



Dedicated Freight Corridors

&

High Speed Rail

India's

Ultra Low Carbon Mega Rail Projects

- Anjali Goyal

Executive Director Finance (Budget), Ministry of Railways, India



## Approach adopted

1. Rail Transport Scenario in India
2. Dedicated Freight Corridor & High Speed Rail – setting the context
3. Complexities in going low carbon in transport sector
4. Structuring DFC and HSR as low carbon projects
5. Launching the projects as a brand
6. Conclusion- suggestions on the way forward



## Freight Cargo Scenario in India:

### Boom in traffic versus serious capacity constraints

- ✦ Railways set to carry 1 billion ton by 2011, 1.5 billion ton by 2017
- ✦ Rail share <38%
- ✦ Freight movement growth (2002-06)
  - Road 48%+ Rail 35 % +
- ✦ Road Commercial carriers- low payloads & fuel efficiency
- ✦ Bulk of IR's traffic moves on the overstretched Golden Quadrilateral
  - Speeds of 26 km/hr, Limited flexibility
- ✦ Capacity constraints will kill the surge



# Rail Tariff : US cents/tkm

(in purchasing power parity)

Sweden



Japan



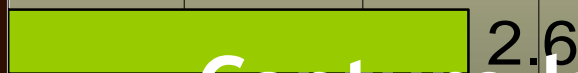
France



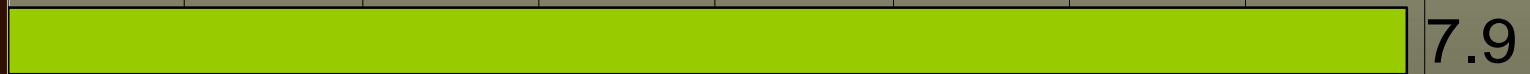
Canada



China



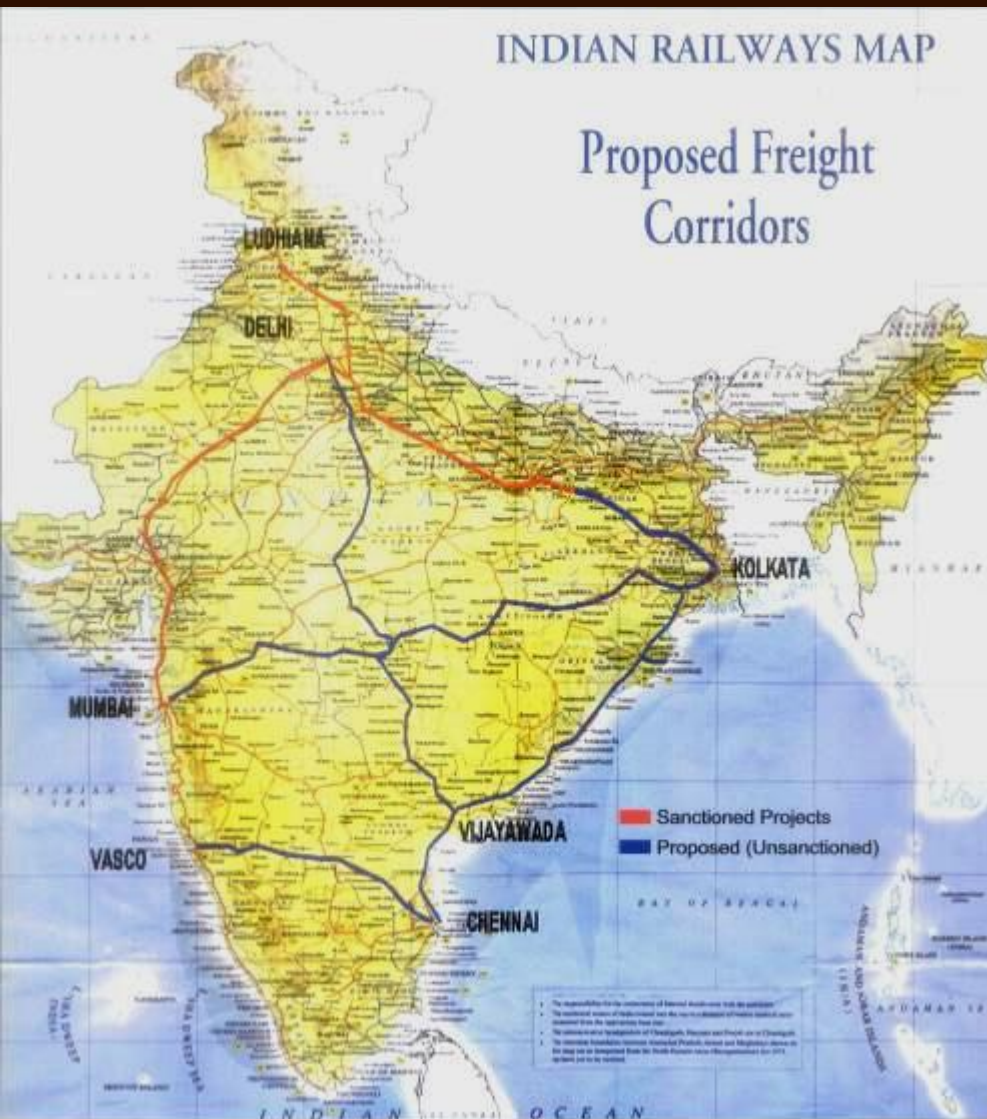
India



0 1 2 3 4 5 6 7 8 9



# Dedicated Freight Corridors

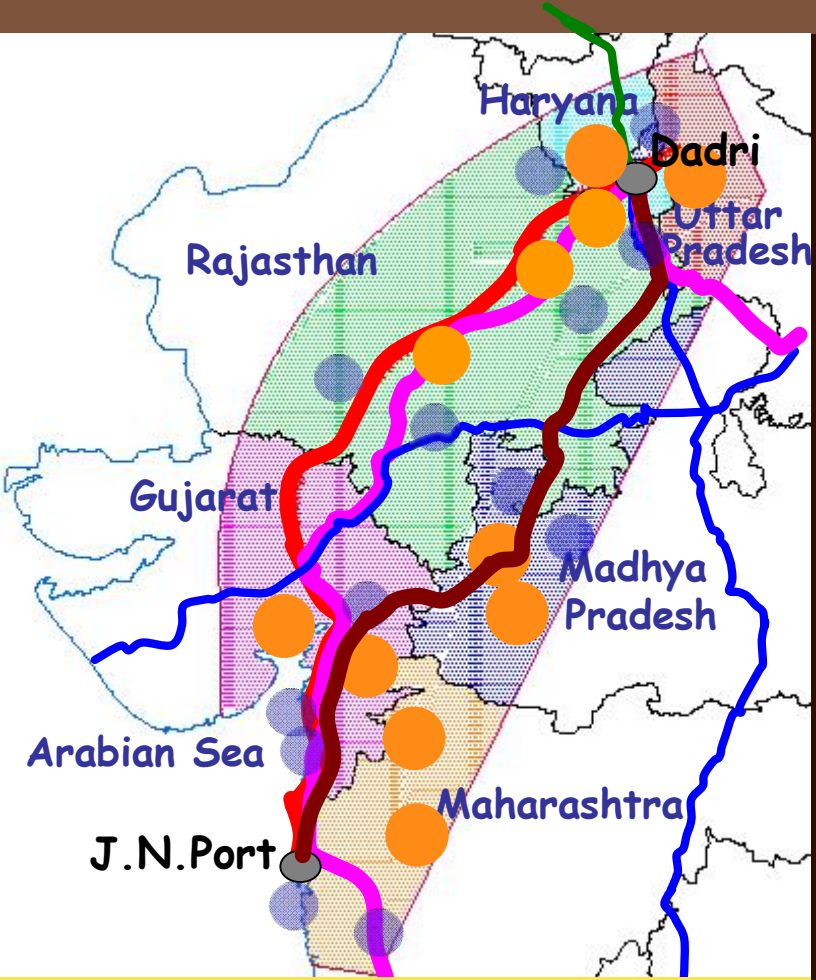


- Eastern Corridor- 1805 km  
Ludhiana – Kolkata
- Western Corridor- 1515 km  
from Mumbai(J.N. port) to  
Dadri
- Liberal Moving Dimensions  
Higher payload/axle
- Suitable for heavy haul trains  
(65 fr. Cars)
- Higher HP & tractive effort  
locomotives
- Higher capacity freight cars
- Speed: 100 -120 kmph+



