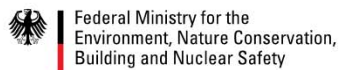




**Intercity Rail Transport & Climate Change: Issues and Options**  
**Key Messages from Case Studies**  
**Intercity Passenger Transport (Case: HSR)**  
**Freight Transport (Case: Dedicated Corridors)**  
**Alternate Freight Infrastructure Choices (Case: Coal-by-Wire Option)**  
**Adapting to Changing Climate (Case: Konkan Railways)**

*Subash Dhar, UNEP/DTU*  
*Minal Pathak, CEPT University*  
*P.R. Shukla, IIMA*

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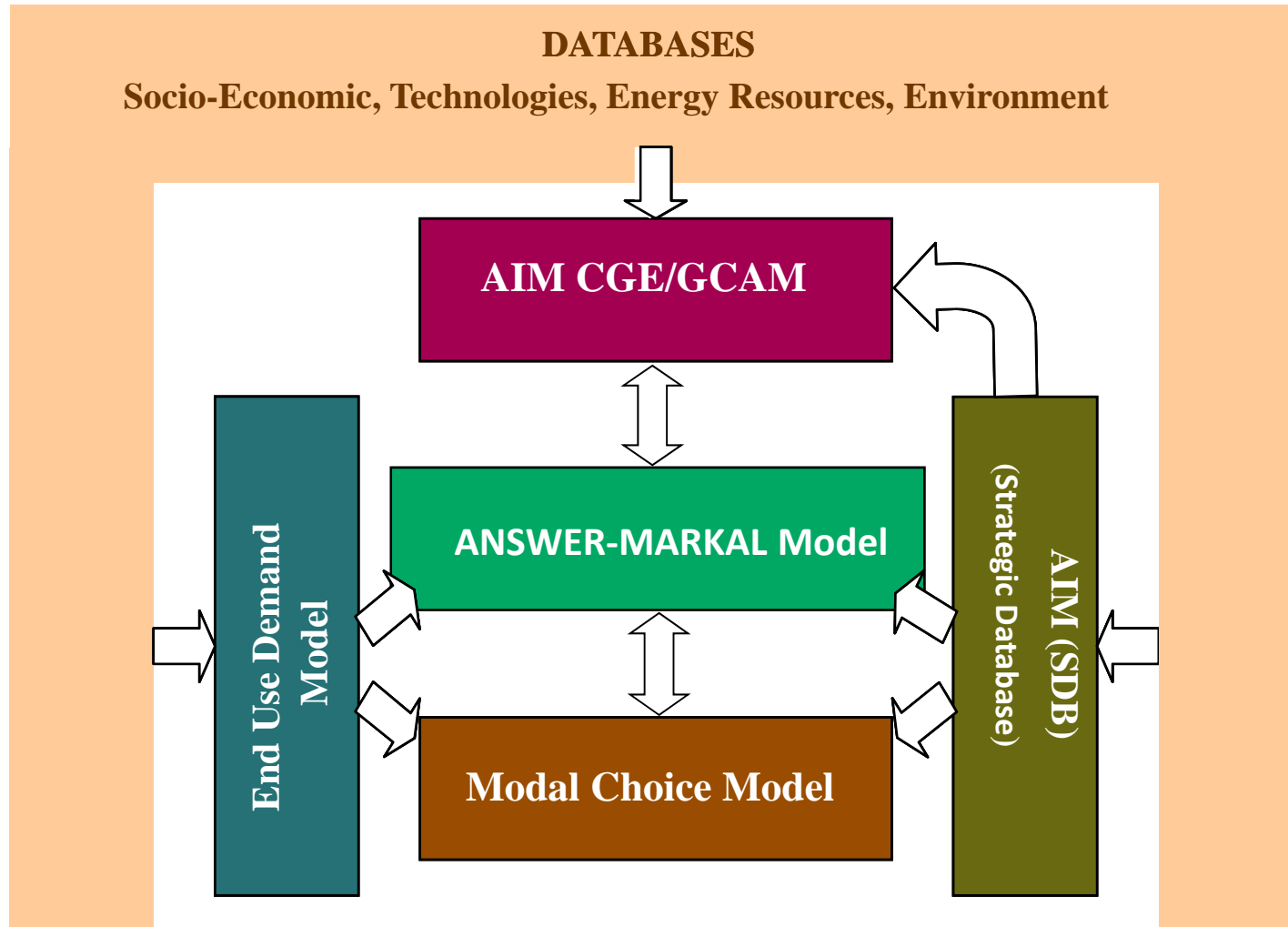
In collaboration with:



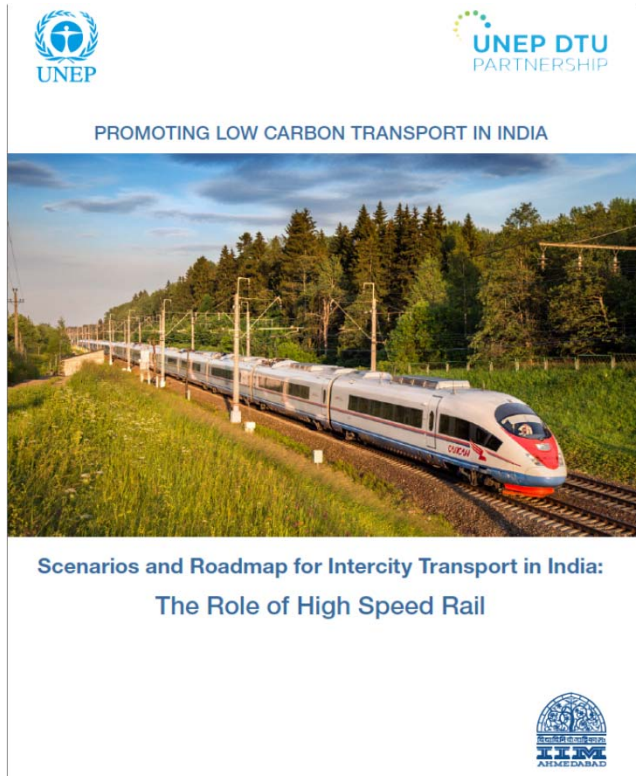
# Transport and Climate Change: India's INDCs

