



Low Carbon Development in Indian Railways: Need for a Bold & Ambitious Policy

28 October 2017

In this presentation

- About Shakti
- Low carbon development in railways – Global statistics
- Low carbon development in Indian Railways
- Proposed low carbon policy outlook
- Few example of low carbon opportunities in Indian Railways

Shakti Sustainable Energy Foundation

POLICY FOCUS | We believe that effective energy policy frameworks are necessary for large-scale, transformative change

OUR WORK | We work with policy makers, civil society, research institutions, think tanks and the private sector to develop policy solutions for energy and climate challenges

Board of Directors

Jamshyd Godrej

*Chairman and Managing Director
Godrej & Boyce Manufacturing
Company Limited*

Nitin Desai

*Former Under Secretary General
United Nations*

Naina Lal Kidwai

*Former Country Head
HSBC Bank India*

Dr. Rajiv Lall

*Founder MD & CEO
IDFC Bank*

Meher Pudumjee

*Chairperson
Thermax Limited*

Suman Bery

*Former Director General
National Council of Applied
Economic Research (NCAER)*

Krishan Dhawan

*Chief Executive Officer
Shakti Sustainable Energy
Foundation*

Program Areas

CLEAN POWER

- Electric Utilities
- Rural Energy Access
- Renewable Energy and fuel themes

ENERGY EFFICIENCY

- Buildings
- Appliances
- Industry

SUSTAINABLE TRANSPORTATION

- Public transport systems
- Vehicle fuel efficiency
- Electric Vehicles

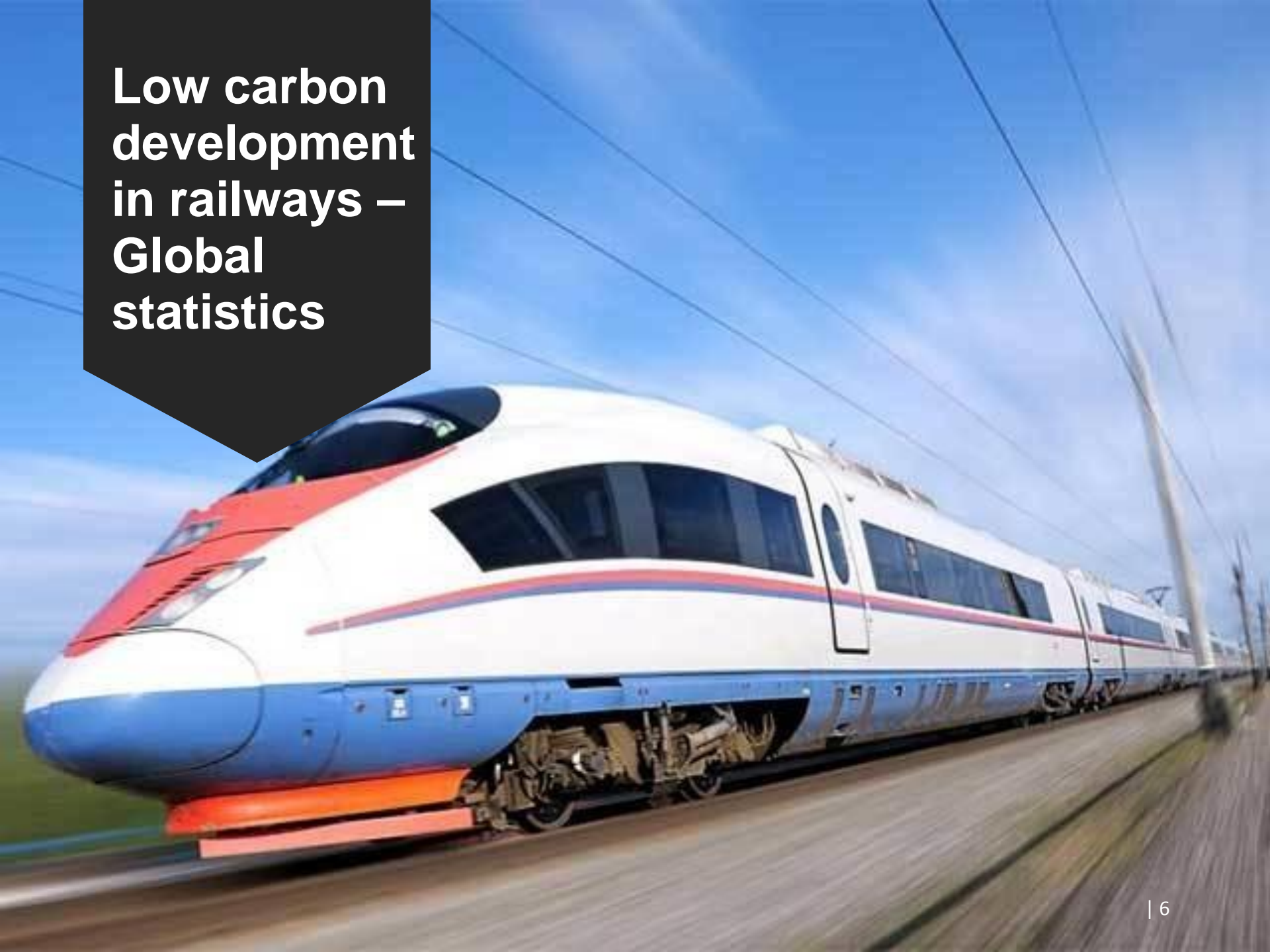
CLIMATE POLICY

- Low carbon development
- Air quality management
- HFC phase out, short-lived climate pollutants

SUSTAINABLE FINANCE

- International
- Domestic
 - ❖ Public
 - ❖ Private
 - ❖ Equity
 - ❖ Debt

**Low carbon
development
in railways –
Global
statistics**



Low carbon growth in railways – Global figures

The transport sector was responsible for emitting 7.5 billion tCO₂ (23.4%) in 2013. **3.5%** of transport CO₂ emissions were due to the rail sector, while railways transported **8%** of the world's passengers and goods.

At a global level, the International Union of Railways (UIC), targets for reducing its specific energy use and CO₂ emissions has proven to be in line with the trajectory of the **2** Degree Scenario (2DS) outlined in the IEA Energy Technology Perspectives publication (IEA 2016a).

