INTERNATIONAL UNION OF RAILWAYS

unity, solidarity, universality

Transport Day – Middle East Rail Development & CO2 Update

Alex Veitch

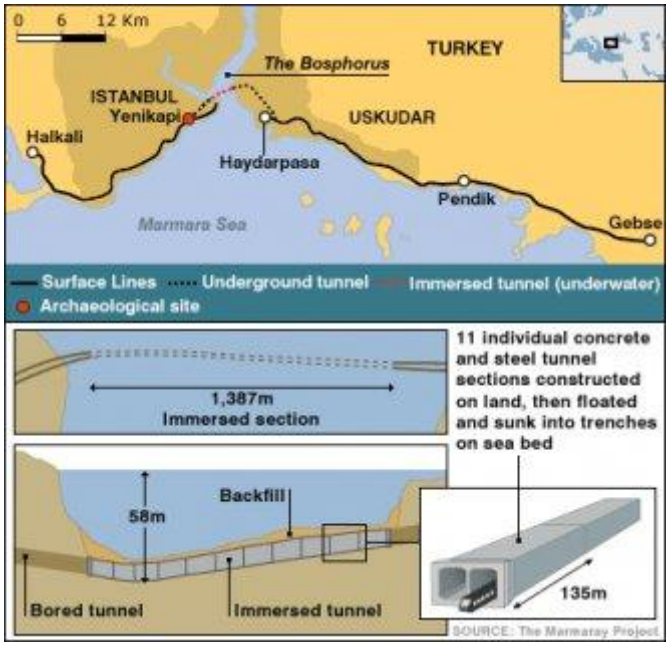
Head of Unit – Sustainability, UIC

Contents

- Middle East Rail Development
- Rail and CO2 – Update

Turkey: Suburban Rail

- Major project to improve the rail network around Istanbul
- Includes the Marmaray Tunnel – the world's deepest undersea immersed tube tunnel dedicated to rail traffic, linking the European and Asian sections of Istanbul
- Upgrades to the suburban rail lines will increase Istanbul's rail usage from 3.6% to 27.7%,
- This would be the third highest in the world, behind Tokyo (60%) and New York City (31%).



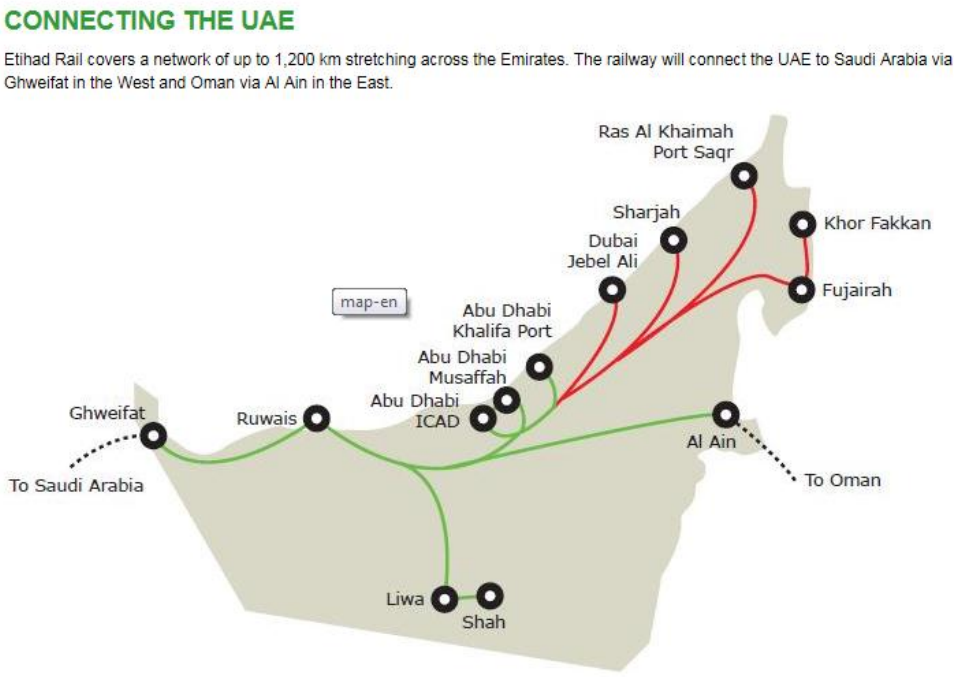
Turkey: Ankara Konya High Speed

- The Ankara-Konya high speed rail line, a high quality double-track enabling speeds of up to 300 km/h, was inaugurated on 23 August 2011
- The travel time is now 1h 30 and the time will be reduced to 1h 15 after new high speed train sets are procured
- The line was completed in 4 ½ years, compared to an average high speed rail construction time of 5-13 years.
- General characteristics of the line
  - Total Length : 309 km
  - Length of construction : 212 km
  - Project speed : 300 km/h
  - Min. Curve Radius : 6500 m
  - Max. Slope : %o 16
  - Travel Time : 1 h 30 min
  - Cost : TL 950 mil.

Mr. Recep Erdogan, Turkish Prime Minister, Mr. Binali Yildirim, Minister of Transport, and Mr. Süleyman Karaman, President and Director-General of Turkish Railways TCDD, in the driver's cab of the YHT high speed train during the inauguration of the new Ankara-Konya high speed section (© TCDD)

United Arab Emirates: Etihad Rail

- Total investment is estimated at AED 40 billion (around 11 billion USD).
- The project will be phased over a number of years, with the first phase scheduled for completion by 2014.
- The network is estimated to extend up to 1,200 km.
- The railway will initially operate diesel trains but will be designed and constructed to accommodate electrification in the future.
- Freight trains will run at speeds of up to 120 kilometers per hour, while passenger trains will reach speeds of up to 200 kilometers per hour.