- **Rail Transport**
  - Enhancing the share of rail in total land transportation from 36 % to 45 %
  - Dedicated Freight Corridors will reduce 457 million tonnes of CO<sub>2</sub> over a 30-year period
- **Coastal shipping and inland waterways**
  - Implementation of a 1,620-km navigable channel for large commercial ships
  - Establish waterway transportation grid connecting existing and proposed waterways to roads, railways, and ports.
  - Improve and augment capacity in India's ports, promoting efficient transportation of goods.
  - 7,000 km road network along the coast will provide further connectivity to these ports.
- **Mass transit**
  - Focus on moving people and therefore investments in mass transit
- **Vehicle efficiency**
  - First passenger vehicle fuel-efficiency standards from April 2016, set efficiency targets for new cars
- **Alternate Fuels and Vehicles**
  - Promote faster adoption & manufacturing of hybrid and electric vehicles by providing incentives.
  - Promoting Biofuels

# Integrated Modeling Framework

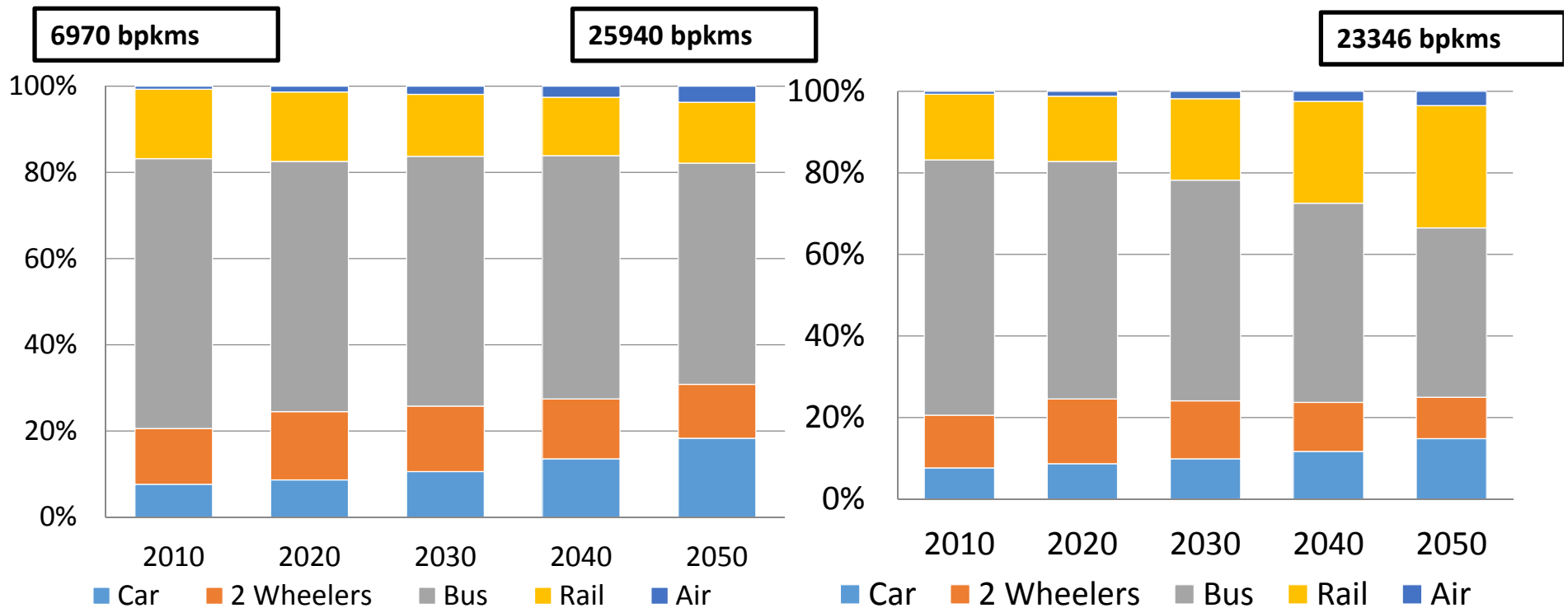


# Intercity Passenger Transport (Case: HSR)



[http://www.unep.org/transport/lowcarbon/PDFs/Role\\_of\\_High\\_Speed\\_Rail\\_Final.pdf](http://www.unep.org/transport/lowcarbon/PDFs/Role_of_High_Speed_Rail_Final.pdf)

# Mode Share: Intercity Transport



BAU

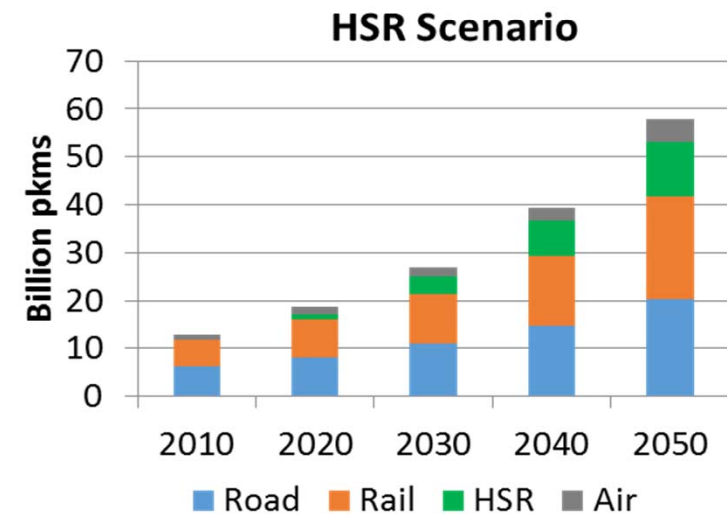
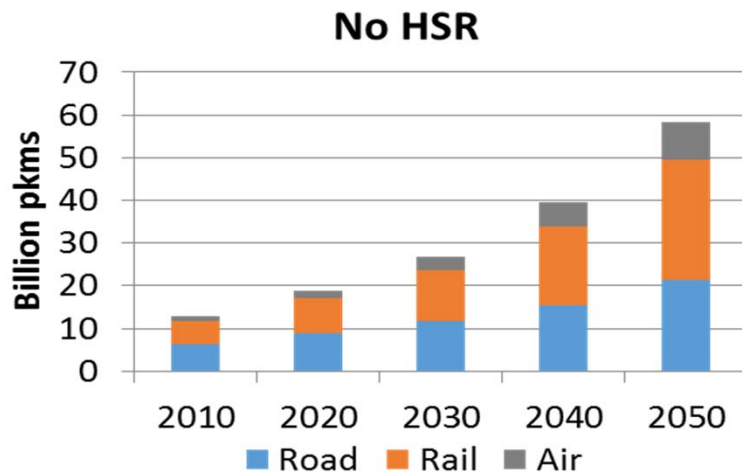
Sustainable Mobility

