



Role of Fuels and Vehicle Technologies in achieving sustainable transport

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Expert Group Meeting on “Special Needs and Challenges in Developing Countries for Achieving Sustainable Transport”

New York

May 10-11, 2016

Challenges for Sustainable Development



- Mobility & Accessibility
(SDG 4.2 & 11.2)
- Mobility Demand is low
- Motorisation is low

Country	Trip Rate	Trip Length (km)	Total Travel Time (min)
Denmark	2.90	13.60	57.10
UK	2.66	11.71	59.34
US	3.79	16.20	60.00
India	1.36	5.07	-

Source: Dhar, Pathak & Shukla, 2015

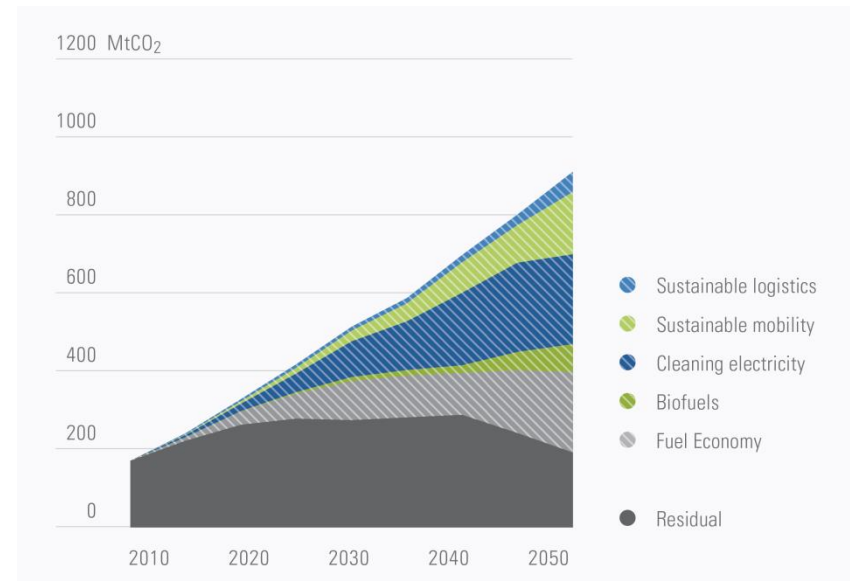
["Promoting Low Carbon Transport in India"](#)

- Air Pollution
(SDG 3.9)
- 100 most polluted cities ?
- Impacts
 - 3.7 million deaths globally

Challenges for Climate

- Climate Change (SDG 13)
 - 4 GT/yr by 2030 (IEA, 2015)
 - Co-benefits
- Aligning Sustainable Development and Climate Goals