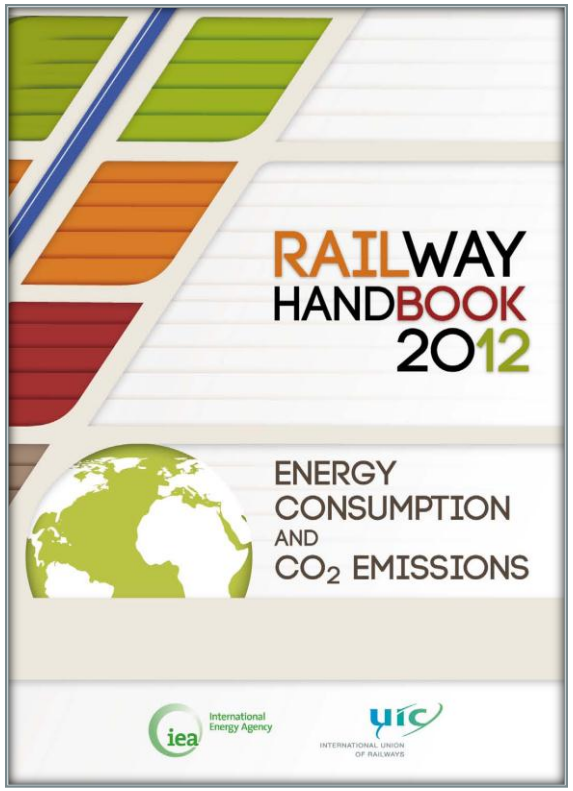
Amman Declaration

- **Declaration at the High-Level UIC Middle East Regional Assembly Conference on 4-5 November 2012 in Amman**
- **Under the high patronage of the Minister of Energy & Natural Resources and the Minister of Transport of the Kingdom of Jordan**
- **Chair: Turkish Railways President Mr. Karaman**
- **The UIC Middle East Regional Assembly agree:**
  - Promote and develop an integrated and coherent transport system for the Middle East, in close cooperation with all stakeholders, financial institutions, within frameworks of multilateral agreements
  - Strengthen regional cooperation between UIC Middle East member railways, particularly in technology, operations, business and training
  - Launch new regional cooperation projects

Rail and CO2 - Update

- Highlights of IEA Data Handbook
- High Speed and CO2

The first UIC-IEA joint publication **on "Energy Consumption and Co2 emission of world railway sector"**



Objectives:

-Promote good performance of railways with sound scientific evidence

-"Certification" of railways official data within international context

- Co-operation for robust Energy and Co2 data of the railway sector

Fig.9 Total CO_2 Emissions by sector, 2009

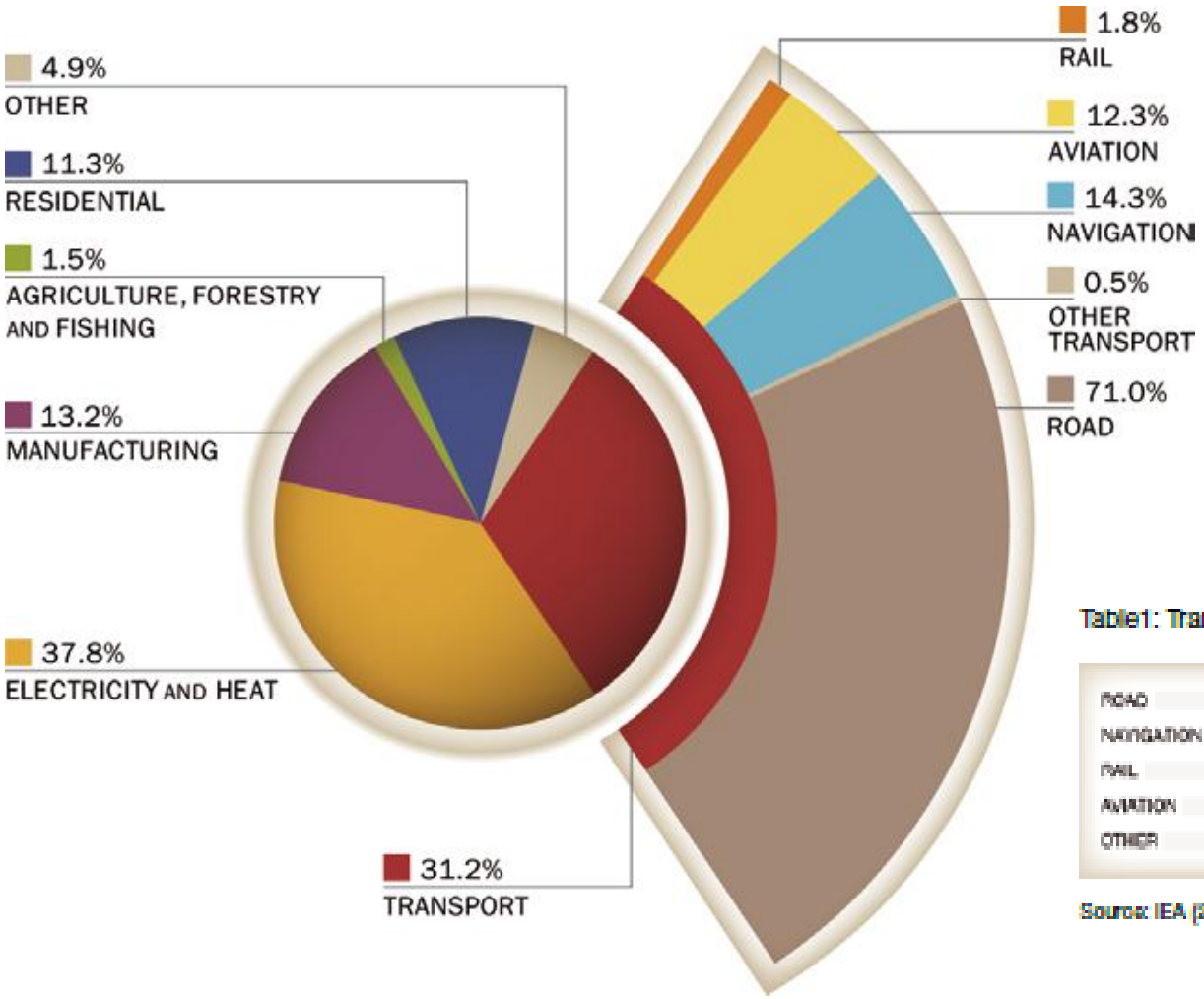
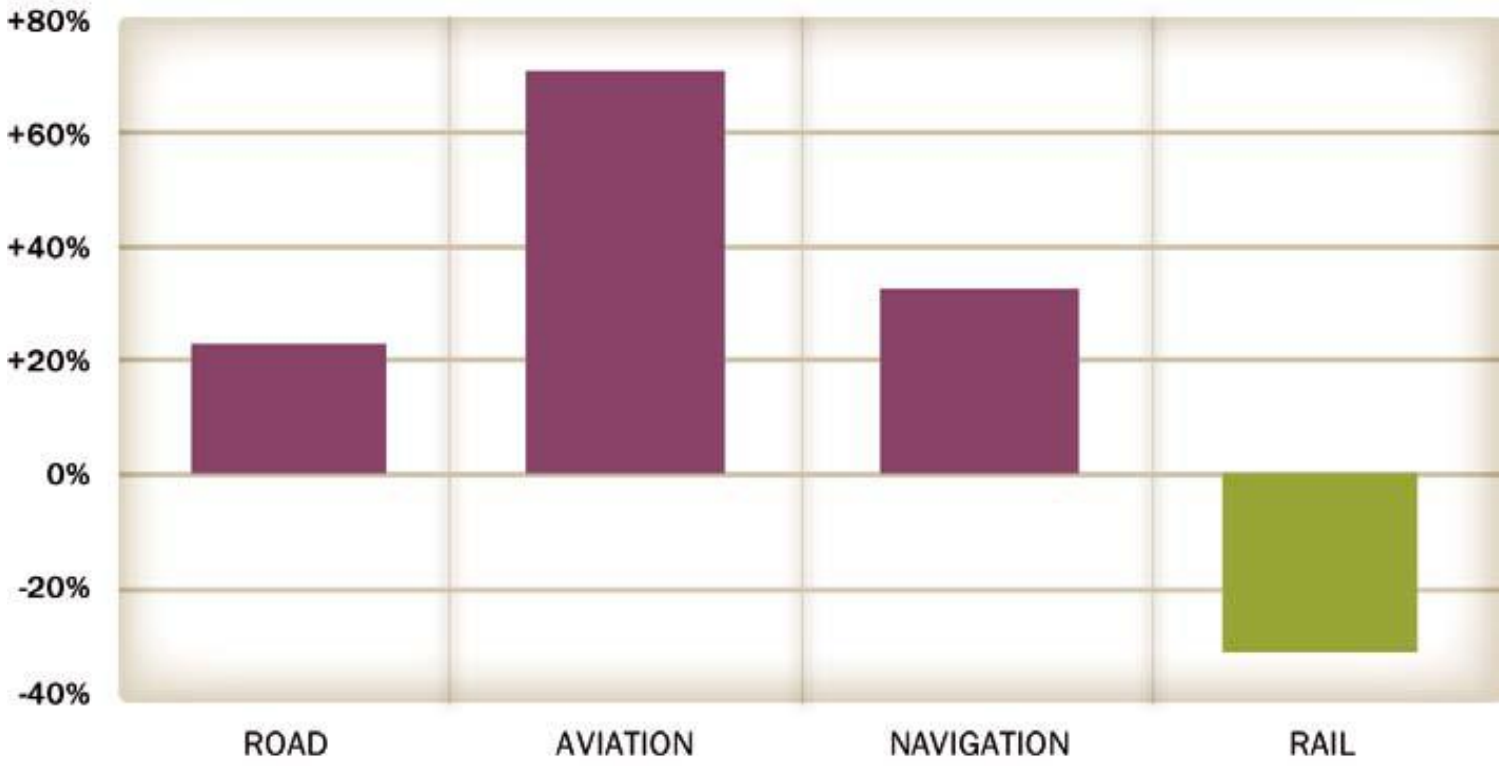


