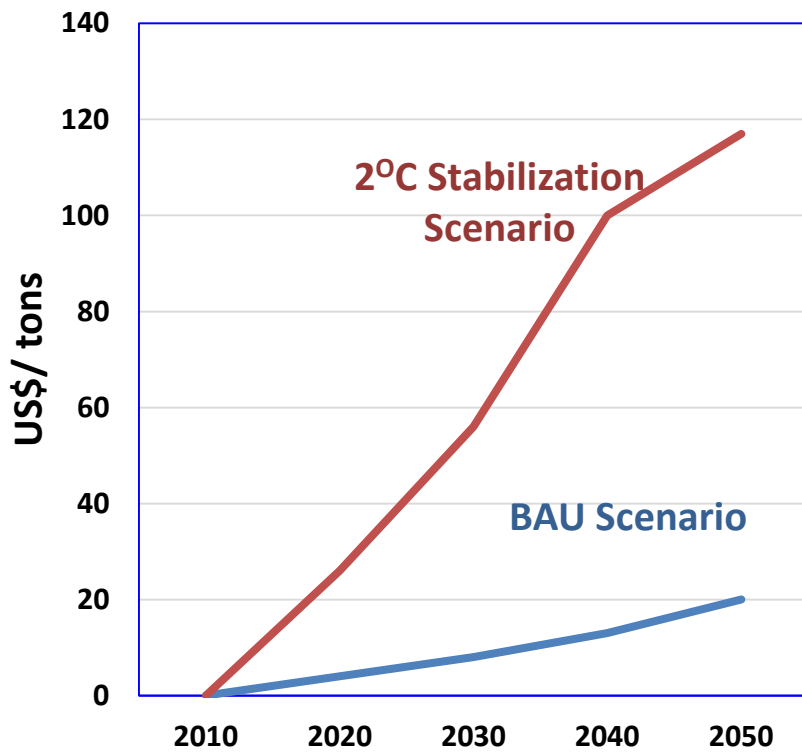


# **Sustainable Low Carbon Transport Scenario**

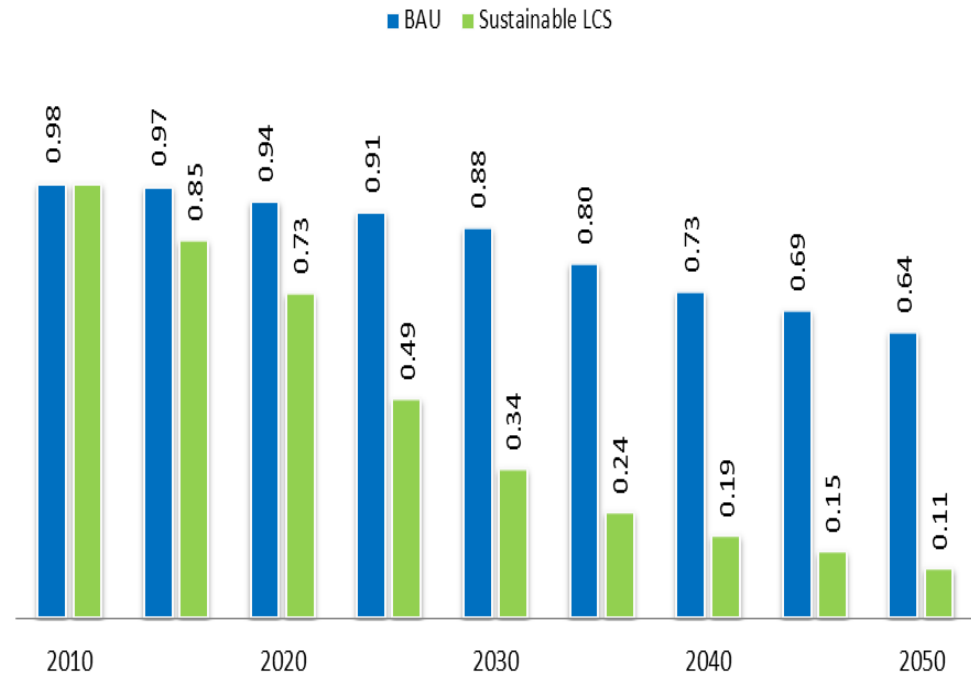
**Results from Modeling