



GHG mitigation in India – Role of Indian Railways

Railway Board, Ministry of Railways
New Delhi 110001

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Specific actions for IR in India's INDC

- ✓ Endeavour to increase share of Railways in total land transportation from 36% to 45%.
- ✓ Construction of Dedicated Freight Corridor
- ✓ To improve Specific Fuel / Energy consumption in Traction system,
- ✓ 100% Production of energy efficient 3 phase locomotives from 2016-17 onwards.
- ✓ To install solar Power on land, roof tops, coaches.
- ✓ PAT scheme to be extended to Railway sector,
- ✓ Bulk users like Railways to use 5% blending of bio-fuels

Energy Consumption by Railways

During 2013-14 Railway consumed

- 2.8 Billion Litres of HSD Oil for Traction
 - 3.4 % of National Consumption and 6.0% of Transport sector consumption
- 14.4 Billion Units of Electricity for Traction
 - 1.8 % of National Consumption

GHG Mitigation strategies for I R

- Debottlenecking the existing network
- Strengthening the existing network
- Augmentation of network
- Energy efficient operation
- Renewable and Alternate sources of Energy

Mitigation Strategies - Passenger Traffic

- Increasing frequency, speeds & throughput of passenger traffic by Rail mode through capacity augmentation
- Use of Non suburban Electrical / Diesel Multiple Units as better option for medium distance transport
- Introduction of High Speed Rail service(HSR)

Mitigation Strategies - Freight traffic

- Stepping up rail share is the need of hour
 - Share of rail in freight decreased from 80% in 1950-51 to 36% in 2013-14
 - But absolute freight traffic increased from 44 BTKM in 1950-51 to 601 BTKM in 2009-10
- Dedicated Freight Corridor
 - 3376 km of Eastern and Western corridors by 2020
- Electrification – 10000 KM by 2020, further 15000 KM

Other important augments----

- Doubling - 10000 km by 2020
 - Further 16000 km by 2030
- Gauge Conversion – 3500 km by 2020
- New lines - @ 400 km p.a. up to 2020
 - @ 500 km p.a. up to 2030

Rolling Stock augmentation

- 4000 locomotives to be manufactured/ procured by 2020, further 7500 by 2030
- 9000/12000 hp energy efficient electric locos and 6000 hp state of the art diesel locos to be inducted.
- To procure 83000 wagons by 2020, further 195000 by 2030
- To manufacture/procure 34000 coaches by 2020, further 83000 by 2030
- To introduce distributed powered electrical multiple unit train sets

Mitigation measures

Energy Efficiency – Diesel Traction

- Improvement in Fuel Efficiency–
 - Passenger Traffic- 5.37% by 2020 compared to 2013-14 and further 4.23% by 2030
 - Freight traffic- 3.71% by 2020 compared to 2013-14 and further 3.86% by 2030
- Provision to handle Hotel load in Diesel Locomotives
- Auxiliary Power Units in Diesel Locos
- Multi Genset locos
- Common Rail Electronic Direct Injection (CReDI)
- Guidance for optimised Loco Driving (GOLD)

Mitigation measures ...Contd.

Energy Efficiency – Electric Traction

- Improvement in Energy Efficiency–
 - Passenger Traffic-2.12% by 2020 compared to 2013-14 and further 2.7% by 2030
 - Freight Traffic-7.22% by 2020 compared to 2013-14 and further 6% by 2030
- Switch over to 3 phase energy efficient Locomotive / EMU technology
- Introduction of latest Energy Efficient Locomotive technology with Regenerative Braking features
- Hotel load provision in locos
- Energy cum speed Monitoring System (EMSON) for energy efficient driving

Efforts on improving Energy efficiency Trailing Rolling Stock

- Pay load to tare ratio to be increased- 3.44 to 4.0/4.21
- Commodity specific wagons for better through put & logistic advantages for customers
- S.S. Coaches with higher C.C. To improve PKM to GTKM ratio