# Ahmedabad Mumbai HSR Corridor



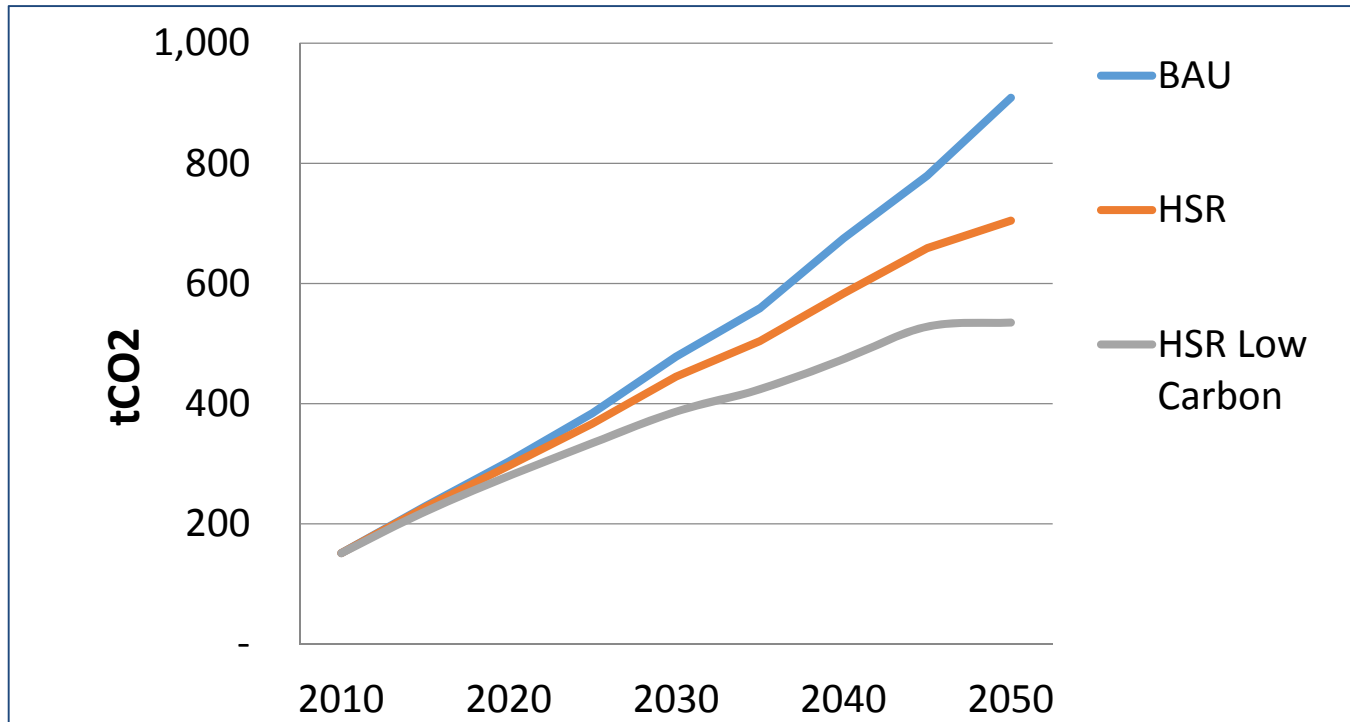
- HSR between Ahmedabad and Mumbai
- Will connect large and intermediate cities
- Reduce travel time
- Financing through governmental funds, multilateral funding and by alternative means of resource mobilization, incl (PPP)
- Support from JICA

# Mode Share for Ahmedabad Mumbai corridor



- Compete with air and increase share of rail
- Reduced Energy Demand
- Connect small and medium cities promoting a balanced regional development