Table1: Transport modal share, 2009 (transport units)

ROAD	71.4%
NAVIGATION	15.0%
RAIL	7.1%
AVIATION	5.2%
OTHER	1.2%

Source: IEA (2011a) and UIC (2011b)

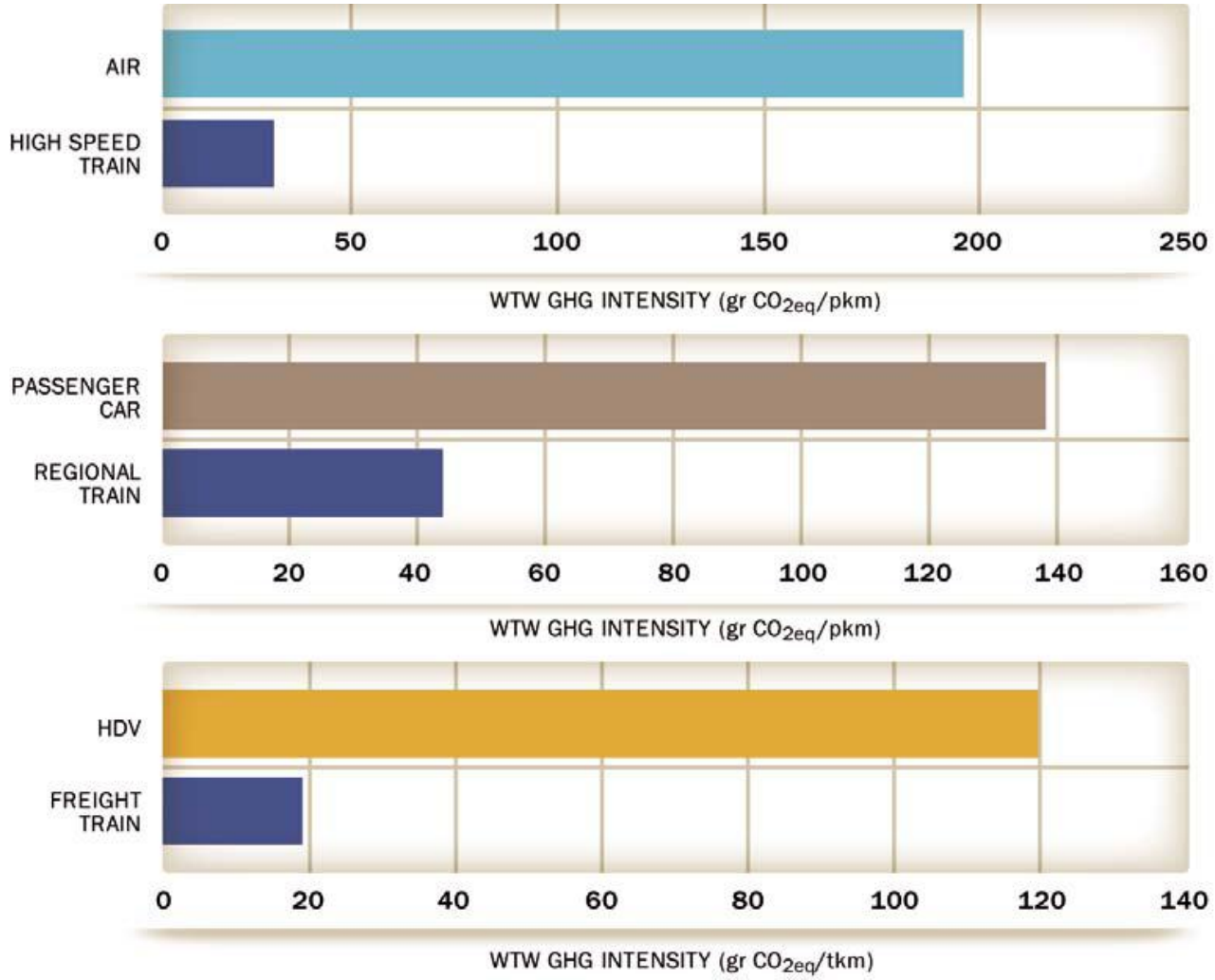
Fig.12: Change in CO2 total emissions from fuel combustion by mode, 1990-2009



