Passenger transport sector in India

Need for railway capacity enhancement

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High Speed Rail Seminar in India
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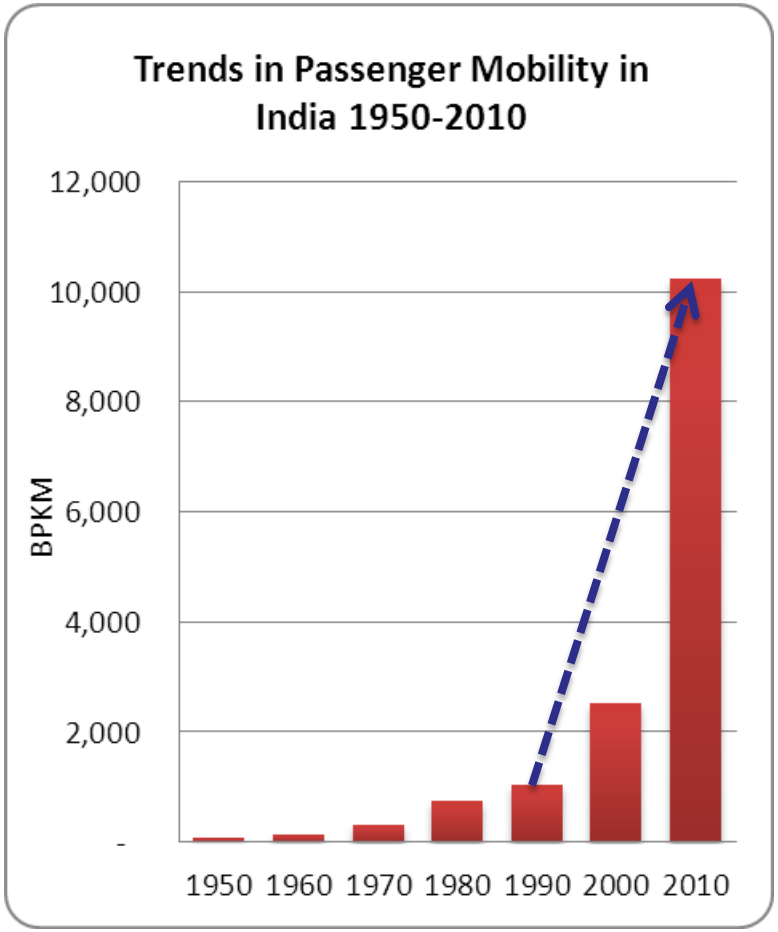
Growth in passenger transport sector in India

- Very fast growth in passenger transport activity (PKM)
- 10 times growth observed after 1990

1,060 BPKM (1990) → 10,230 BPKM (2010)

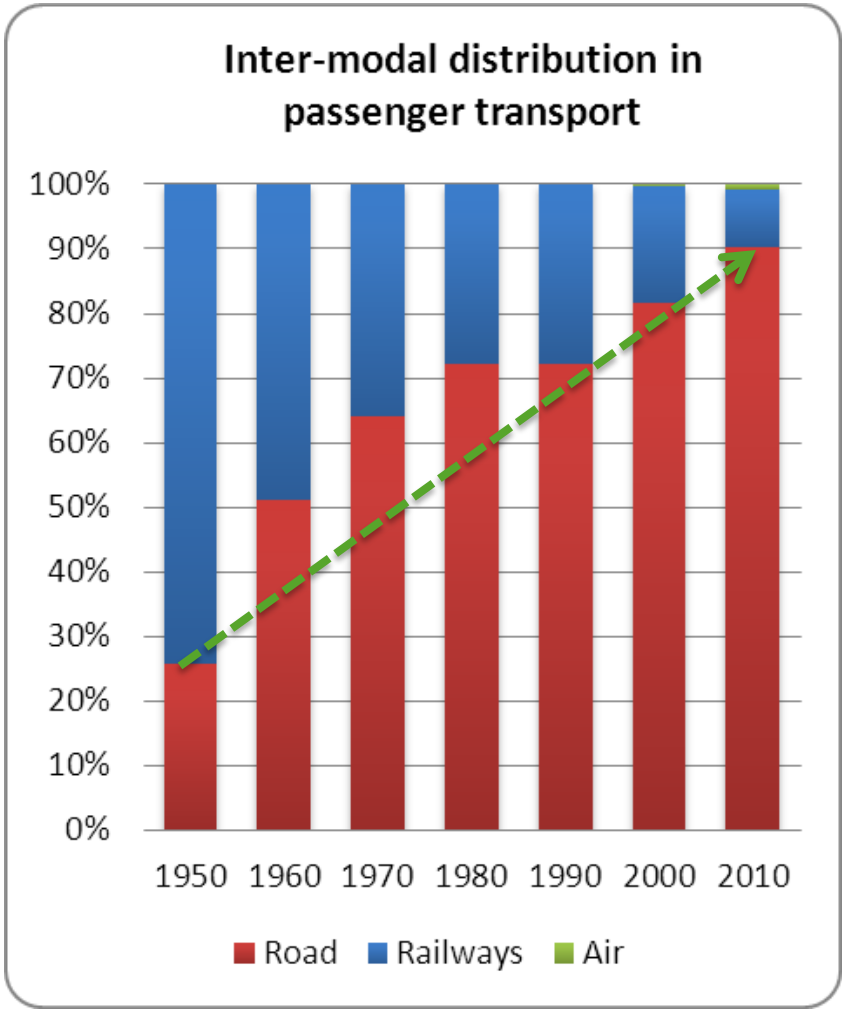
- Growth driven by population growth, economic growth, urbanization and motorization