Assessment**

# Low Carbon Electricity Transition

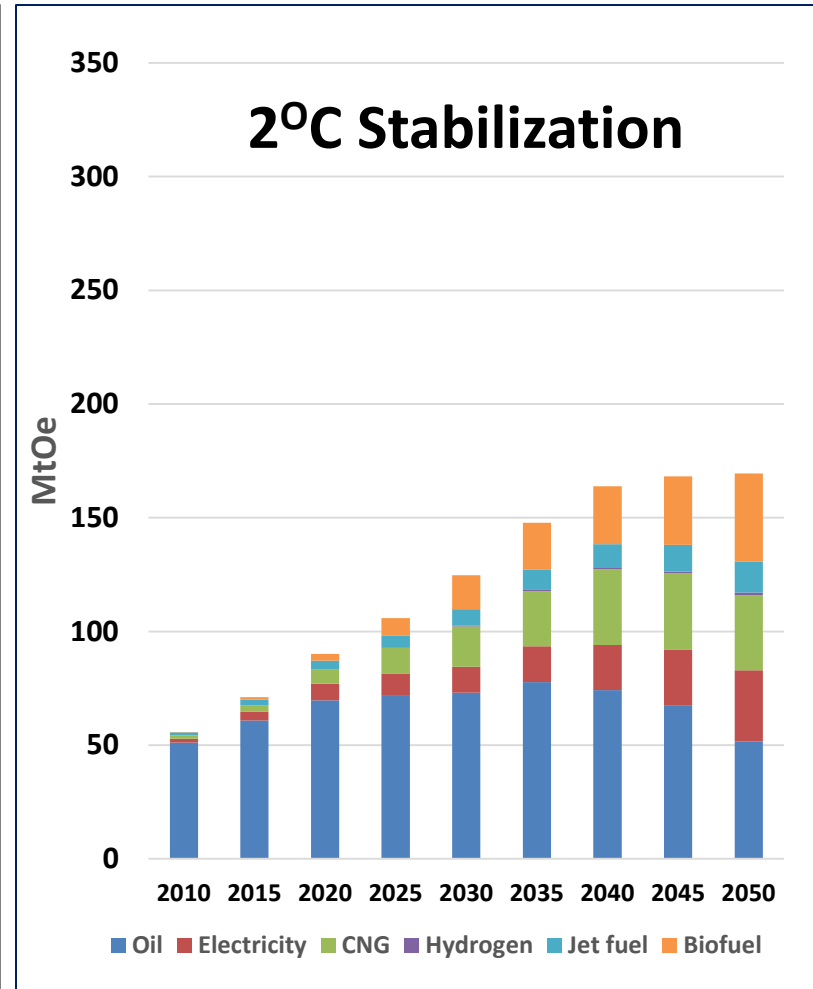
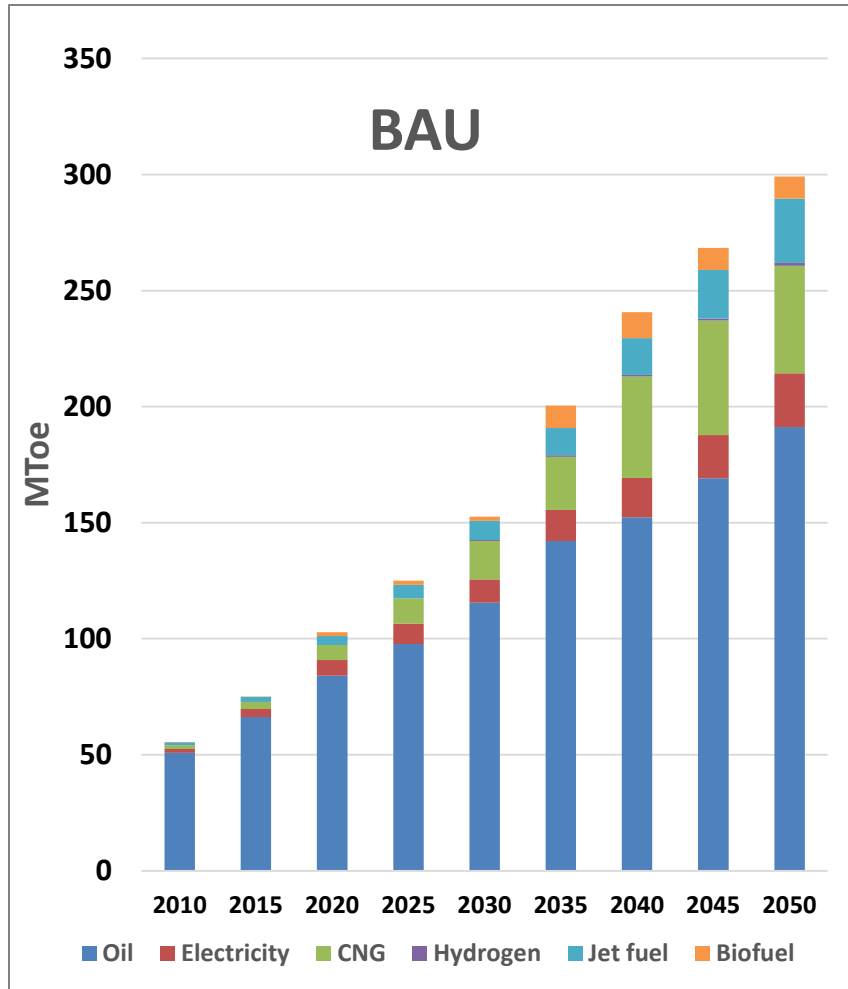
## Carbon Price Trajectory