# DELHI MUMBAI INDUSTRIAL CORRIDOR

## High Impact Development



- 20 industrial clusters regions/areas km (wide planned) conglomeration
- Delhi 450 km long HSR corridor, another 200 km (planned)
- 15 cities of pop 1 million + to 10 million+
- 19 rail links and 26 road links for port connectivity
- 38,500 km existing rail lines in region
- 600 km of existing freeways, 9 domestic
- 45 logistics parks/warehouses
- 159 SEZ s, end to end OFC connectivity
- 6 major ports, 15 impex sea ports, 7 new ports,



# DFC's Mega Logistics Cities

## Efficient supply chain relationships

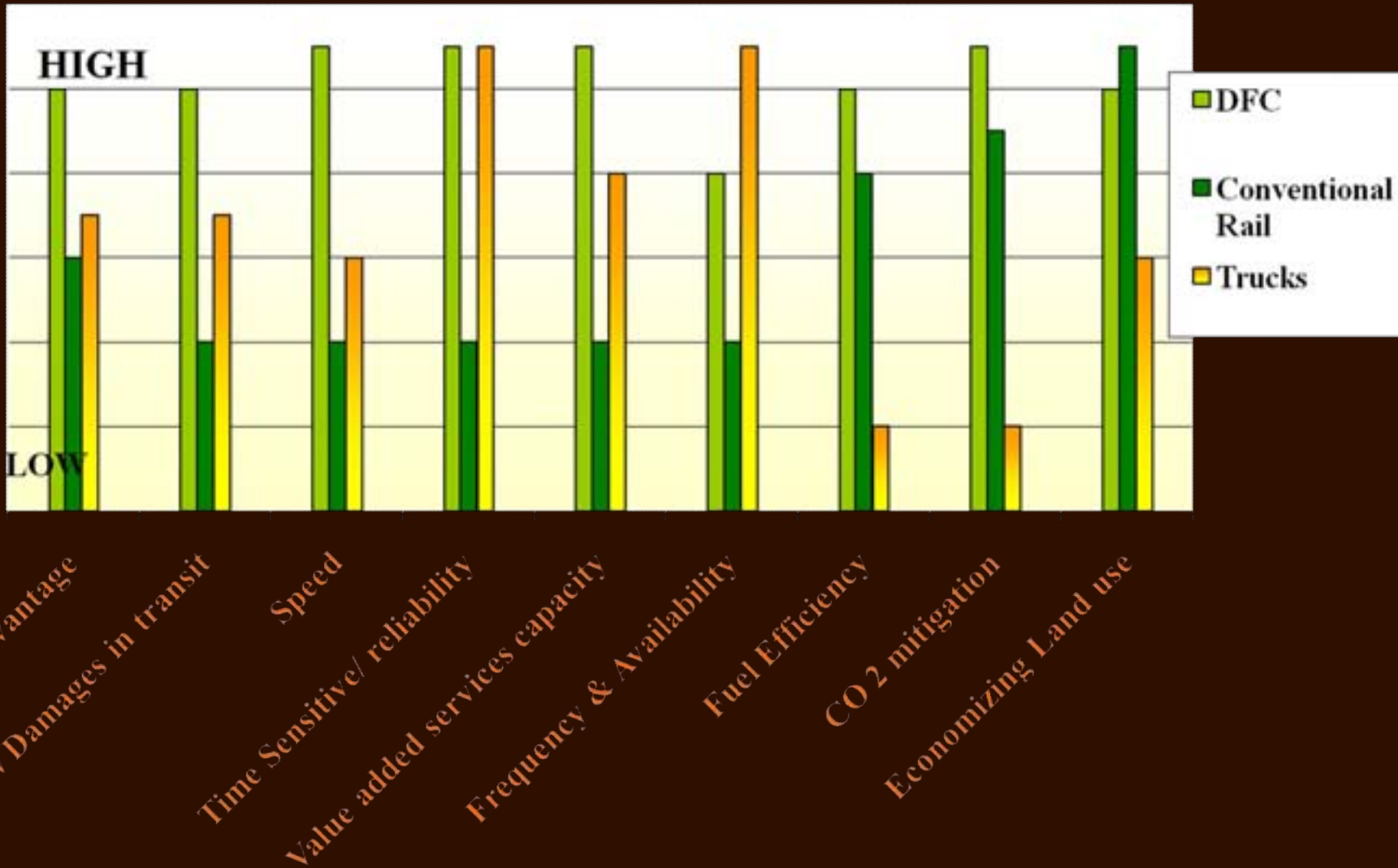
- ✦ Convergence of industrial activities
- ✦ Tremendous potential for high value, end to end logistics solutions provider services-
  - Temp controlled warehouses and other logistics inputs
  - Tapping seamless intermodal potential



These hinge on the special features of DFC as a new rail  
**transport service product**