Mitigation Wedges for Transport: India

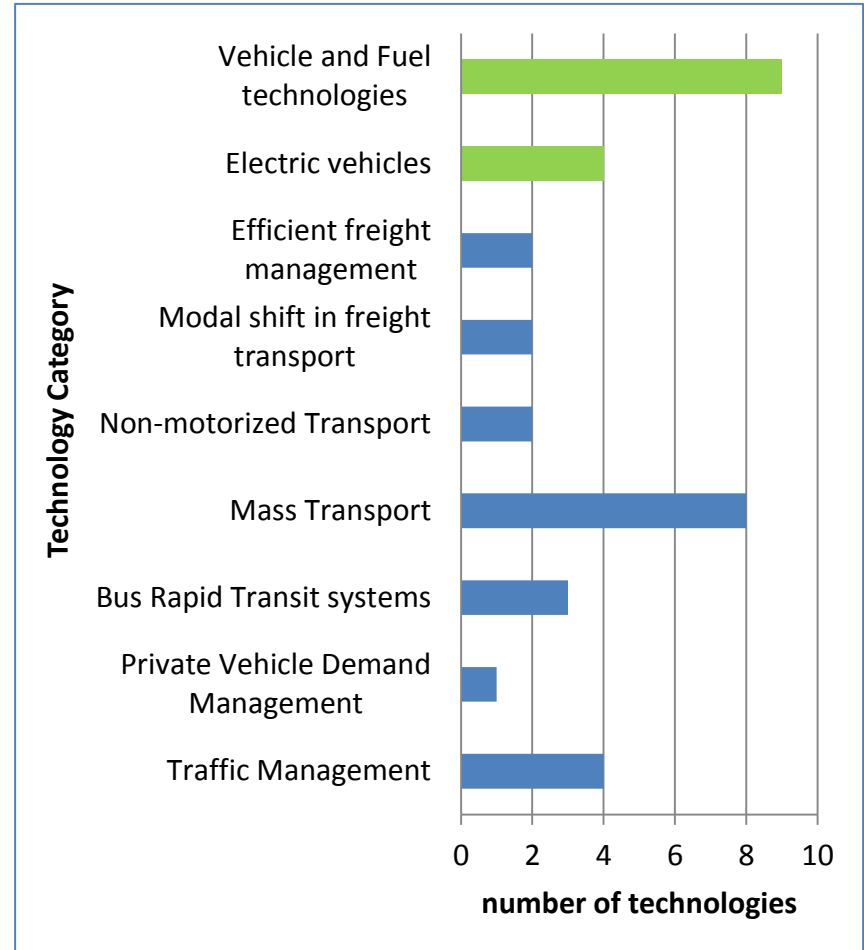


Source : Dhar & Shukla, 2015.

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Technology Needs for Transport

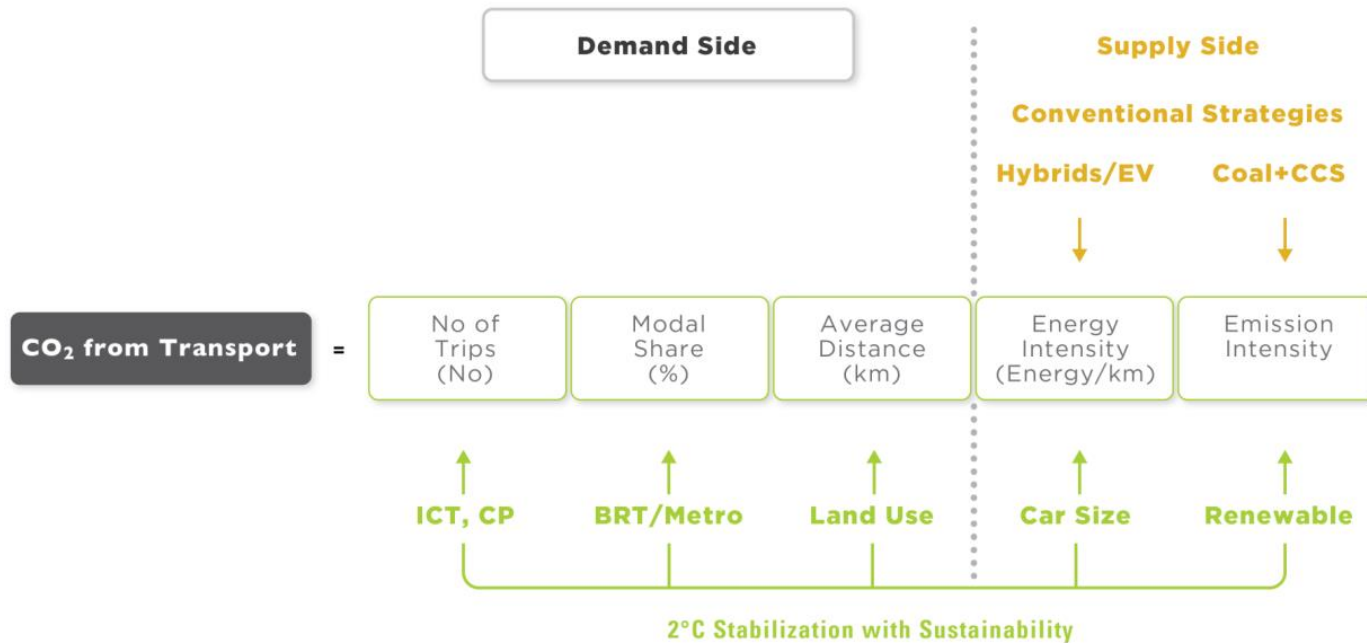
- TNA Countries
 - 40% prioritised transport
- Vehicle & Fuel Technologies
 - Alternative fuels
 - Fuel Efficient Vehicles - LDV/HDV
 - Natural Gas Vehicles
 - Hybrid Vehicles (PHEV & HEV)
 - Electric Vehicles (EV)
 - etc