Source: Estimates by different Ministries and Planning Commission
Estimates are on higher side as compared to many other estimates

Dominance of road sector

- Emergence of road sector as the predominant means of passenger travel
  - Accounts for 90% of total PKM
- Decline in the share of Railways
  - 1950 – 74%
  - 2010 – 9%
- Air transport gaining momentum as an inter-city travel mode
  - Witnessed 8 times growth in the last decade



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Slow growth of rail infrastructure

Key factor responsible for decline in Railways' share

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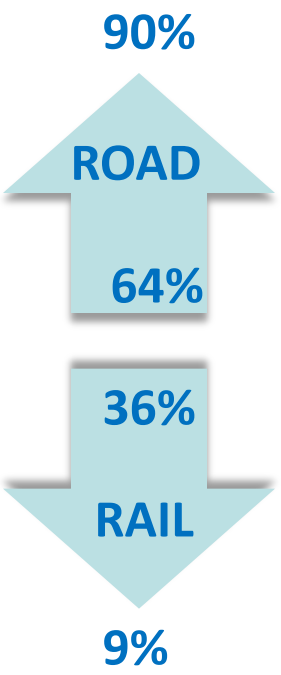
Infrastructure Supply

	1970/71	2010/11	
Total road (kms)	80,603	225,456	@ 3,620 km/yr
Rail (running track kms)	71,669	87,087	@ 385 km/yr
Air (million seat kms)	NA	125,078	

Demand for Transport

	1970/71	2010/11*	
Road (BPKM)	210	9,245	44 times increase
Rail (BPKM)	118	903	8 times increase
Air (BPKM)	NA	89	