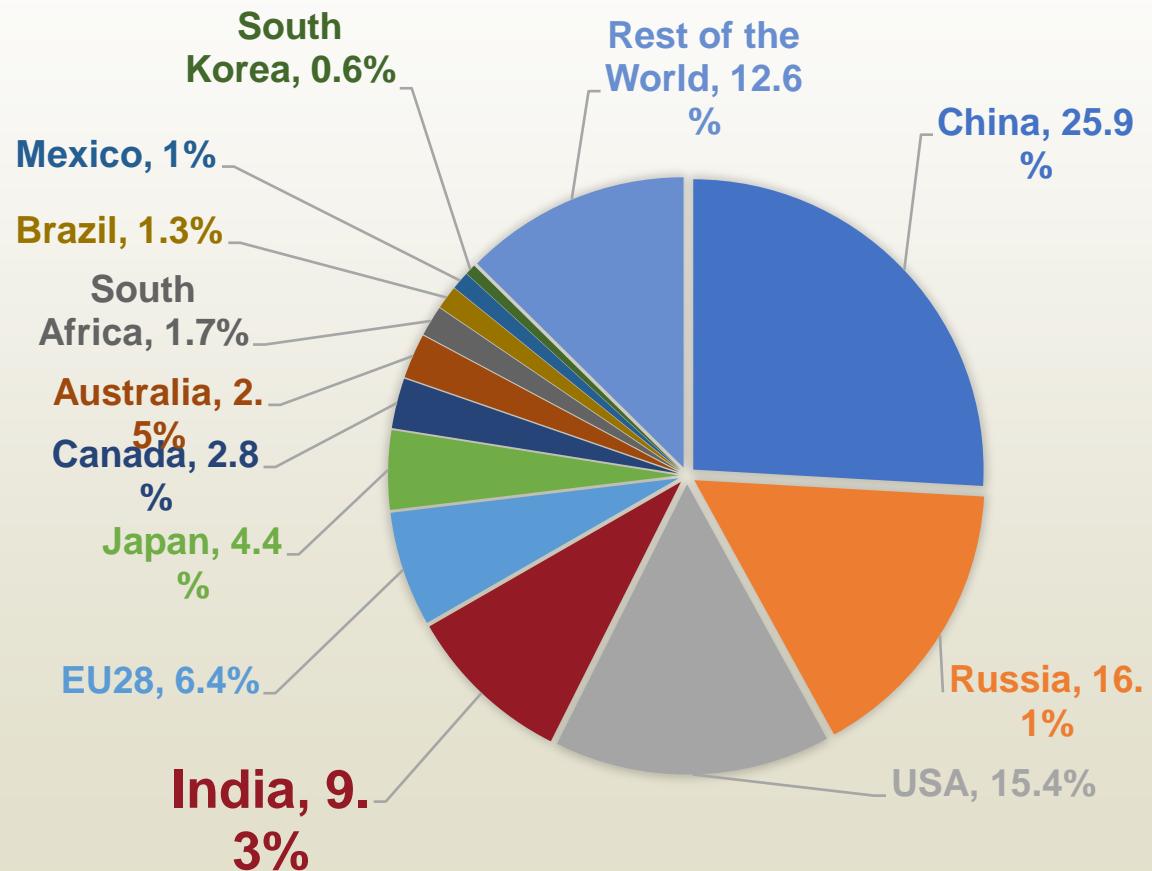
The share of electrified railway tracks has increased by **163%** between 1975 and 2013 at world level. China and Korea increased their share to **325%** and **343%** respectively from 1990 to 2013.

China has the lowest energy consumption (**40 kJ/pKM**) and the lowest CO₂ emissions per passenger-km (7 gCO₂/pKM), while **Russia** holds the lowest rate of energy consumption per tonne-km for goods transport by rail (**86 kJ/tKM**) and the lowest specific CO₂ emissions from freight (9 gCO₂/tKM).