## CO2 Intensity of Grid (tCO<sub>2</sub> / Mwh)

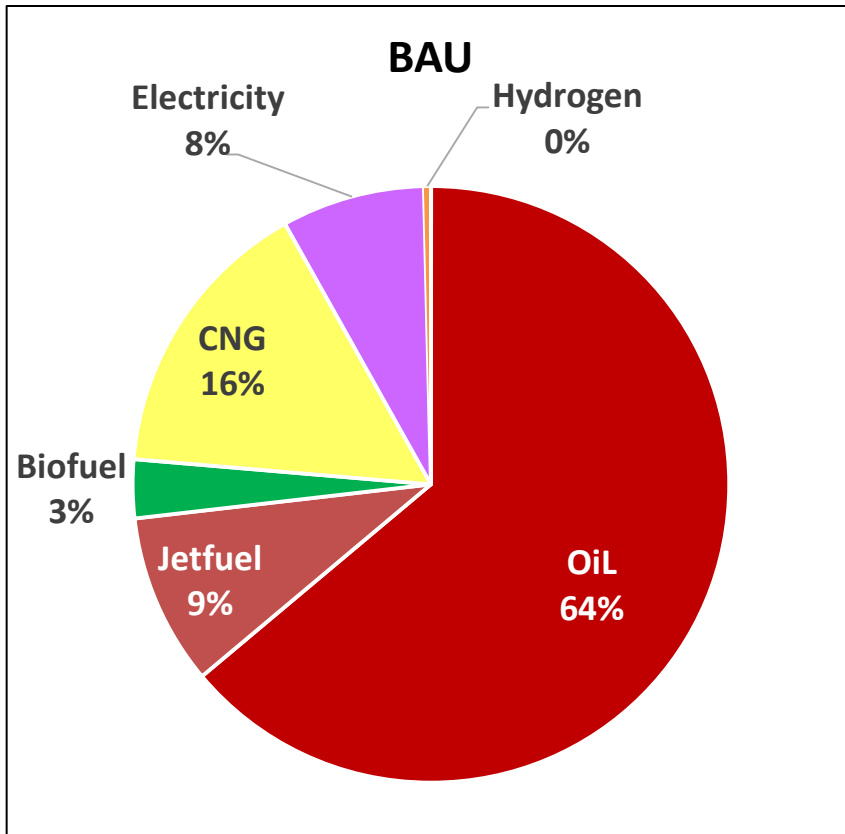


# Energy Mix for Transport

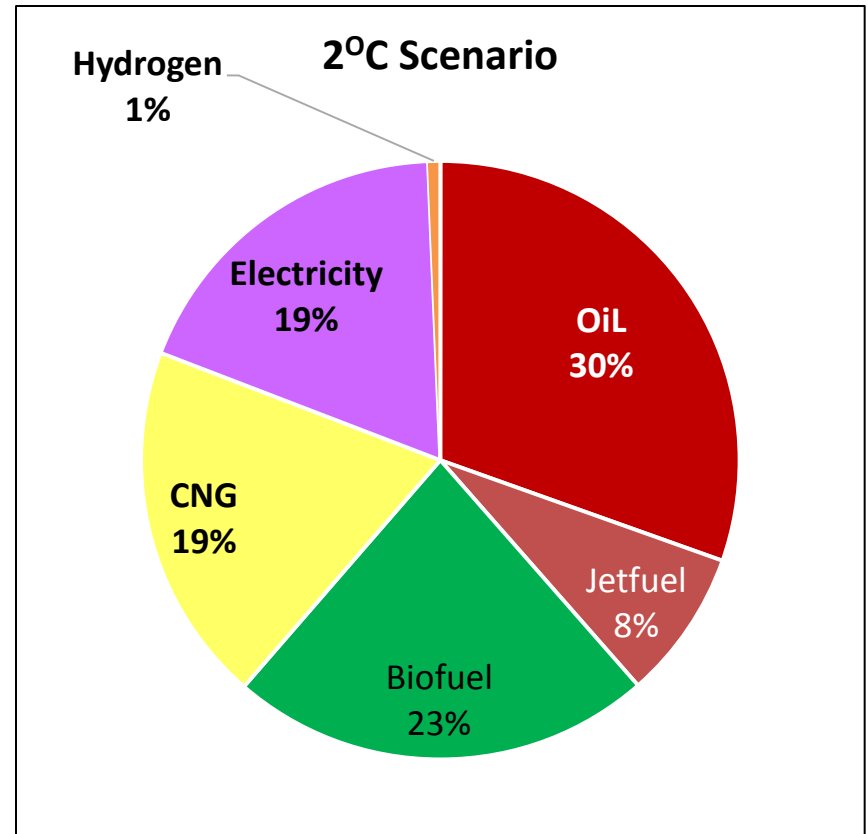


