



INTERNATIONAL UNION
OF RAILWAYS

unity, solidarity, universality

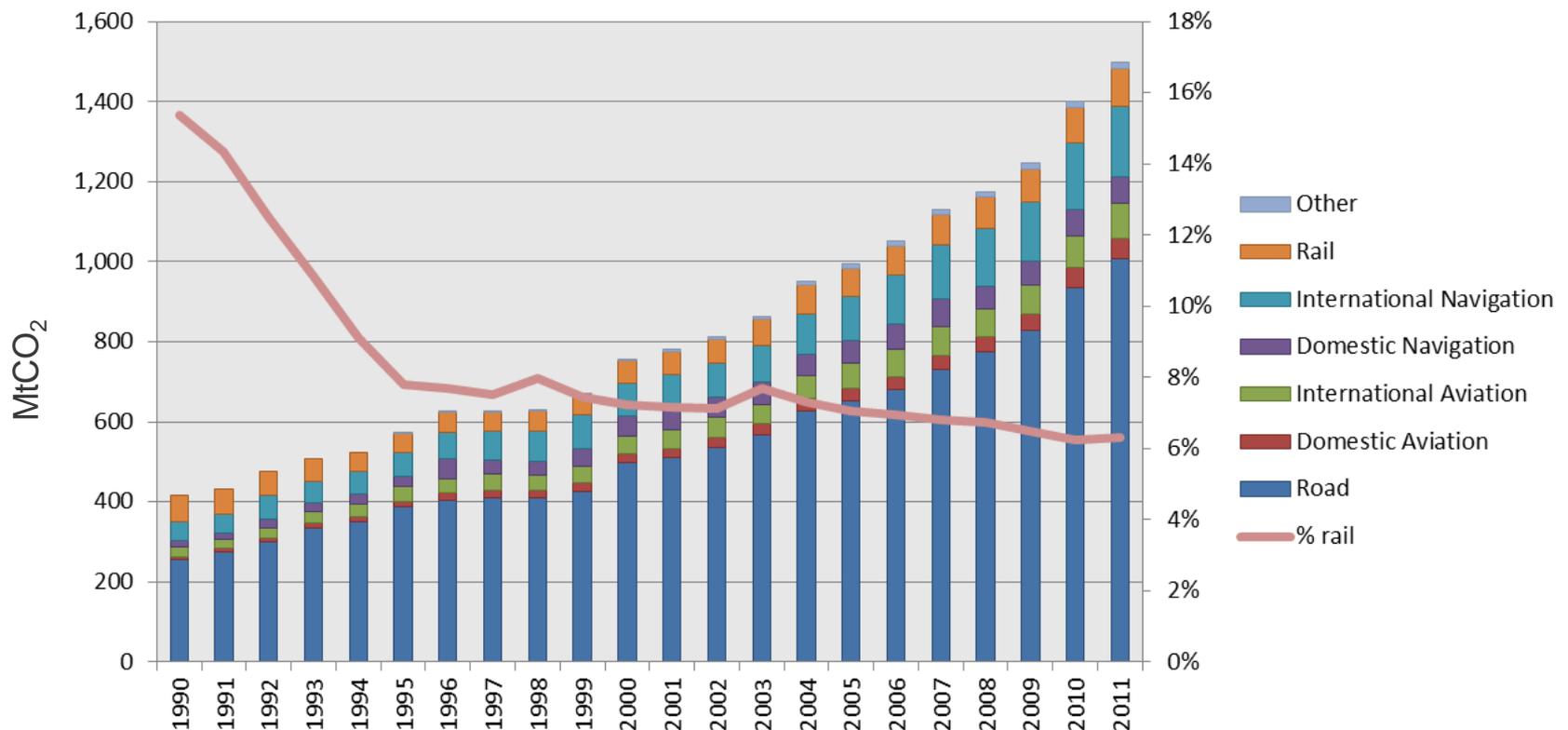
Expanding Railways – A Vital Means to Meet the Growing Transport Demand in Asia

Background paper on railways and sustainable development

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Sustainable Development
Colombo, 21st November 2014