# CO2 Emissions (Million tCO2)

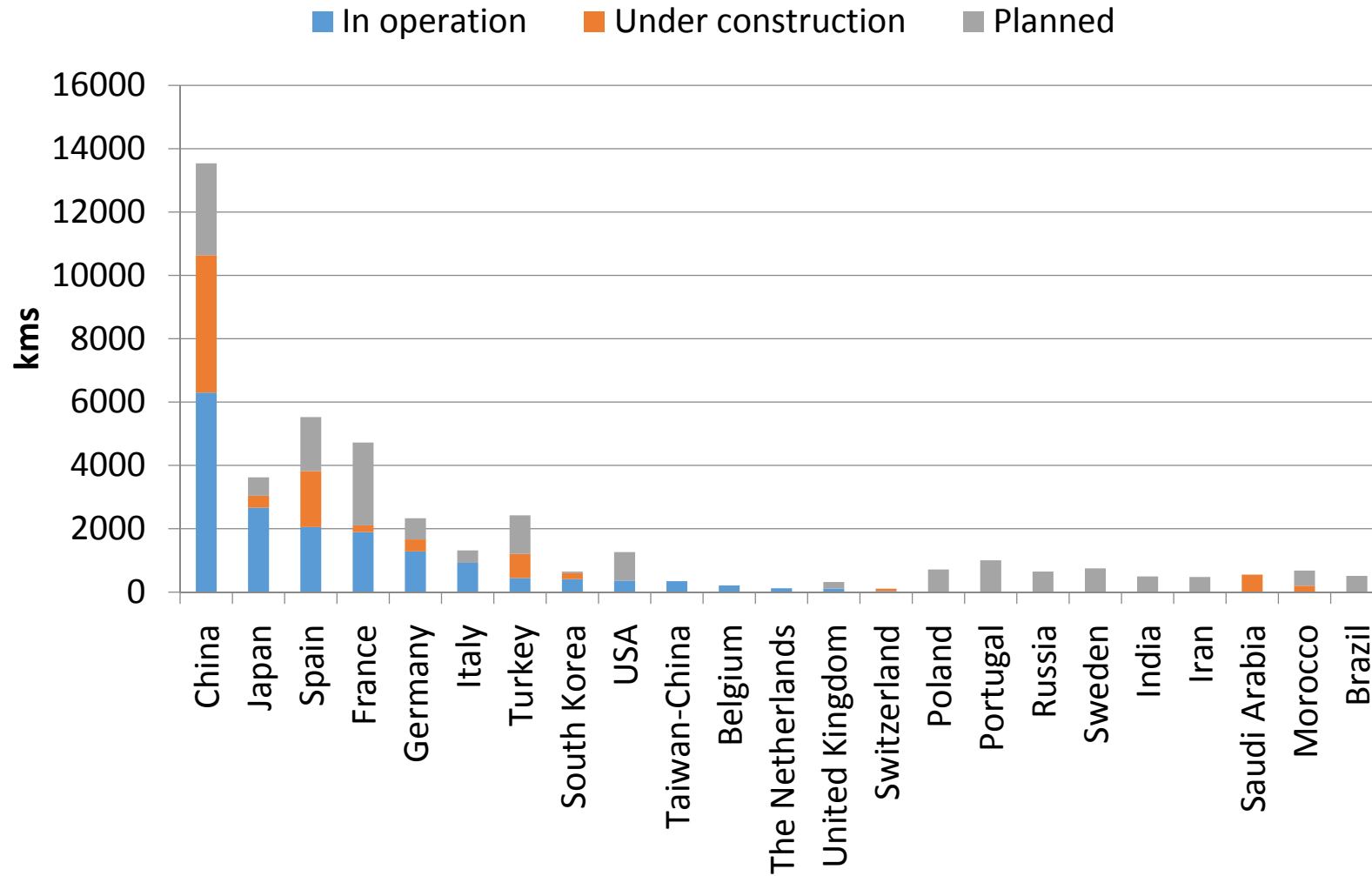


**Share of railways in BAU and HSR Scenario**

Scenario	2010	2020	2030	2040	2050
BAU	16.1%	16.1%	14.4%	13.6%	14.1%
HSR Scenario	16.1%	16.1%	20.0%	25.0%	30.0%



# Existing and Proposed HSR lines (2015)



Source: UIC (2015)

# Intercity Transport and Climate Change

## Key Messages

- *Increased investments for improving the efficiency of railways and building high speed corridors are a way to **address the declining rail share** in total intercity transport kilometres.*
- ***Rail is more efficient compared to air and road** - increased share of rail delivers a very sizable reduction in energy consumption in the long-term and, therefore, **contributes to energy security**.*
- *Energy reductions lead to significant abatement of CO2 emissions. More significantly, **decarbonized electricity** contribute even more to CO2 abatement in HSR plus low-carbon scenario.*
- *Compared to air, **HSR can connect a number of small and medium cities** and deliver a more balanced development.*

# Freight Transport (Case: Dedicated Corridors)



PROMOTING LOW-CARBON TRANSPORT IN INDIA



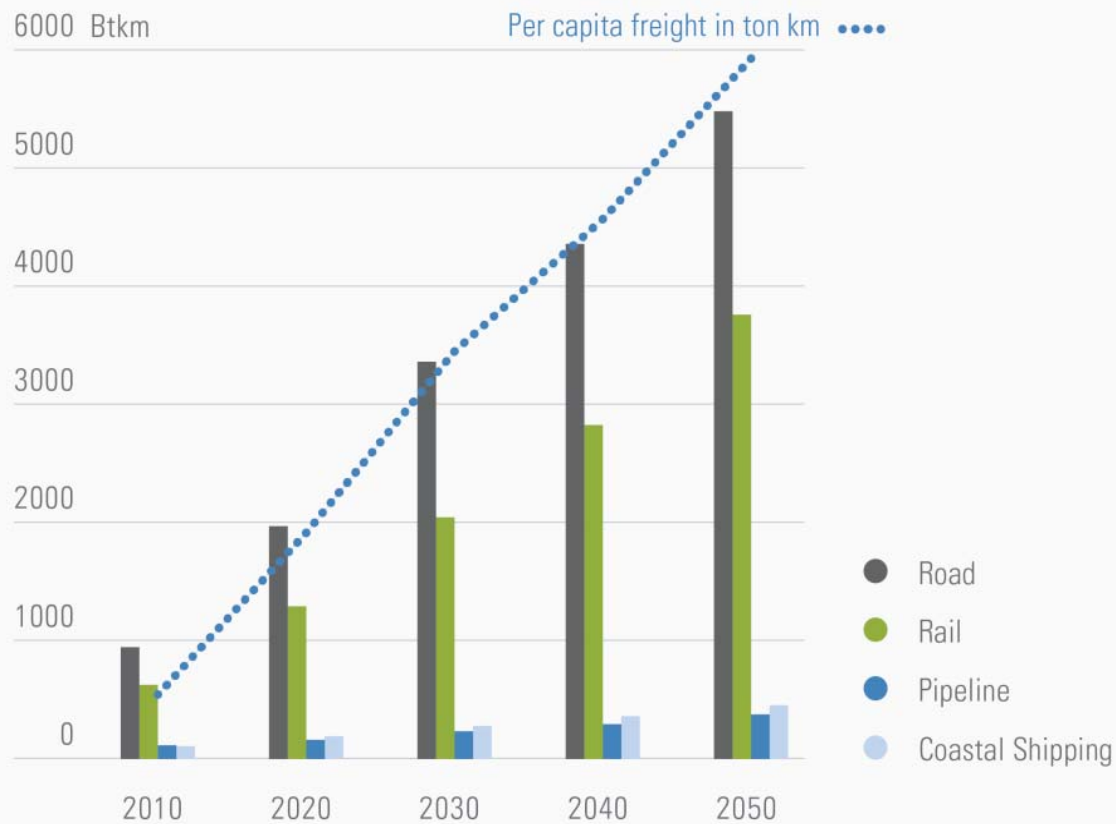
Infrastructure for Low-Carbon Transport in India:  
A Case Study of the  
Delhi-Mumbai Dedicated Freight Corridor