Low carbon growth in railways – Global figures

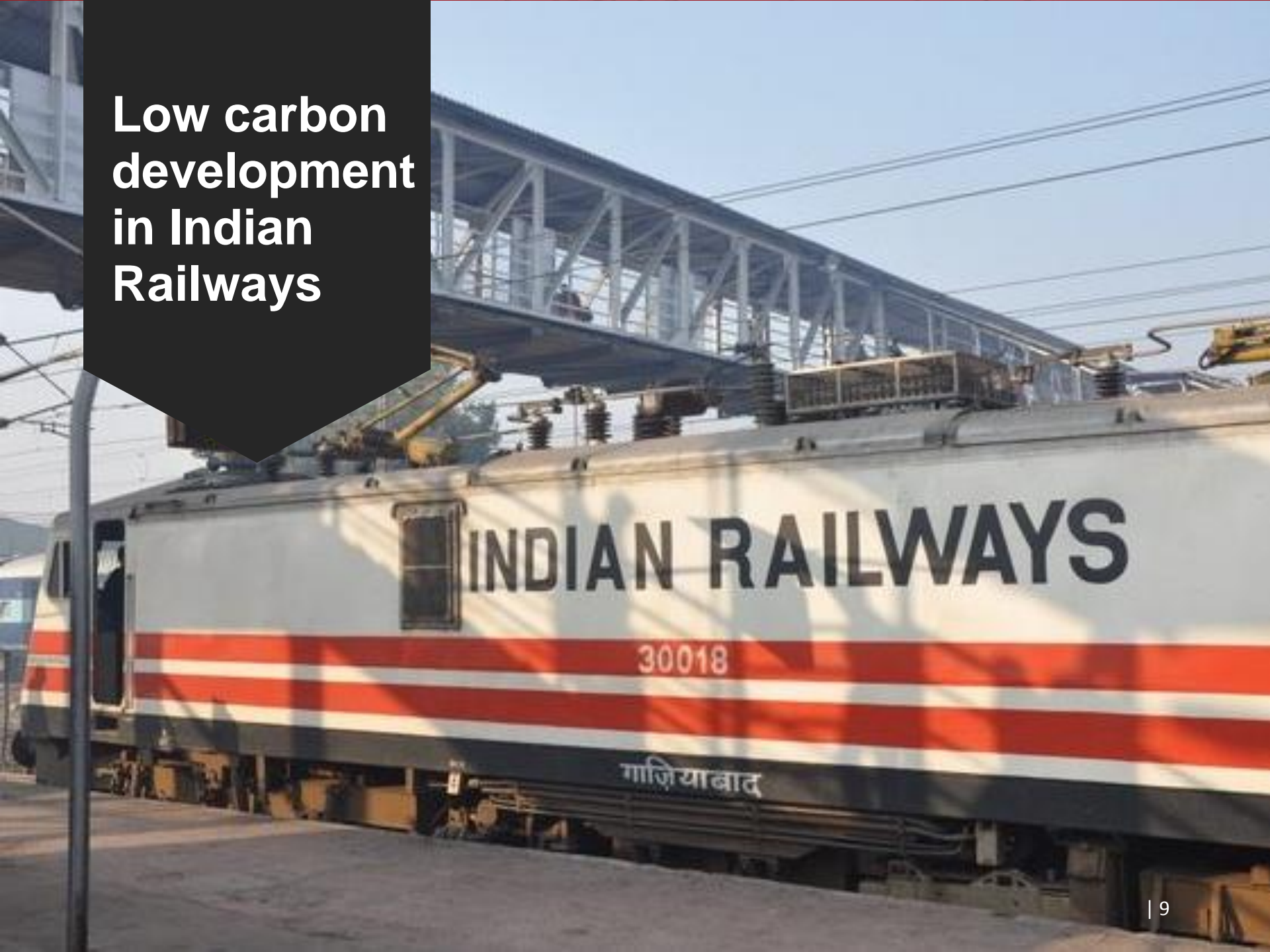
- Globally, specific energy consumption in Railways decreased by **63%** and **48%** in passenger and freight services respectively, between 1975 and 2013.
- Specific CO₂ emissions in the rail sector dropped by **60%** in passenger services and by **38%** in freight services between 1975 and 2013.

Figure: Share of railway CO₂ emissions by geographic area, 2013



Source: Elaboration by Susdef based on IEA (2015a)