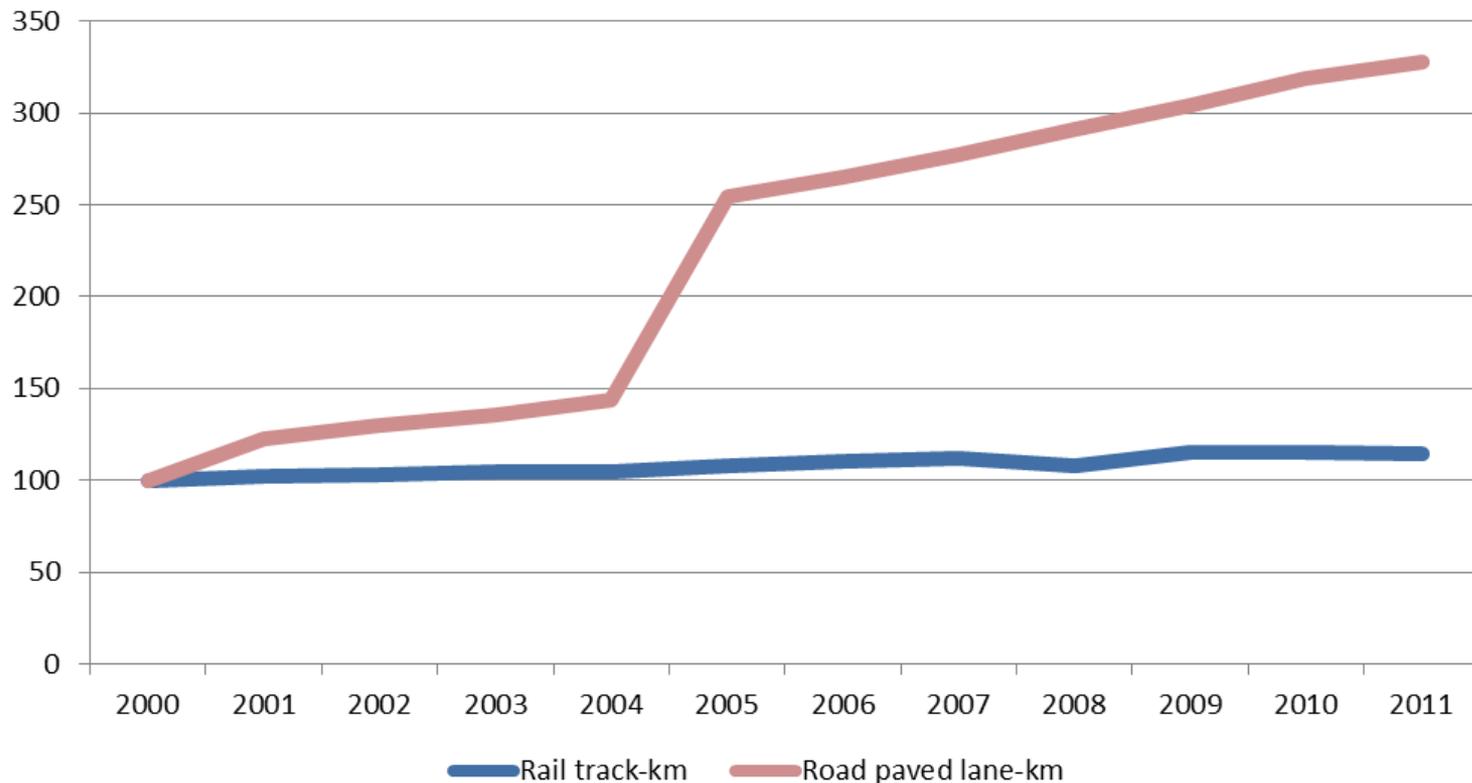


Total CO2 emissions from transport in Asia have increased almost four fold from 1990 to 2011. In the same timeframe, emissions from railways have been halved, dropping from nearly 16% of total transport emissions to about 6%, mainly due to better energy efficiency, substantial reduction of steam traction and more use of electrical traction systems.



Infrastructural choices have been heavily imbalanced in favour of road construction : the total amount of investments in road projects in Asia (new infrastructure and maintenance) is estimated at USD 332 billion, while the equivalent in rail is estimated at USD 17 billion (= ratio 1 / 20).

Road lane-km vs. rail track-km, China (2000=100)



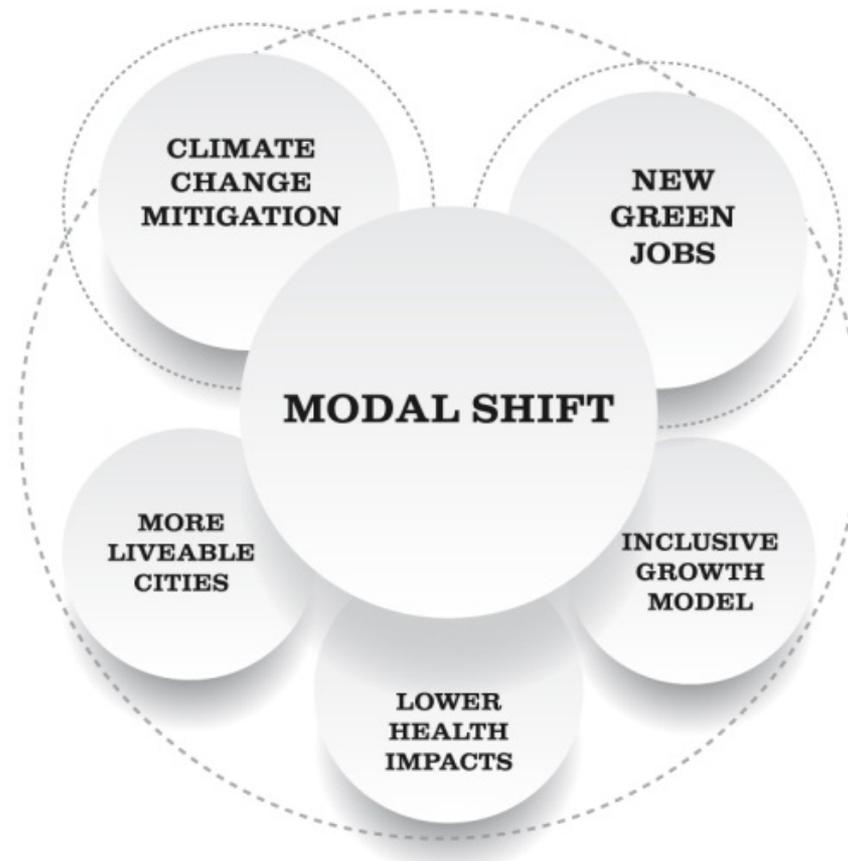
Unsustainable patterns of transport activity

In the long run a policy that favours road at the detriment of rail is destined to be not sustainable. Given the long term nature of transport infrastructure there is a risk that these investments will lock in **unsustainable patterns of transport activity** for years to come.

The IEA 2DS scenario, which generates many savings in road infrastructure expenditures (and incidentally allows for a world temperature increase of only 2 degrees) calls in fact for *Avoid* and *Shift* strategies in the transport sector.

An increased effort in the construction of new rail infrastructure is therefore needed : the 2DS scenario calls therefore for 200,000 more track-km than in the 4DS (or business-as-usual) scenario.