Inter-modal share



* Govt. estimates – are on higher side as compared to many other estimates

Passenger transport growth trends

Not desirable from the perspective of energy and environment considerations

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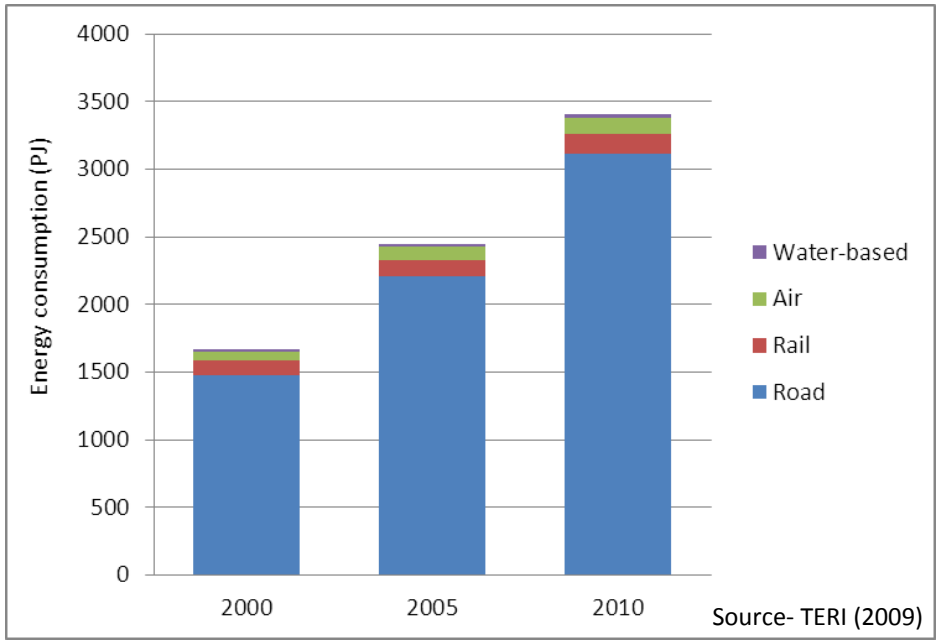
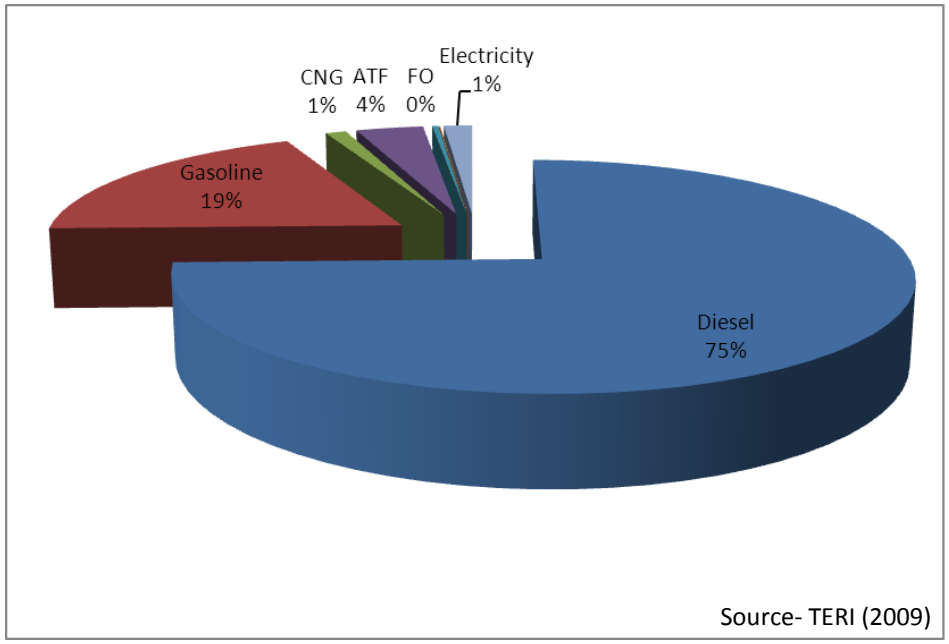
- Energy consumption has doubled in the last decade
- Driven by growth in road sector
- Heavy dependence on petroleum products
- About 75% demand met by diesel



Source- TERI (2009)



Source- TERI (2009)

Trends not sustainable from the perspective of energy security, climate change impacts and local environmental impacts

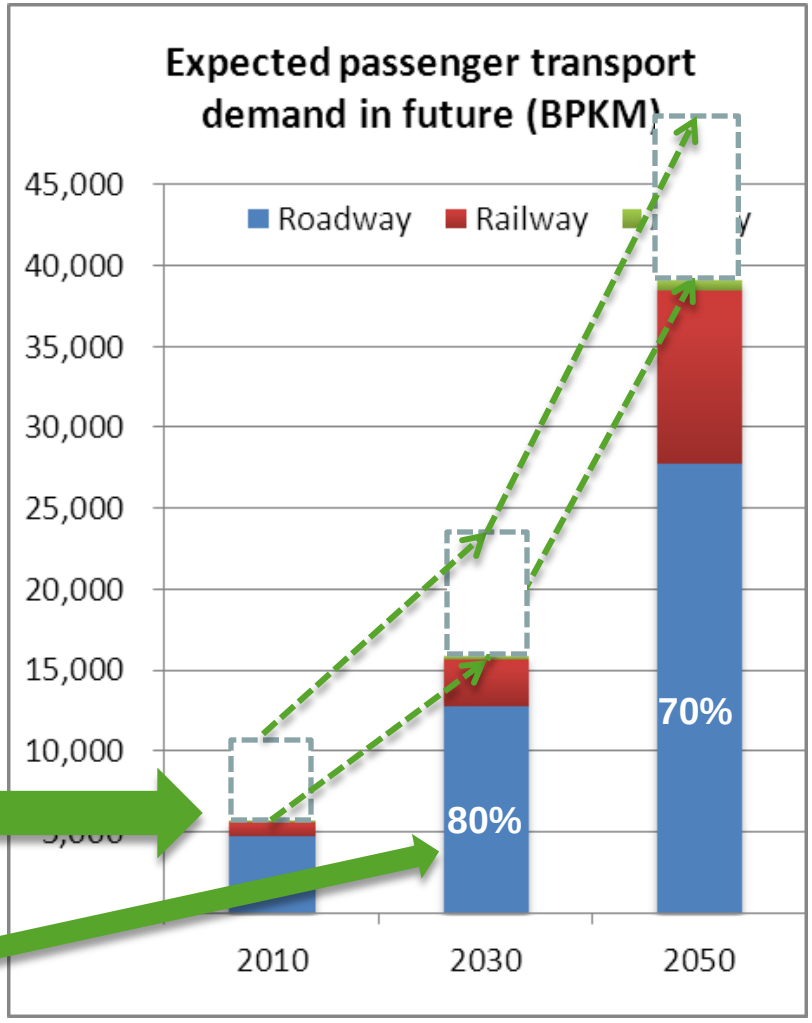
BAU trends expected to continue in future