Comparison of Energy intensity in various modes

- Railways is the most energy efficient mass transport system
- Energy intensity comparison- 2004-05

Pass.	Railways	Taxis	Bus
Terra Joule/ BPKM	71	1338	196
Freight	Railways	HCVs	
Terra Joule/ BTKM	91	1125	

Railways is 2.8 times energy efficient in Pass. Traffic and 12.4 times in Freight Traffic

Transport Sector

Share of Traffic & GHG Emissions (2007)

Sector	Passenger Traffic (in %)	Freight Traffic (in %)	GHG emissions (tCO ₂ mn)	% Share of GHG emissions
Road	84.2	57.16	123.24	87.47 %
Rail	14.1	42.82	6.11	4.33 %
Aviation	0.7	0.02	10.12	7.18 %
Waterways	--	0.01	1.42	1.12 %

NTDPC estimates for Freight Movement

Years	Rail (BTKM, % shares)		Road (BTKM, % shares)		Total BTKM
1950-51	44	88	6	12	50
1970-71	127	69	57	31	184
1990-91	247	47	283	53	530
2004-05	411	39	643	61	1054
2011-12	668	34	1279**	66	1947**
2016-17 (GDP=6.9%)	982	35	1824	65	2807
2021-22 (GDP=8%)	1669	39	2610	61	4279
2026-27 (GDP=8.5%)	3011	45	3680	55	6691
2031-32 (GDP=9%)	5363	50	5363	50	10726

Report of Expert Group on Low Carbon Strategies

Passenger transport shares

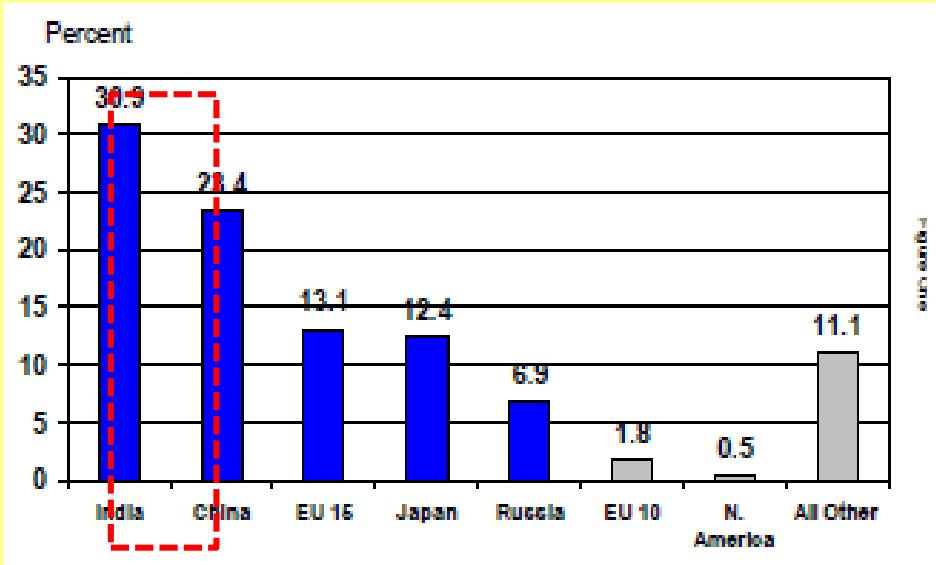
	2005	2010	2015	2020	2025	2030
Air	0.5%	0.71%	0.85%	0.97%	1.12%	1.32%
Rail	15.84%	14.6%	14.34%	14.5%	14.79%	14.94%
Road	83.67%	84.69%	84.81%	84.53%	84.09%	83.74%

