



# Alternative Fuels and Vehicles: Co-benefits and Co-costs for India

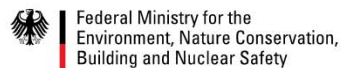
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Supported by:



based on a decision of the German Bundestag

Partner Organizations:



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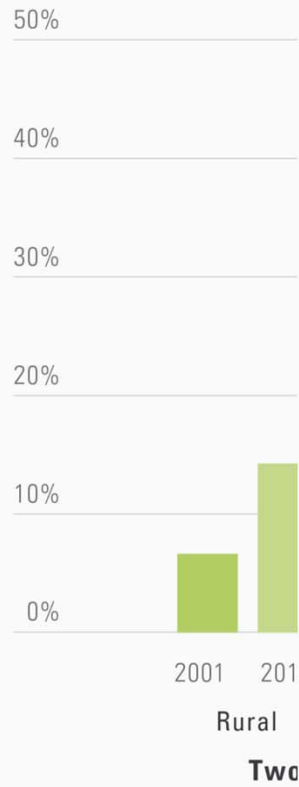
- Context
- Low Carbon Transition Strategies
  - Fuel Economy
  - Biofuels
  - Electric Vehicles
- Conclusions



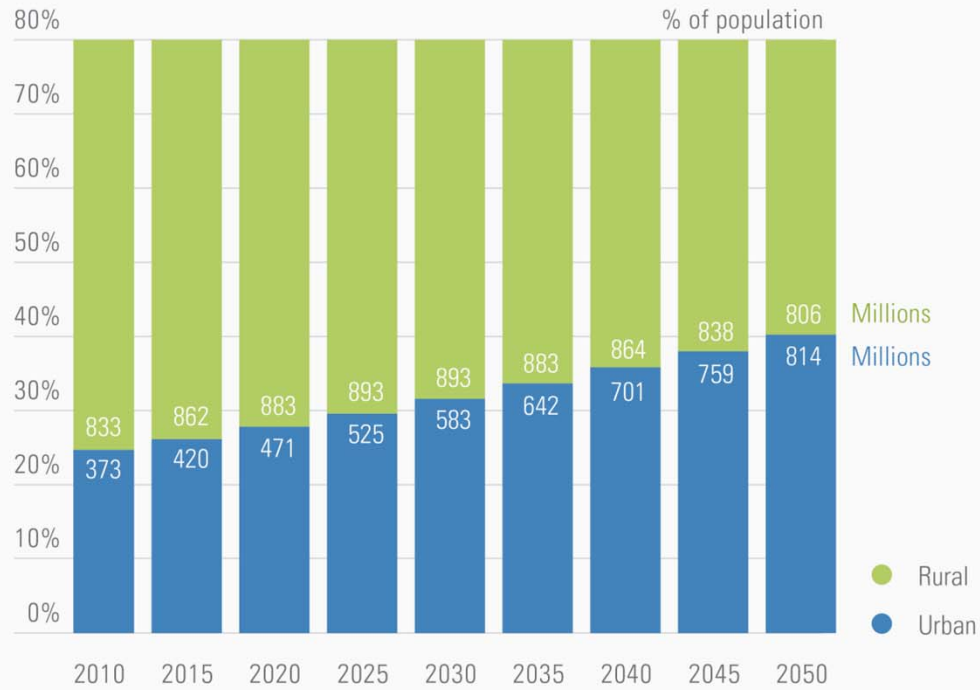
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# Trends in Vehicle Ownership

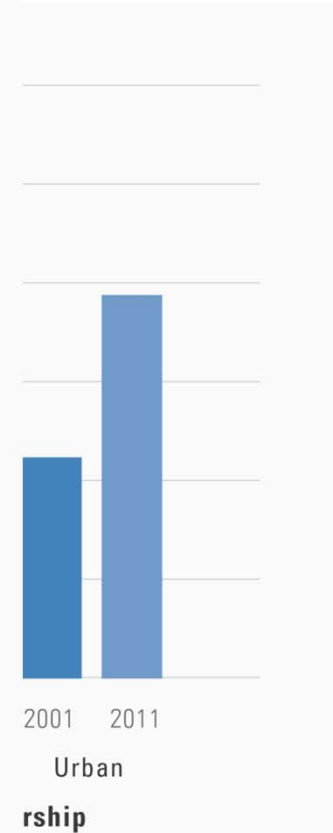
**Figure 9. Rural urban population transitions**