# Transport Fuel Mix in 2050

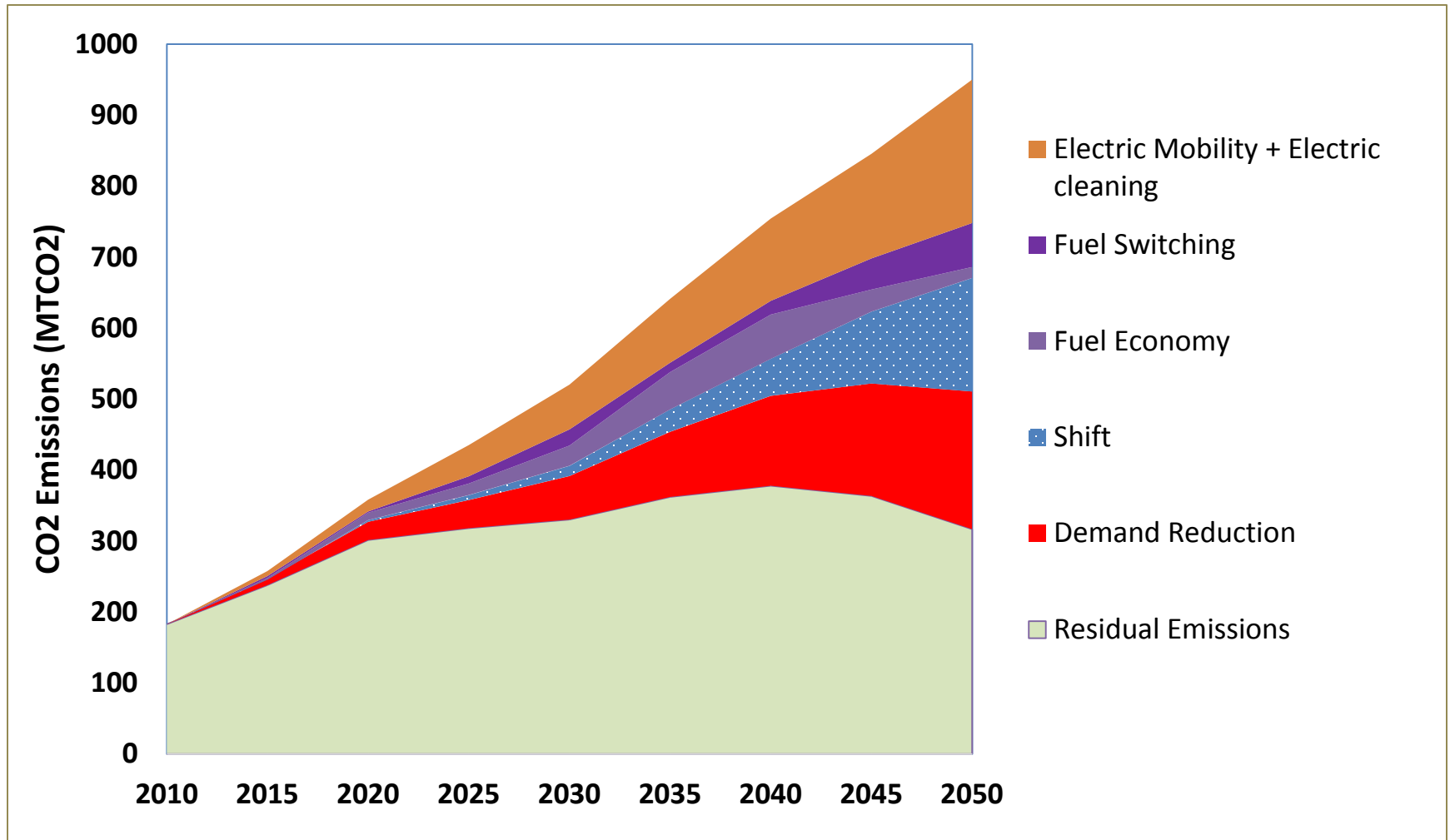
Transport Energy : 299 Mtoe



Transport: 169 Mtoe

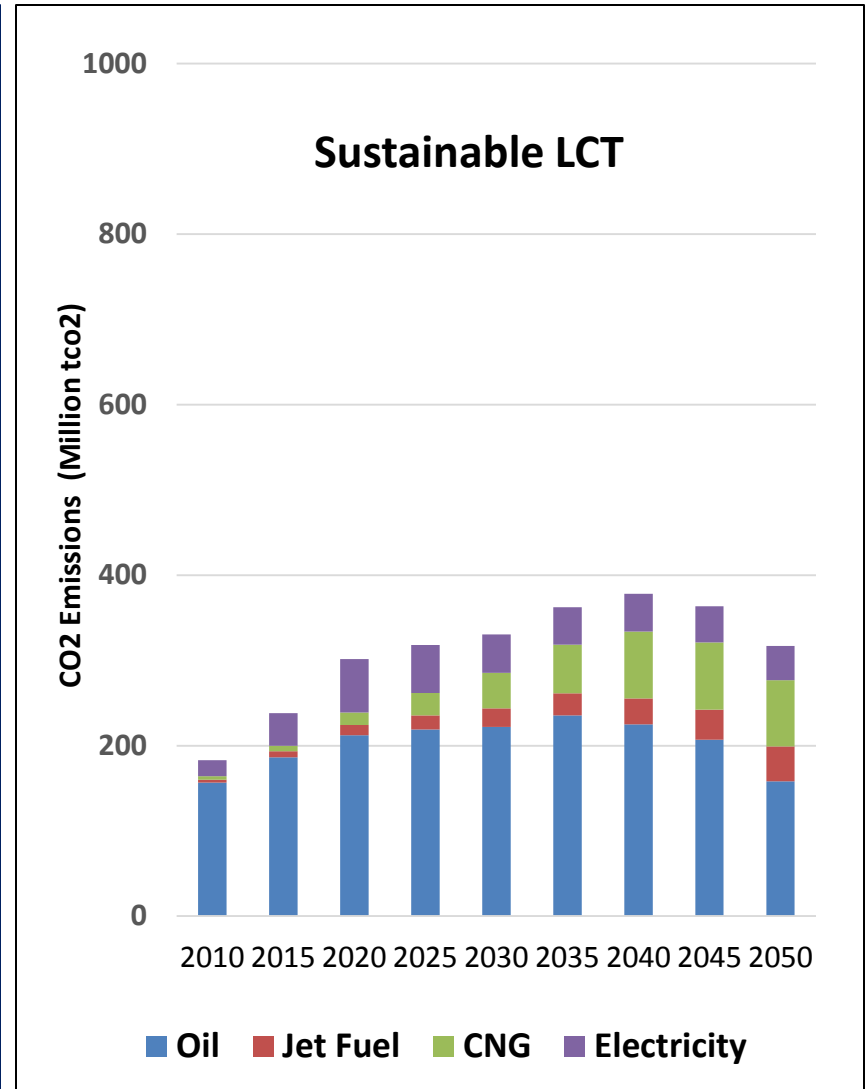
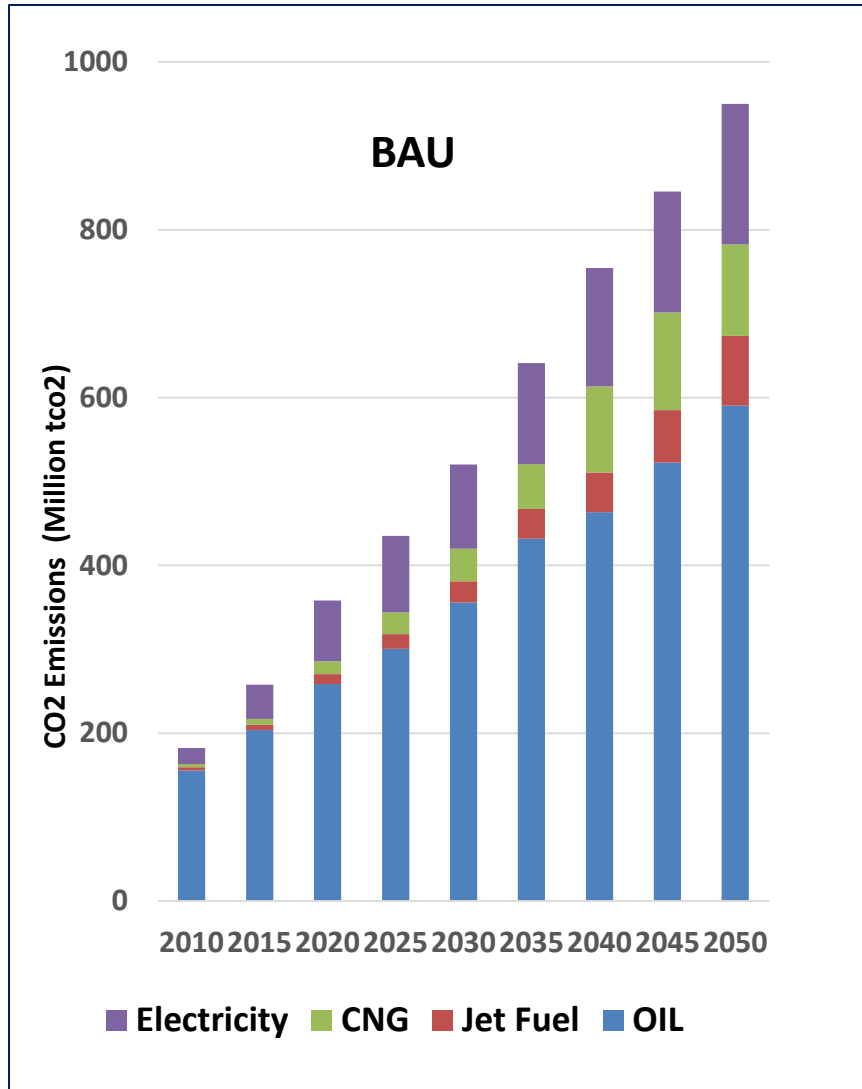