Low carbon development in Indian Railways



गजियाबाद

Indian carbon emission by sector

Share of CO2 emissions from fuel combustion by sector, 2013

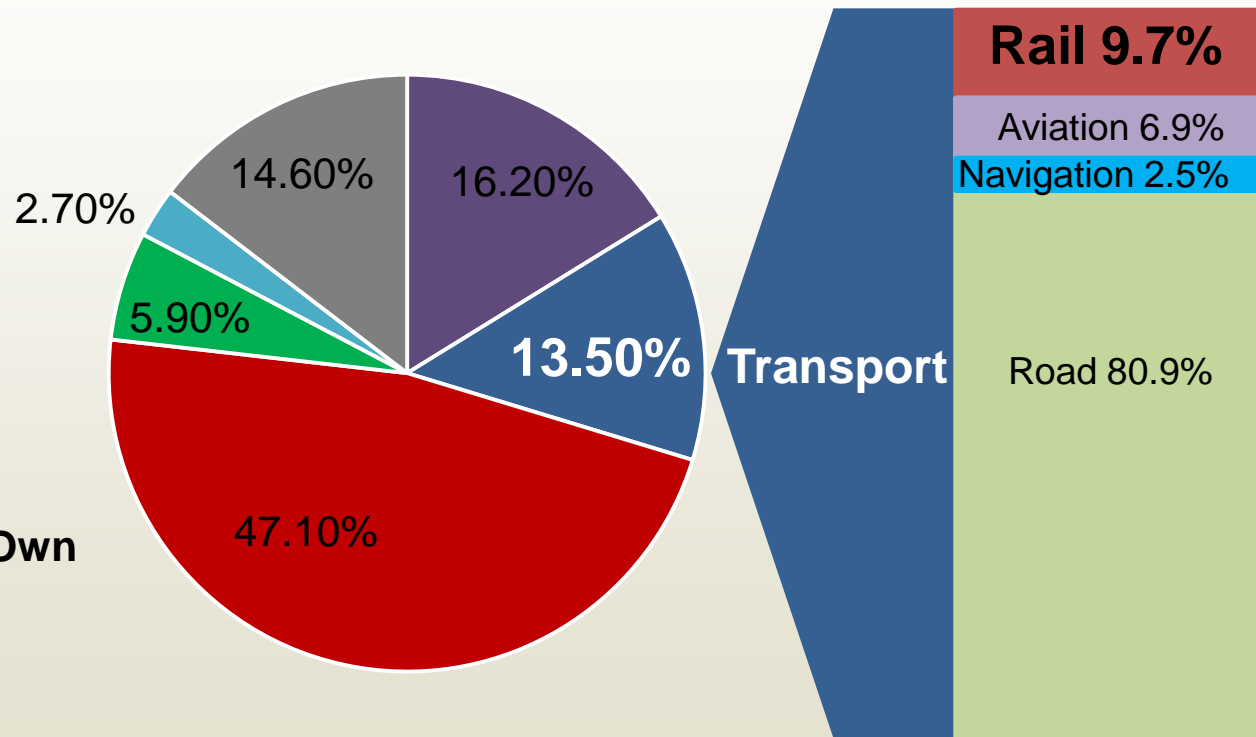
■ Residential

■ Transport

■ Manufacturing Industries and Construction
■ Commercial and Public Services

■ Energy Industry Own Use

■ Others



Note: Electricity and heat emissions are reallocated to the end-use sectors. In transport, all the emissions from electricity/heat production are reallocated to rail.

Indian Railways' vision addresses strategic national low carbon goals:

“To promote Green environment and clean energy while making the Indian Railways a global leader in sustainable mass transport solutions”.