Source: Census of India, 2011



Source: UN, 2014

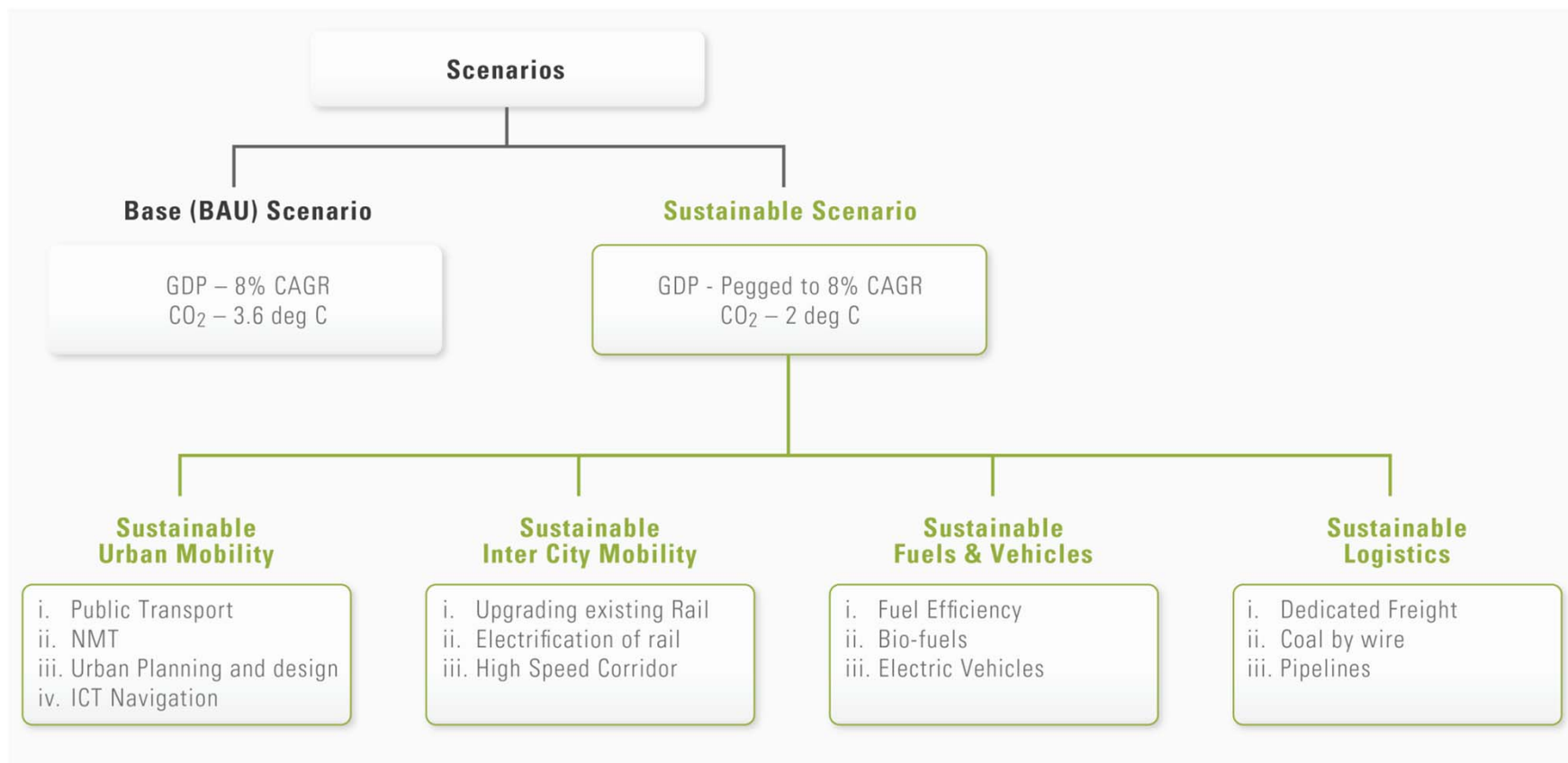


# Policies for fuels and vehicles



Policy Name	Description
<b>Fuel Economy Standards for cars</b>	<ul style="list-style-type: none"> <li>• Binding fuel economy standards starting 2017</li> <li>• Fuel efficiency improvement in cars of 10% by 2017, and 20% by 2022 relative to 2010 levels</li> </ul>
<b>Auto Fuel Policy</b>	<ul style="list-style-type: none"> <li>• Phased implementation of vehicle and fuel quality norms in the country</li> </ul>
<b>National Policy on Biofuels</b>	<ul style="list-style-type: none"> <li>• Proposed blending target of 20% blending of biofuels both for bio-diesel and bio-ethanol by 2017</li> <li>• Financial incentives</li> <li>• Waiver on excise duty for bio-ethanol and excise duty concessions for biodiesel</li> </ul>
<b>National Electric Mobility Mission Plan</b>	<ul style="list-style-type: none"> <li>• Investments in R&amp;D, power and electric vehicle infrastructure</li> <li>• Phase-wise strategy for research and development, demand and supply incentives, manufacturing and infrastructure upgrade</li> </ul>