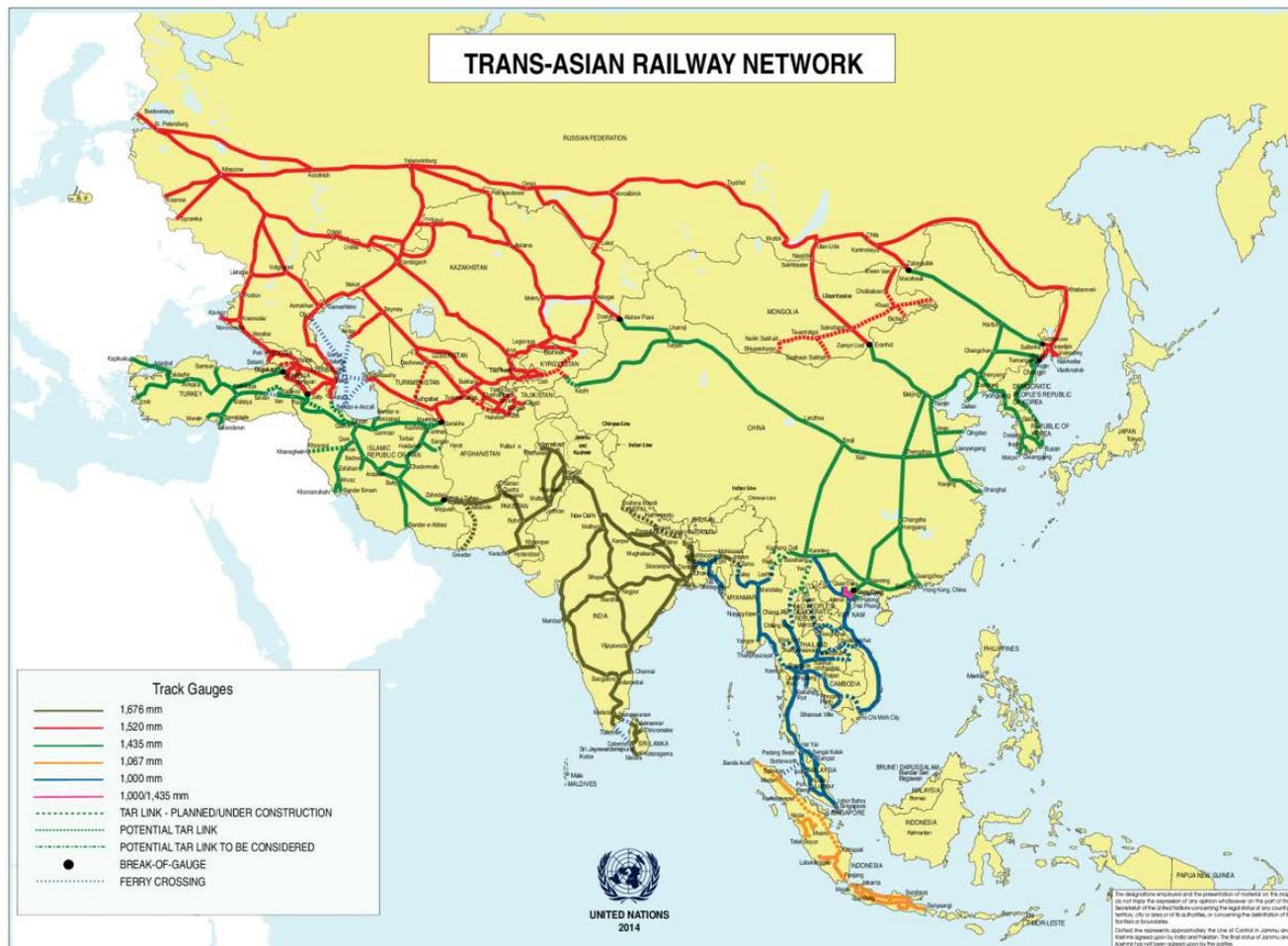
Green growth



More sustainable transport systems are required if we want to reach **green growth** , i.e. an acceptable level of GHG reductions, lower externalities , creation of green jobs, less health costs, social inclusion and economic growth.

Trans-Asian Railway (TAR)

The main initiative being developed to facilitate rail communication in Asia is the **Trans-Asian Railway (TAR)**, an integrated railway network comprising 117,500 km of line and serving 28 Asian countries. The project is promoted by UNESCAP.



Missing links

In the **TAR**, several **missing links** still need to be built and lines need to be upgraded (**opportunities** in OSJD corridors that go from Eastern Europe to China, Mongolia and Vietnam and ECO rail corridors that connect Turkey to Iran and Central Asia, as well as in the SKRL routes in ASEAN countries, between Thailand, Cambodia, Laos, Myanmar and Vietnam).

5 different **track gauges** are used in the railway lines : this creates the *break of gauge* issue : crossings – typically at international borders – where the track gauge changes.

The **electrification of the network** is another great option for development. Only about one-third of the lines are currently electrified.



The higher sustainability of rail : air quality

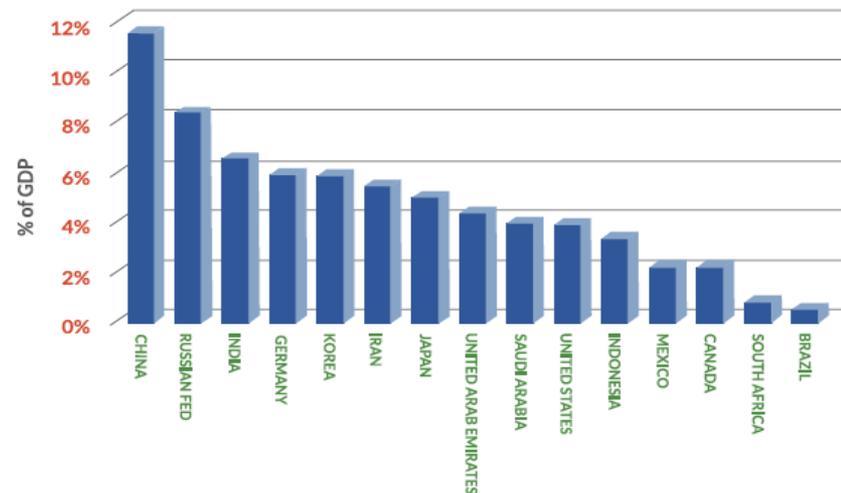
Pollutant	Mumbai	Delhi
CO	Transport: 92% Industrial, Domestic and others: 8%	Transport: 76 - 90% Industrial, Domestic and others: 10 – 24%
NOx	Transport: 60% Industrial, Domestic and others: 40%	Transport: 32 - 74% Industrial, Domestic and others: 26 – 68%
SOx	Transport: 2% -4% Industrial, Domestic and others: 96 -98%	Transport: 5 - 12% Industrial, Domestic and others: 88 – 95%
TSP	Transport: Nil - 16% Industrial, Domestic and others: 84 - 96%	Transport: 3 - 22% Industrial, Domestic and others: 78 – 97%

Source: Adapted from the expert committee report on auto fuel policy, GOI, India, 2002

Note: Transport sector contributes a major share of ambient PM10 concentrations. However, apportionment of PM10 is not yet established and hence is not given here in this table.

Urban road-related transport is responsible for the majority of CO₂ and Nox emissions. Particulate matter, whose main source is road vehicles, leads to diseases and high rates of mortality. The modal shift to urban rail can drastically reduce these impacts.