Source: Technology Database, TNA Project

Kaya Framework

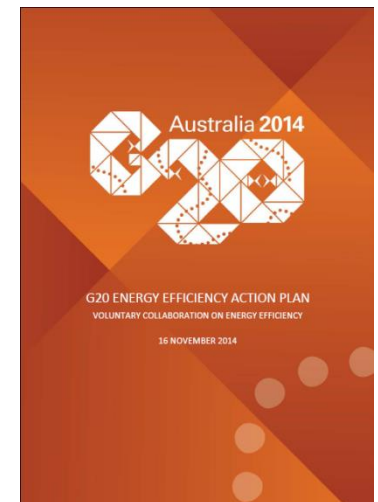
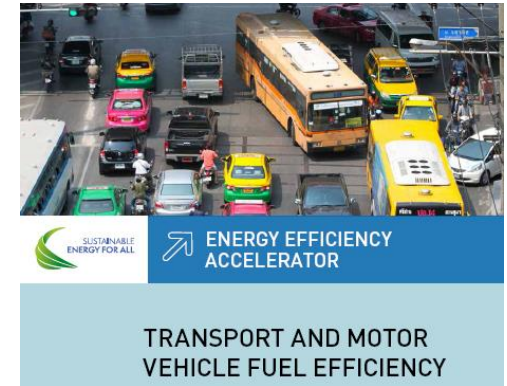
Emission Identity