Low carbon growth - Indian Railways

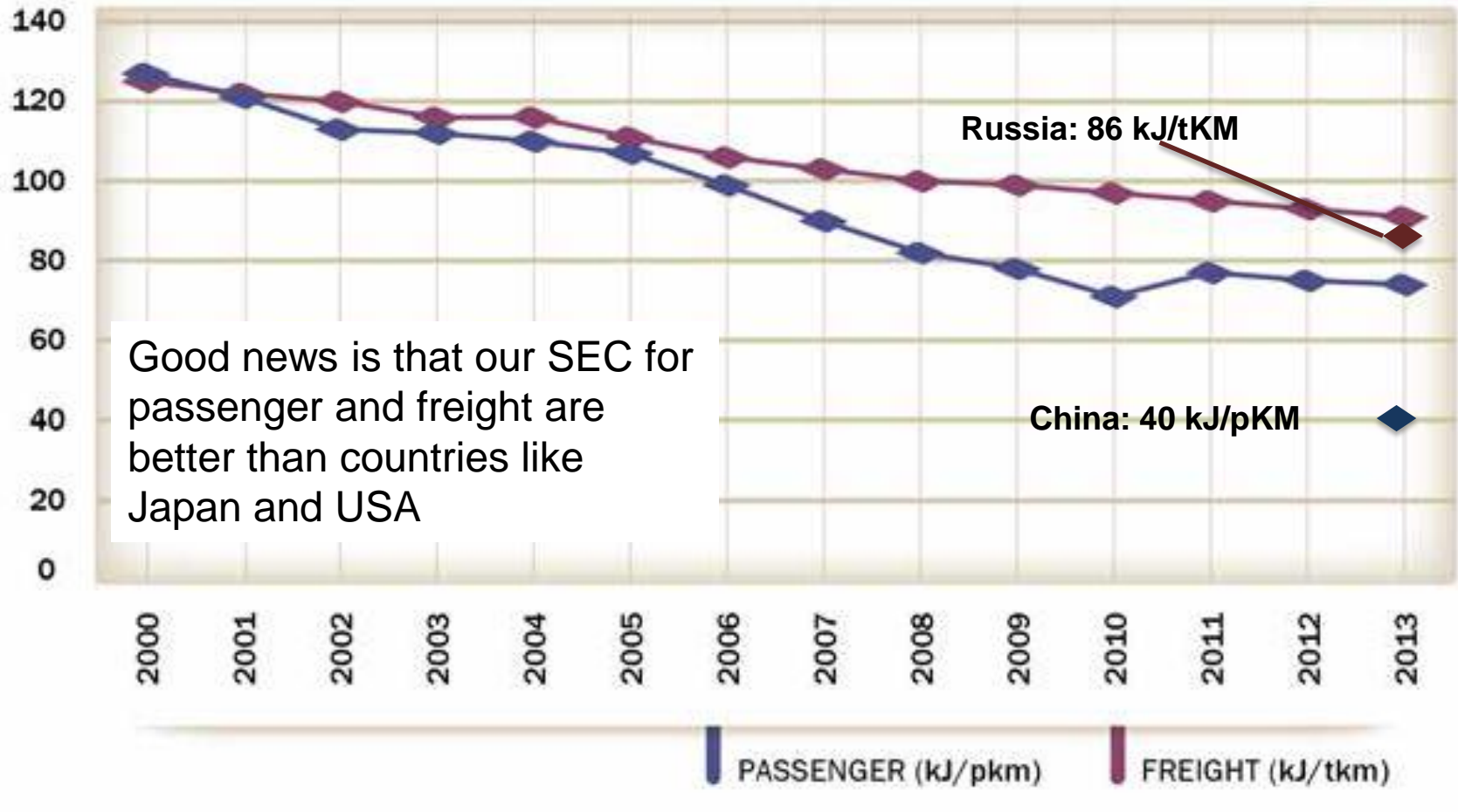
The low carbon mission statement of Indian Railways:

Mission Statement

- To promote energy conservation measures.
- To maximize the use of alternate forms of clean energy, thereby minimizing the carbon footprint of Railways.
- To provide clean and hygienic environment to customers.
- To promote conservation of water and other natural resources.
- To march towards Zero waste discharge from the major Railway units.
- To promote Green built-up spaces and expand tree-cover.
- Building in-house capacity to set up an effective Environment Management System.
- Noise reduction in railway operations.