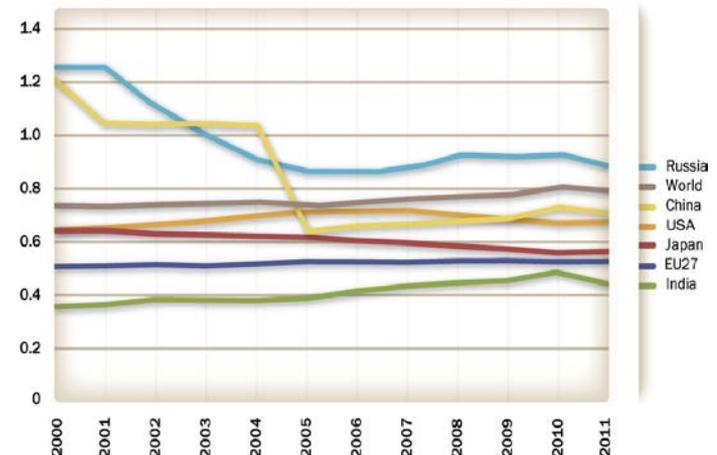
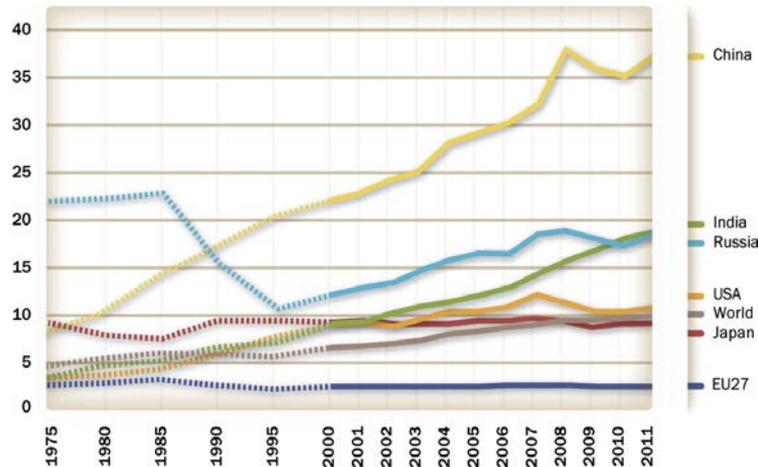
COST OF MORTALITY FROM OUTDOOR PM 2.5 EXPOSURE
-AS % OF GDP (MEDIAN ESTIMATES), 2010, 15 LARGEST CO₂ EMITTERS



The higher sustainability of rail : occupancy

Railways have a much higher occupancy level than road. In the world, for each kilometre of track, railways carry 10 times more transport units (pkm + tkm) than what is carried in one kilometre of paved road. In India and China, **railways transport at least 40 times more transport units than road per km of infrastructure**, and while road occupancy has been stable since 2000, it has grown by 50% for rail worldwide (70% in China and nearly doubled in India).

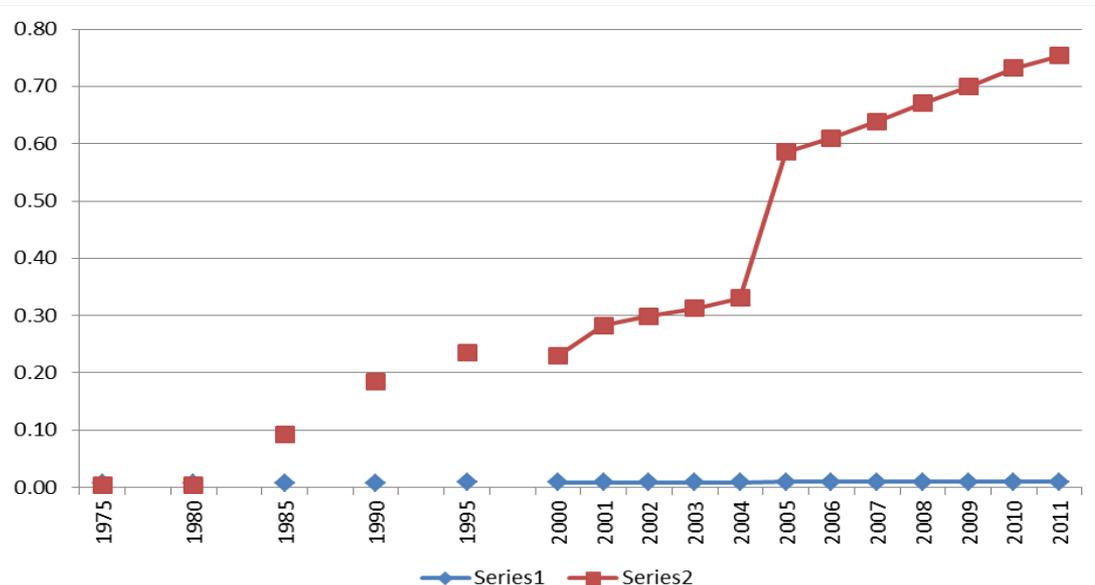
Evolution of railway tracks (left) and paved roads (right) occupancy level, 2000-2011 (million transport units per paved lane-km or rail track-km)



The higher sustainability of rail : land use

The amount of land used by road infrastructures in China is 79 times higher than the amount of land used by railway infrastructures. The increase of land use of road has been of **143% in India and more than 300% in China**. At the same time, the land use of railways has been more or less constant globally, with small increase of 8% and 13% in India and China respectively.