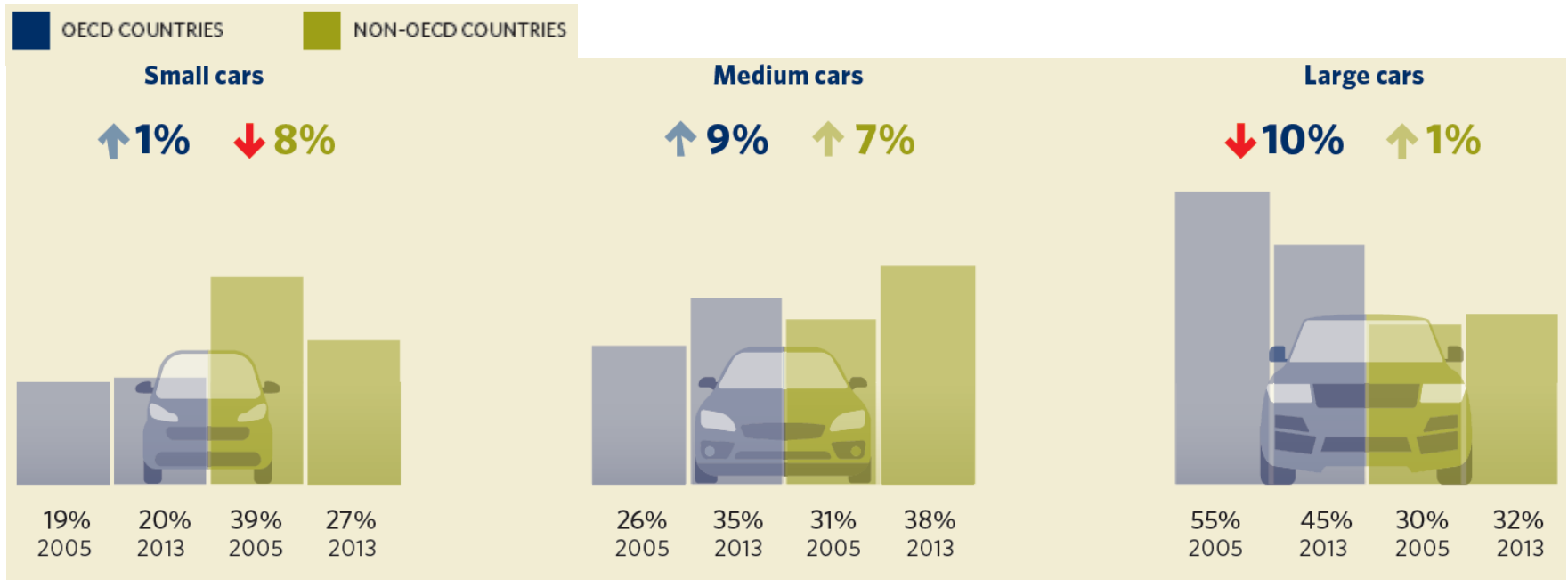
Global Fuel Economy Initiative



		2005	2008	2011	2013	2030
OECD average	average fuel economy (Lge/100km)	8.6	7.9	7.3	6.9	
	annual improvement rate (% per year)	-2.7%		-2.6%	-2.6%	
		-2.6%				
Non-OECD average	average fuel economy (Lge/100km)	7.3	7.4	7.3	7.2	
	annual improvement rate (% per year)	0.5%		-0.4%	-0.9%	
		-0.2%				
Global average	average fuel economy (Lge/100km)	8.3	7.7	7.3	7.1	