# DFC v/s Competing modes- efficiency scorecard

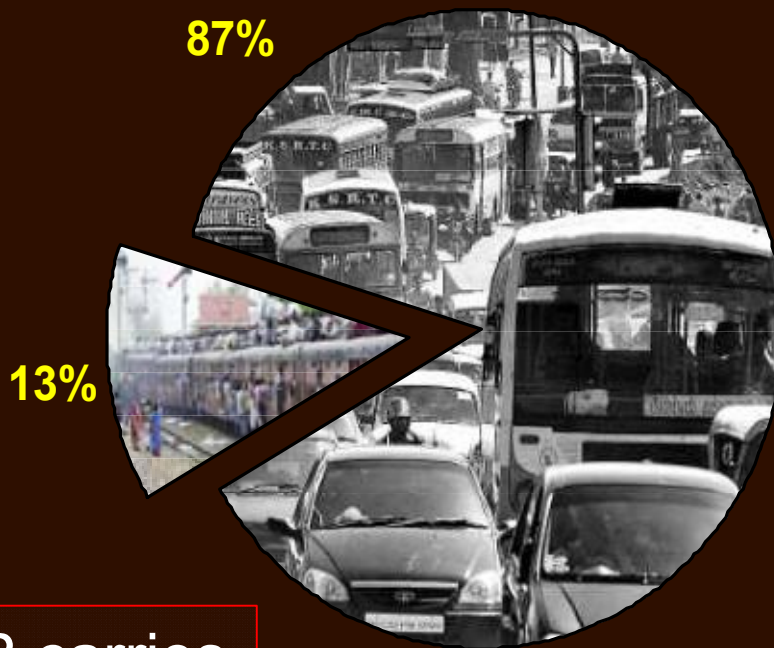






# India's Passenger Transportation Landscape

■ Rail    ■ Non-Rail

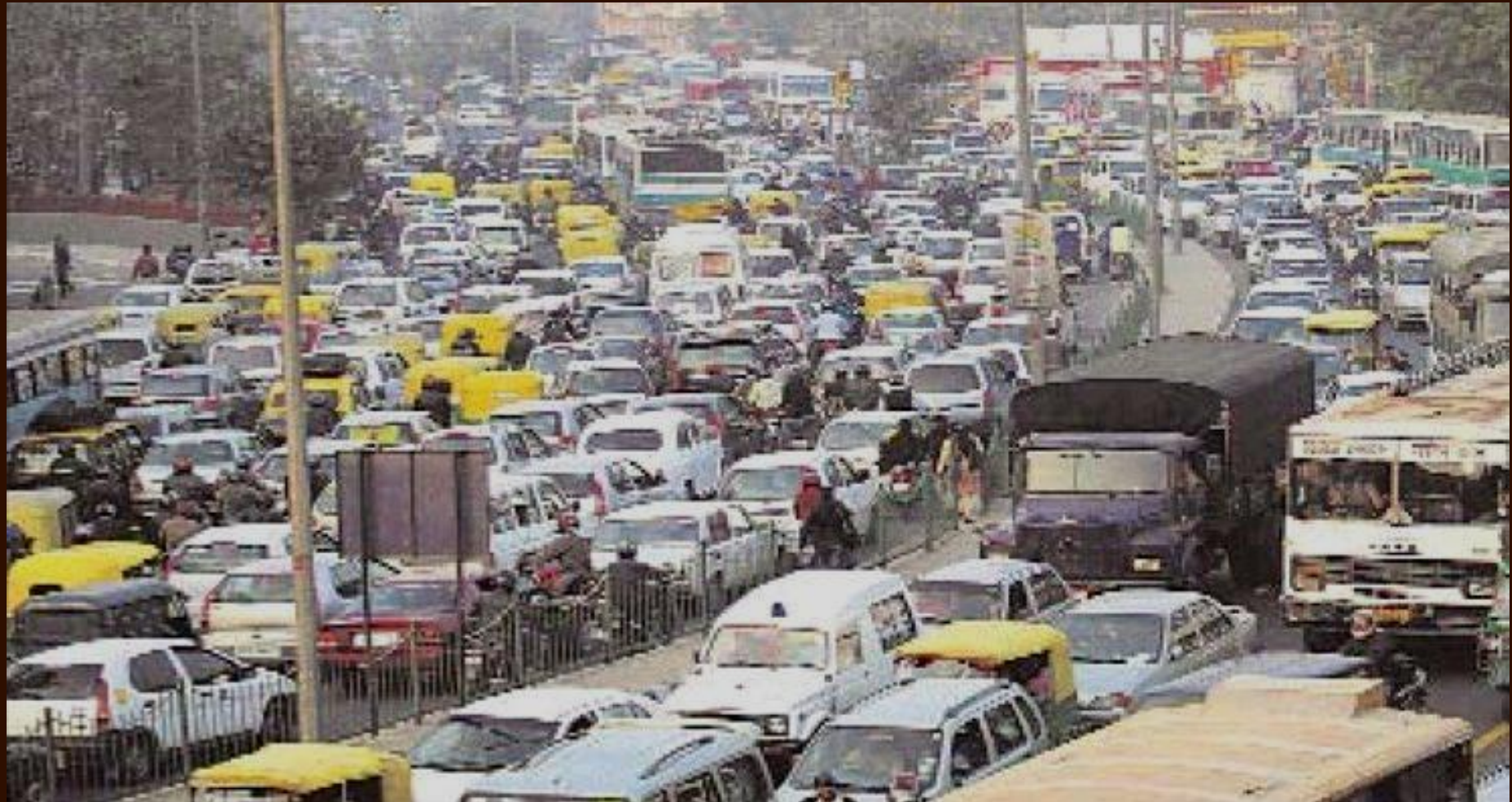


IR carries  
7 billion

- Fast Mobility transport modes on the rise
- Cars/airlines growing at 15-20%
- Nearly 2 million cars p.a
- Set to go up when Nano cars hit the market
- So will the emissions



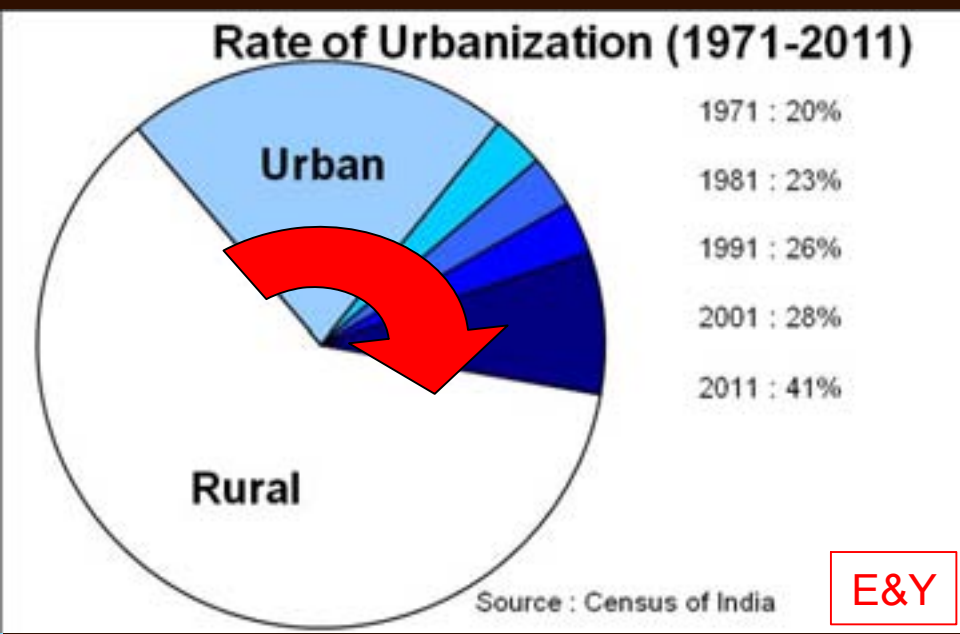
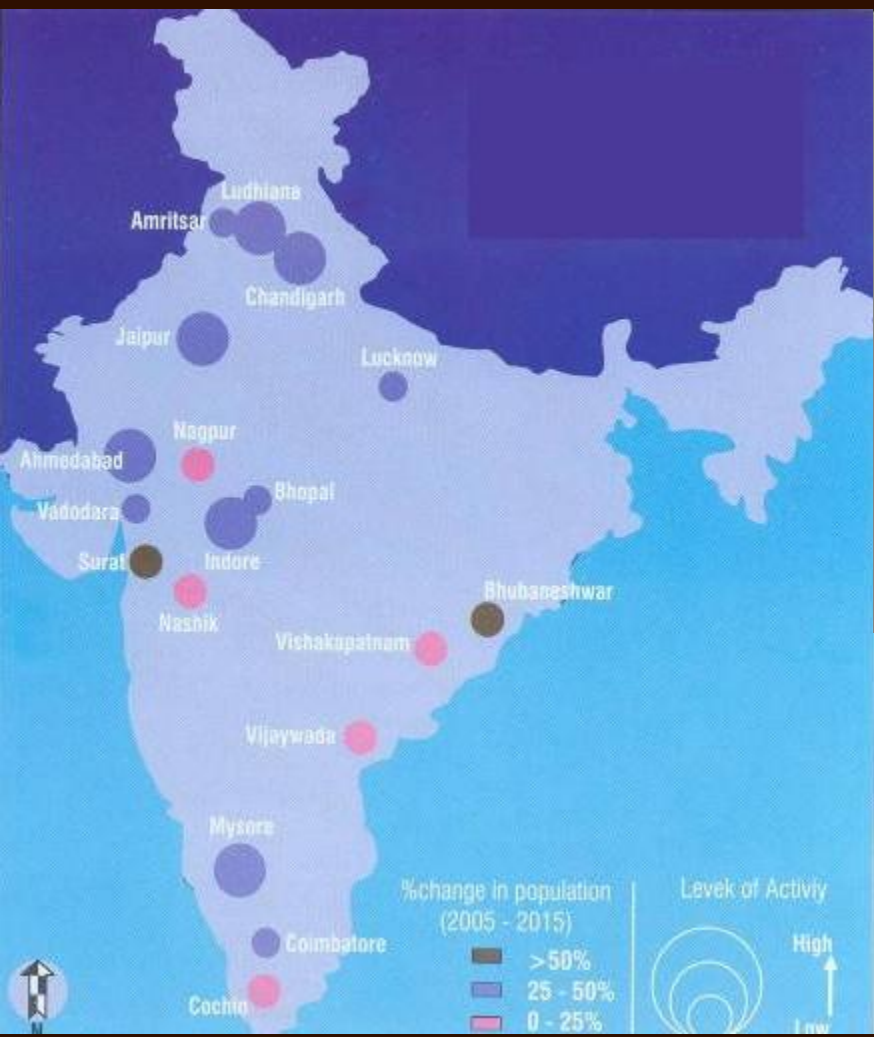
# India's Freeways Today Nano Cars Yet To Hit The Roads