[http://www.unep.org/transport/lowcarbon/  
Pdf's/publications/dfc\\_fullreport.pdf](http://www.unep.org/transport/lowcarbon/Pdf's/publications/dfc_fullreport.pdf)



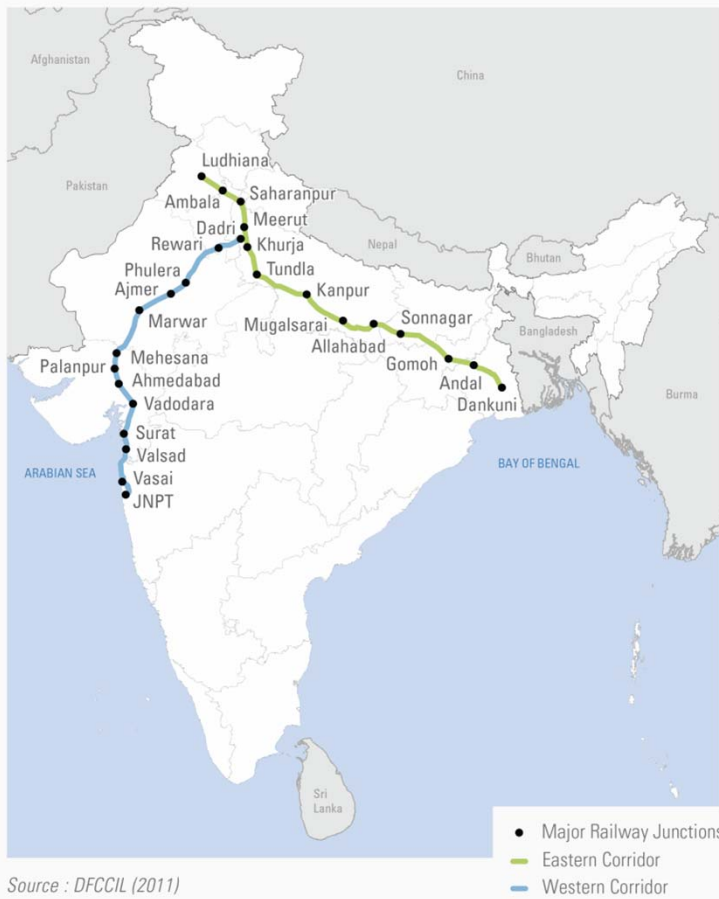
# Freight Transport Demand

**Figure 18.** Freight Transport Demand BAU and Per Capita Freight



# Dedicated Freight Corridors

**Figure 26.** Freight Corridors in India



**Figure 28.** Comparison of Design features of existing and proposed DFC

Feature	Existing	Moving dimension	On DFC
Height	4.265 m 		7.1 m for Western 5.1 m for Eastern 
Width	 3.20 m		 3.66 m
Container stack	 Single stack		 Double stack
Train length	 700 m		 1500 m
Train load	 4000 ton		 15000 ton

Source : DFCCIL (2011)