Source: elaboration based on IEA (2011a)

CROSS INDICATORS:
Plane vs highspeed, car vs regional, freight train vs HDVs

EU average



Source: IEA (2012), UIC (2011a)

Fig.27: European Railways electricity mix, 2005 inside - 2009 outside

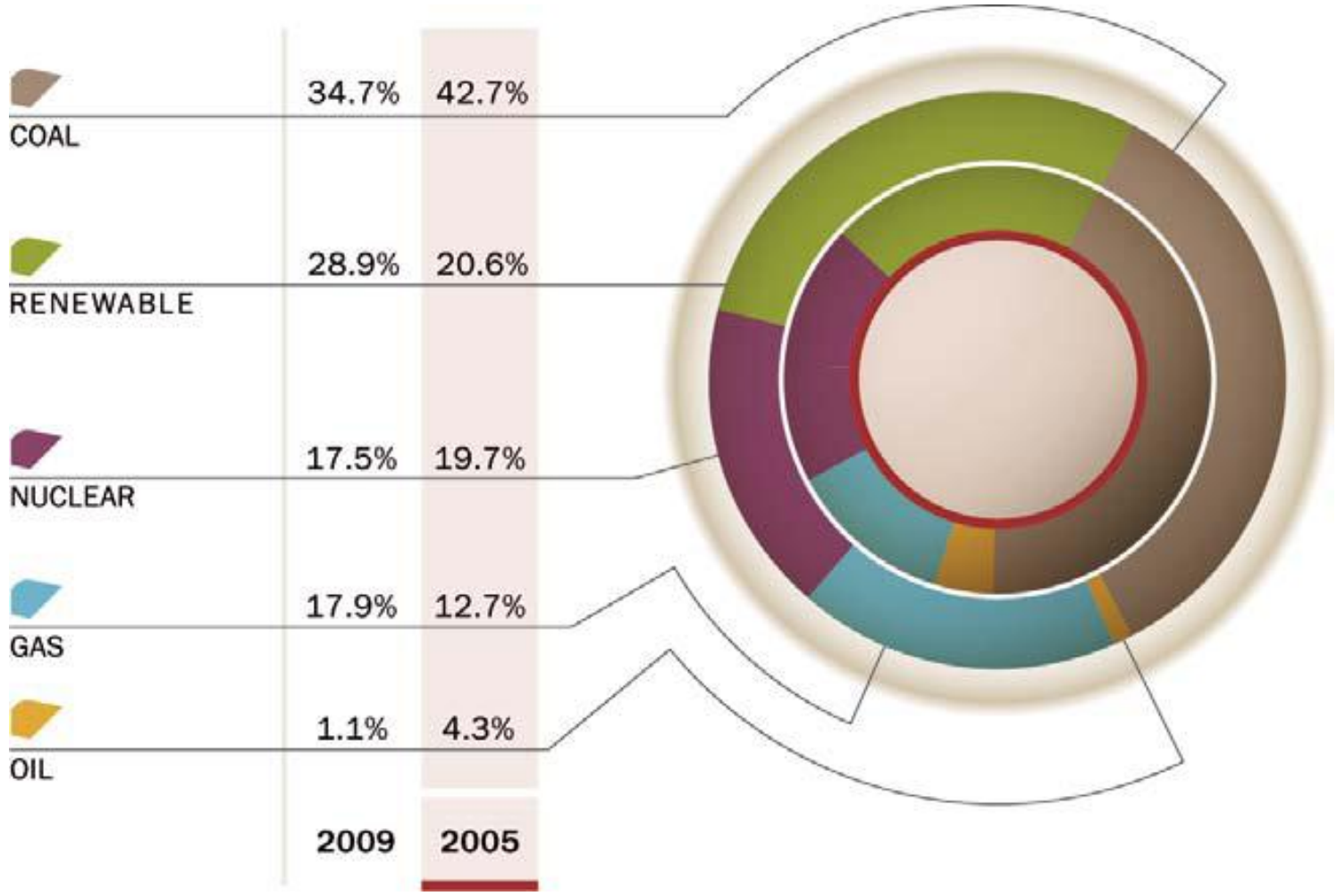
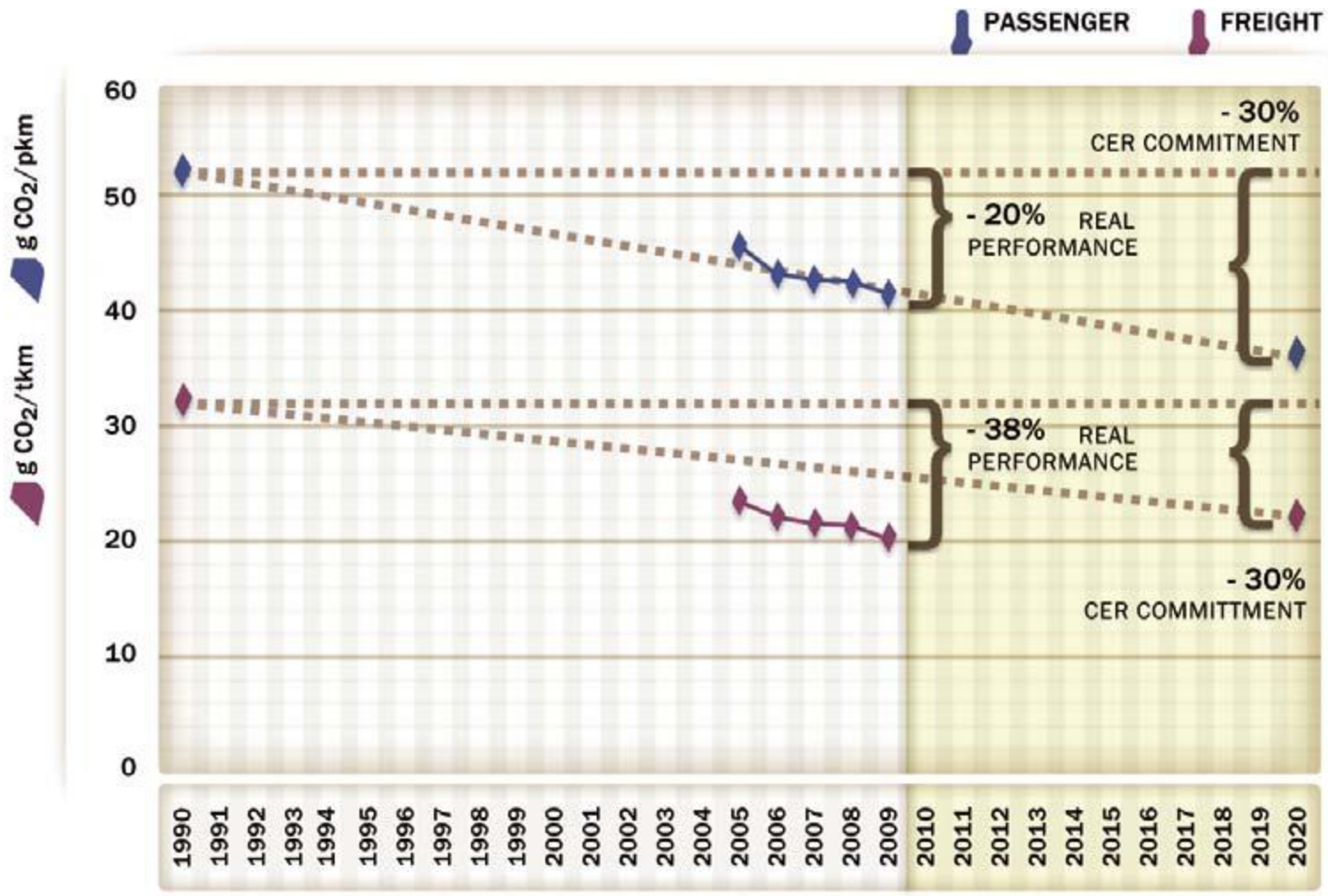