# Market Requirements

- ★ New growth centres:
  - More spread of economic activity
  - Dramatic increase in urban population

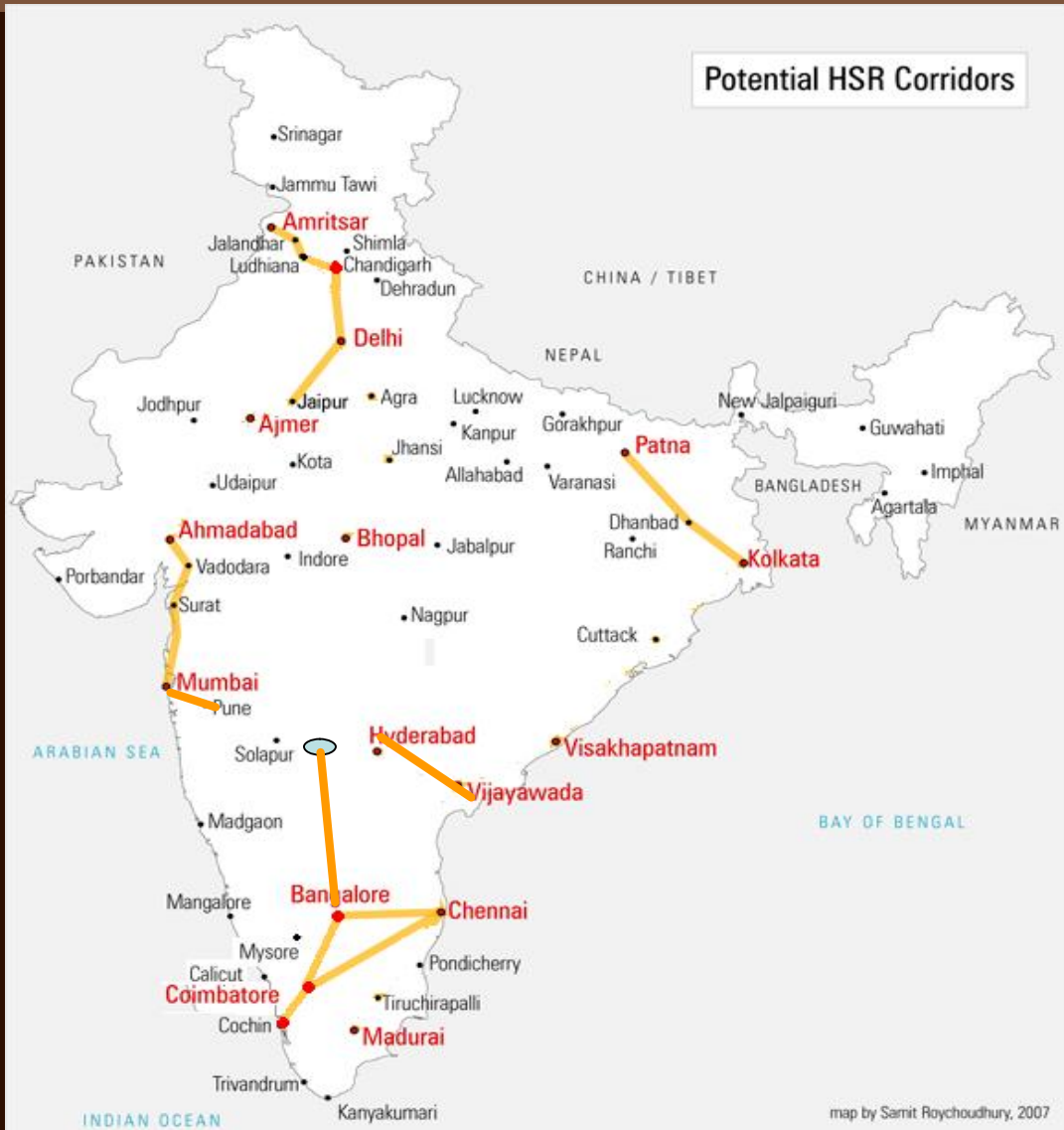


## Change in Population

	> 50%
	25-50%
	0-25%



## Potential HSR Corridors





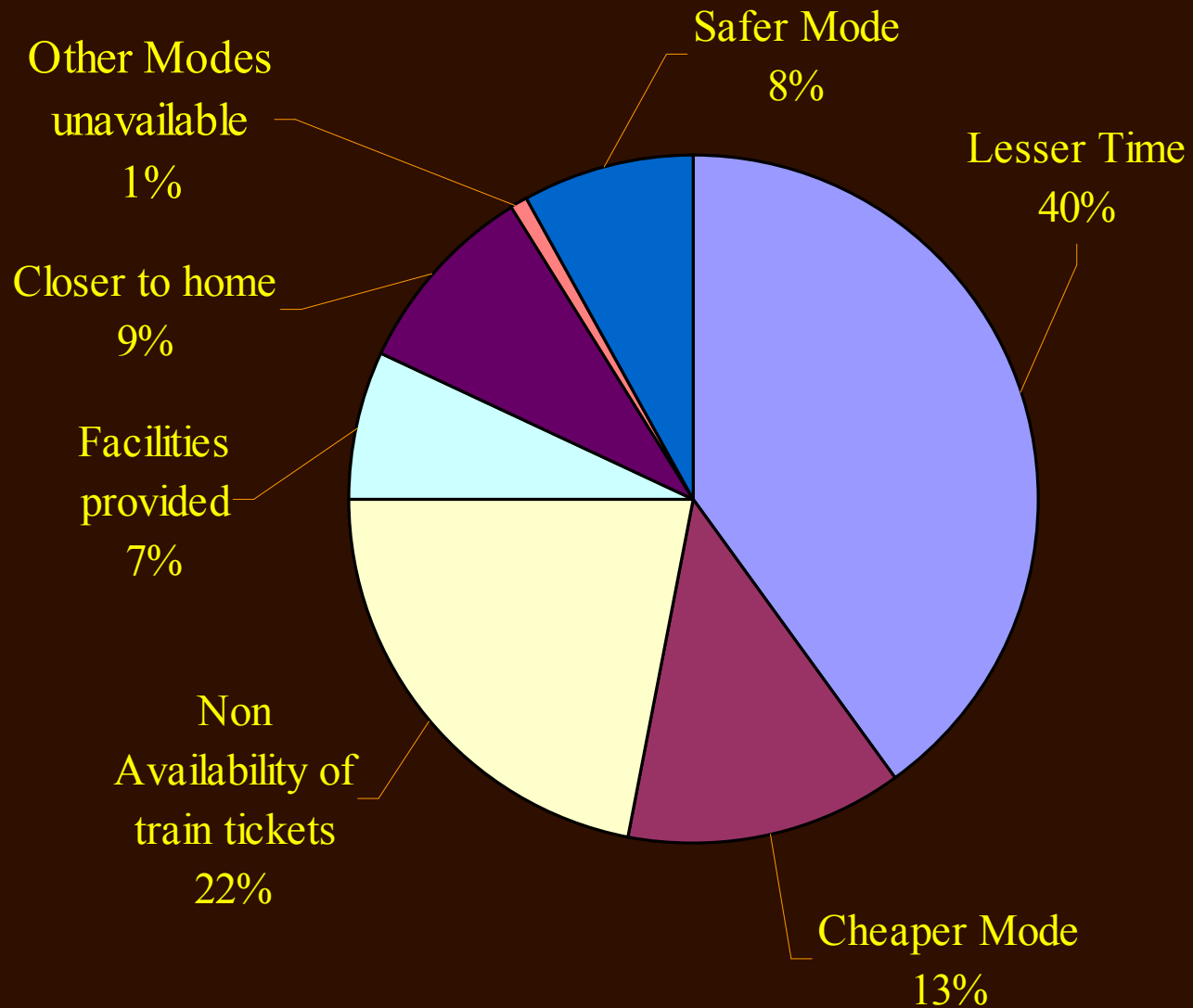
# Highway Traffic-Delhi Amritsar Corridor -Summary Volume Counts