# Alternate Freight Infrastructure (Case: Coal-by-Wire)



PROMOTING LOW-CARBON TRANSPORT IN INDIA



**Transport Scenarios for India:  
Harmonising Development and Climate Benefits**

November 2015

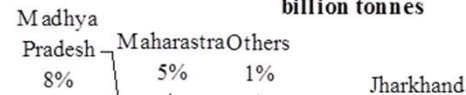


<http://www.unep.org/transport/lowcarbon/publications.asp>

# Coal Reserves & Power Generation

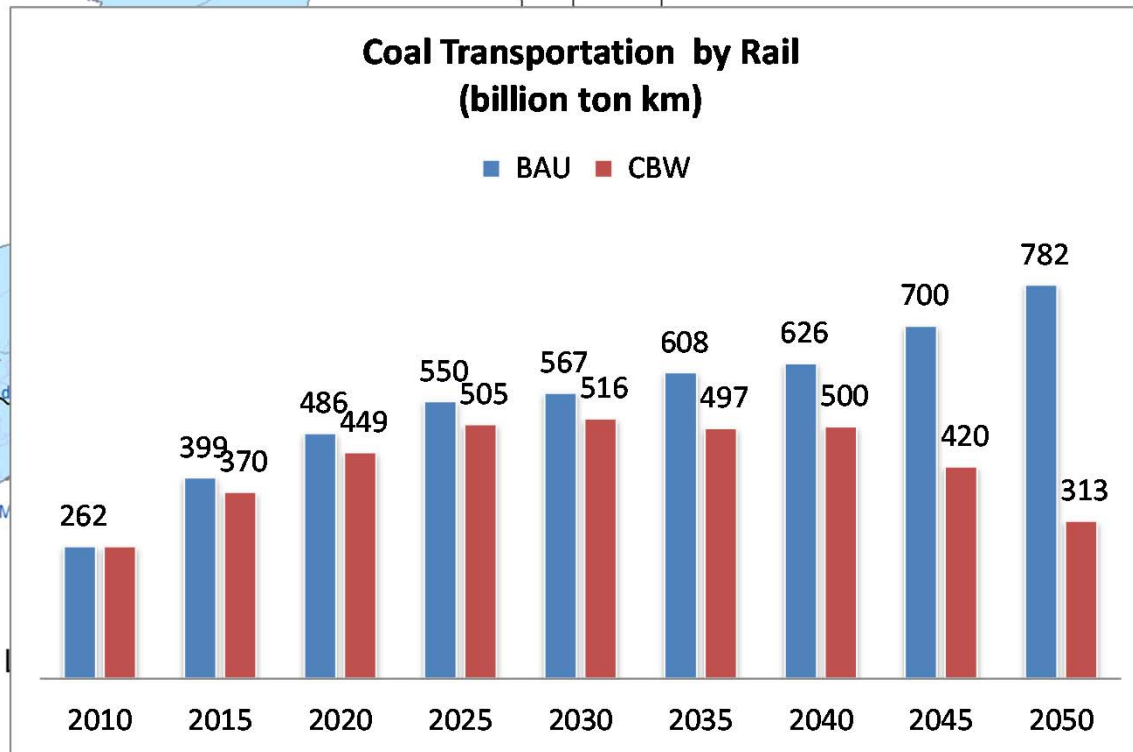
## State Wise Coal Reserves

Total Proven Reserves 95.9 billion tonnes



## Coal Transportation by Rail (billion ton km)

■ BAU ■ CBW

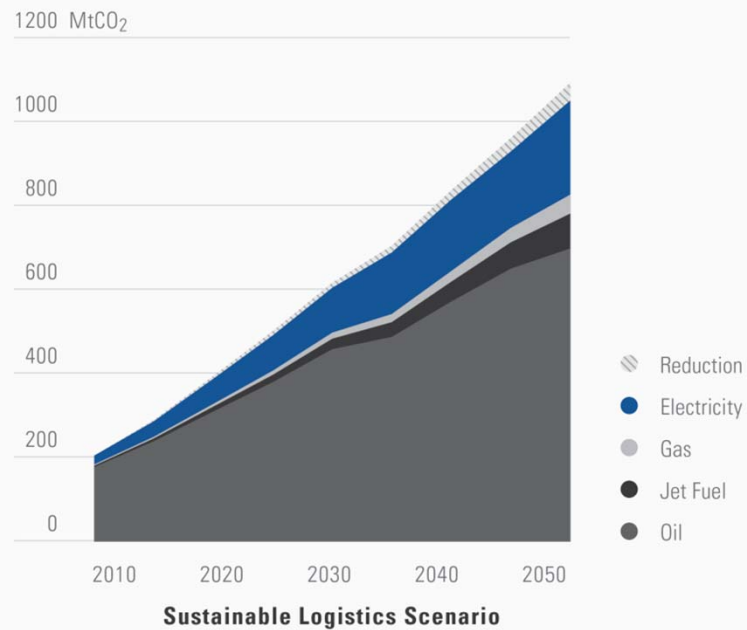


- Major Places
- Major Railway
- Lignite Mines
- Coal reserves

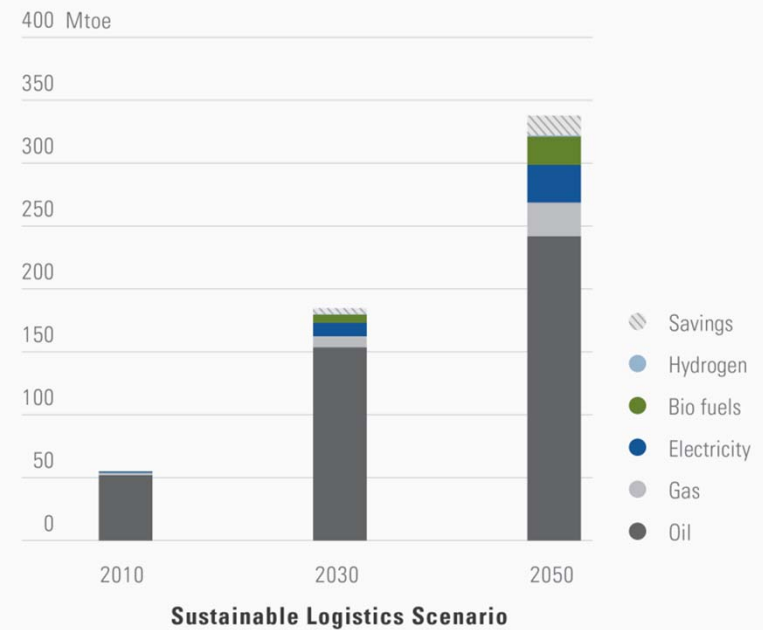
- 8. North Eastern Coal Field Ltd. (a unit under CIL HQ.)
- 9. Singareni Collieries Co. Ltd.
- 10. Neyveli Lignite Corporation

# CO<sub>2</sub> and Co-benefits

**Figure 29.** CO<sub>2</sub> Emissions Reduction by Sources – Sustainable Logistics



**Figure 30.** Energy Demand and Savings – Sustainable Logistics





# Key messages: Freight transport

- *Freight is a smaller but growing share within the transport sector. **Sustainable logistics can have an impact on the final energy demand from transport, especially in the long term***
- *Large infrastructure projects, such as the proposed Dedicated Freight Corridors (DFCs), are critical drivers of the national economy and have **major implications for achieving sustainability and low-carbon development goals.***