	annual improvement rate (% per year)	-2.3%		-1.9%	-1.8%	
		-2.0%				
GFEI target	average fuel economy (Lge/100km)	8.3				4.2
	required annual improvement rate (% per year)	2005 base year	-2.7%			
		2014 base year	-3.1%			



Vehicle Size Trends



New Registered Vehicles

Source: GFEI, 2016, Fuel State of the World, 2016

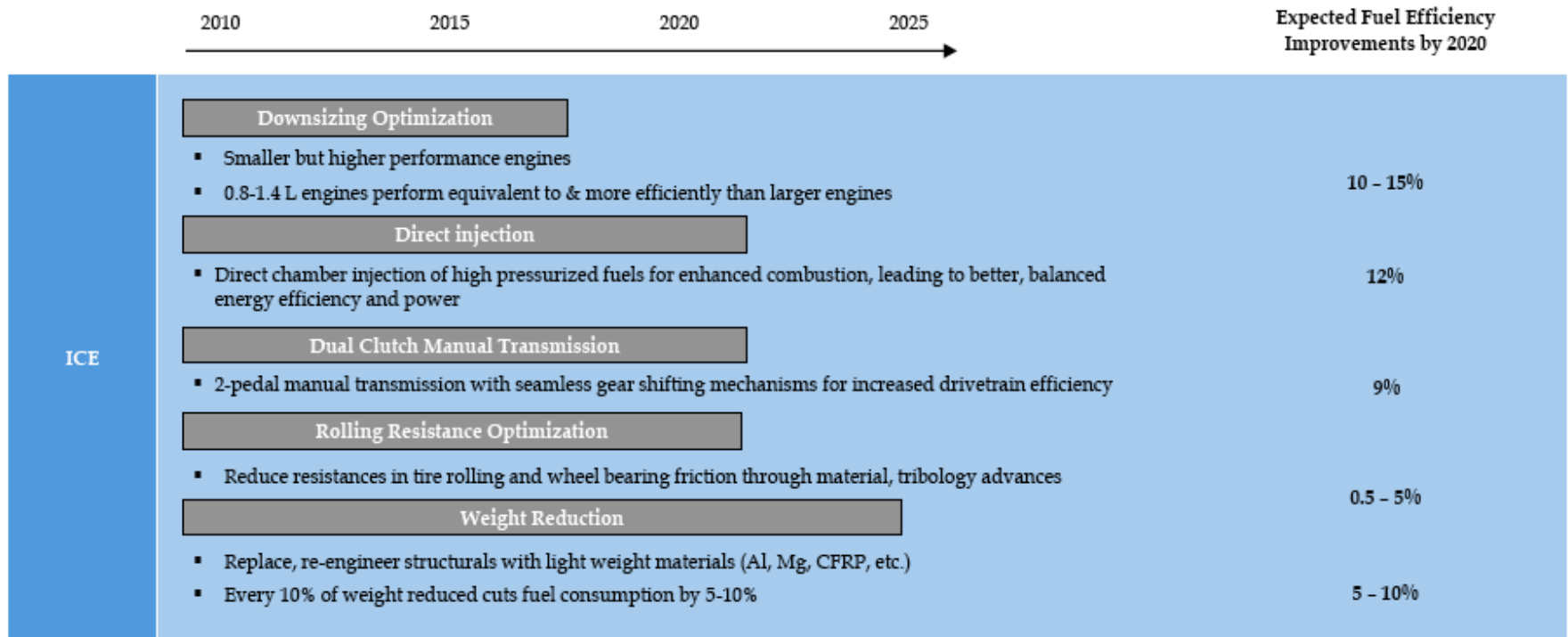
Drive Train Technologies

- Internal Combustion Engine (ICE)
 - Spark Ignition (Petrol)
 - Compression Ignition (Diesel)