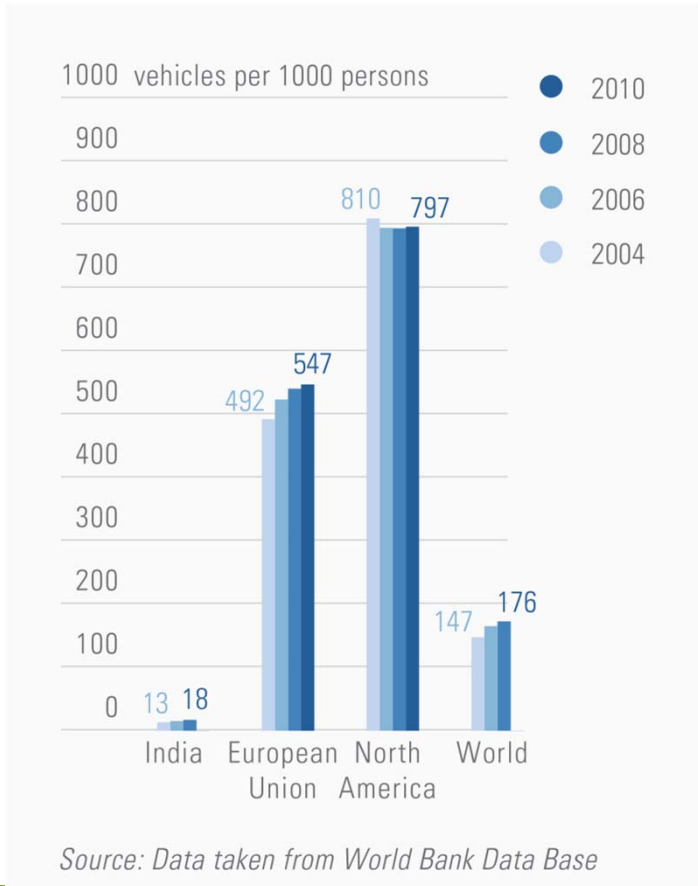
# Scenario Framework



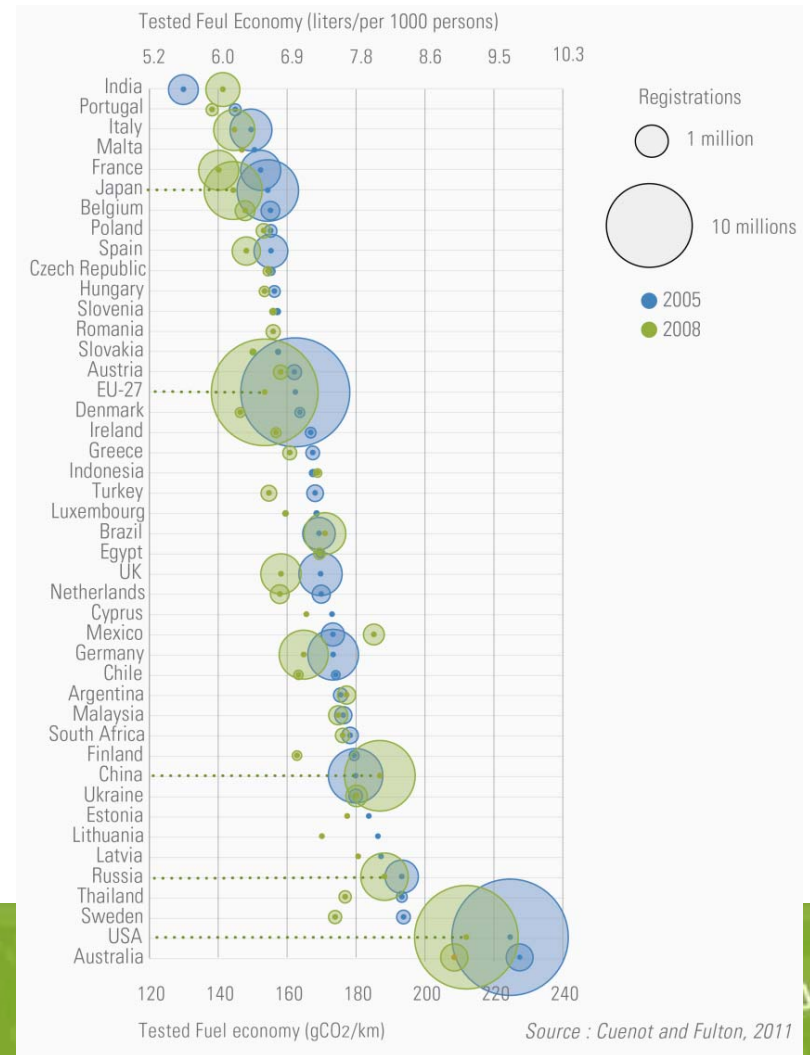
# FUEL ECONOMY

# Global Comparison - Vehicles

## Vehicle Ownership

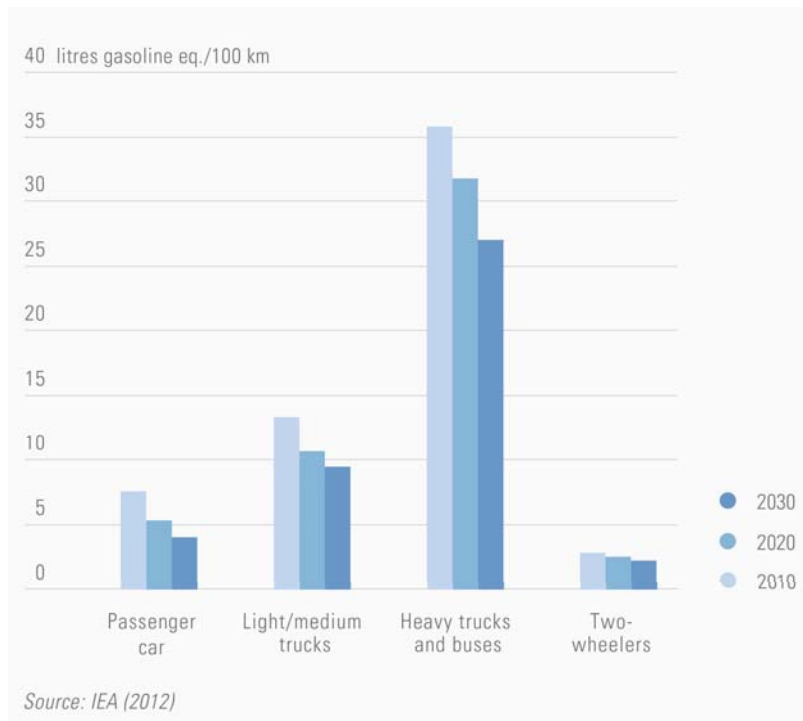


## Vehicle Efficiency

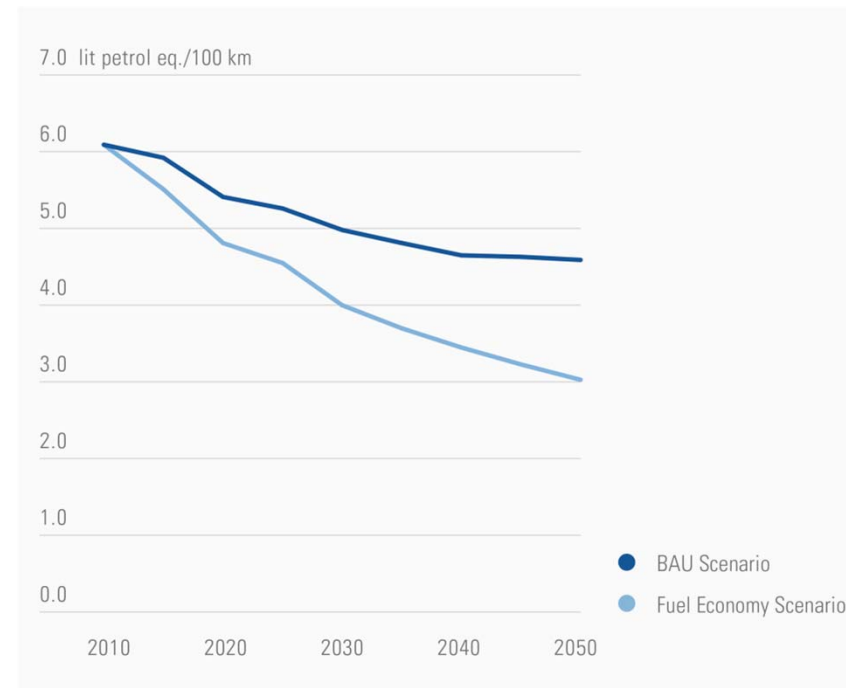


# Future Fuel Economy

## GFEI Targets



## Average Fuel Economy : 4 wheelers

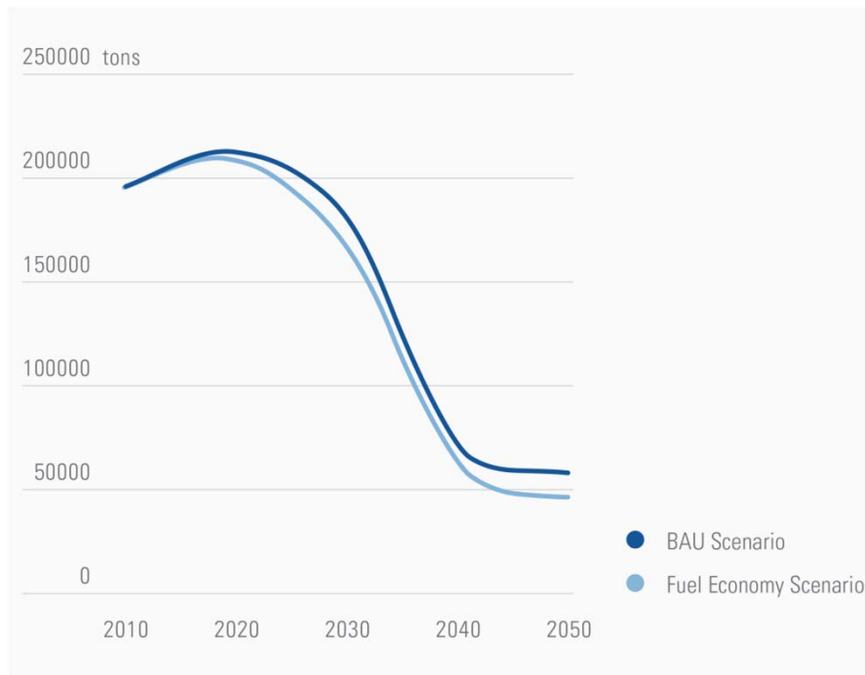