# Adapting to Changing Climate (Case: Konkan Railways)



PROMOTING LOW CARBON TRANSPORT IN INDIA

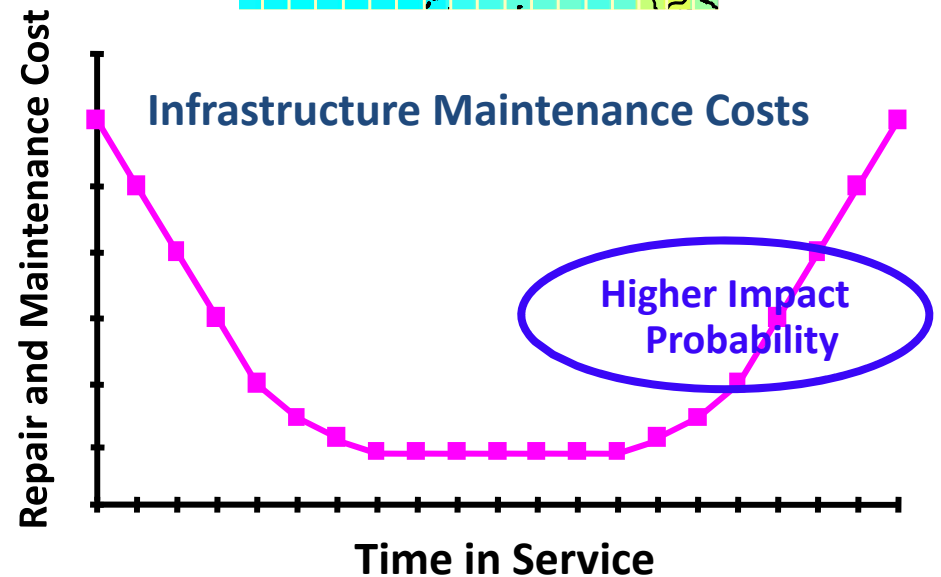
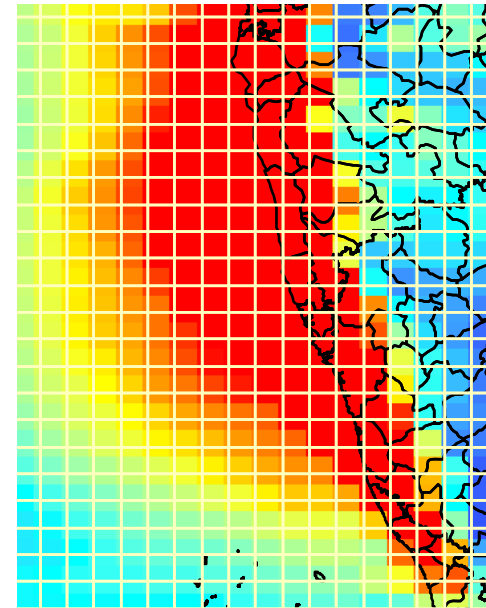
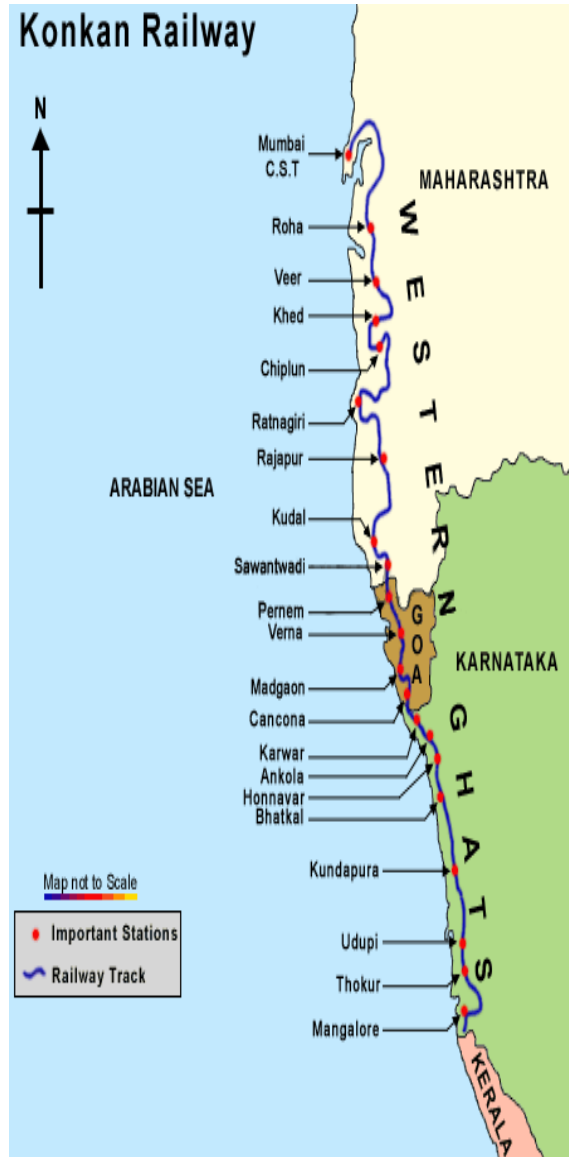