- Rapid increase in passenger transport demand expected

2010 to 2030 ➡ 3 times increase

2010 to 2050 ➡ 7 times increase

- If higher estimates of BPKM for 2010 given by Govt. agencies are considered, future demand could be even higher
- Road sector's dominance to continue in BAU



Source: Estimates by TERI (2009)
Estimates are in the medium range as compared to many other estimates

BAU trends expected to continue in future (contd.)

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Infrastructure will grow at slower pace as compared to growth in passenger transport demand….. **More so in the case of Railways**

Sector	Year	Infrastructure supply (km)	Avg. annual growth rate of infrastructure supply	Demand in BAU (BPKM)	Avg. annual growth rate of demand
Rail	2010-11	Route kms - 64, 015 28% double/multiple lines	3.9%	868	13.5%
	2020-21	Route kms - 89,015 33% double/multiple lines		2,360	
Road	2010-11	70,934 km (National Highways)	5.1%	4,722	7.5%
	2020-21	1,06,900 km (National Highways)		8,276	

Very slow growth in route kms & creation of multiple lines

If additions in SHs/ MDRs/urban roads are considered, growth in infra supply could match demand growth rate

Energy consumption levels will increase in future

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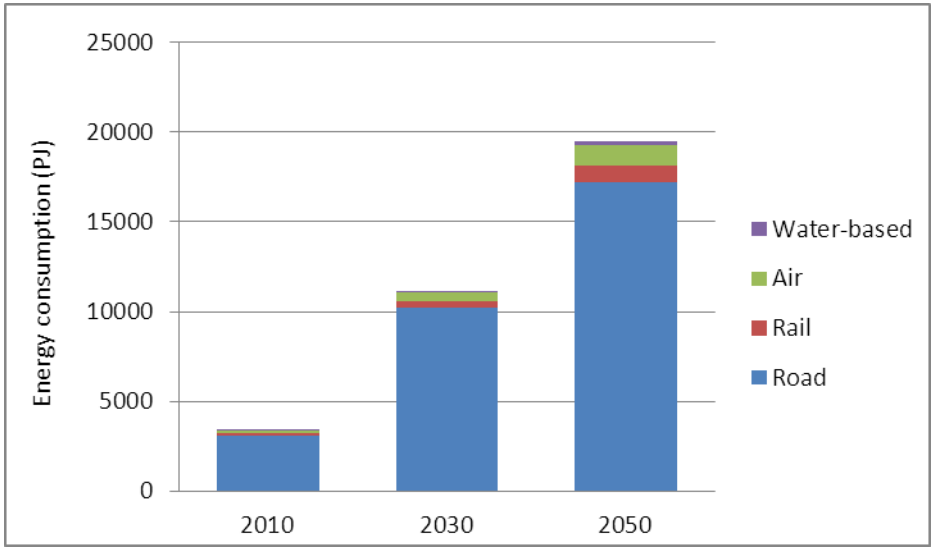
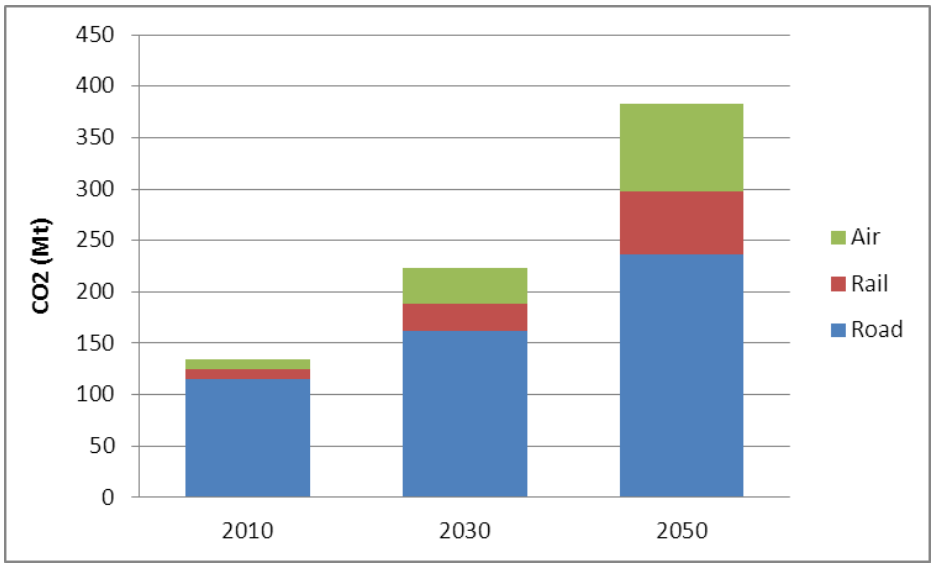
- 6 times increase in energy consumption from 2010 to 2050 expected
- 90% energy consumption by road transport sector
- Heavy dependence on petroleum products (95%)
- 80% energy demand will be met by diesel
- 3 times increase in CO_2 emissions from 2010 to 2050 expected
- Road and air transport - key contributors to CO_2