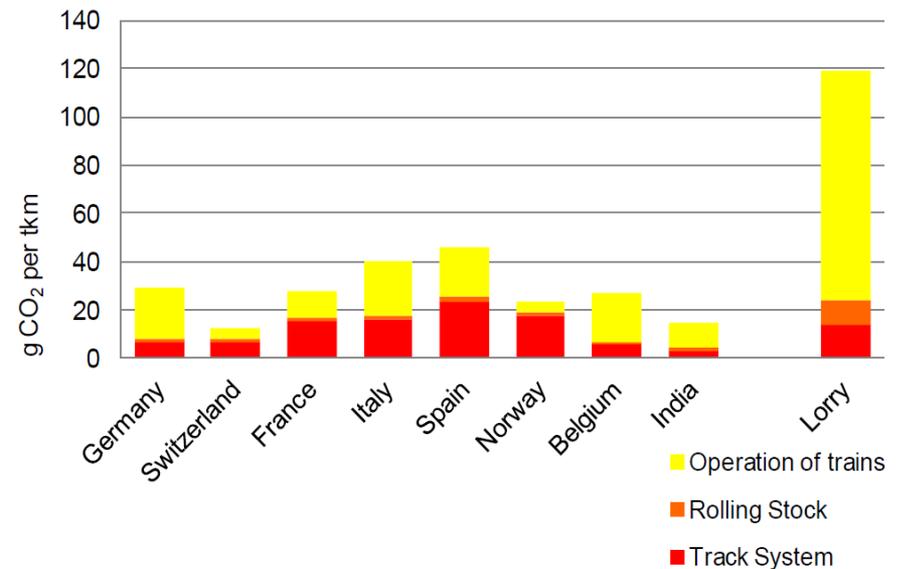
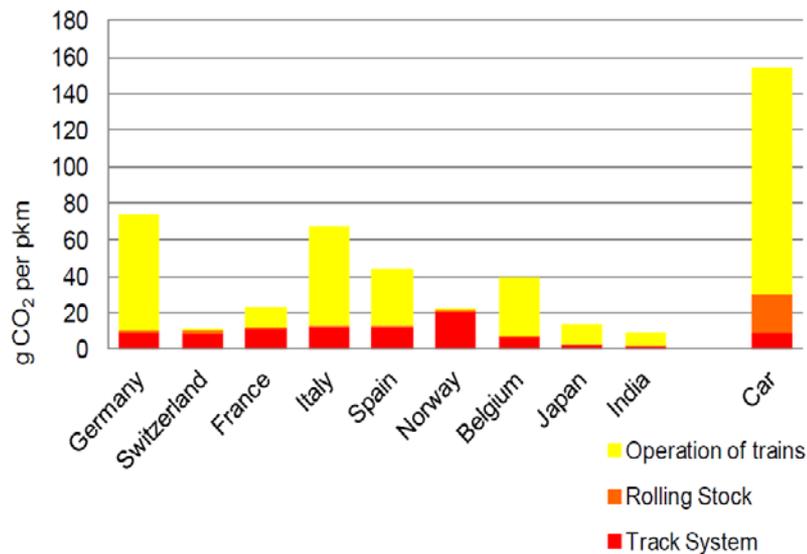
Evolution of paved roads and railway tracks land use in China, 1975-2011 (paved lane-km or rail track-km per km² of land)



The higher sustainability of rail : lower carbon footprint of infrastructure

A research commissioned in 2011 by UIC (Tuchs Schmid 2011) has studied the carbon footprint for several countries (including India and Japan). The result is that even though the construction of rail infrastructure has a considerable impact on the footprint, the environmental advantage of railways, compared to road, is kept both in passenger and freight transport.

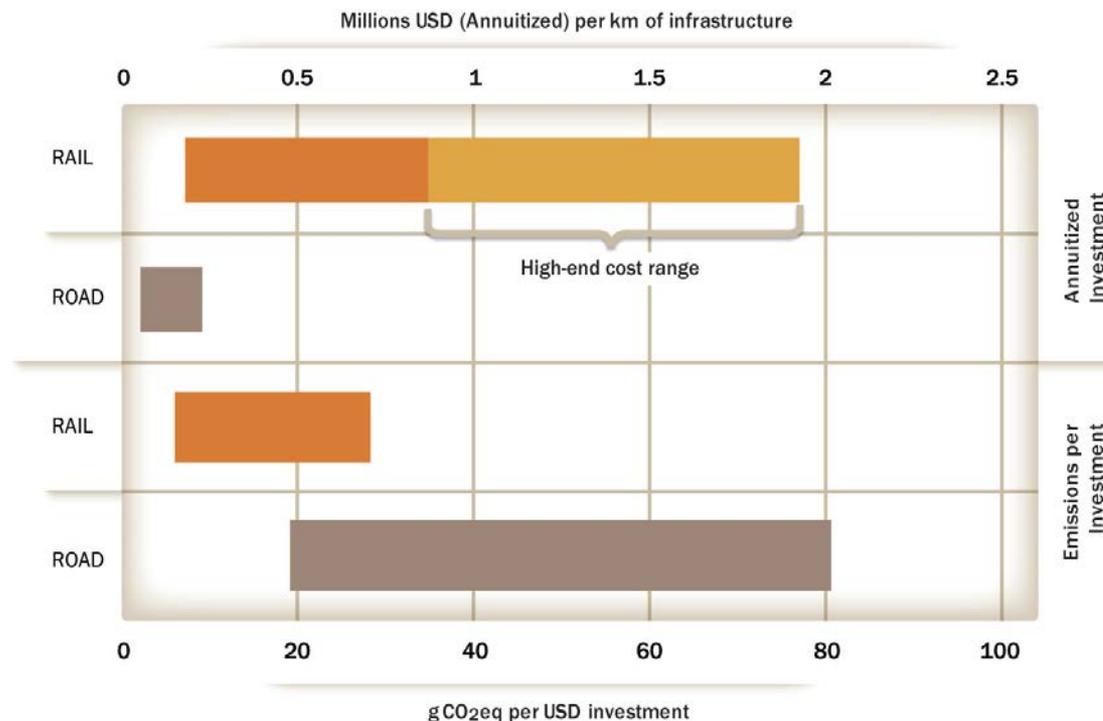
Carbon Footprint of passenger and freight rail transport in selected countries



The higher sustainability of rail : Lower emissions per investment

The IEA estimations show that each US Dollar spent in road infrastructure gives rise to road activities, **which itself generates from 3 to 14 times more CO₂ than what would be generated by rail activities** if the same US Dollar was spent in rail infrastructure.