# Contribution to CO2 Mitigation in Sustainable Low Carbon Transport Scenario

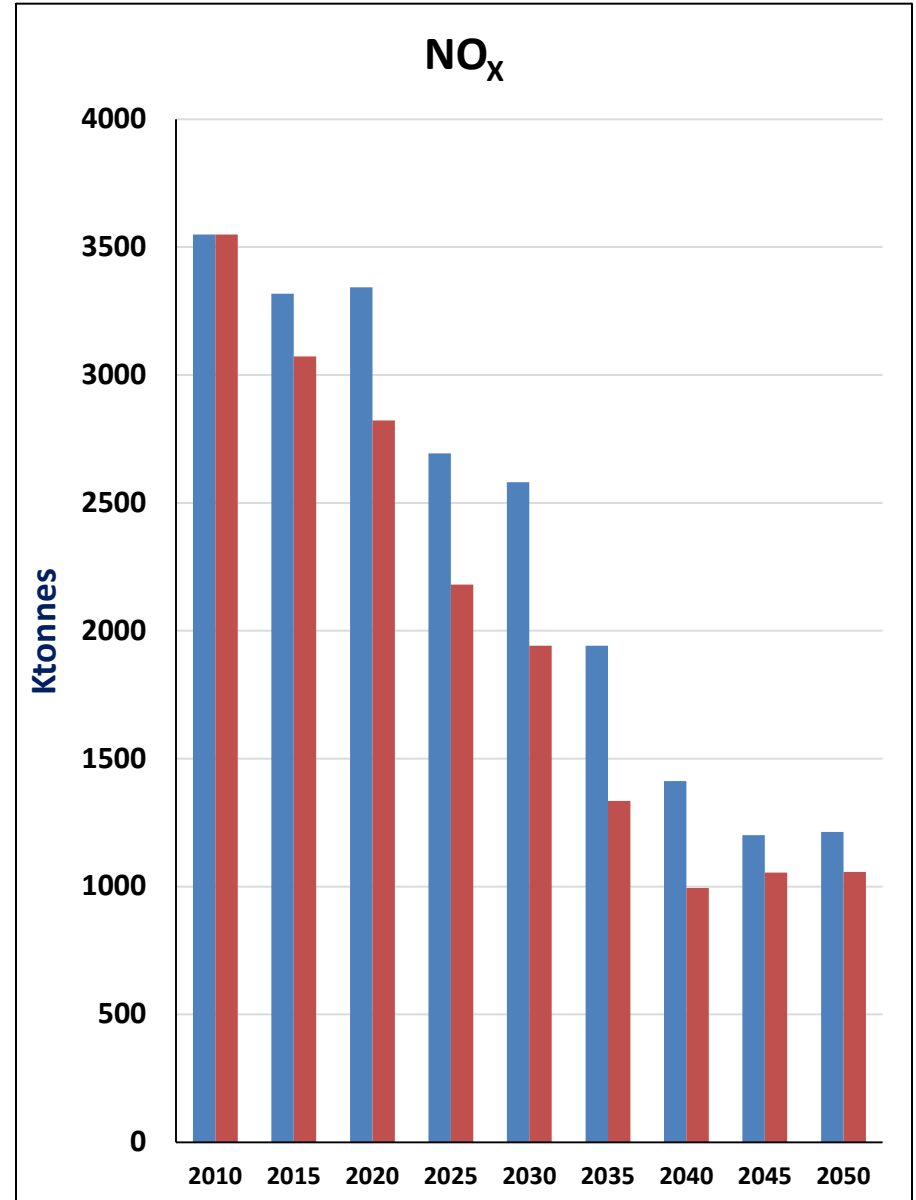
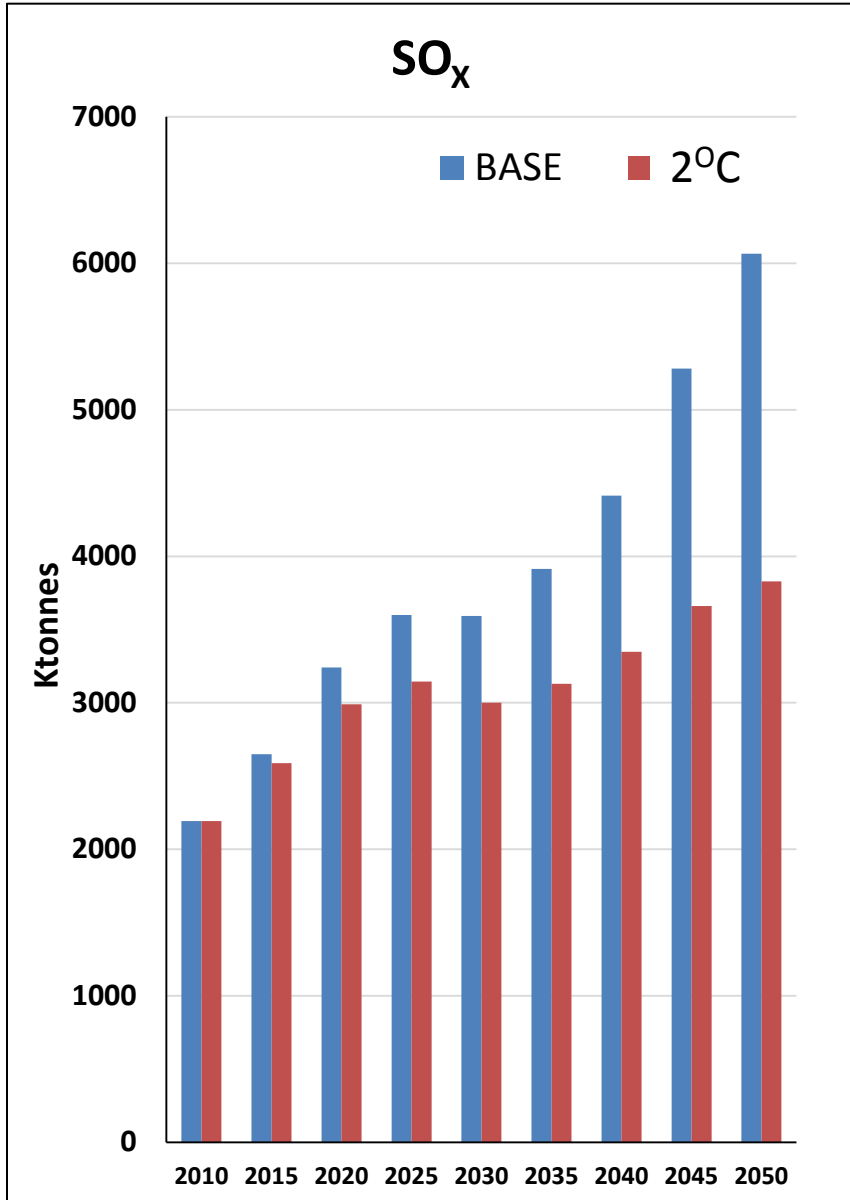