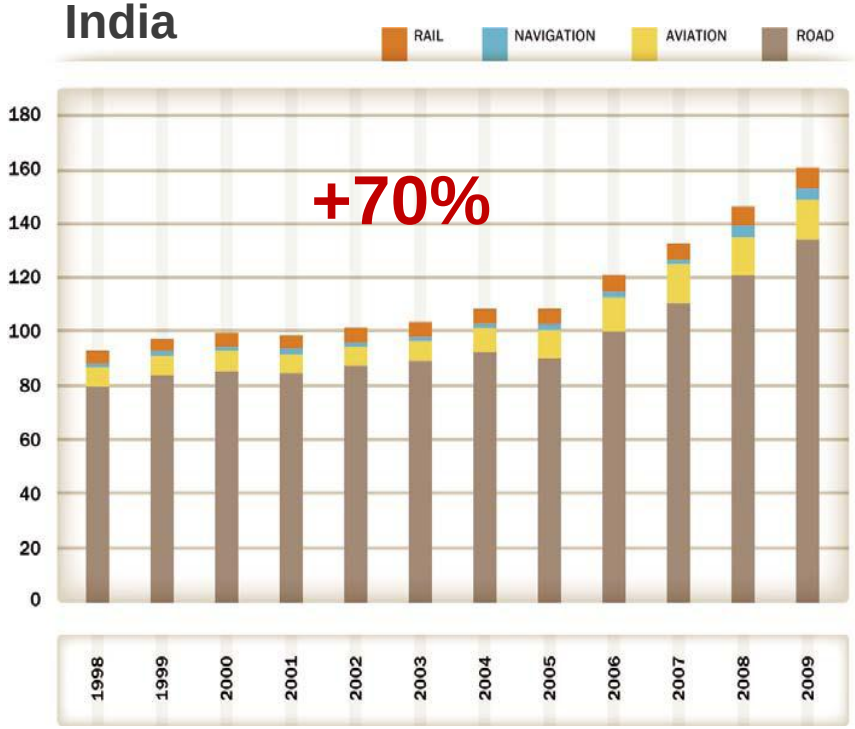
Fig.35: Specific CO_2 emissions, progress towards 2020 targets