**Impact Assessment and Management  
Framework for Infrastructure Assets:  
A Case Study of Konkan Railways**

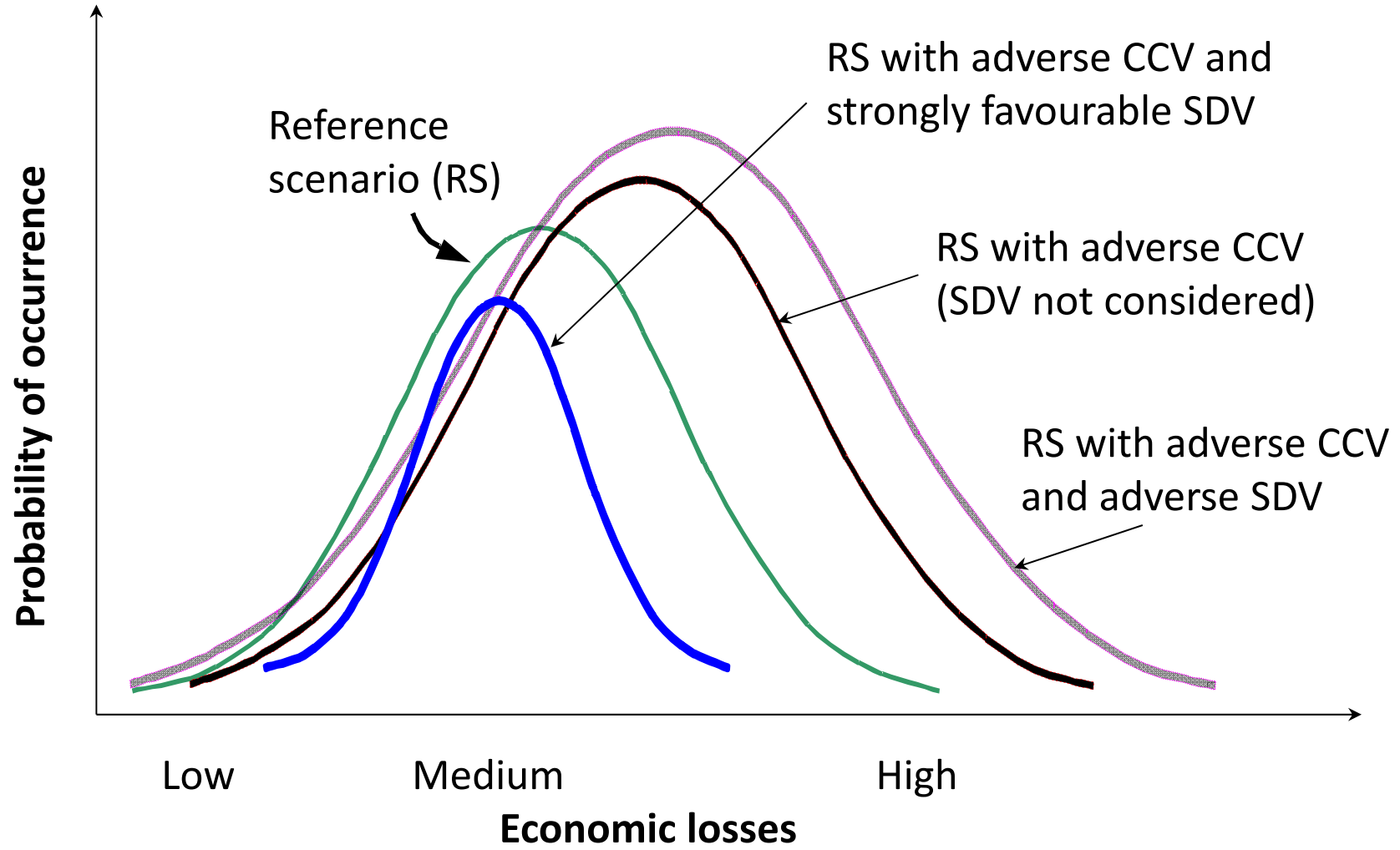


<http://www.unep.org/transport/lowcarbon/PDFs/ImpactAssessment.pdf>

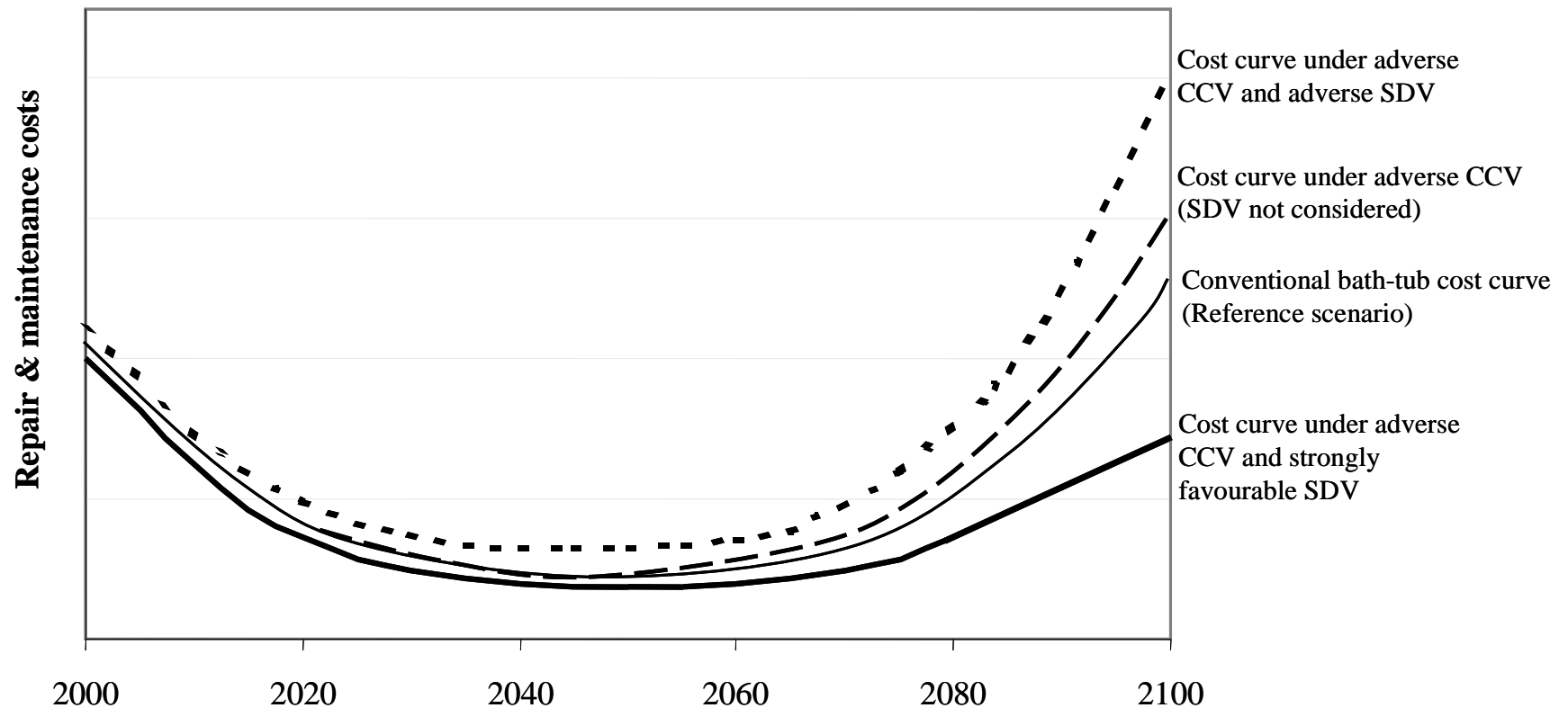
# Climate Change Impacts: Konkan Railways



# Economic Loss & Probability of Occurrence



# Climate Change and Maintenance Costs



- ▶ Long-life assets commissioned now will have higher failure rates after several decades as they become old.
- ▶ Climate change shall exacerbate over the century. Hence, impact probability and costs on the infrastructure would increase significantly in later years.

# Key messages:

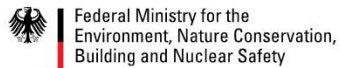
## Climate Change and Transport Infrastructures

- *Transport infrastructures are **log-life assets** exposed to weather conditions . Climate change can add to the in-situ climate risks*
- *It is wise to incorporate **future climate conditions** during the **design** stage and also include the **expected future climate change in operations and safety plans**.*
- ***Climate insurance** should be considered as an important aspect of assessing '**liability**' vis-à-vis the risks from in-situ climate.*
- *Infrastructure projects **impact assessment** should include the '**reverse matrix**', i.e. matrix of impacts on the project resulting from the changing climate (& the environment) .*



*Thank you*

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