Alternative Drive Train Technologies

- Battery and Electric Motor Vehicles
- Hybrid
- Fuel Cells
- Micro turbines
- Catenary electric motors (Tram / Metro)

Potential Improvement in ICE



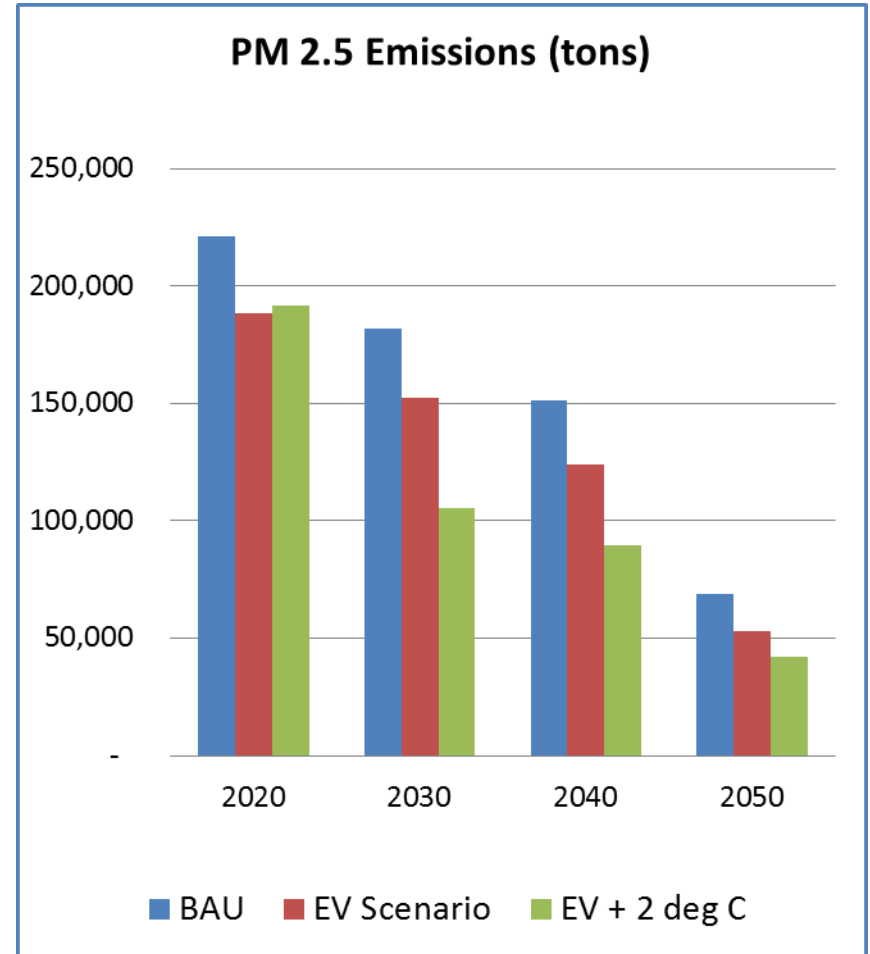
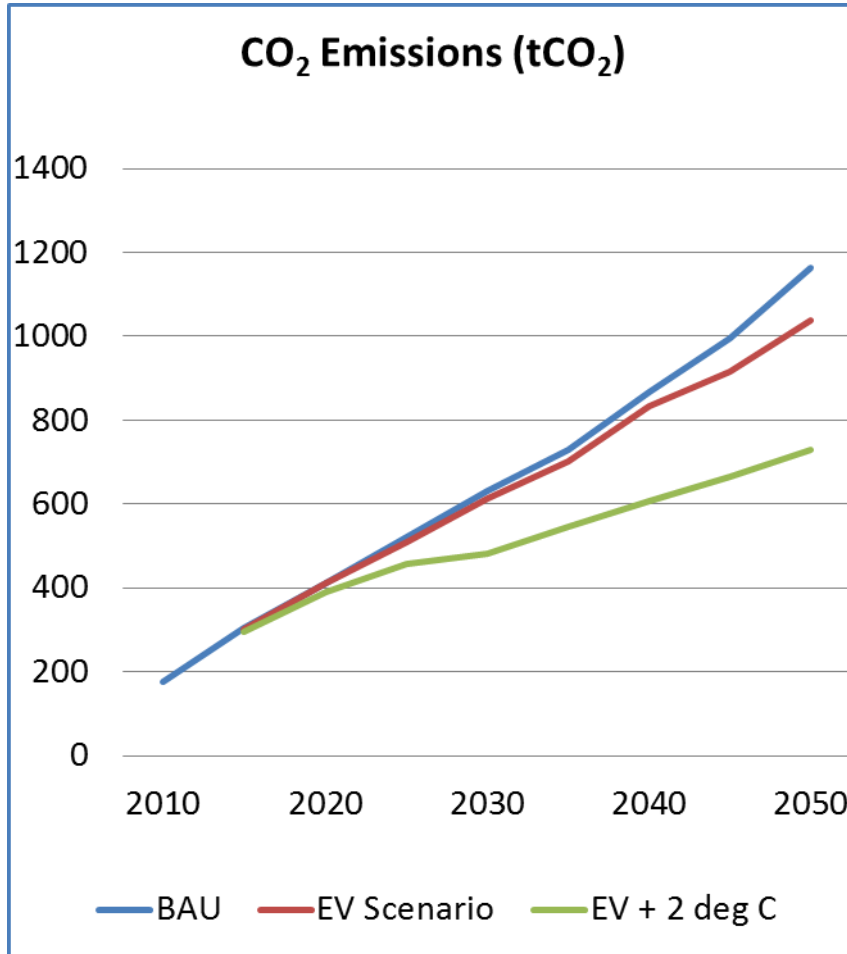
Source: Argonne National Laboratory, Automotive OEM press releases, Booz Allen Hamilton Technology Center, Booz & Company analysis