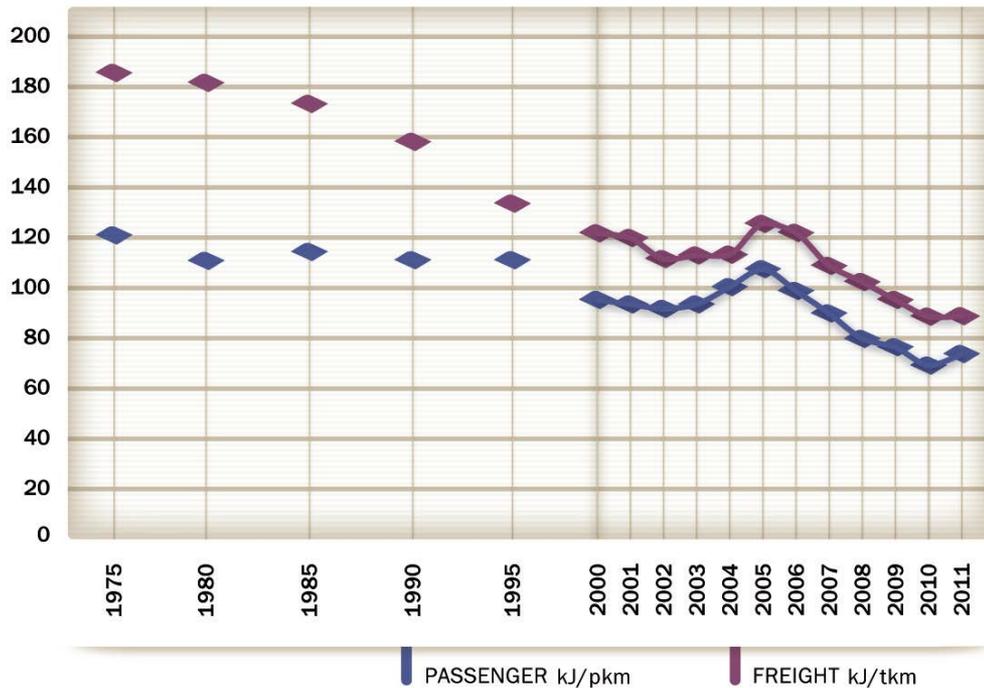
Estimate of annuitized investments (top) and emissions per investment (bottom) for road and rail



Asian Railways have improved !

The specific energy consumption in India has decreased by 40% for rail passenger and by 53% for freight transport. The Indian Railways have set an ambitious program of energy efficiency both for train traction and non-traction management (stations, buildings, workshops).

Railway specific energy consumption in India, 1975-2011



Traction Applications

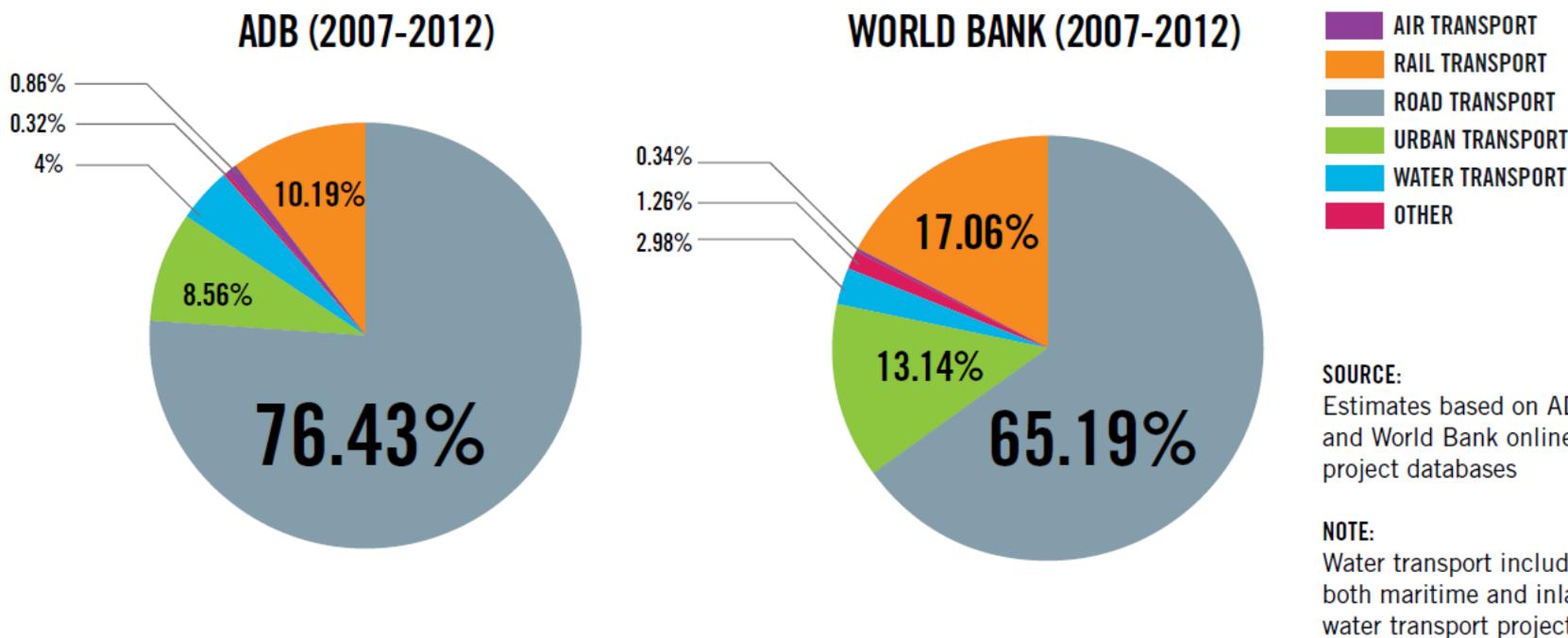


- Shift to three-phase locomotives from conventional locomotives.
- Shift to IGBT based 3 - phase locomotive .
- Promote use of train-sets with regenerating braking features.
- Promote use of Head On Generation System for train lighting and air-conditioning load
- Electrification as a tool to reduce fuel consumption

Investments: right choices ?

More than 76% of the Asian Development Bank's investments in transport is spent on road projects, and **only 10% on rail**. The World Bank is only slightly more focused on rail, with 17% of its spending compared to 65% spent on road.

ADB and World Bank investment in transport, 2007-2012



Good examples of modal shift investments

The Indian Dedicated Freight Corridor (DFC)