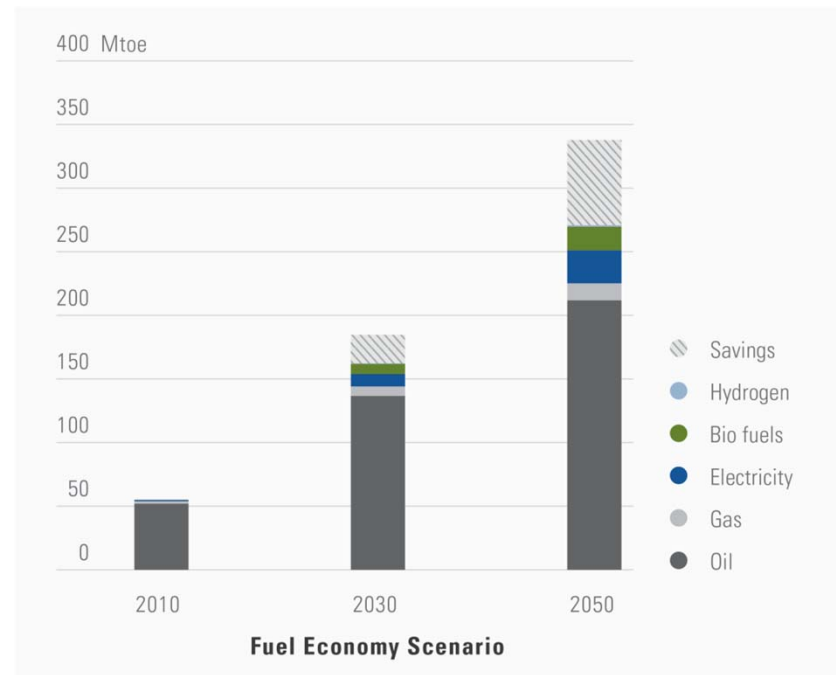
# Fuel Economy : Co-benefits



## PM 2.5 Emissions



## Fuel Savings



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# BIO FUELS

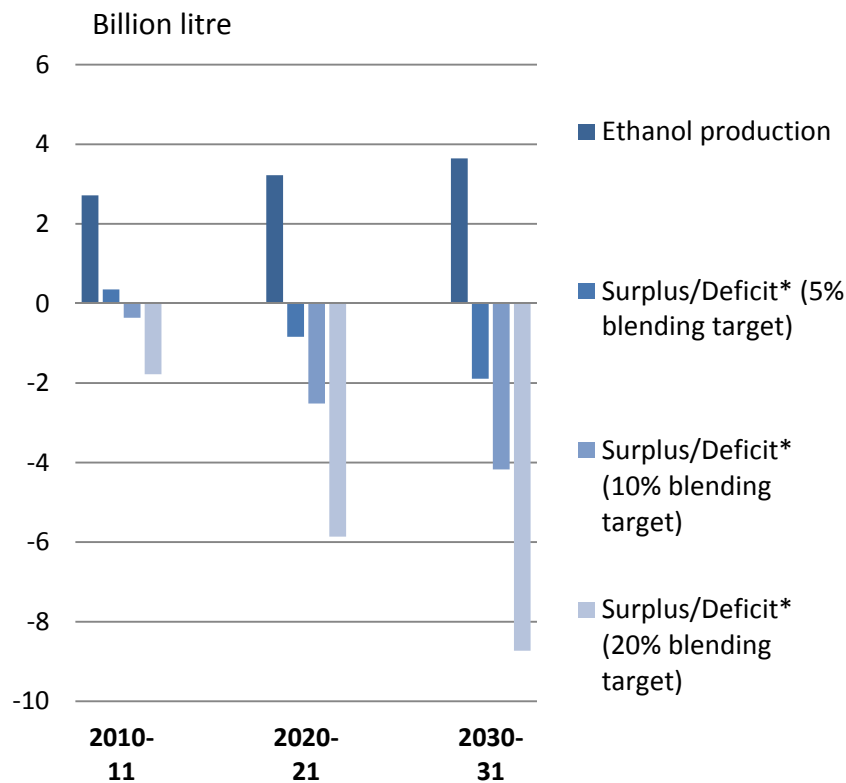


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# Biofuels Targets & 1st Generation



Ethanol Surplus /Deficit from 1st Gen.