Indian Railways – in the right path

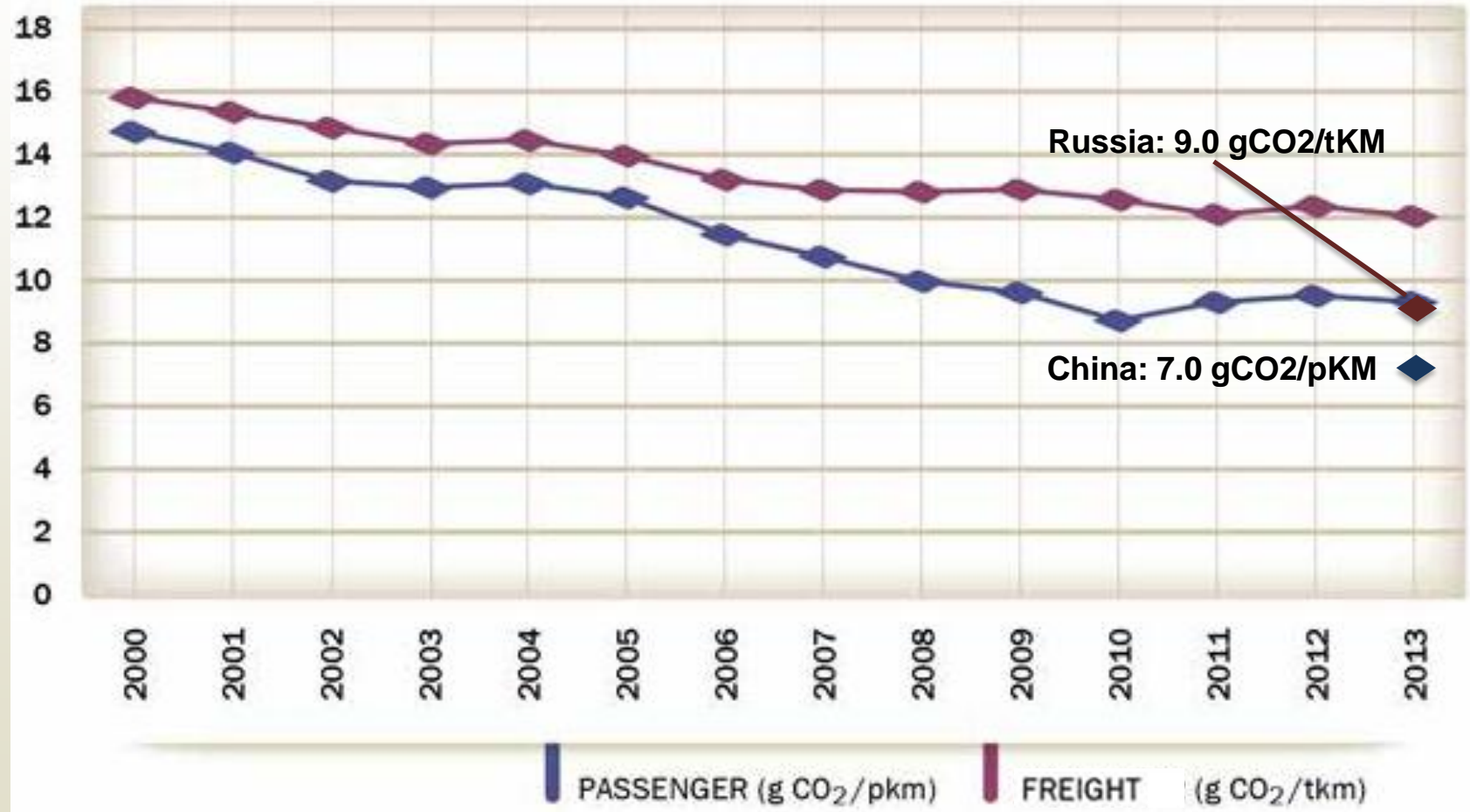
The Specific Energy Consumption (SEC) between 2000 and 2013: Dropped by **42%** for passenger services and by **27%** for freight services.



Specific energy consumption, 2000-2013

Indian Railways – in the right path

The specific CO₂ emissions between 2000 and 2013: Fell by **37%** for passenger services and by **24%** for freight services.