Source- TERI (2009)

Trends not sustainable from the perspective of energy security

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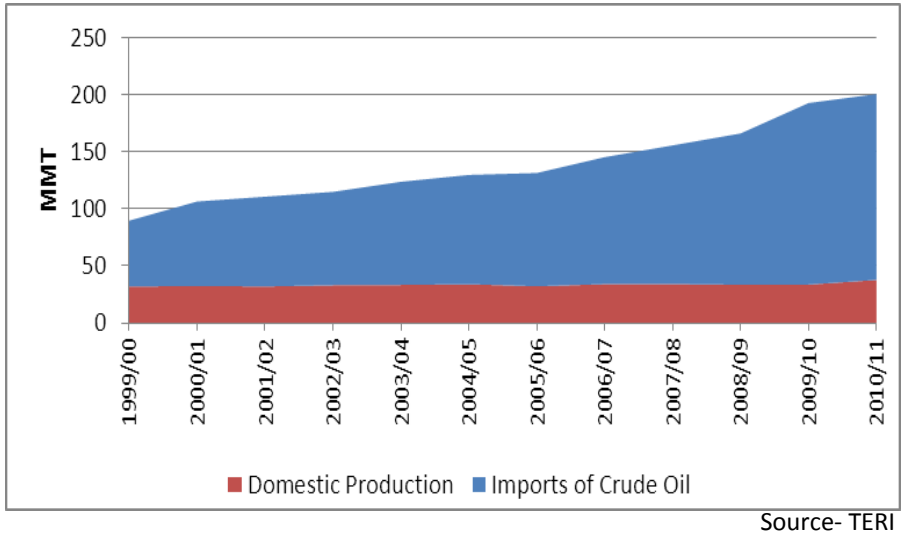
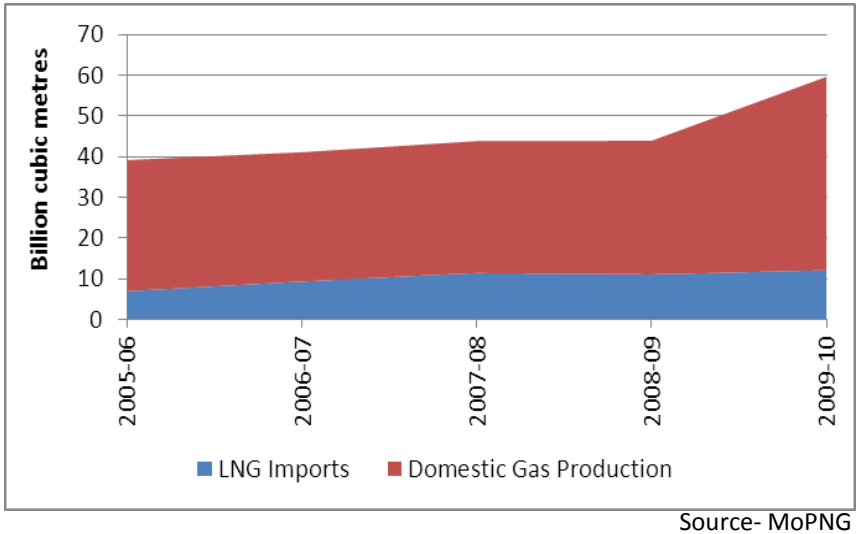
- India imports almost 80% of its total crude oil requirements
- Import dependence expected to reach almost 90% by 2031-32
- More than 20% of the domestic gas requirements are met through imports

Domestic production and imports of crude oil



Source- TERI

Domestic production and imports of natural gas



Source- MoPNG

Need to reduce energy consumption from transport sector –
Need to adopt alternative growth pathways for passenger transport sector

Energy efficient options

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- Inter-city/long distance passenger transport – Shift from roads/air to railways
- Intra-city/short distance transport – Shift from private modes to public modes
- Improvements in vehicle fleets – vehicle efficiency and emission reduction
- Phasing out old vehicular fleet
- Establishing strict inspection and maintenance regime for in-use vehicles
- Promoting use of alternative/clean fuels and technologies
- Measures for urban areas like TDM, ITS, etc.