# CO2 Emissions- Transport

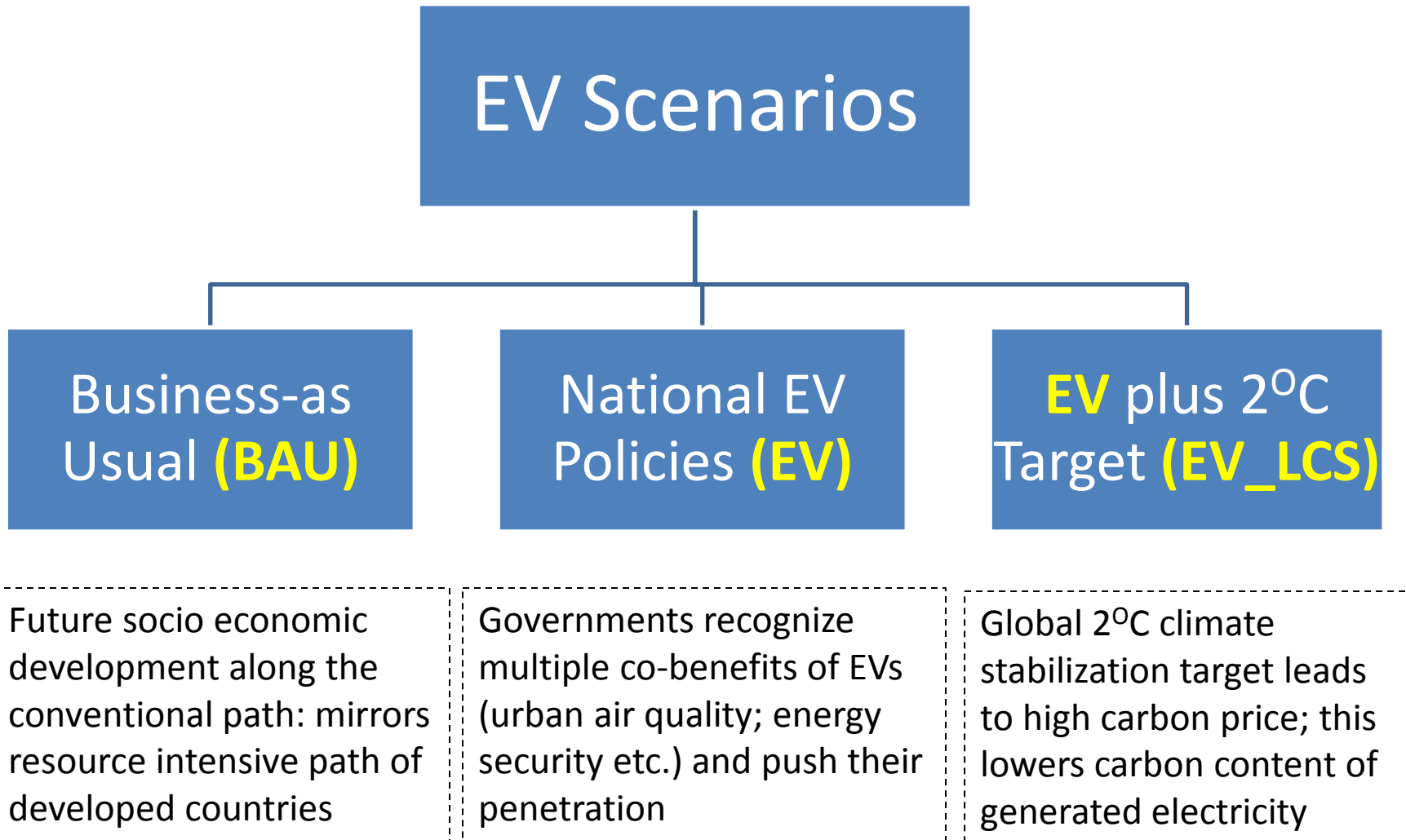


# Air Quality Co-benefit



# Electric Vehicle Scenarios

# Electric Vehicles (EV) Scenarios



# Scenarios Description: EV & EV\_LCS

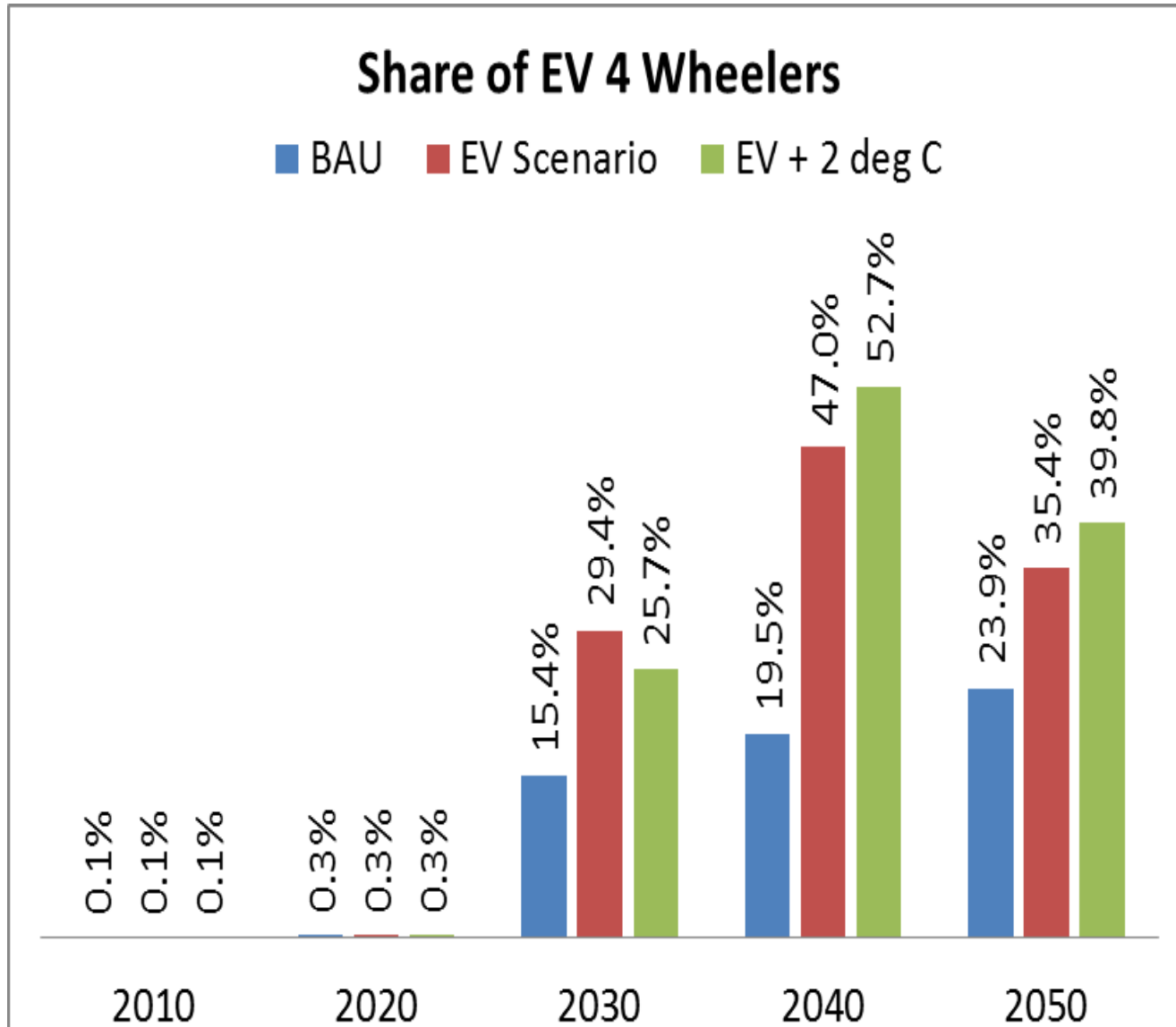
## Electric Vehicle Scenario (EV): Assumptions

- 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 EVs penetration for urban transportation