Alternative Drive Train Technologies

	Battery Electric vehicles	Hybrid Petrol	Plug in Hybrids	Fuel Cells
Drive Range	100 - 160 km for cars, 60 km for 2 wheelers	Same as petrol cars	20 - 50 km on battery alone, remaining using ICE	Same as petrol cars
Drive Train	Electric Motor	ICE, Electric Motor	ICE, Electric Motor	Fuel Cell, Electric Motor
Market Status	Dominant technology for 2 wheelers in China, EV 4 W emerging a strong contender	More than 5.8 million vehicles globally sold till end of 2012		Few hundred globally
Energy consumption per pkm (w.r.t to a petrol engine) **	70-80% lower	11-22% lower	20-60% lower	55% - 70% lower
Typical Fuel	Electricity	Petrol	Electricity / Petrol /Diesel	Hydrogen

** IEA, 2009 Transport Energy & CO₂; Kobayachi et. al., 2009 Energy efficiency technologies for road 11 vehicles. Energy Efficiency 2, 125–137; Plotkin et. al., 2009 Multi-path transportation futures study : vehicle 12 characterization and scenario analyses

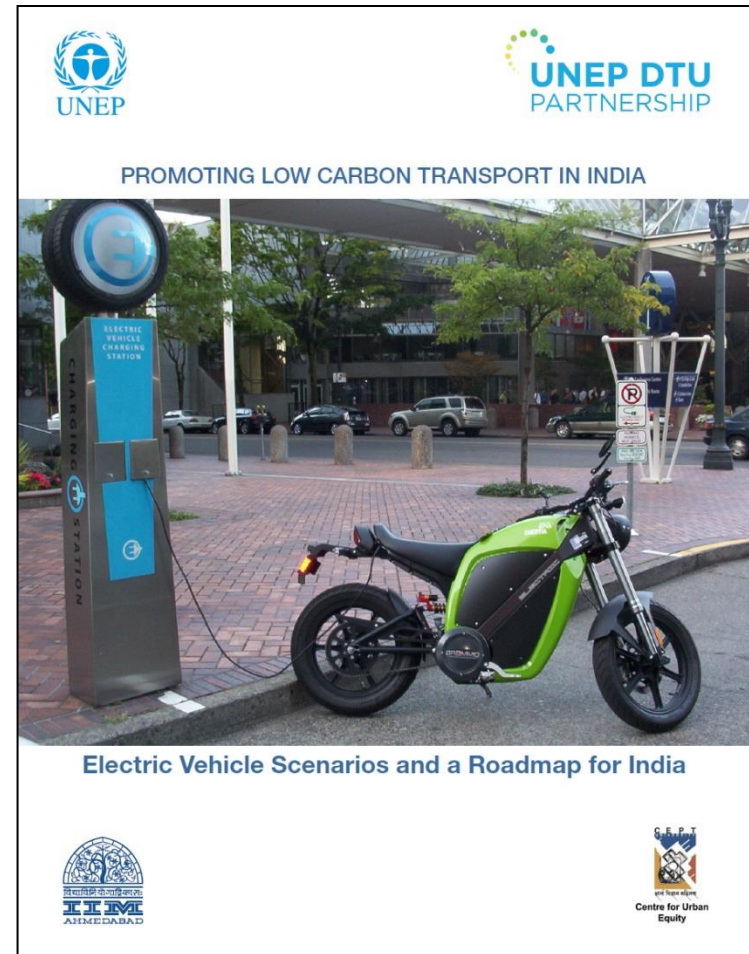
Case Study - India EVs



Source: Shukla, et. al., 2014, *Electric Vehicles Scenarios and Roadmap for India*
["Promoting Low Carbon Transport in India"](#)

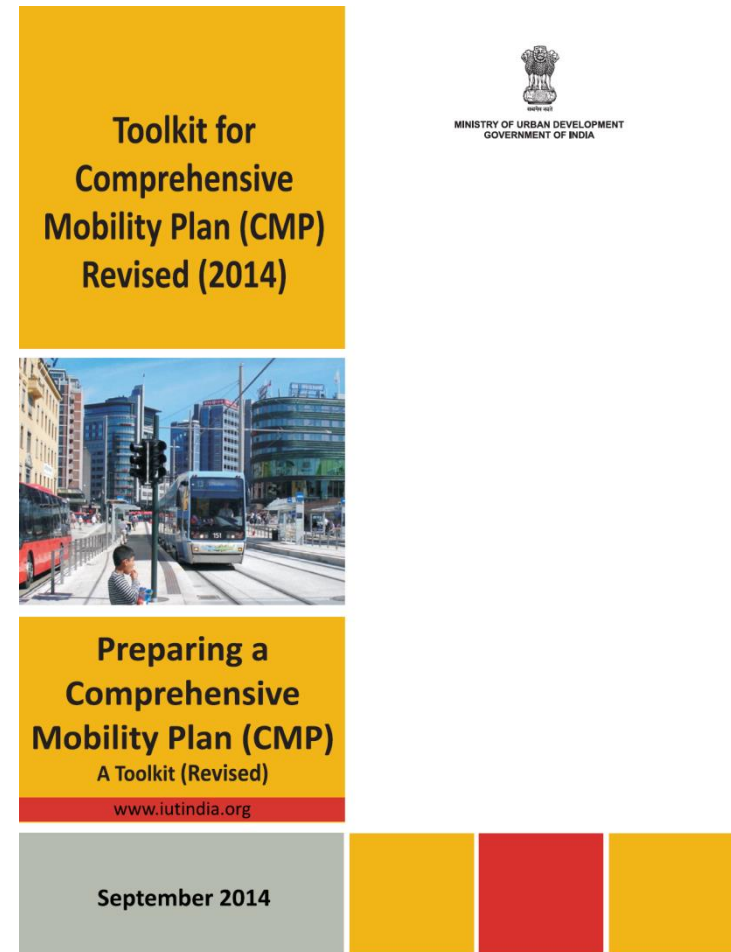
E Mobility Program

- Focus : Developing and transitional countries
- 4 work streams:
 - 1- electric 2 & 3 wheelers
 - 2- electric bus fleets
 - 3- national policies for electric vehicles
 - 4- regional replication and outreach



Conclusions

- Fuels and Vehicles essential for sustainable transport
- **Aligning climate and sustainable development goals can help in achieve more for both**
- **Alignment of National and local policies**
- **Policies** are the key issue



The image shows the cover of a toolkit for Comprehensive Mobility Plans (CMP). The top section is a yellow box with the text: "Toolkit for Comprehensive Mobility Plan (CMP) Revised (2014)". Below this is a photograph of a city street with a tram and buildings. The bottom section is a yellow box with the text: "Preparing a Comprehensive Mobility Plan (CMP) A Toolkit (Revised) www.iutindia.org". At the very bottom, there is a grey box with the date "September 2014" and three colored squares (yellow, red, yellow).

MINISTRY OF URBAN DEVELOPMENT
GOVERNMENT OF INDIA

September 2014