Source: Purohit & Dhar, 2015

Land Required for Jatropha

Year	Diesel demand (BL)	For 5% blending		For 10% blending		For 20% blending	
		A	B	A	B	A	B
2010	46.9	2.3	3.0	4.7	6.0	9.4	11.9
2020	98.8	4.9	6.3	9.9	12.6	19.8	25.2
2030	155.7	7.8	9.9	15.6	19.8	31.1	39.7

A = Biodiesel demand (BL)

B = Jatropha area (Mha)

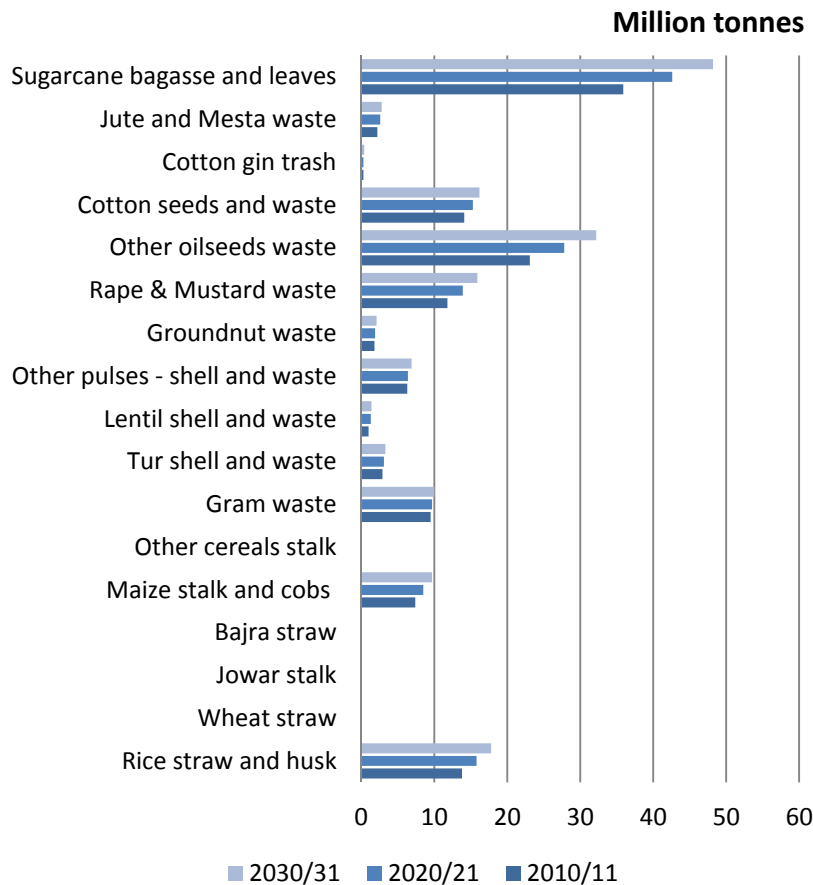
Source: Purohit & Dhar, 2015



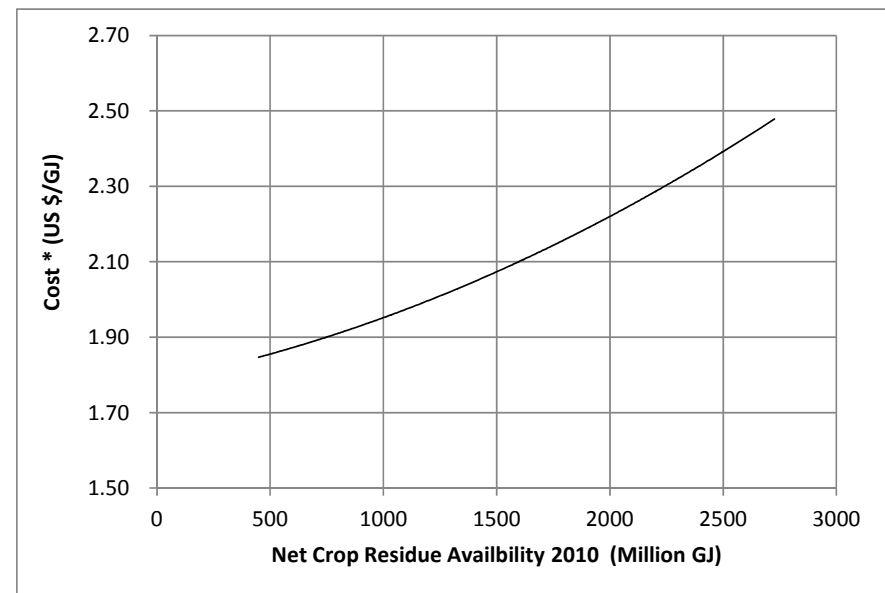
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# Biomass for Biofuels

## Biomass Availability



## Biomass Supply Curve



Source: Purohit & Dhar, 2015



Low Transport in India  
Source: Purohit & Dhar, 2015

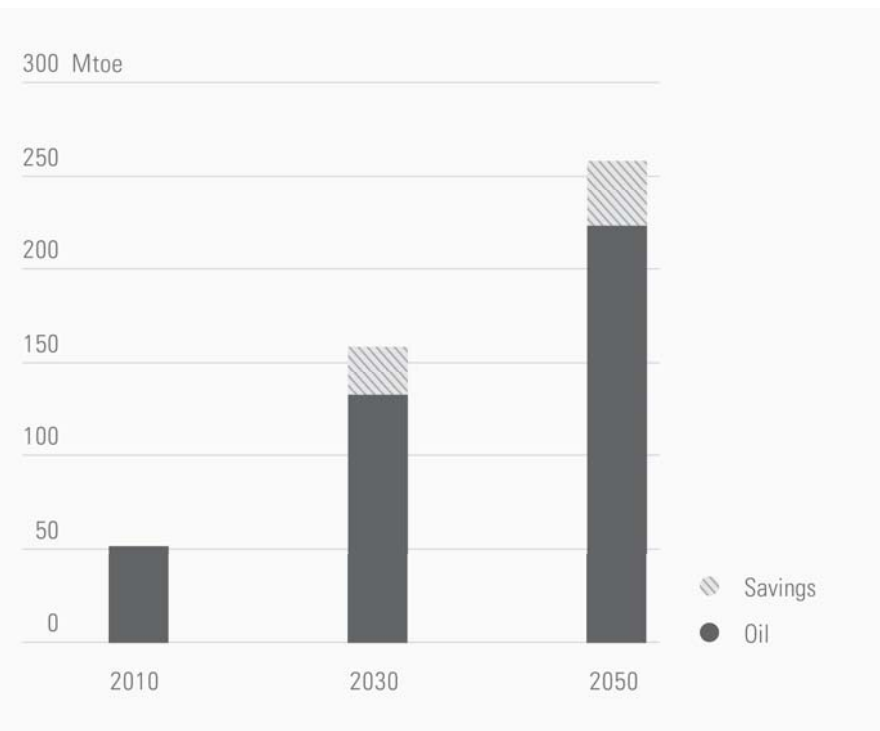
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# Biofuel Co-benefits (20% Blending)