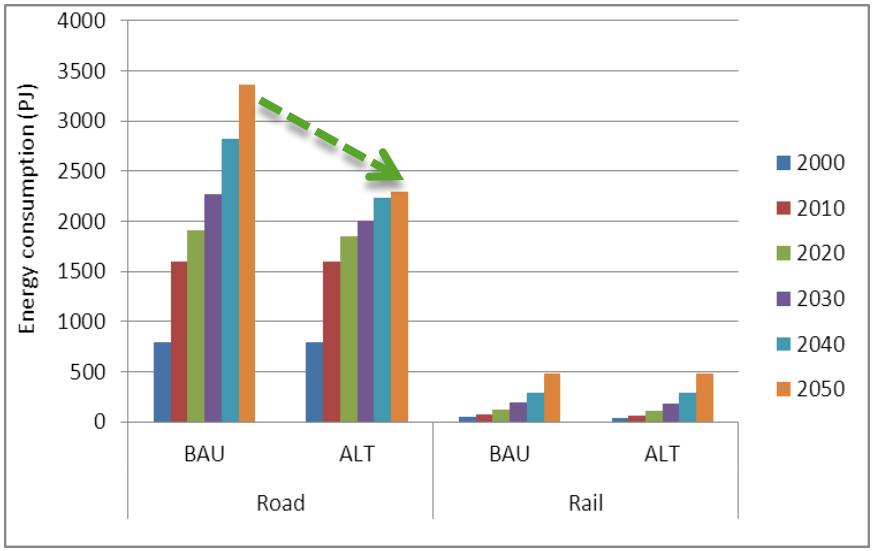
Impact of energy efficient options

- 40% reduction in energy consumption can be achieved by implementing energy efficient options
- Reductions mainly a result of-

  - **Inter-modal shift from roads to rail**

  - Shift from private modes to public modes within road sector

Inter-modal share of Railways in the alternate growth scenario envisaged at 50%



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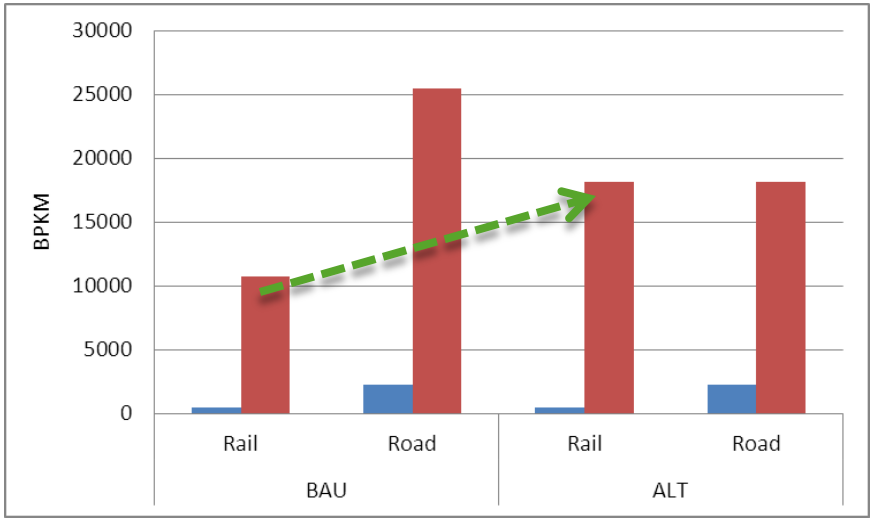