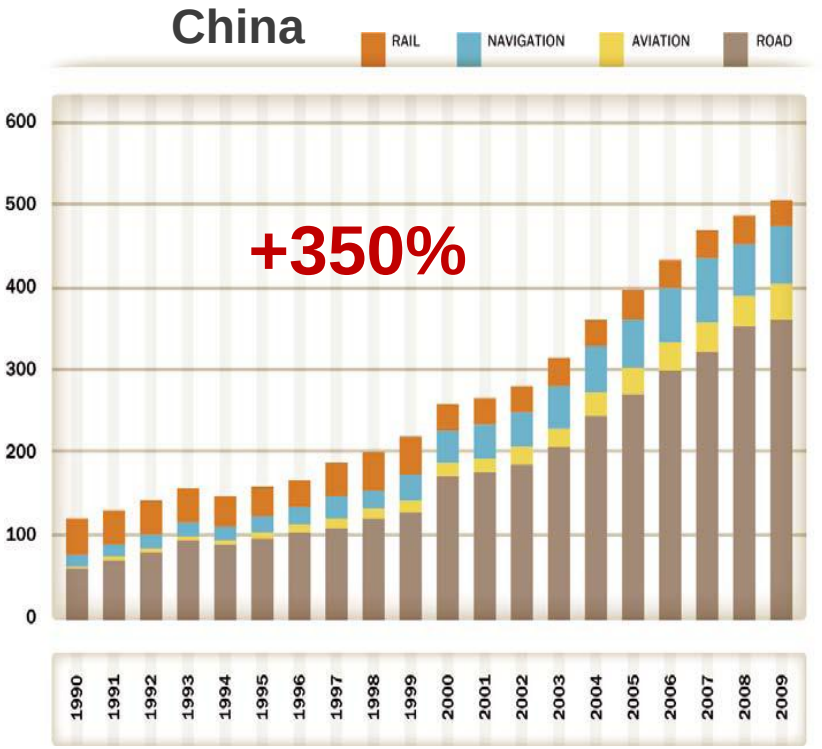
And ….outside Europe ?

Transport CO2 emissions by mode, 1998-2009 (million tonnes)

India

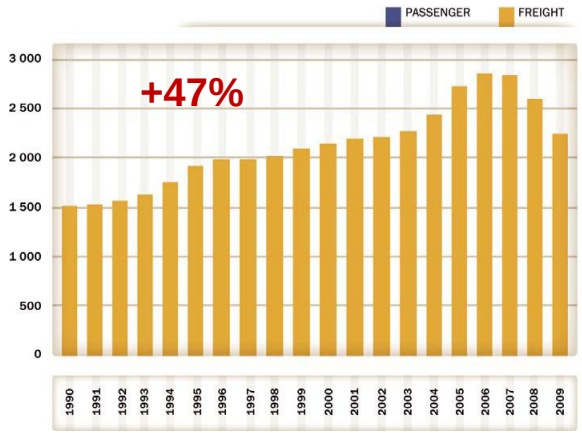


China

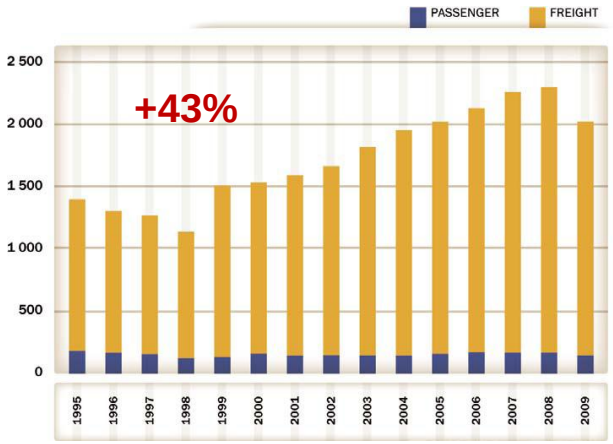


Railway transport activity 1990-2009 (billion transport units)