Section	Non-AC Small Cars	AC Small Cars	AC BigCars	Mini Bus Ordinary	Mini Bus Deluxe	Mini Bus AC	Normal Bus Ordinary	Normal Bus Deluxe	Normal Bus AC
Delhi-Sonipat	4015	10509	9996	73	89	7	1250	240	58
Sonipat-Panipat	894	7710	9309	70	84	50	1252	265	87
Panipat-Ambala	2346	7651	9013	180	117	60	1187	298	285
Ambala-Ludhiana	1435	5737	6993	128	220	29	688	296	74
Ludhiana-Jalandhar	2961	8305	7975	168	161	12	1105	668	21
Jalandhar-Amritsar	1961	4466	5772	196	90	14	635	218	34
Ambala-Chandigarh	2022	6593	7767	82	53	27	1880	472	293

\* Daily Figures based on survey



# Car User Preferences





# Car Passenger Preferences

- **97% preferred**
  - **three hour or shorter journey** on Delhi – Amritsar Corridor
  - **HST to be frequent**, rather than one train in the morning one in the evening.
- Willing to pay more for time saving
- 93% preferred a restaurant with price of a meal in the range 100 to 200 Rupees
- Current car passengers wanted facilities, like, pre-recorded video programmes, cable TV and shop on the train.

# Why the entry of India and China in HSR is important for the world



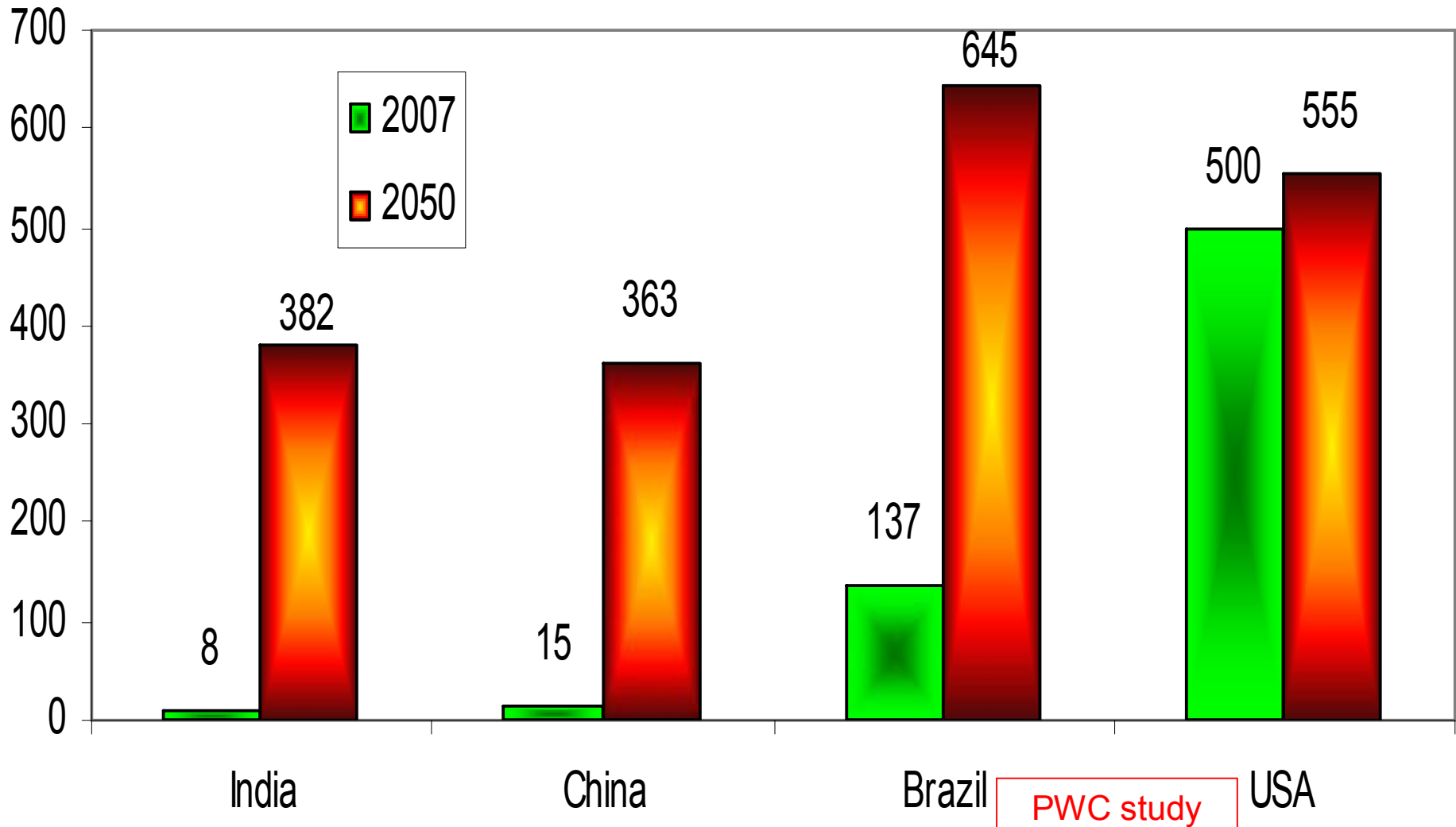
- High carbon emissions of developed and fast developing countries a major worry
- Per capita emissions in India & China low but total emission volumes high- Rising fast
- Both countries will (and should) accelerate their GDP growth
- Both economies automobile industry driven - Low fuel efficiency







# Cars per 1000 Persons





The number of cars is increasing alright.  
But I think stopping people buying cars is  
not the right way.

