Action for low carbon and climate resilient transport

13th EU Hitachi Science and Technology Forum
"Transport and Mobility towards 2050"

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Joint Research Centre
The European Commission's in-house science service

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One Directorate-General of the European Commission

7 institutes in 5 countries: Italy, Belgium, Germany, The Netherlands, Spain

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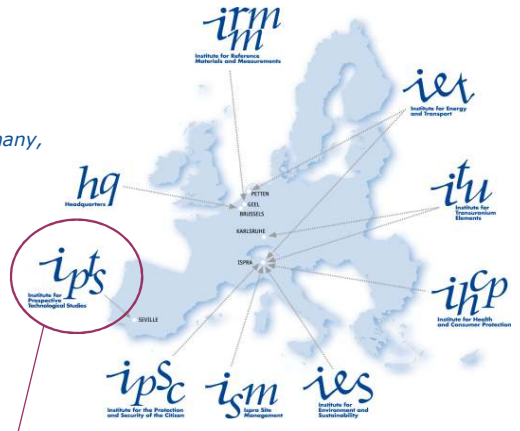

Unit on Economics of Climate Change, Energy and Transport

The Transport White Paper

A Roadmap to a Single European Transport Area – Towards a competitive and resource-efficient transport system
*(*COM(2011) 144 final)

Future challenges for transport:

- *Growing **competition** in world transport markets (e.g. R&D spending and technology developments by emerging economies)*
- ***Oil dependency***
- *A tight **carbon budget** for the transport sector (-60% by 2050 wrt 1990, see A Roadmap for moving to a competitive low carbon economy in 2050 (COM(2011) 112 final)*
- *Strong requirements for **infrastructure investments** (1500 billon € for 2010-230 needed to match growing demand)*

"**Curbing mobility is not an option**"

- ***10 Goals* for a** competitive **and** resource efficient transport system**: benchmarks for achieving the 60% GHG emission reduction target**
- ***40 proposed** initiatives **for which implementation measures to be developed, assessed, and proposed***

Impact assessment Transport scenarios

COMMISSION STAFF WORKING PAPER, *IMPACT ASSESSMENT*
***Accompanying document to the* WHITE PAPER (SEC(2011) 358 final)**

Model-based results: Transport models (TRANSTOOLS, PRIMES-TREMOVE and TREMOVE), energy models (PRIMES, POLES), macro-economic model (GEM-E3) and **Academic research** to assess potential **economic**, **social** and **environmental** consequences

Important remarks:

- Broad policy measures assessed without going into the precise specifications on concrete proposals
- "Modelling results are global and tentative, and present the impacts as illustrations rather than as conclusive evidence to support the preferred option.
- A 40-years outlook is surrounded by a significant degree of uncertainty, especially for such a complex system as transport (economic growth, oil prices or technological developments).

=> results to be treated with caution.
=> Each policy option assessed incorporates a set of possible policy interventions at EU level, which will be the subject of an individual Impact Assessment report when necessary."

Impact assessment Transport scenarios

Reference scenario (policy option 1)

Demography: +0.2%/yr by 2035, slight subsequent decline (500 million inhab.), ageing population

Economic growth: lost lasting effects of economic crisis +1.2% (2000-2010), +2.2%/yr (2010-2020), +1.6% (2020-2050)

Fossil fuels: IEA projection - 59 USD/barrel (2005), 106 USD/barrel (2030), 127 USD/barrel (2050)

Technology: limited penetration of EDV (high battery costs 560-780 €/kWh)

Policies in place: Biofuel directive, RES directive, GHG Effort Sharing decision, EU ETS Directive, Fuel Quality Directive, Energy Taxation Directive, Regulation on CO2 from cars, Regulation on CO2 from vans

Main trends

Persistent **oil dependency**: 96% (today), 89-90% (2030-2050)

Uncurbed **Co2 emissions** (+31%/+35% by 2030/2050 wrt 1990) and high share (38%/50% of total emissions by 2030/2050). Growing **external costs**

Growing **transport activity**: Freight: +40% in 2030, ~+80% by 2050 compared to 2005;
Passenger: +34% by 2030, 51% by 2050 compared to 2005

Unchanged **modal shares** (passenger cars ~2/3 total passenger transport in 2050)

High **congestion** levels (urban passenger transport, intra-urban network freight transport). Congestion costs to increase by 50% by 2050 (~200 billon €/year). Saturated european sky and airports (+50% pkm passengers)