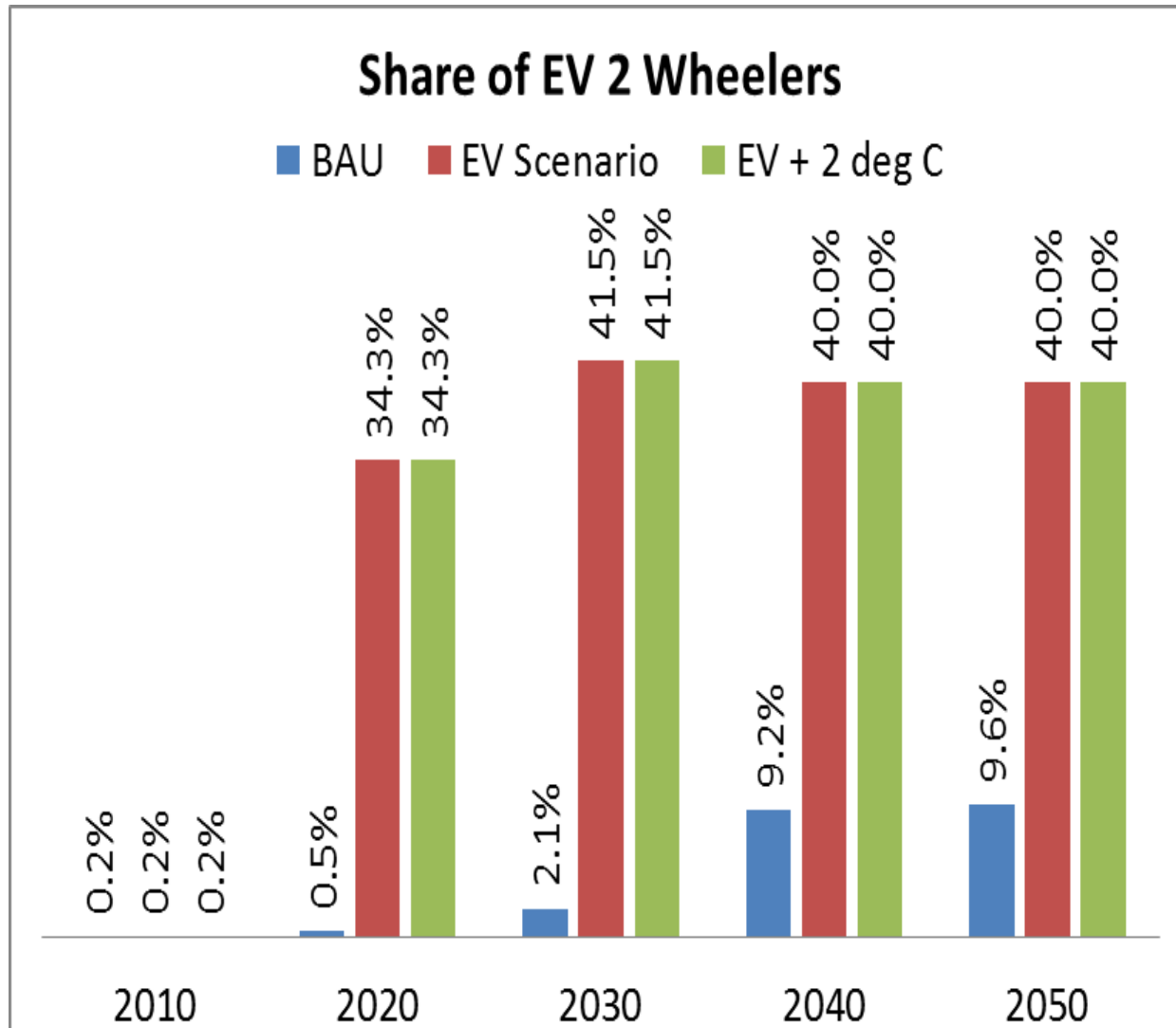
## Electric Vehicle plus 2°C Scenario (EV\_LCS): Assumptions

- Global 450 ppmv CO<sub>2</sub> equivalent concentration stabilization target
- Carbon Price rise: from US\$ 46/tonne CO<sub>2</sub> in 2020 to US\$ 200/tonne CO<sub>2</sub> in 2050 (based on outputs from IMAGE and MESSAGE models)

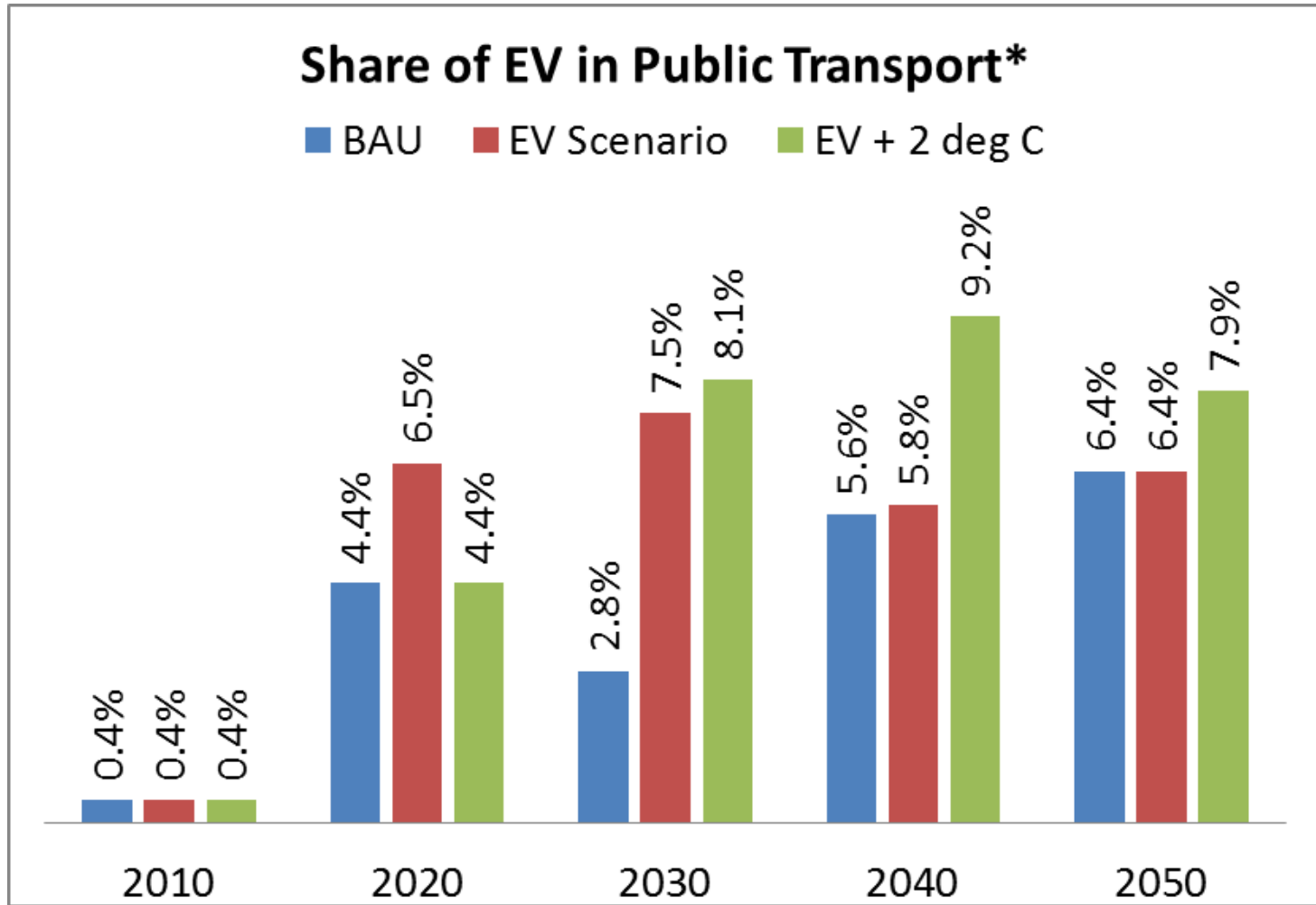
# EV Share in Personal Motorised Transport