- Job creation especially in rural areas
- Energy Security improvement through oil savings and fuel mix diversification

Oil Savings





# ELECTRIC VEHICLES



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# Key Barriers for EV



- Charging infrastructures
- Battery Costs
- Driving Range

# Mode Shares and Trip Lengths



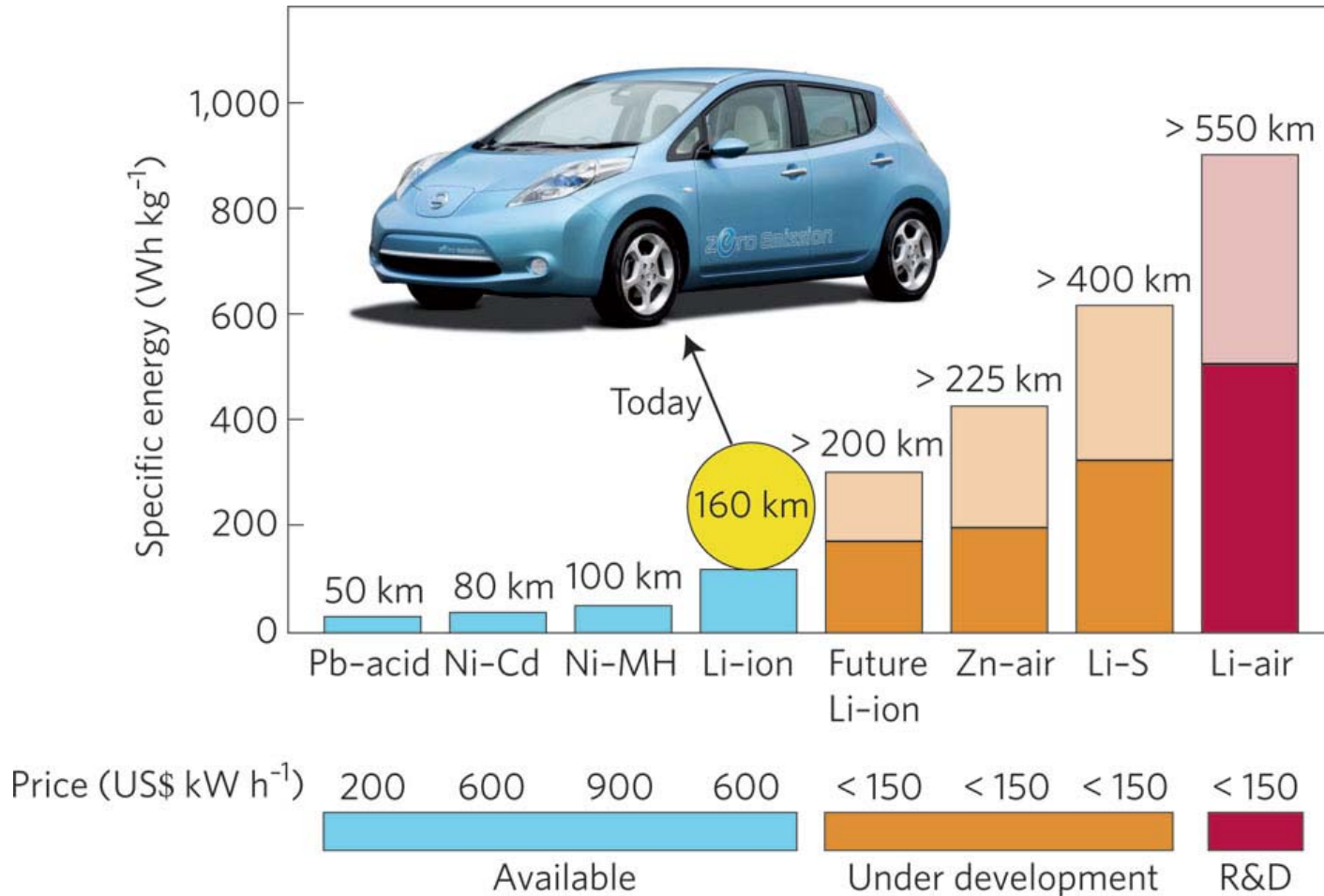
	Modal Shares (% of trips)			Average Trip Length (km)		
	Vizag	Rajkot	Udaipur	Vizag	Rajkot	Udaipur
3-wheeler	9.0%	10.8%	11.0%	5.9	4.31	4.47
Bus	18.0%	3.1%	2.0%	11.7	8.47	8.47
Car	2.0%	2.3%	3.0%	9.3	11.67	5.98
2-wheeler	15.0%	35.4%	34.0%	5.8	4.18	5.22
Bicycle	3.0%	10.0%	2.0%	3.2	3.4	5.08
Cycle-rickshaw	1.0%	0.8%			4	
Walk	52.0%	37.7%	48.0%	0.7	1.68	2.54
Average Trip Length (km)				4.1	2.8	3.9
Average Trip Rate	1.66	1.30	1.12			