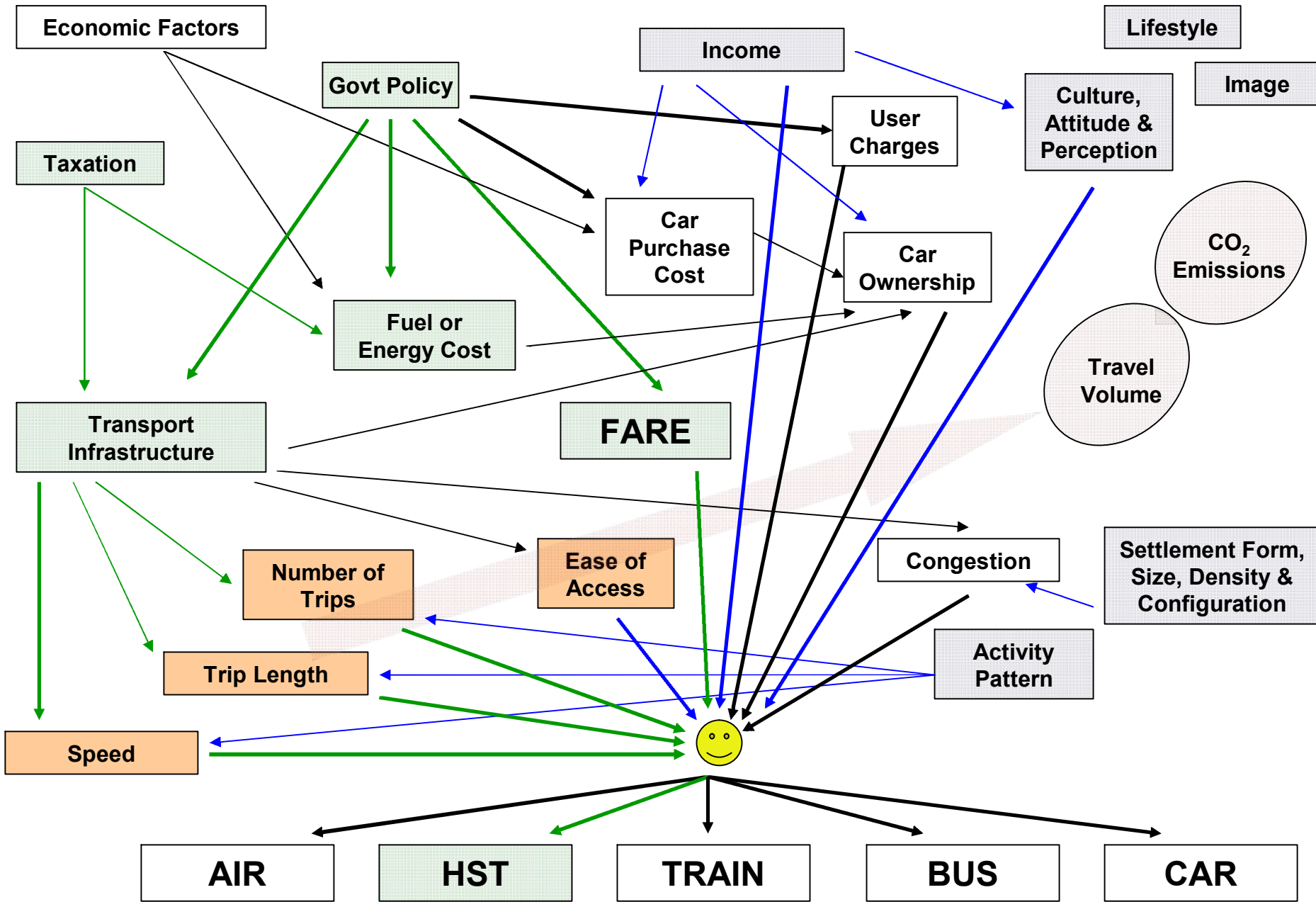
Helping people to use their cars in a  
different manner is the way to go.

*-Nicholas Stern in an interview –Down to Earth 30, Nov. 2007*



# Complexities in going low carbon in Transport Sector

★ Peoples Mobility- a matter of personal choice



Source: Managing Transport Energy.



## Complexities in going low carbon in Transport Sector

- ✦ Peoples Mobility- a matter of personal choice
- ✦ Freight Transportation decisions - driven by cost competitiveness, supply chain commitments
- ✦ CDM- rewards/ offsets mostly for investors- nothing much for users
- ✦ Apprehensions of the stakeholders in business as usual carbon based transport infrastructure



## Stakeholders

Automobile industry Passenger cars, SUVs,

**Commercial vehicles**

**Commercial Truck operators**

**Locomotive manufacturers**

**Investors/ banks/ lending institutions**

**Rail shippers, Rail passengers, Car passengers, Logistics players**

**Oil companies**

**Coal based thermal power producers**

**Airlines, air craft manufactures**

?

## Common Apprehensions On Carbon Mitigation in Transport

Stricter emission norms- Better technologies not yet developed- High cost R&D

Adverse impact on sales/ expansion

High taxes and penalties

High cost of clean fuel technologies

Large scale Solar, Wind power - costly, not yet commercially viable

Too fragmented CO<sub>2</sub> savings proposals

CO<sub>2</sub> reduction strategies not yet clear /backed by clear government policies



## Breaking the barriers

- ✦ Need to launch CO<sub>2</sub> mitigation strategies with
  - a new image
  - a new platform for a popular movement
- ✦ New business opportunities- taken to scale
- ✦ Rewards offset to address these influencing elements
- ✦ People's participation through branding
- ✦ IR's proposed two Ultra low carbon mega rail projects best platform to launch CO<sub>2</sub> emission reduction as a popular movement and brand



## Structuring of India's Ultra Low Carbon Mega Rail Projects

- ✦ HSR & DFC- new transport projects will cause carbon emissions- Owning the footprints
- ✦ Identify and measure actions which create emissions
- ✦ Adopt clean energy/ technologies/ waste reductions
- ✦ Neutralize/ Offset emissions to maximum extent
- ✦ Own the costs of emission reductions
- ✦ Encourage users to avail the benefits of clean public transport
- ✦ Document and Communicate

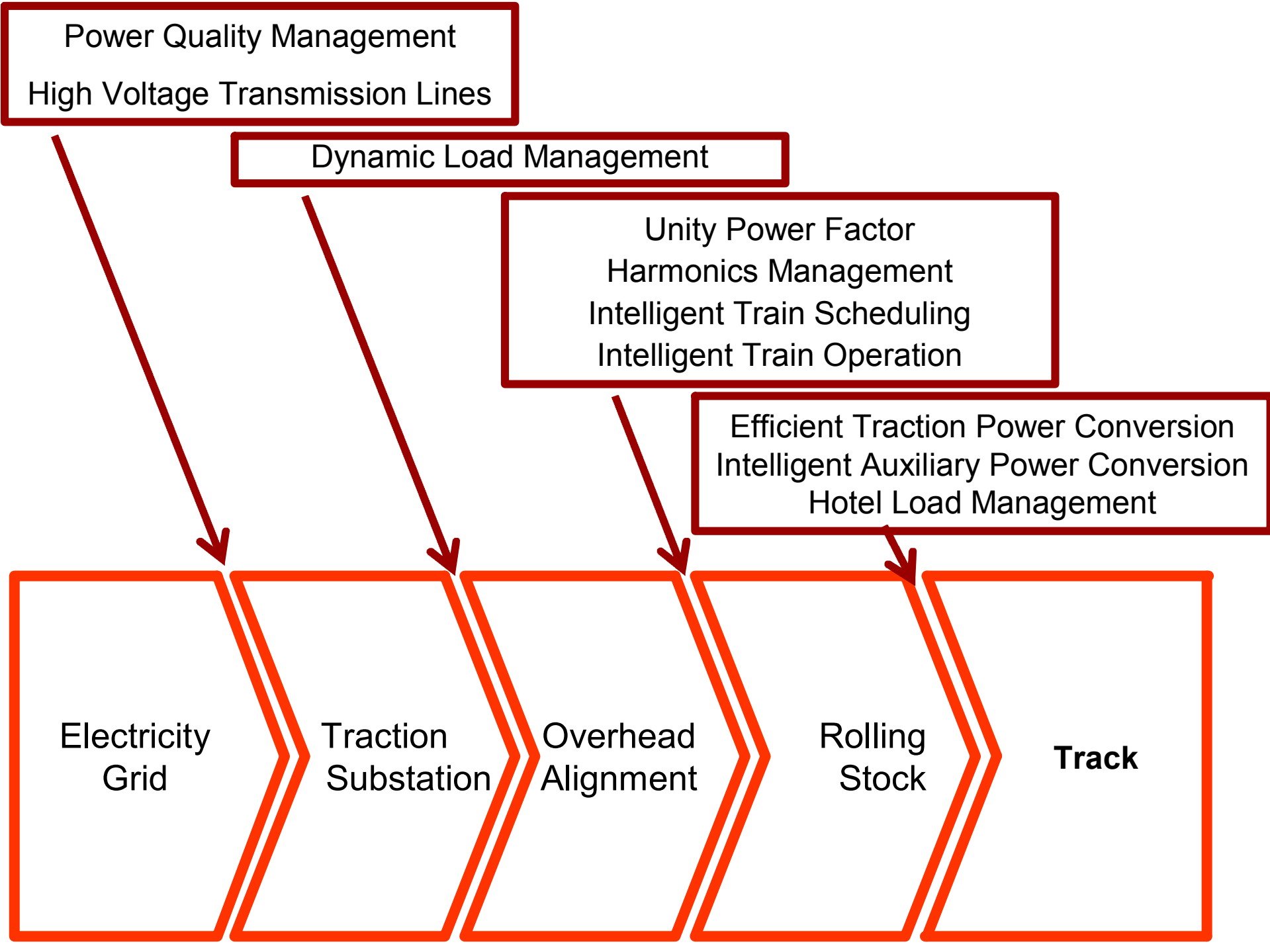




# Ultra Low Carbon Rail Projects -CO<sub>2</sub> Reduction Strategies

## Primary – neutrality objective

- ✦ Power requirement – non fossil fuel
- ✦ Traction/ Operation
- ✦ Rolling Stock