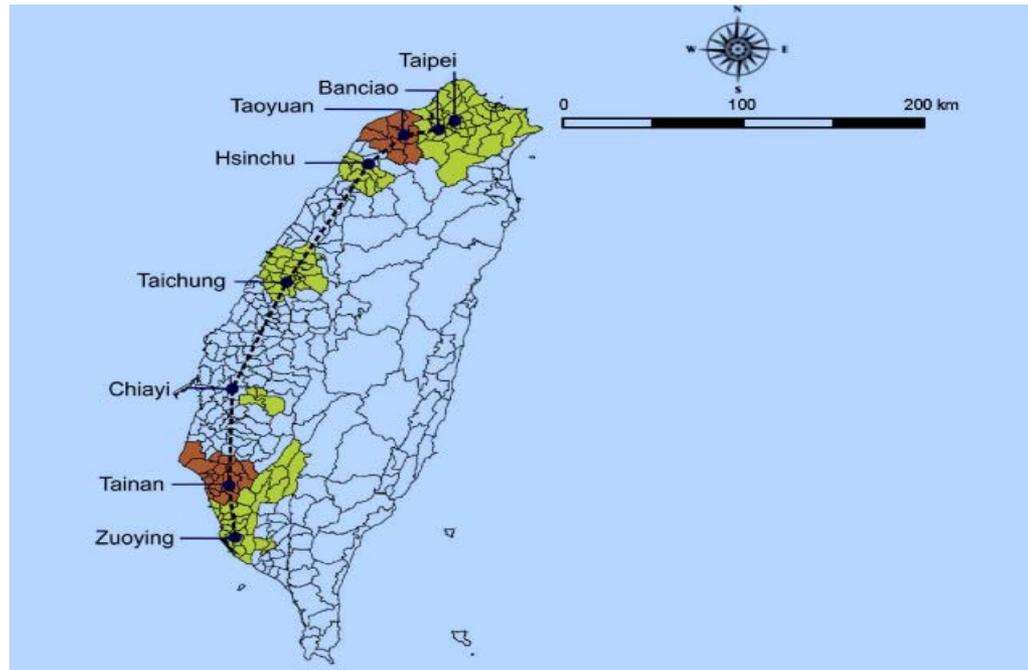


The two corridors are currently under construction.

Cumulative emission reductions (in the 25-year period between 2016-17 and 2041-42) have been estimated to 60% for the Eastern corridor, and about 83% for the Western corridor (for a total reduction of 457 million tonnes of CO₂, or 79%).

Good examples of modal shift investments

High Speed Rail Taipei-Kaohsiung



During the period from January 2007 to December 2012, the amount of domestic flights serving the west coast declined dramatically by 44%. Express buses rides and private car rides also decreased significantly.

World Railways: the UIC new energy efficiency target

Energy Consumption per pkm + tkm

1990

-50%

2030

By 2030 the world railway sector will reduce its specific final energy consumption from train operation by 50% compared to the 1990 base year, measured per transport unit (passenger*km + ton*km)

1990

-60%

2050

By 2050 the world railway sector will reduce its specific final energy consumption from train operation by 60% compared to the 1990 base year, measured per transport unit (passenger*km + ton*km)

World Railways: The UIC new CO₂ emissions target

CO₂ emissions per pkm + tkm

1990

-50%

2030

By 2030 the world railways will reduce their specific average CO₂ emissions from train operation by 50%, compared to baseline year 1990.

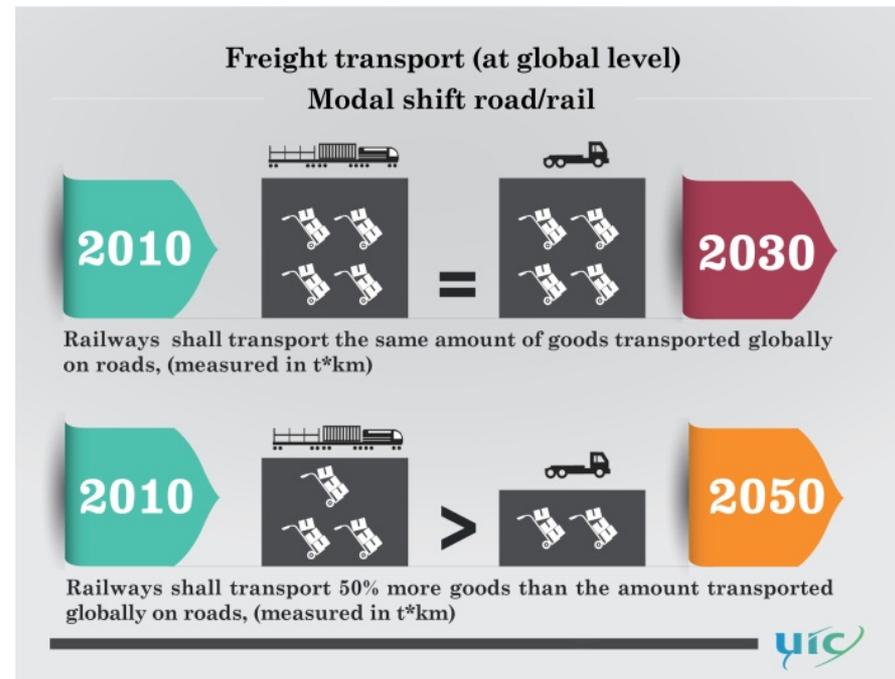
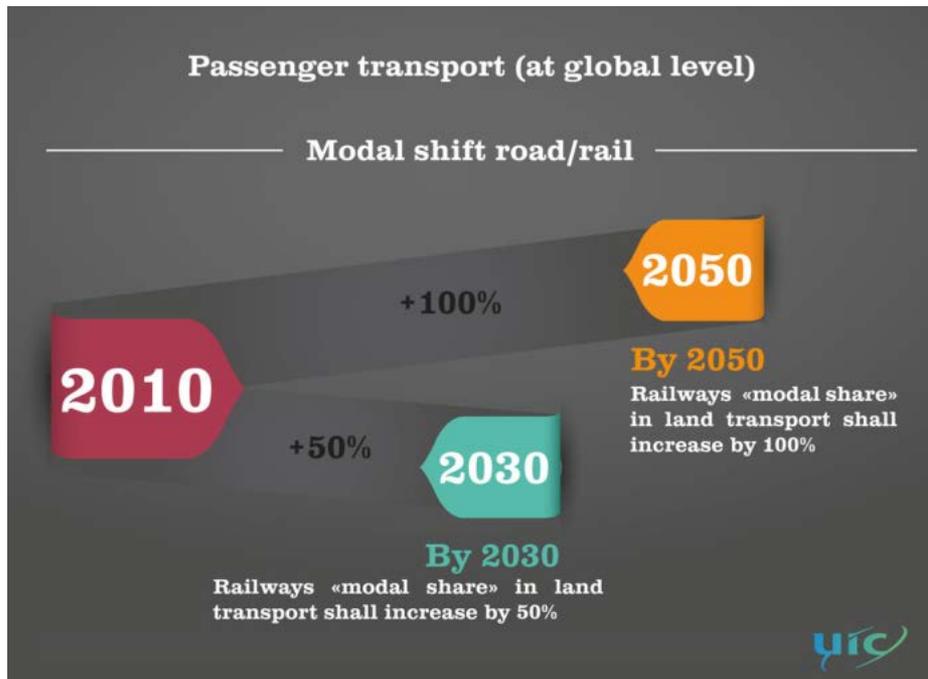
1990

-75%

2050

By 2050 the world railways will reduce their specific average CO₂ emissions from train operation by 75%, compared to baseline year 1990%.