Accessibility uneven across Europe

Impact assessment Transport scenarios

Alternative scenario definition:
Main role of individual instrument type:

- ***market-based instruments*** *such as charging and taxation can ensure efficient allocation of resources and efficient modal choices;*
- ***internal market measures*** *and an effective enforcement of EU competition rules are needed to solve instances of regulatory failure and insufficient competition and to derive benefit from scale economies;*
- ***infrastructure policy*** *is required to address coordination failures and the existence of network and cross-border externalities;*
- ***efficiency standards*** *have produced a significant acceleration in the introduction of more efficient vehicles, by providing clear targets for the industry and avoiding 'wait and see' strategies of manufacturers;*
- ***research and development*** *programs appear necessary to solve other types of market failures in innovation, as for example, the coexistence of multiple technical standards;*
- ***planning policies*** *can take into account the interaction of transport with other policy areas, such as housing.*

None of the categories of instruments alone would be capable of tackling at the same time and in a satisfactory way all the various problem drivers and all the elements of the specific policy objective. ***A mix of actions would be needed.***

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Policy scenarios

option 2	option 3	option 4
Stronger focus on transport efficiency measures: - completion of the **internal market,** **- infrastructure development,** **- pricing and taxation**.	Stronger focus on **technologies**: Developing and deploying technologies through the introduction of rigorous **standards** for all vehicles. Promotion of **R&D policies** into the development and subsequent deployment of alternative fuel use.	Balanced contribution of **transport efficiency measures** (option 2) and **technology orented measures** (option 3).

Impact assessment summary

Economic impact: Policy Option 4 seems to be overall preferable. While achieving the CO2 target at higher costs than Policy Option 3, it has lower congestion costs and the overall benefits of a less distorted pricing system.

Social impact: Policy Option 4 would be the most desirable.
Compared to Option 2, it does not affect drastically the present lifestyles (e.g. mobility) and is therefore expected to have lower social costs of adaptation to new circumstances.
Compared to Option 3, it would have the benefits of better choice, higher safety and greater accessibility.

Environmental impact: Policy Option 2 is the most ambitious option since it covers the broadest range of environmental impacts.

=> **Policy option 4 as the preferred option.**

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	Option 4
Pricing	**Full internalisation**: of all external costs, all modes, all Member States by 2050.
Taxation	
Fuels	Minimum tax rates aligned based on a **CO2 and energy component tax based**
VAT	Gradual VAT rate to a uniform rate (19%)
Vehicle taxation (registration / circulation)	Alignement to a CO2 component based scheme
Company car taxation	Elimination of distorsion
Internal market	
Opening transport markets and removing regulatory, administrative and technical barrers	**Increase in the efficiency of all transport mode**s (=> decreases in the ticket price for passenger rail and operation costs and time costs for freight (10% to 25%, depending on mode) and higher load factors for road freight).
Wide deployement of intelligent transport systems	More efficient use of infrastructure, vehicle capacity and mode (=> reduction in congestion and improvements in energy efficiency)
Infrastructure (core backbone of high performing infrastructure in terms of environmental impact)	**Increased capacity and performance** of the network and increase in the train length (to 1.5 km) and maximum axle load (to 22.5 tonnes), resulting in a decreases in operation costs and time costs (6% to 20%, depending on mode) and higher load factors for freight.
Transport planning	**Urban mobility plans** and measures to manage demand in non-collective motorised transport modes
Research and innovation	Notably improving cost efficiency of **batteries**
Efficiency standards and flanking measures	
CO2 standards	CO2 standards by 2020 same as in Policy Option 2. **Cars** from 95g CO2/km in 2020 to 20 g CO2/km in 2050; **Others**, improvement in energy efficiency by 2050: Heavy duty vehicles (40%), trains (40%), ships (45%) and aircrafts (60%)
Deployment of less GHG intense energy carriers	Increasing shares of biofuels and electricity
Eco-driving	
Fuel efficiency labelling	

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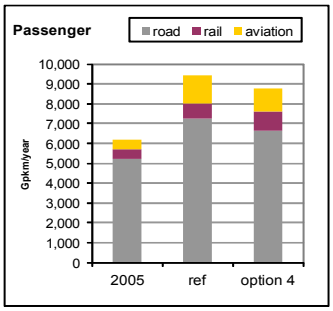
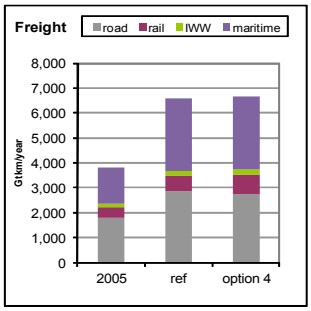
Transport activity by 2050