Freight transport shares

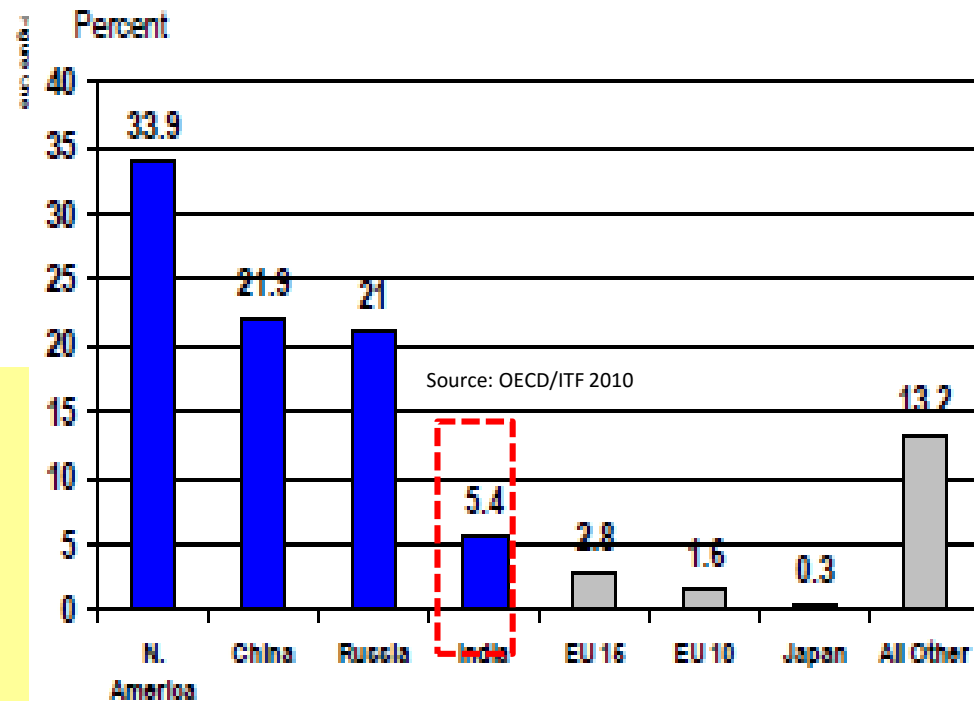
	2005	2010	2015	2020	2025	2030
Air	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
Rail	42.82%	41.69%	39.47%	36.79%	34.3%	32.32%
Road	57.16%	58.29%	60.51%	63.18%	65.67%	67.65%

Shares of global rail based transport

Global shares of passenger traffic



Global share of freight traffic



Declining railway shares is almost a global phenomenon

Country/Region	1970	1990	2000	2006	2007
China	76.6	40.5	31.3	24.7	24.8
Russia	76.2	59.0	58.6	57.5	59.3
India	71.1	63.0	40.0	34.0	35.0
EU10	77.3	63.0	40.5	31.0	29.3
EU15	31.5	19.7	15.4	15.0	14.8
US	3.6	38.2	29.7	44.8	44.8
Japan	31.7	9.0	6.6	6.3	6.2

Thank You

Use of Renewable Energy Sources

- Commitment to source at least 10% of electric energy through Renewable sources
- Includes 1000 MW of solar energy & 170 MW of wind energy
- Blending upto 5 % by using bio-Diesel by 2020
 - ✓ As on 12 KL being procured
 - ✓ Next year 50 KL to be the target
- CNG based Multi Unit under trials
- LNG based Diesel Locos being developed.

Bio - Toilets

- Developed indigenously with DRDO
- 17388 bio toilets installed in about 7000 coaches upto 2014-15
- 17,000 bio toilets to be fitted in 2015-16
- 4711 bio toilets fitted in 1347 coaches up to Aug. 2015
- All coaches to be fitted with bio toilets by 2021-22

Target for Emission Intensity reduction over IR

	tCo2/million GTKM	% reduction	Annual savings in million tCo2
2005	12.40	Base year	Base year
2014	10.82	12.7	3
2020	9.44	23	9
2030	8.35	31	23