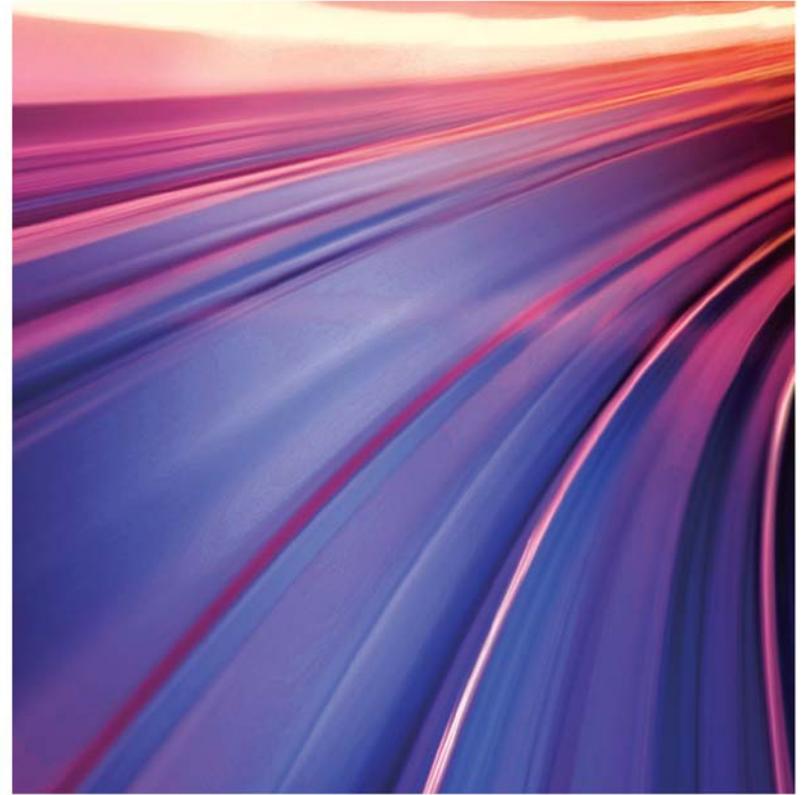
UIC Modal Shift Challenge





STRATEGIC ACTION PLAN FOR UIC ASIA PACIFIC

2013-2016



CHALLENGE 2050

THE RAIL SECTOR VISION



Synergies between UIC and its partner organisations

Railways associations: OSJD, regional railway associations: CER, EIM, AAR, ALAF, AUR, UAR / UAC, ...

Railway industry and contractors: UNIFE, FIEC, EFRTC, ...

Intergovernmental organisations:

- UN, UN / ECE, ESCAP, ...
- OECD
- EU institutions,
- Council of Europe,
- Specialised bodies: ERA, CEMT / ITF, OTIF, ...

Transport sector trade associations: UITP, IRU, IATA, UFTAA, FIATA, UIRR, UIP, ERFA, ...

International associations and interest groups for tourism, environment, ...

International financial institutions: World Bank, EIB, EBRD, ADB, ...

International standardisation bodies: ISO, CEN / CENELEC, ETSI, IEC, ...



Signatories of the Declaration on Sustainable Mobility and Transport

- AAE
- ADIF
- AMTRAK
- ATOC
- Atlica
- CD
- CFL
- CFL Cargo
- CFR Calatori
- CFR Marfa
- CFR SA
- CP
- DB
- DSB
- Eurostar
- FS
- GYSEV Raaberbahn
- HZ Holding
- Indian Railways
- INFRASEL
- JBV
- JIR
- JR-East
- KR
- KTZ
- MOR
- Network Rail
- Niroo Rail
- NRIC
- NSB
- ÖBB
- PKP
- ProRail
- RAI
- RZD
- SBB AG
- SETRAG
- SNCB
- SNCB-Holding
- SNCF
- SZ
- SZDC
- Taiwan HSR Corp
- TODD
- TRAFIKVERKET
- UNIFERTRANS SA
- VR Group
- ZSR
- ZSSK
- ZSSK Cargo



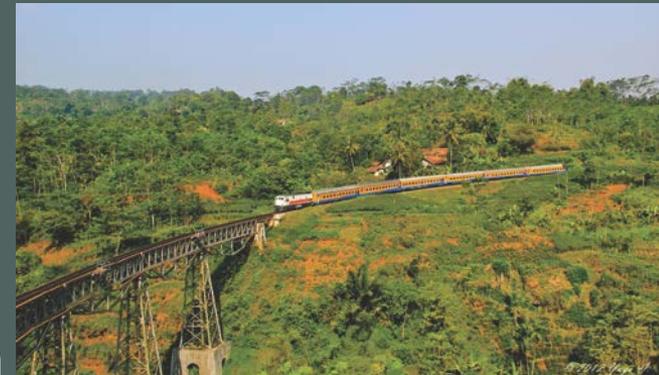
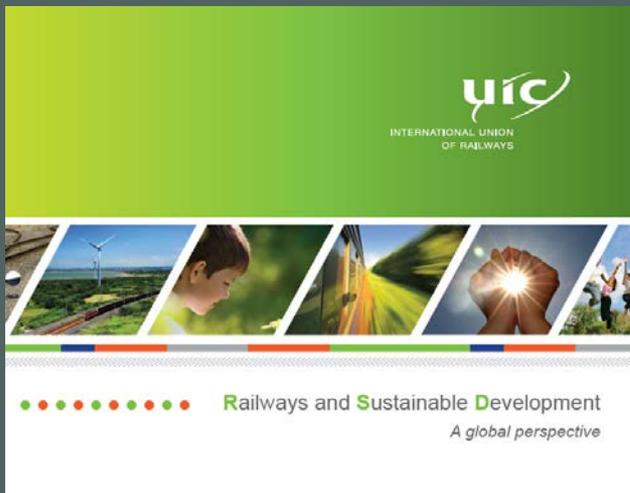
Latest update: 23 May 2012





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■ ■ ■ Thank you for your kind attention

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