Increasing Railways' share -
Need increased rail capacity at fast pace

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Two key solutions

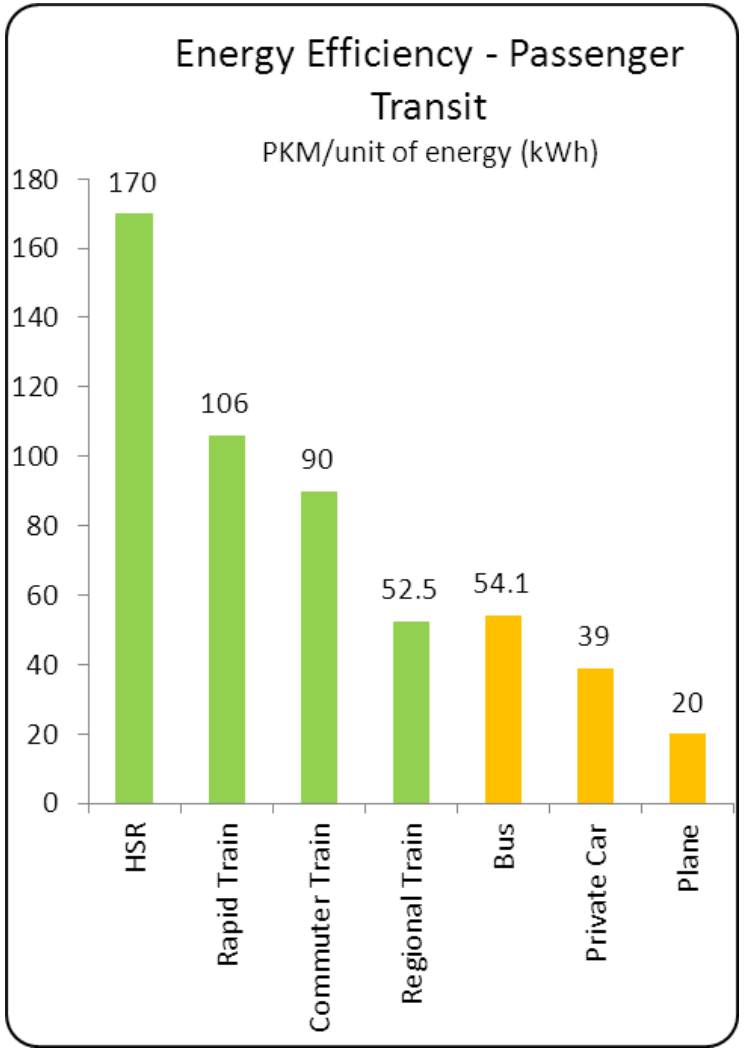
- Improve the existing rail network in terms of commercial speeds/ create more capacity for passenger services

- Introduce new high-speed passenger rail network

High speed rail (HSR)

Benefits

- Reduction in energy usage on account of modal shift
  - Energy efficiency:
  - –8.5 times airplane
  - –4 times car
  - –3 times bus
- Reduction in carbon emissions
  - CO_2 emissions (kg) per 100 PKM
  - –Airplane: 17
  - –Car: 14
  - –HSR: 4
- Could act as catalyst for economic growth, facilitate regional development



Source: UIC HSR Presentation by Jean-Pierre Loubinoux 2009

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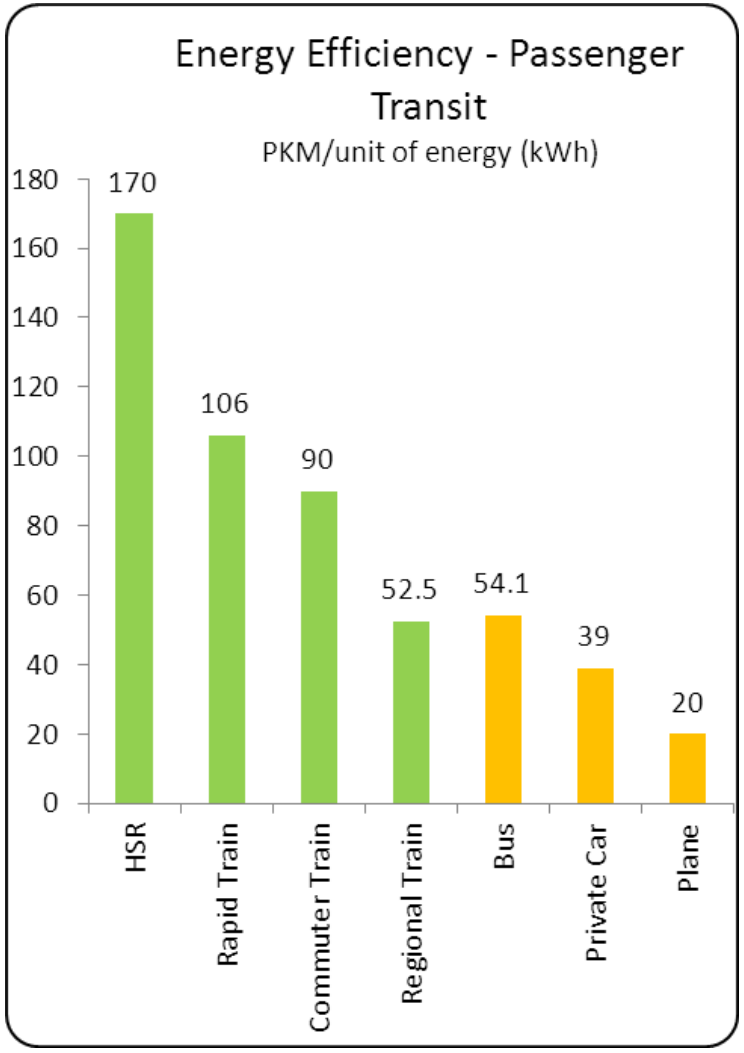