Specific CO₂ emissions, 2000-2013

Proposed low carbon policy outlook

MISSION ELECTRIFICATION



PLACE WITH
Y EFFICIENT
ING, A/Cs,
PUMPS



ALL NEW +
EXISTING INSTALLATIONS
AS PER BEST PRACTICES
AND TRACTION
ELECTRIFICATION

RENEWABLE
ENERGY

1GW



4GW

TARGET OF ROOF-TOP
SOLAR ACROSS RAILWAYS
STATIONS, CAR SHEDS AND
RAILWAY WORKSHOPS

TARGET OF LAND-BASED
SOLAR PV ACROSS ALL
RAILWAY ZONES

GOALS



25%

savings in electricity
consumption + Traction
energy efficiency



266MT

Savings of CO₂eq



10%

of all electricity
from renewables



72MT

Savings of CO₂eq

TAKING FORWARD INDIA'S NDCS

Set ambitious and bold low carbon goals

*Journey towards **Global Leadership** in low carbon development*

Global Best in Passenger segment (2013)	Indian specific energy consumption (2013)
40kJ/pKM (China)	~ 75 kJ/pKM (18.9 kWh/000GTKM)
Global Best in Passenger segment (2013)	Indian specific energy consumption (2013)
86 kJ/ tKM (Russia)	~ 90 kJ/ tKM (6.13 kWh/000GTKM)

- To achieve global leadership in low carbon & sustainable mass transport, Indian Railways must announce ***bold, ambitious & time-bound policy commitments.***
- To contribute to India's climate commitment.
- To overcome the chronic Indian ***fear of scale and speed.***

Bold policy decisions taken by Government of India

Few recent examples



175Giga Watt renewable energy integration by 2022.



Affordable housing (Pradhan Mantri Awas Yojana) **for all** by 2022.



LPG connections to **50 million below-poverty-line families** in three years under Pradhan Mantri Ujjwala Yojana.



Tax reform by implementing **Goods and Services Tax (GST)**.



Bullet trains for India by 2022.

Example of low carbon opportunities in Indian Railways



Low carbon opportunity in traction

- ***Direct impact on specific energy consumption for passenger and freight transport***

Rapid electrification of Indian Railways

Need for faster pace.....

YEAR	TOTAL ROUTE IN KMS	ROUTE KMS ELECTRIFIED	% AGE OF ELECTRIFIED TO TOTAL ROUTE KMS.
2010-11	64,460	19,607	30.41
2014-15	66,030	22,224	33.66
2015-16	66,687	23,555	35.32

- During 2015 - 16, **Direct CO₂** emission due to diesel consumption in railways is **7.6 million Tons**: Reduction Opportunity.
- Provide necessary **electrical load** for the power sector which is currently running at a low plant load factor.
- Direct impact on **specific energy** consumption in '000kWh/GTKM.

Low carbon opportunity in non- traction

- ***Impacts overall energy
consumption by railways***

Redevelopment of 400 railway stations

Immediate low carbon opportunities.....

BACK ON THE RAILS

461,487 hectares

Total Railways land

46,333 hectares

Vacant land Railways wants to monetise

July 2016

First contract awarded to Bansal Group to develop Habibganj station

₹450 crore

Expected investment for Habibganj

- ❑ **400** stations will be redeveloped for commercial use at an investment of about **INR One lakh crore.**
- ❑ **23** stations are selected for the first phase.
- ❑ The 400 stations will be designed by a pool of Railways-appointed architects and designers.

- Lock the benefit of **low carbon building design.**
- Mandate **Energy Conservation Building Code (ECBC) 2017** compliance.
- New constructions should be build as per the guidelines of either **ECBC+** and **Super ECBC.**

District energy system (DES)

DES for all Multimodal hubs developed by Railways

Example: Railway Station & Multimodal Hub proposed for Bhubaneswar

Site Area : 12 Acres

Type: Redevelopment Project

Total Built up area: **194,306 Sq.m**

Implementation: In 2 Phases

Typologies: Mixed Use
(Hotel, Office, Residential, Retail, Bus Terminal
& Railway building)

District Cooling Load: ~ **10,000 TR**

Demand reduction possibility: ~ **4 to 6 MW**



Can electrify 8 to 10 million below-poverty-line families.

Thank You