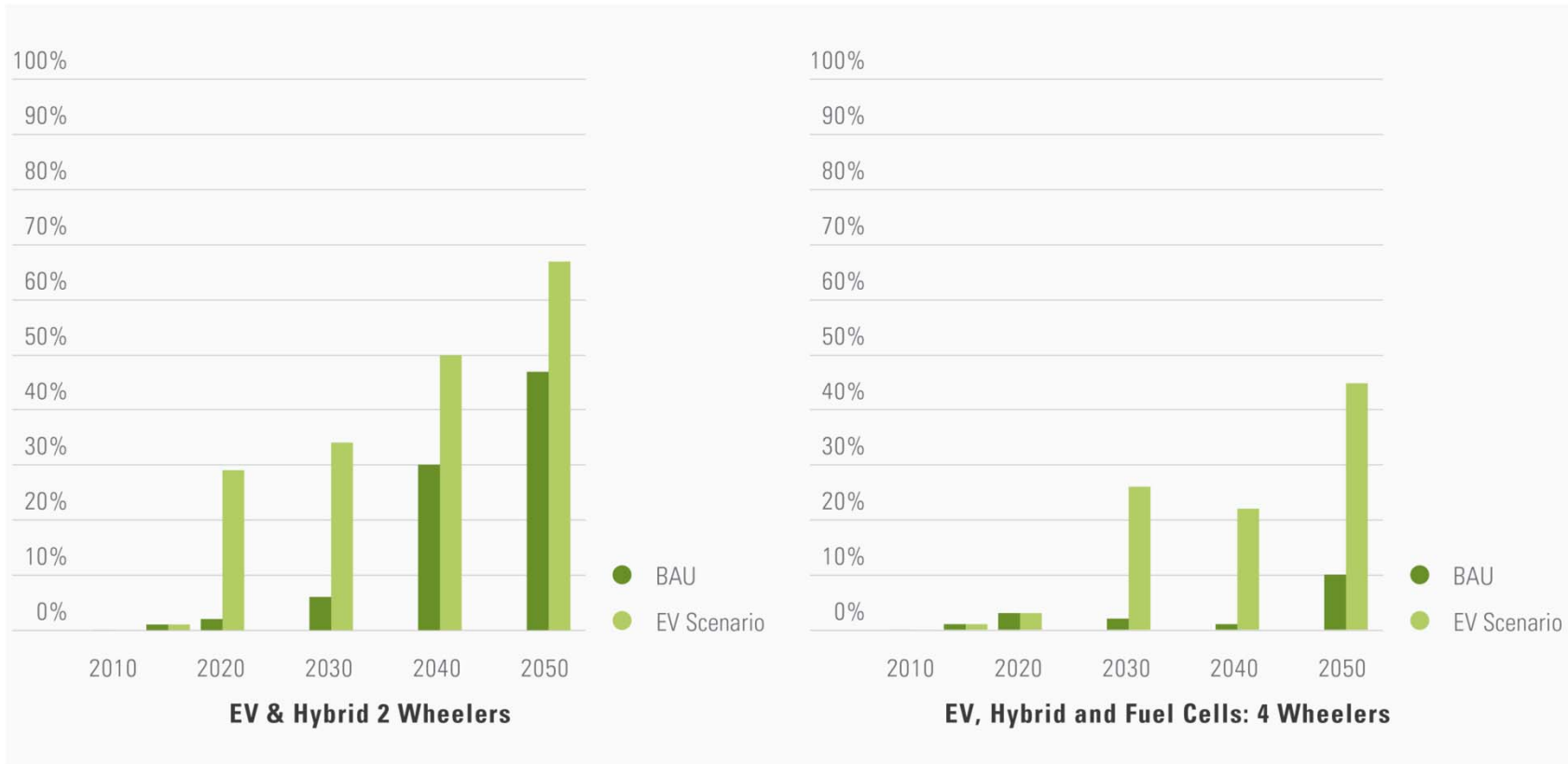
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# Battery Costs