Modal share

	2005	2050	
		ref	option 4
road	84%	77%	76%
rail	7%	8%	11%
aviation	8%	15%	13%

	2005	2050	
		ref	option 4
road	47%	13%	12%
rail	11%	3%	4%
IWW	4%	2%	2%
maritime	38%	82%	82%

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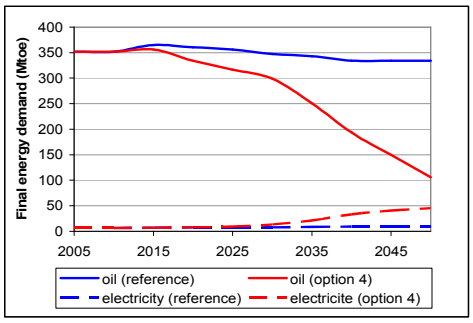
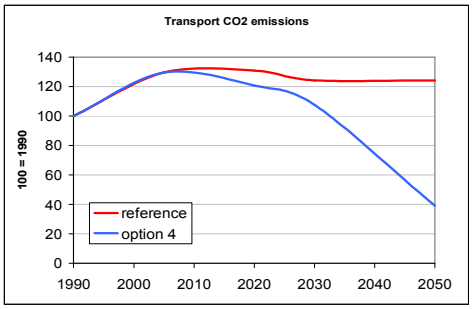


Electricity: ~50% of final demand

Biofuels: ~40% for aviation, navigation, freight road transport,

15%-25% for road transport



Energy use and CO2 emissions

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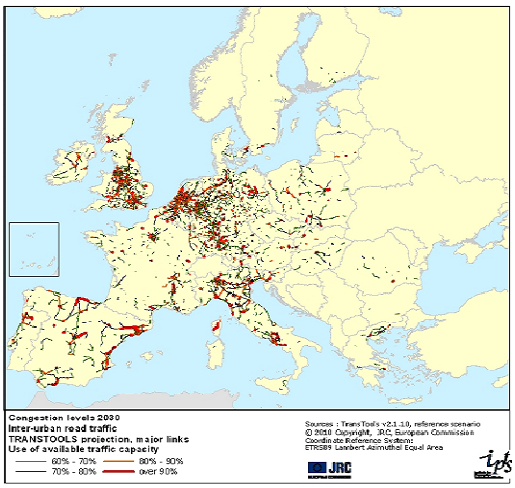
Road Congestion in reference scenario



Externalities

(% reference)

	option 4	
	2030	2050
congestion	-4%	-11%
air pollution	-17%	-78%
noise	-4%	-32%
accidents	-3%	-9%

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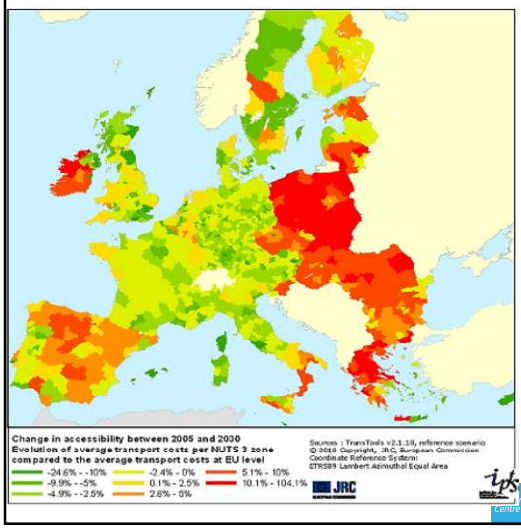
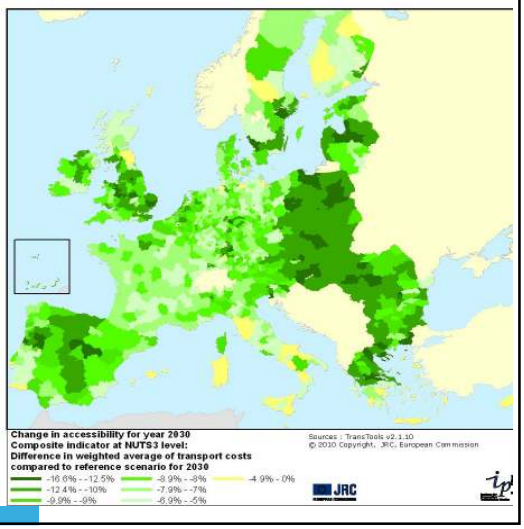
Social impact: Accessibility