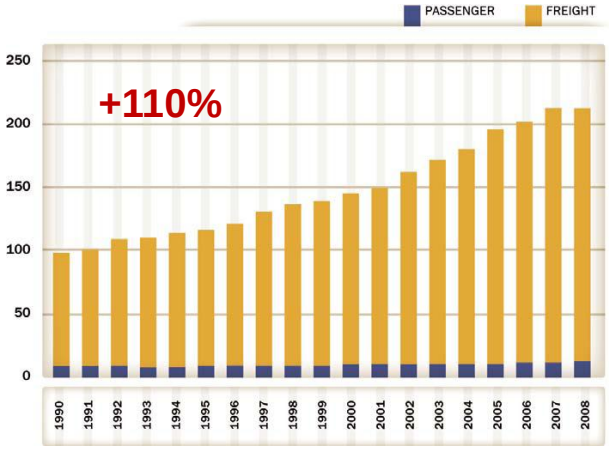
USA



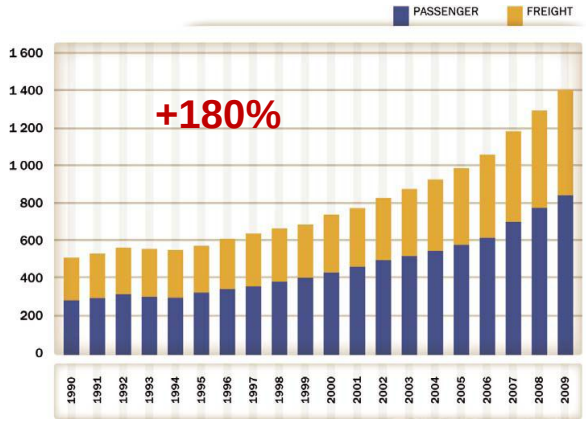
Russia



Australia

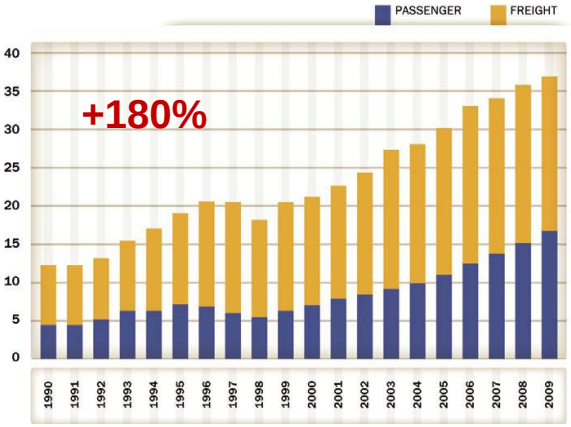


India



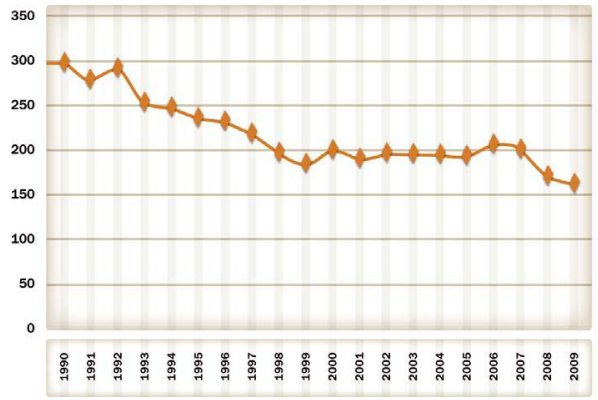
China

Iran

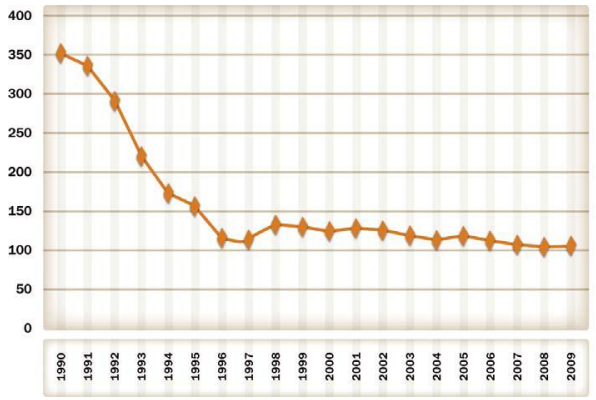


Railway specific energy consumption, 1990-2009 (kJ/transport unit)

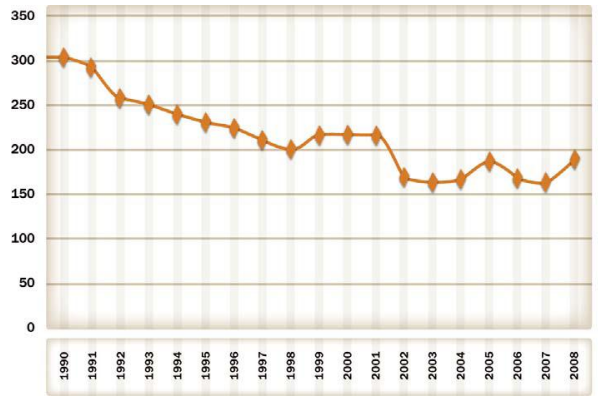
USA



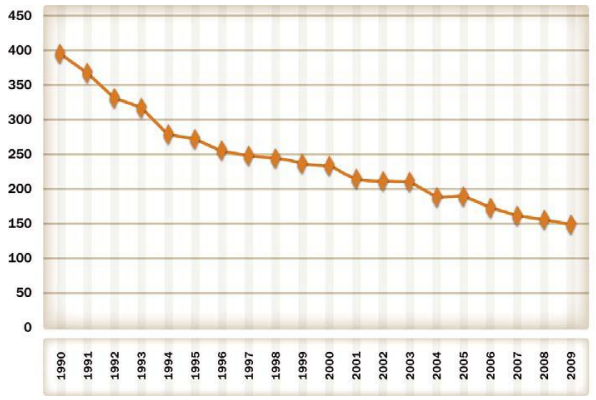
India



Australia



China



We need robust data as the foundation on which to build the greening of our future transport choices!

www.uic.org/environment

High Speed Rail & CO2

- **“Let me be clear why we need HS2. There are three reasons, the most important of which in my view is the desperate need for more capacity north-south.**
- **The second reason is economic development. Evidence from other European countries is that high speed rail reaches the parts other transport modes can’t. We need to ensure prosperity is shared round the country, not just concentrated in London and the south-east.**
- **Thirdly, there will be carbon gains arising from modal shift from domestic air to rail.”**

Minister for Transport, Norman Baker,
Speech to LibDem Party Conference,
19th September 2011

