Rail, Energy and CO$_2$:
Moving towards sustainability

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The 12th UIC Sustainability Conference
Venice, 25-27 October 2012
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- Transport is 25% of the final energy use
- 92% of the supply of the transport sector comes from oil
- More than 60% of the oil is used in the transport sector
Rail in the big picture

- Rail is 2% of the transport energy use
- 2/3 of the supply of the rail sector comes from oil
- 1/3 of the energy use goes to passenger rail
IEA/UIC railway handbook

- Rail ways traffic activity in EU27

Fig. 3: Modal evolution of passenger traffic activity, 2000-2009 (pkm)

Fig. 7: Modal evolution of freight traffic activity, 2000-2009 (tkm)

Year 2000 = 100
Source: EC (2011) and UIC (2011a)
CO₂ emissions are tiny (EU27)

Fig. 9: CO₂ Emissions from fuel combustion by sector, 2009

Note: Emissions from rail electric traction are included into the transport sector, see Methodology Notes, p. 107.
Train CO₂ efficiency in the EU27

Fig.33: Passenger specific CO₂ emissions by service type and traction type, 2005 (gCO₂/pkm)

Source: elaboration based on UIC (2011b)
Improving railways efficiency

Benefits of electrification, aka the « no-brainer »

- Rapid return on investment (<10 years)
- Decarbonization made easier
- Other co benefits
  - Noise
  - Local pollutants
Improving rail efficiency

- CO₂ intensity of electricity generation
Improving rail efficiency

- CO\textsubscript{2} intensity of electricity generation

Railway operator mix

National mix
Importance of « Improve » strategies

- Other modes are working hard as well

Note: The clear line indicates world average, the bar representing MoMo regions’ discrepancy.
Potential of modal shifting

- Significant benefits to shift from road to rail
- Even bigger benefits from air to rail
Policies for shifting towards rail

- True cost of transport, including external costs, Freight

**Figure 1: Average External Costs: Freight 2000 (Excl. Congestion)**

- **Road Freight**:
  - Accidents: 8.78€ per 1000 km
  - Air Pollution: 22.5€ per 1000 km
  - Up- and Downstream Processes: 179€ per 1000 km
  - Noise: 271.3€ per 1000 km
  - Nature & Landscape: 22.5€ per 1000 km
  - Urban Effects: 271.3€ per 1000 km
  - Climate change low scenario: 271.3€ per 1000 km
  - Climate change (difference low/high scenario): 22.5€ per 1000 km

- **Rail**: 17.9€ per 1000 km

- **Aviation**: 271.3€ per 1000 km

- **Waterborne**: 22.5€ per 1000 km
External costs internalization, Passenger

- **Car**: €76.0
- **Bus**: €37.7
- **Rail**: €22.9
- **Aviation**: €52.5

**Categories**:
- Accidents
- Air Pollution
- Up- and Downstream Processes
- Noise
- Nature & Landscape
- Urban Effects
- Climate change (low scenario)
- Climate change (difference low/high scenario)
Other policies to promote rail

- High speed rail network development
ETP 2012

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ETP 2012 scenarios

- Modal shift plays a modest role,
  - Still inevitable to reach 2DS
Focus on Infrastructure Investment

**Case 1**

**Total Rail Track-Km (Millions)**

**Case 2**

![Graph showing the total rail track-km (millions) for different regions from 2000 to 2050. The graph compares Case 1 and Case 2, with different regions and their rail track-km increments depicted in various colors.](image-url)
Conclusions

- Rail is probably the most sustainable (motorized) mode of transportation, esp. when electrified:
  - Decarbonization made easy
  - Pollutant emission centralized at power plants

- Improving rail efficiency is important

- Modal shift represent much bigger potential savings

- High speed could play a big role in modal shifting strategy
Thank you
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