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High speed rail (HSR)

Key requirements

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- Special trains
  - High speed operations require “train sets” for reasons, such as aerodynamic conditions, reliability and safety
- Special dedicated lines
  - Conventional lines, even with major upgrades, will not be able to operate at more than 200-220 km/hr; new tracks will have to be laid for operating high speed trains
- Special signaling system
  - In-cab signaling will be necessary for high speed operations
- Services
  - Time spent buying ticket, entering the station or waiting for a taxi on arrival, should be competitive with transit time by other modes

High speed rail (HSR)

Investment requirements

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Average costs of various categories of a HSR project

(Magnitude of costs for HSR in Europe)

Capital costs	
Infrastructure creation	12-30 million Euros per km
Rolling stock	20-25 million Euros per train
Running Costs (p.a.)	
Infrastructure maintenance	70,000 Euros per km
Rolling Stock maintenance	1 million Euros per train

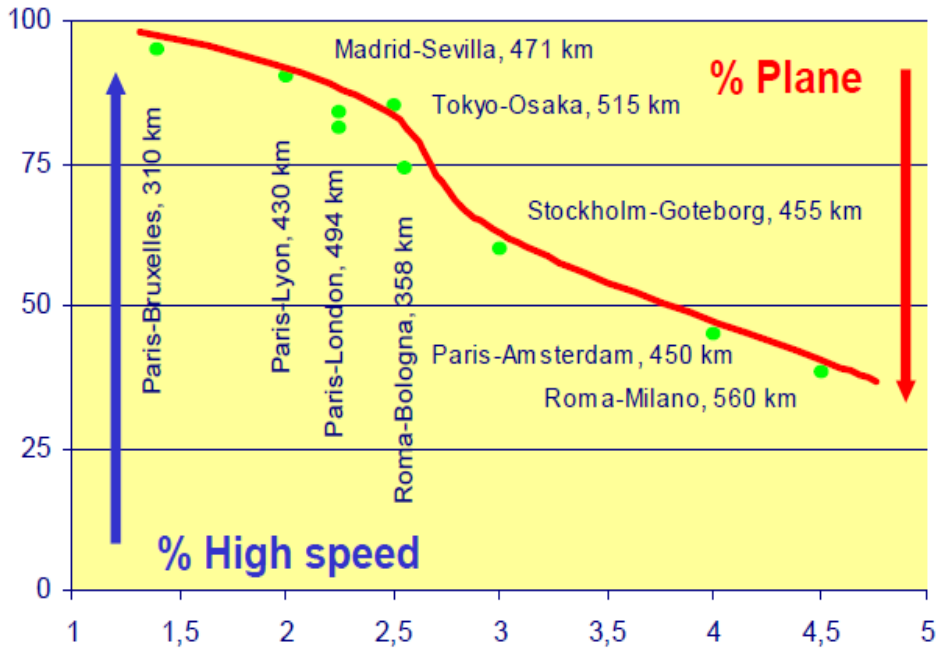
Source: UIC: High Speed Rail – Fast Track to Sustainable Mobility 2010

High speed rail (HSR)

Impacts

- 70% increase in maximum speed from 200 to 340 kmph results in net energy consumption increase by 80%
- Modal share - rail can hold a majority share of the rail plus air market for journey times up to 3.5 hours

Relationship between rail speed and market share



Source: UIC-High Speed Presentation by Jean-Pierre LOUBINOUX 20090

High speed rail (HSR)

Impacts (contd.)

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Expected travel time savings on six routes proposed by MoR

(Assuming a maximum speed of 350 kmph and a commercial speed to maximum speed ratio of 0.7)

Section	Distance (km)	Existing time (hrs)	HSR travel time (hrs)
Delhi- Amritsar	443	5’05’’	2’04’’
Mumbai-Surat-Vadodara-Ahmedabad	491	6’45’’	3’00’’
Hyderabad-Tirupati - Chennai	869	13’	5’ 31’’
Chennai -Bangalore	362	4’50”	1’ 45’’
Delhi-Agra-Kanpur	435	4’40’’	2’ 00’’
Delhi-Jaipur	308	4’15”	1’ 40’’
Kolkata-Asansol-Dhanbad	259	3’	1’25”

High speed rail (HSR)
Challenges

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- Funds:
  - Cost of construction around Rs.100 Crores/km
- Political will:
  - Commitment, both political and economic, for a costly and long duration program
- Land acquisition:
  - Can lead to cost and time over runs
- Technology:
  - Indian Railways will need time to absorb the new technology
- Organization:
  - New Organization may need to be created

Thank You