Power Quality Management  
High Voltage Transmission Lines

Dynamic Load Management

Unity Power Factor  
Harmonics Management  
Intelligent Train Scheduling  
Intelligent Train Operation

Efficient Traction Power Conversion  
Intelligent Auxiliary Power Conversion  
Hotel Load Management

Electricity  
Grid

Traction  
Substation

Overhead  
Alignment

Rolling  
Stock

**Track**



# Ultra Low Carbon Rail Projects

## -CO<sub>2</sub> Reduction Strategies

### Primary – neutrality objective

- ✦ Power requirement – non fossil fuel
- ✦ Traction/ Operation
- ✦ Rolling Stock
- ✦ FEMU for light cargo
- ✦ LEED rated energy efficient terminal buildings & Logistic Parks
- ✦ Warehouses PV panels- roof, outer walls
- ✦ Land use-no farmers land

### Consequential

#### - Mode Shift

- ✦ Inter city ridership
  - Cars/Buses/Air to HSR
- ✦ Trucks to DFC freight trains
  - Shift by choice and piggy back rides



## Transforming India's Freight Cargo Movement

### Product Design

- ✦ Sourcing 30% of energy requirement from clean power
- ✦ Only fuel efficient 3 phase locomotives with regenerative braking- kinetic energy supply to grid -10%
- ✦ FEMU services for time sensitive light cargos.
- ✦ Hybrid cars and efficient trucks



### Inter-modal Shift

- ✦ Rail bridging through road-railers and piggy back services
- ✦ Value added services through mega logi parks
- ✦ Time-tabled open access movement
- ✦ Earn Diamond Miles

**CO<sub>2</sub> savings**





# HSR: Changing Market Tectonics

## Product Design

- ✦ Substantially carbon neutral – traction power source-non fossil fuels based Swap/barter strategy
- ✦ High Speed Regenerative locomotives- kinetic energy recovery
- ✦ HSR on PPP mode- partners eligibility based on owning new small hydel power plants
- ✦ Hybrid cars for hire at terminals



## Inter- Modal Shift

- ✦ Fare Structure - less than car usage costs, low priced air tickets
- ✦ 1000 passengers per trip
- ✦ Drastic cut in travel time (compared with road travel)
- ✦ Improve on board ambience and quality of services on HSR- at par with air craft and luxury cars
- ✦ Safe & fast transit
- ✦ Carbon miles for non use of personal cars- park your car at HSR terminal, travel by HSR