Option 1



Option 4



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Transport user costs and yearly additional cost

Total passenger costs

(compared to share in household income by 2005 in policy option 1)

	% households income	option 4	
	2005	2030	2050
total	**27.8%**	**0.3%**	**1.3%**
capital costs	**11.7%**	**0.5%**	**1.6%**
fuel costs	4.2%	-0.7%	-1.7%
fixed and variable non fuel costs	11.8%	0.6%	1.4%

Average additional total costs wrt reference: ~0.3% GDP (0.2%-0.4%)

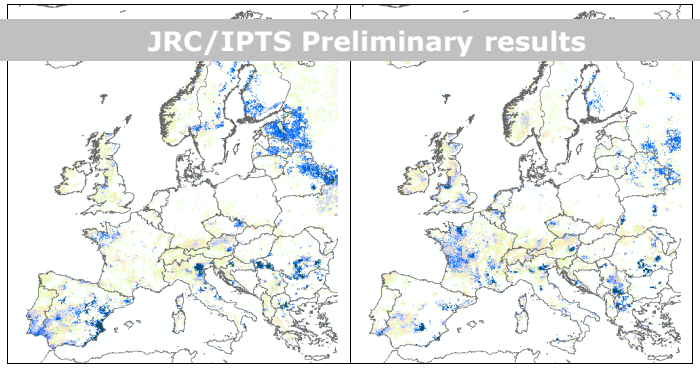
300-330 billion euros fuel savings wrt reference

Transport - Climate resilience

Vulnerability to bridge scouring

Bridges and 100-yr river discharge as % of historical period

for 2040-2070 and 2070-2100 (KNMI)



~20% of bridges vulnerable to bridge scour

=> Mainstreaming climate change in in infrastructure design and maintenance

(see TEN-T guidelines)

Source: Nemry, Demirel, 2012, in preparation

Concluding remarks

60% GHG emission reduction by 2050 shown to be

feasible for EU transport, and to be

compatible with other overarching goals (economic progress, enhanced competitiveness, high quality mobility services)

A mix of actions is needed: market-based instrument, efficiency standards, research and development programs, internal market, infrastructure policy, planning

To be translated into implementing measures towards a comprehensive and strategically coordinated EU action

Appropriate legislative proposals with key initiatives to be put forward, preceded by a thorough impact assessment

Topic for discussion: A clear vision on future EU transport to guide actors decision and planning

Thank You!

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The Transport White Paper

*Ten Goals for a **competitive and resource efficient transport system**: benchmarks for achieving the 60% GHG emission reduction target*

***(1)** Halve the use of 'conventionally-fuelled' cars in **urban transport** by 2030; phase them out in cities by 2050; achieve essentially CO2-free city logistics in major urban centres by 2030.*

***(2)** Low-carbon sustainable **fuels in aviation** to reach 40% by 2050; also by 2050 reduce EU CO2 emissions from **maritime bunker fuels** by 40% (if feasible 50%).*

***(3)** 30% of **road freight over 300 km should shift to other modes** such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.*

***(4)** By 2050, complete **a European high-speed rail network**. Triple the length of the existing high-speed rail network by 2030 and **maintain a dense railway network in all Member States**. By 2050 the majority of medium-distance passenger transport should go by rail.*

***(5)** A fully functional and EU-wide multimodal **TEN-T 'core network'** by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.*

The Transport White Paper

*Ten Goals for a **competitive and resource efficient transport system**: benchmarks for achieving the 60% GHG emission reduction target*

***(6)** By 2050, **connect all core network airports to the rail network**, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.*

***(7)** Deployment of the modernised air **traffic management infrastructure** (SESAR12) in Europe by 2020 and completion of the European Common Aviation Area. Deployment of equivalent land and waterborne transport management systems (ERTMS, ITS, SSN and LRIT, RIS). Deployment of the European Global Navigation Satellite System (Galileo).*

***(8)** By 2020, establish the framework for a **European multimodal transport information**, management and payment system.*

***(9)** By 2050, move close to **zero fatalities** in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.*

***(10)** Move towards full application of "**user pays" and "polluter pays**" principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.*