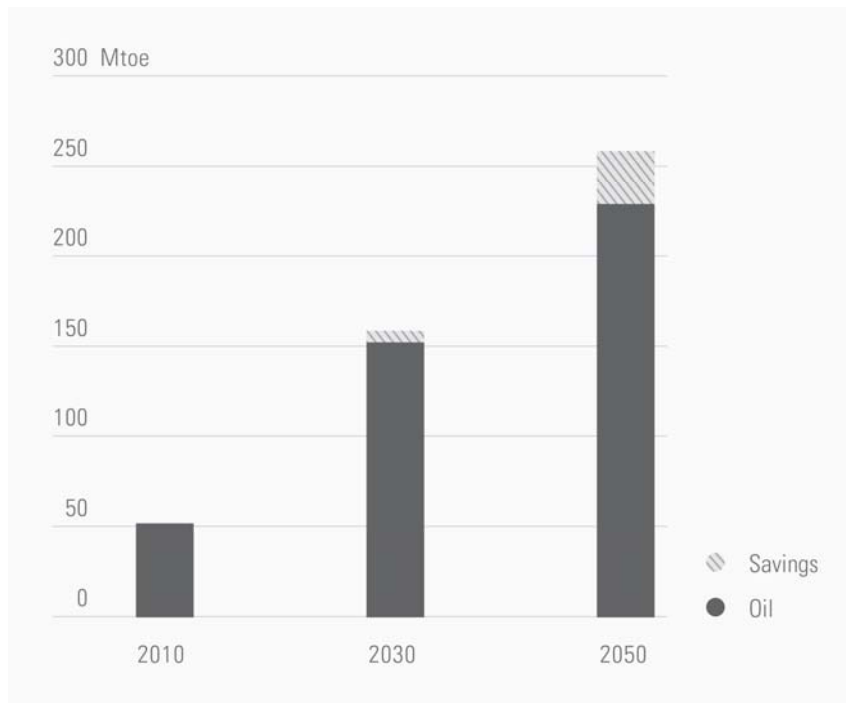


# Share of Electric Vehicles

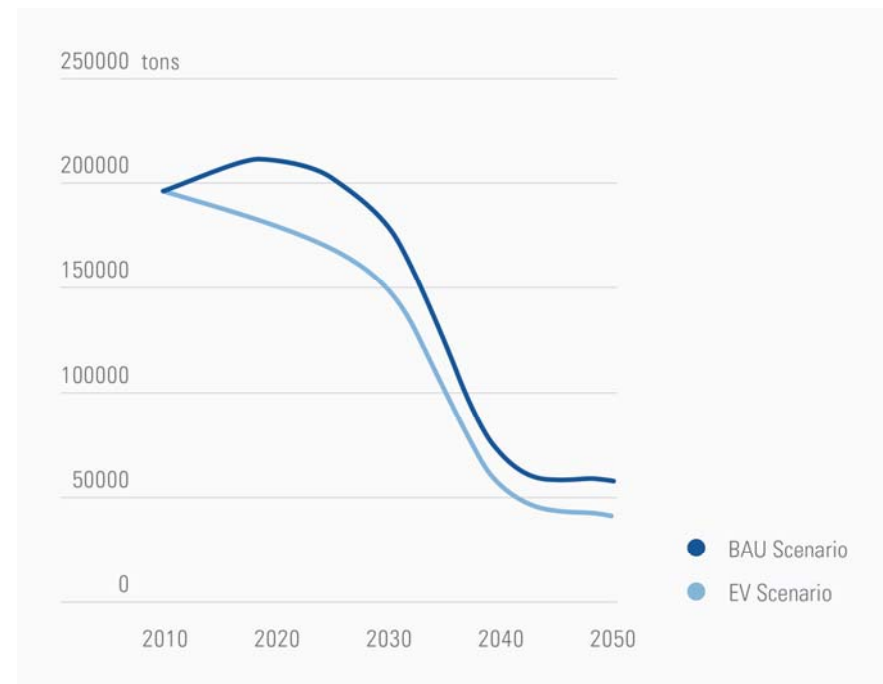


# Co-benefits EVs

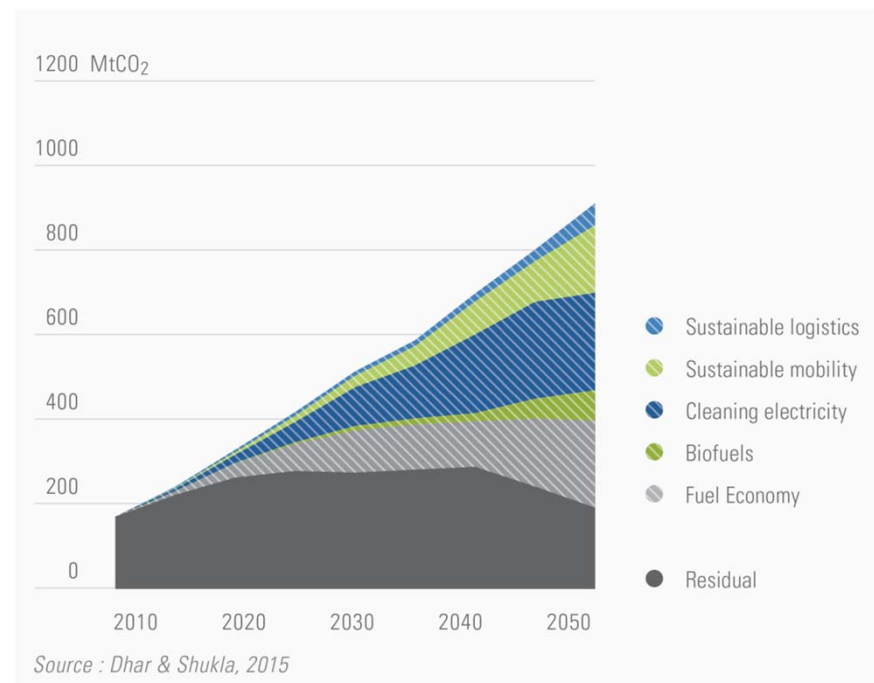
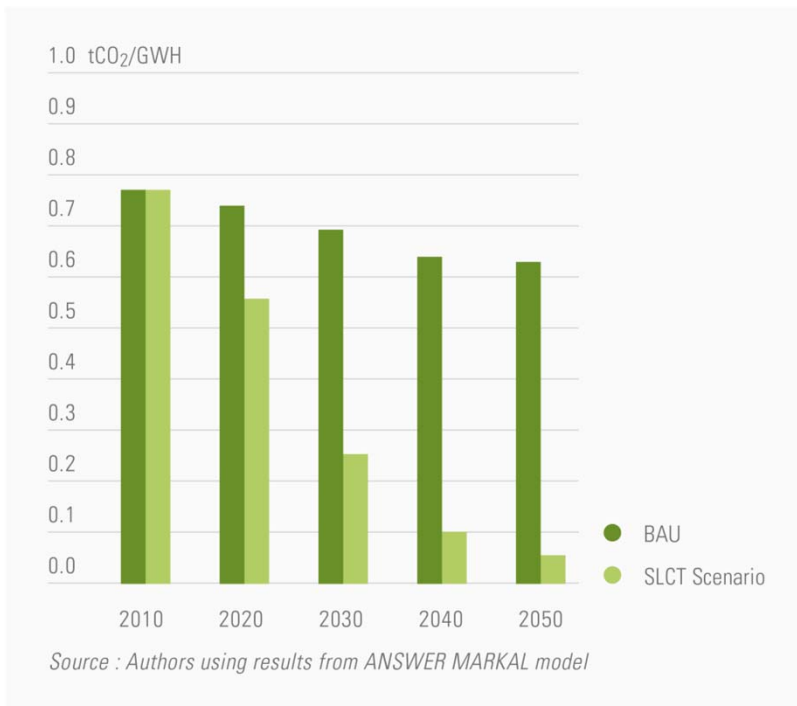
## Oil Savings



## PM 2.5 Emissions



# Overall Contribution of Supply Side Measures



# Key Messages



- A growth in vehicles is inevitable for India
- Supply Side measures provide the bulk of CO<sub>2</sub> emission reduction
- Financial incentives and infrastructure essential for success of supply side change
- All the three supply measures will improve energy security
- EV provide the largest benefits for air quality in cities
- Electricity cleaning is essential for low carbon transport

- Questions?

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- Ressources

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

*Reports Referred*

- Shukla, P. R., Dhar, S., Pathak, M., & Bhaskar, K. 2014. **Electric Vehicles Scenarios and Roadmap for India**. Copenhagen: UNEP DTU Partnership.
- Purohit, P., & Dhar, S. 2015. **Biofuel Roadmap for India**. Copenhagen: UNEP DTU Partnership, Technical University of Denmark
- Dhar, S., Pathak, M., & Shukla, P. R. 2015. **Transport Scenarios for India: Harmonising Development and Climate Benefits**: UNEP DTU Partnership, Technical University of Denmark