**CO<sub>2</sub> savings**

# The Pacala and Socolow Wedge Theory and India's mega Rail projects



Gt of carbon per year

7

14

Business as Usual

Stabilization Wedge

Stabilization Wedge

Stabilization Wedge

Stabilization Wedge

Stabilization Wedge

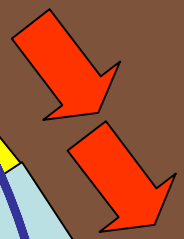
Stabilization Wedge

Stabilization Wedge

Stabilization Trajectory

2004

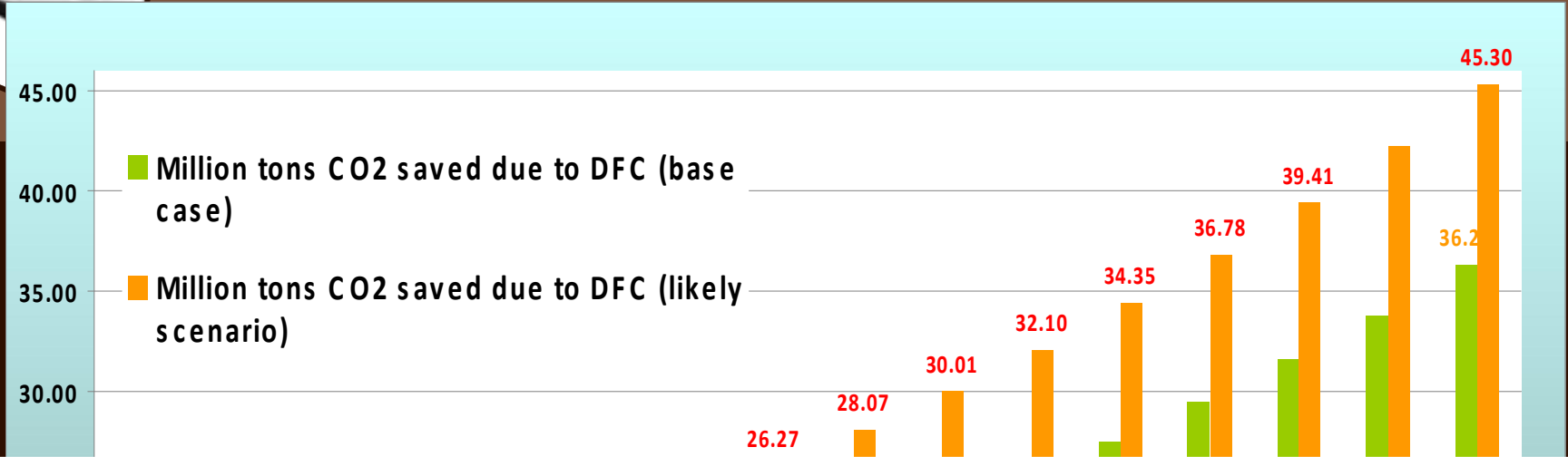
2054





# Wedge #1&2

Double Fuel Efficiency  
&  
Cut Distances to half

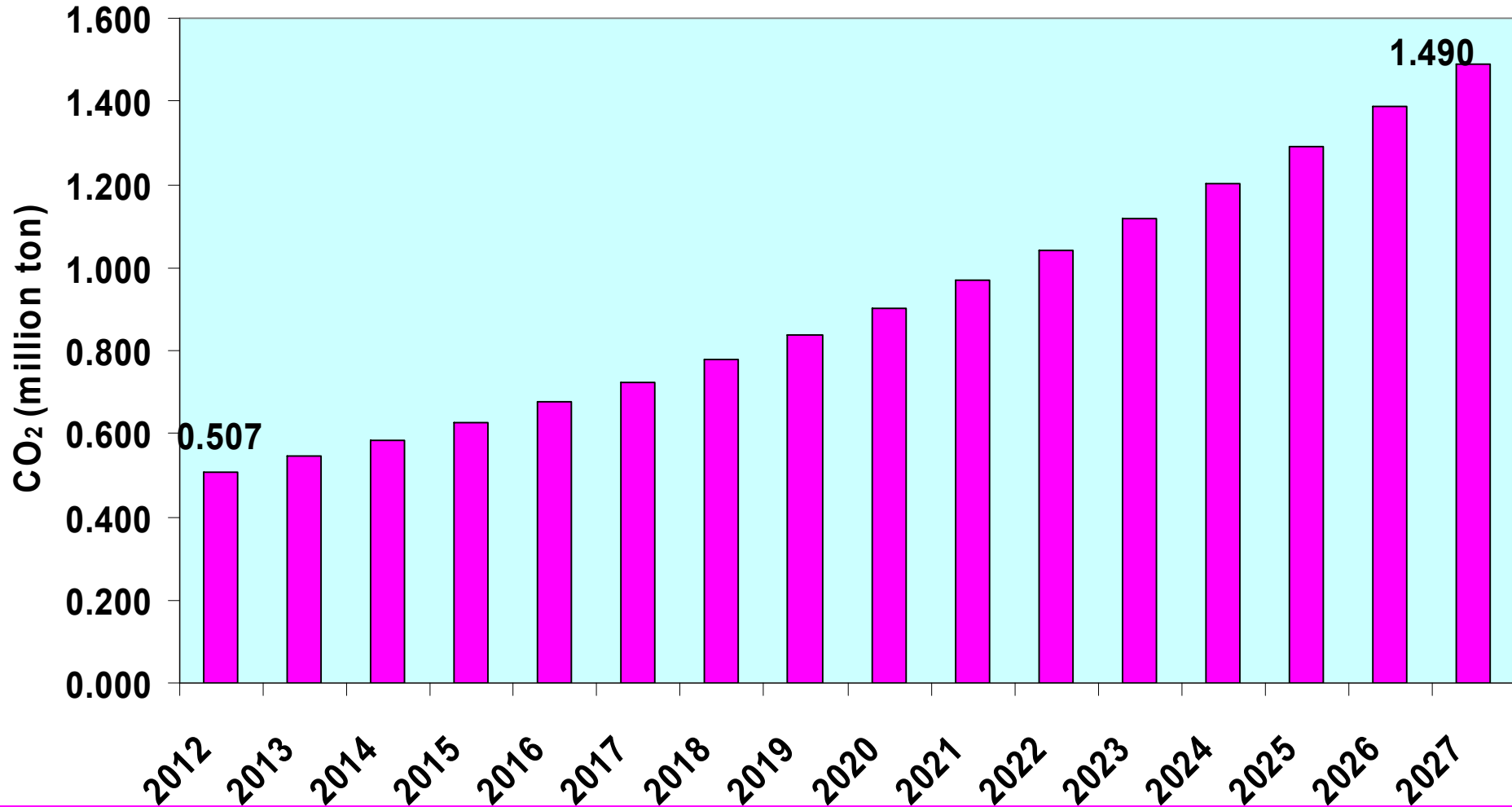


- Through vehicle displacement alone, the two DFC s expected to save 347 -500 million tonnes of CO2 by 2027 (cumulative)
- Emissions saved through locomotives with regenerative braking an additional 3 million tonnes
- Through swap/barter strategy an additional 9 million tonnes

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027



# Reduction in CO<sub>2</sub> Emission due to HST on Carbon Neutral Electricity \*



**Reduction of CO<sub>2</sub> in 15 Years = 14.679 Million Ton**



## Wedges # 3, 4 & 5

Wedge	Implementation
Cutting carbon emission from buildings	Freight & HSR Terminals and Logi cities will cut carbon emissions by 25% - LEED rated buildings
700 fold Expansion of photovoltaic solar energy	Logi cities - Confluence of Warehouses, Trade and Commercial complexes, malls, Hotels- encouraged to draw power from solar sources- especially from large solar farms in Rajasthan, Gujrat, Maharashtra.
Halting of current deforestation	Rail uses less land than road



## Stakeholders

Automobile industry Passenger cars, SUVs,

**Commercial vehicles**

**Commercial Truck operators**

**Locomotive manufacturers**

**Investors/ banks/ lending institutions**

**Rail shippers, Rail passengers, Car passengers, Logistics players**

**Oil companies**

**Coal based thermal power producers**

**Airlines, air craft manufactures**

?

## Common Apprehensions On Carbon Mitigation in Transport

Stricter emission norms- Better technologies not yet developed- High cost R&D

Adverse impact on sales/ expansion


High taxes and penalties

High cost of clean fuel technologies

Large scale Solar, Wind power - costly, not yet commercially viable

Too fragmented CO<sub>2</sub> savings proposals

CO<sub>2</sub> reduction strategies not yet clear /backed by clear government policies



**Regenerative  
braking/ kinetic  
energy harnessing  
electric locos**

**Research on  
biofuels, cellulosic  
ethanol ,**

**Complementary role of  
airlines- partnering  
HSR**

**Mega logistic  
parks- intermodal  
hubs- truckers  
parks,Hybrid cars**

**Road railers, Piggy  
back riders  
through inter-  
modal movement**

**Hybrid Diesel locos,  
regenerative  
batteries, bio diesel**

**Possibility of lower  
fares / lower tariff -  
high through put HST /  
heavy haul faster  
freight trains**

**Large scale solar  
power in logi  
cities & HSR  
terminals**

## **New Business Opportunities in Carbon Mitigation**



## **Areas of Convergence in specially crafted low carbon projects**

**Dedicated  
Freight  
Corridor**

**Logistics Parks**

**High Speed Trains**



## Changing Perceptions

- ✦ Climate Change in itself bad news
- ✦ Despair, Gloom, Catastrophe
- ✦ IR's proposed two Ultra low carbon mega rail projects best platform to launch co 2 emission reduction as a popular movement and brand



# Low carbon brand personality

DFC : Freight Vehicles displacement

HSR: Motorized Passenger Vehicle displacement

Power generation from hydel/ solar plants

Locomotives-regenerative

Logistics Parks - substantial use of solar panels

HSR Terminals- low carbon, green buildings

Conserving on farmers land acquisition





## India's HSR – A Low Carbon Highly Marketable Brand

- ✦ Position Indian HSR with an ultra low carbon brand personality- an endearing symbol- no lifestyle loss in public transport
- ✦ HSR ridership –India's giant population HSR market size : opens with 7 million passengers/ corridor
- ✦ Huge Market potential huge :Indian ad market to cross USD 6 billion in 2011
  - 0.40 million+ (true green) 30 seconds ad spots per year (estimated)
- ✦ Vast Out of Home (OOH), premium ad space in HSR terminals
- ✦ Net **“true green ad ”** revenues can support HSR's debt servicing
- ✦ Vast potential for real estate development



## Another Ultra Low Carbon Brand Personality - DFC & Mega Logistic Cities

- ✦ Heavy haul freight corridor with a brand personality
- ✦ Partly user- funded rail project
- ✦ Baptism for high carbon sinner industries- freight carbon miles- possibilities of convertibility into carbon credits?
- ✦ Carbon credits for clean energy warehouses- to be shared with warehouse users as benefits





# Acceptability of Mitigation Strategies

- ✦ GDP growth retardation- developing countries
- ✦ Erosion in quality of lifestyles
- ✦ Punitive taxes- regressive,
- ✦ Misgivings on trading in carbon credits
- ✦ CDM- rewards/ offsets mostly for investors- nothing much for users
- ✦ Availability/ Costs of renewable energy
- ✦ Quantum reduction not possible - lack of scale of technological breakthrough
- ✦ Bio fuel impact on agri land and food prices,
- ✦ People's participation important for success-Rewards offset will have to address these influencing elements
- ✦ Points for pondering- should this dictate approach for future policy



## Way Forward

- ✦ Carbon Mitigation Rating for Transport Sector Projects
- ✦ Setting Pre-qualification Benchmarks for low carbon projects - Facilitate Convergence
- ✦ Concessional Funding
- ✦ Mechanism for sharing benefits - investors and users - maybe even the brand builders & advertisers too
- ✦ Diamond grams reward scheme for rail users – Payment card schemes to benefit too.



THANK YOU