# EV Share in Personal Motorised Transport



# Share of EV for Public transport

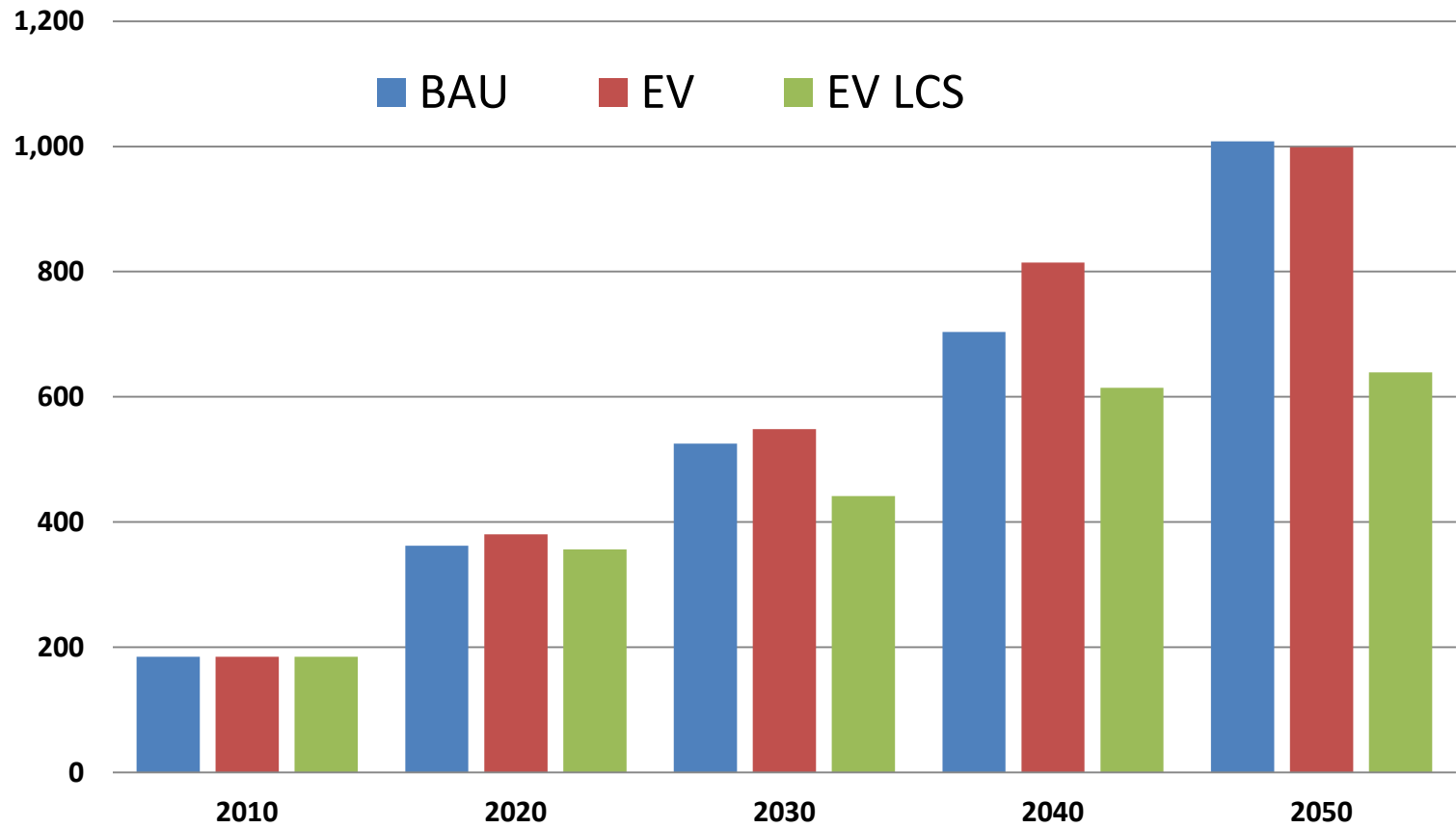


(\* ) Excludes Demand for Passenger Transport met by Railways.



# CO2 emissions: BAU, EV, EV\_LCS

CO2 Emissions from Transport Sector  
(Million tCO2)



# Conclusions

- Under global 2°C stabilization policy, in 2050, India's:
  - Transport sector would mitigate 66% of BAU emissions
  - Transport Emissions will still be 60% above 2010 emissions
- The low carbon transition of transport sector is accompanied by sizable shift in fuels and technologies
- Low carbon transport transition shall deliver *Air Quality* and *Energy Security* co-benefits
- Electric Vehicles (EV) by themselves do not contribute to CO<sub>2</sub> mitigation; they may even increase emissions
- Under global 2°C stabilization policy, in India, EV contribute sizable mitigation, nearly 38% to the BAU transport emissions in 2050
- Early penetration of EV in India would come through 2-wheelers; this would create infrastructures that would facilitate larger vehicles.

# Thank You

## Low Carbon Transport Project Website :

[www.unep.org/transport/lowcarbon](http://www.unep.org/transport/lowcarbon)



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