UIC study – carbon footprint of selected HSR lines

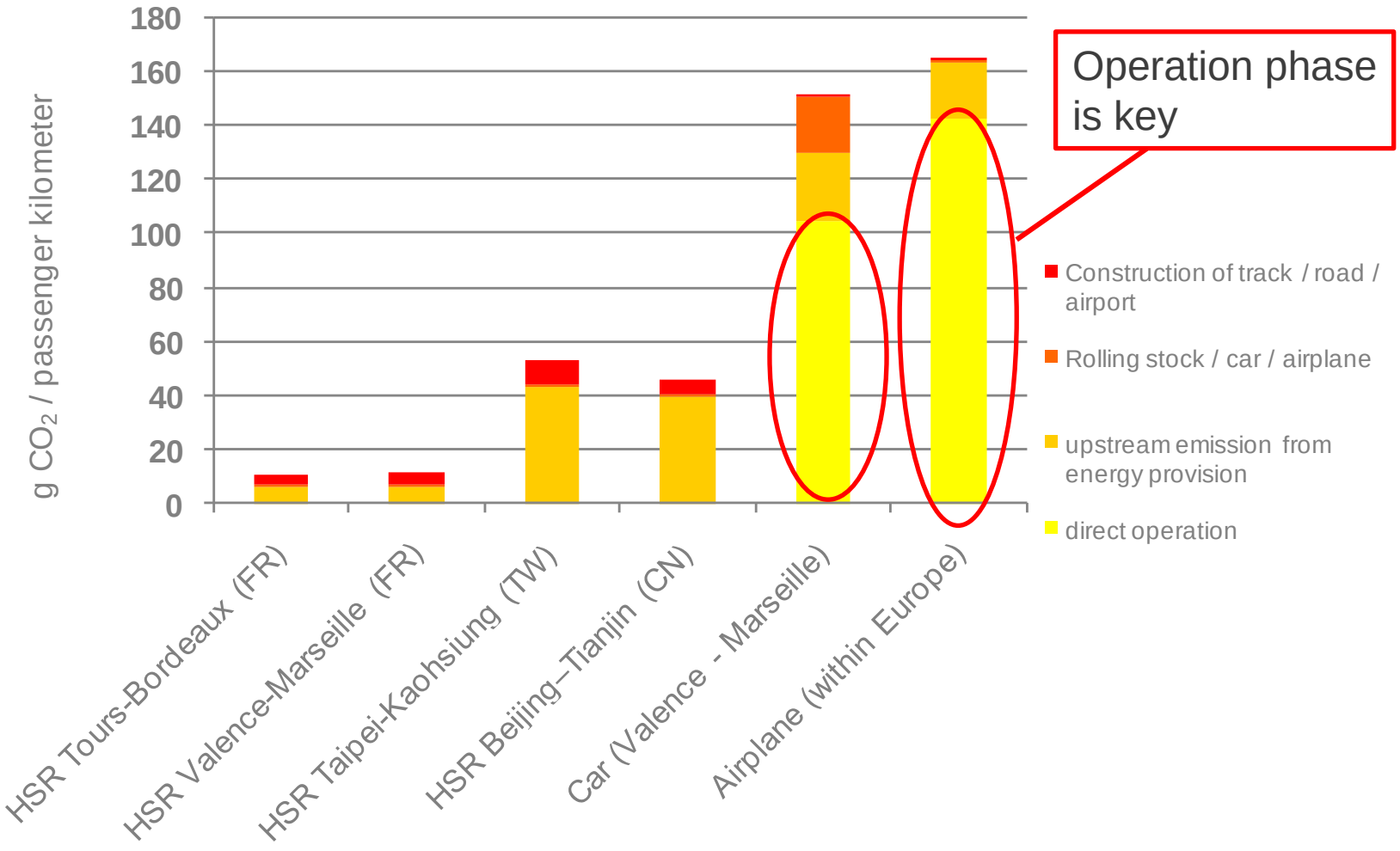
- **A carbon footprint analysis of four high speed rail lines:**
  - Valence to Marseille in France
  - Tours to Bordeaux in France
  - Taipei to Kaohsiung in Taiwan
  - Beijing to Tianjin in China
- **Study published at www.uic.org/environment**

Overview of methodology

1. Conception		Energy in offices Paper Informatics and Electronic materials
2. Construction		Earthwork Transport of construction materials Civil Engineering Structures (Bridges, Tunnels, etc.) Tracks with Ballast, Rail & Sleeper Equipments for Signaling & Electricity transport Railway Stations & Maintenance Centers Rolling Stock Construction
3. Operation		Energy Consumptions for Rolling Stock (traction, air conditioning, recovery braking energy) Maintenance of Rolling Stock
4. Disposal :		Disposal of Rolling Stock

- **The analysis of the impact of High Speed Lines has been carried out "from cradle to grave".**
- **This includes the planning, construction, operation, maintenance and end-of-life of the high speed rail life cycle.**

Summary results – comparison with car and plane



Independent studies confirm that operation phase is key

"While high-speed rail has the potential to be the lowest energy consumer and greenhouse gas emitter, appropriate planning and continued investment would be needed to **ensure sustained high occupancy.**"

IOPscience | Login | Create account | Athens/Institutional login

Quick search | Fin

Environmental Research Letters

Title/Abstract

All j

Home | Search | Collections | Journals | About | Contact us | My IOPscience | Authors

Environmental Research Letters | Volume 5 number 1 | Abstract | References | Related articles beta | Supplementary inf

Environ. Res. Lett. 5 (January-March 2010) 014003
doi:10.1088/1748-9326/5/1/014003

Life-cycle assessment of high-speed rail: the case of California

Mikhail Chester[1] and Arpad Horvath

Department of Civil and Environmental Engineering, University of California, Berkeley, Berkeley, CA 94720, USA

[1] Author to whom any correspondence should be addressed

E-mail: mchester@cal.berkeley.edu and horvath@ce.berkeley.edu

Received 13 October 2009
Accepted 11 December 2009
Published 6 January 2010

Abstract. The state of California is expected to have significant population growth in the next half-century resulting in additional passenger transportation demand. Planning for a high-speed rail system connecting San Diego, Los Angeles, San Francisco, and Sacramento as well as many population centers between is now underway. The considerable investment in California high-speed rail has been debated for some time and now includes the energy and environmental tradeoffs. The per-trip energy consumption, greenhouse gas emissions, and other emissions are often compared against the alternatives (automobiles, heavy rail, and aircraft), but typically only considering vehicle operation. An environmental life-cycle assessment of the four modes was created to compare both direct effects of vehicle operation and indirect effects from vehicle, infrastructure, and fuel components. Energy consumption, greenhouse gas emissions, and SO_2, CO, NO_X, VOC, and PM_{10} emissions were evaluated. The energy and emission intensities of each mode were normalized per passenger kilometer traveled by using high and low occupancies to illustrate the range in modal environmental performance at potential ridership levels. While high-speed rail has the potential to be the lowest energy consumer and greenhouse gas emitter, appropriate planning and continued investment would be needed to ensure sustained high occupancy. The time to environmental payback is discussed highlighting the ridership conditions where high-speed rail will or will not produce fewer environmental burdens than existing modes. Furthermore, environmental tradeoffs may occur. High-speed rail may lower energy consumption and greenhouse gas emissions per trip but can create more SO_2 emissions (given the current electricity mix) leading to environmental acidification and human health issues. The significance of life-cycle inventorying is discussed as well as the potential of increasing occupancy on mass transit modes.

Keywords: passenger transportation, life-cycle assessment, California, high-speed rail, trains, cars, autos, aircraft, planes, energy, fuel, emissions, greenhouse gas, criteria air pollutants

Have existing HSR lines reduced CO2?

- Yes
- Operation phase is key – particularly shift from air to HSR
- Commercial success = environmental success

Thank you!

Alexander Veitch

Head of Unit – Sustainable Development

veitch@uic.org