



**TRT TRASPORTI E TERRITORIO SRL**

# **Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities**

**Study for the European Commission, DG MOVE**

**Dr. Silvia Maffii, TRT Managing Director**

**ESPO Conference**

**Livorno, May 24<sup>th</sup>, 2019**



*\*Only for Milano  
headquarters*



# Preamble

- **This presentation shows the main finding of the study *Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities***
- **Project consortium:**
  - **CE-Delft (NL) Team Leader**
  - **TRT (IT)**
  - **Ricardo (UK),**
  - **INFRAS (CH),**
  - **Planco (DE),**
  - **ISL (DE)**
  - **PMR (PL)**

# Preamble

- **Project timeline: September 2017 – May 2019**
- **Main Deliverables:**
  1. **Overview of transport infrastructure expenditures costs**
  2. **Handbook on the external costs of transport: version 2019**
  3. **Transport taxes and charges in Europe: an overview study of economic internalisation measures applied in Europe**
  4. **State of play of internalisation in the European transport sector**
  5. **Final report: sustainable transport infrastructure charging and internalisation of transport externalities**

# Outline of the presentation

- **Background**
- **Objectives**
- **Scope**
- **Approach**
- **Methodology**
- **Infrastructure and external costs**
- **Transport taxes and charges**
- **State of play of internalisation**
- **Conclusions**
- **Policy applications**

# Background of the study

- **Transport is a precondition for the functioning of modern society and for the well being of people and economy**
- **Transport activities however generate a range of external effects (pollution, noise, accidents, etc.)**
- **Construction and management of transport infrastructures give rise to significant costs**
- **Without policy interventions the external and infrastructure costs tend not to be borne by transport users**

# Objectives of the study

- **Provide a very comprehensive overview of external costs, infrastructure costs and transport related taxes and charges (\*)**
  - **Better understand to what extent existing policies internalise infrastructure and external costs**
  - **Estimate total, average and marginal figures - the first two were missing in previous studies**
  - **Investigate options for further internalisation of transport infrastructure and external costs (market-based (charges, taxes), regulatory (emission standards) and voluntary instruments (industrial agreement))**
- (\*) **the study does not consider transport subsidies and public service obligations, with the exception of tax/charge breaks or exemptions. Subsidies for infrastructure (e.g. CEF funding) are fully accounted**

# Scope of the study

- **Transport modes and vehicles**

Road	Rail	IWT	Maritime	Aviation
<ul style="list-style-type: none"><li>▪ <b>Passenger car</b></li><li>▪ <b>Motorcycle</b></li><li>▪ <b>Bus</b></li><li>▪ <b>Coach</b></li><li>▪ <b>Van</b></li><li>▪ <b>Heavy Goods Vehicle</b></li></ul>	<ul style="list-style-type: none"><li>▪ <b>High speed train</b></li><li>▪ <b>Passenger train electric</b></li><li>▪ <b>Passenger train diesel</b></li><li>▪ <b>Freight train electric</b></li><li>▪ <b>Freight train diesel</b></li></ul>	<ul style="list-style-type: none"><li>▪ <b>Inland vessel</b></li></ul>	<ul style="list-style-type: none"><li>▪ <b>Freight vessel</b></li></ul>	<ul style="list-style-type: none"><li>▪ <b>Passenger aircraft</b></li></ul>

- **Geographical coverage**

- **Road, rail and IWT for the EU28**
- **Maritime 33 selected EU ports**
- **Aviation 34 selected EU airports**
- **Specific results for NO, CH, US, CA, JP**

# Methodology for assessing the internalisation level

**For each transport mode and vehicle:**

- **Elaboration of consistent transport performance dataset (i.e., v-km, p-km and t-km)**
- **Estimation of infrastructure and external costs**
- **Identification and measurement of taxes and charges**
- **Assessment of the extent to which external and infrastructure costs are internalised by current taxes and charges (i.e., cost-coverage ratio)**
- **2016 adopted as base year for costs, taxes and charges**
- **Purchase Power Standard (PPS) adjustments**

# Infrastructure costs

## Infrastructure cost categories:

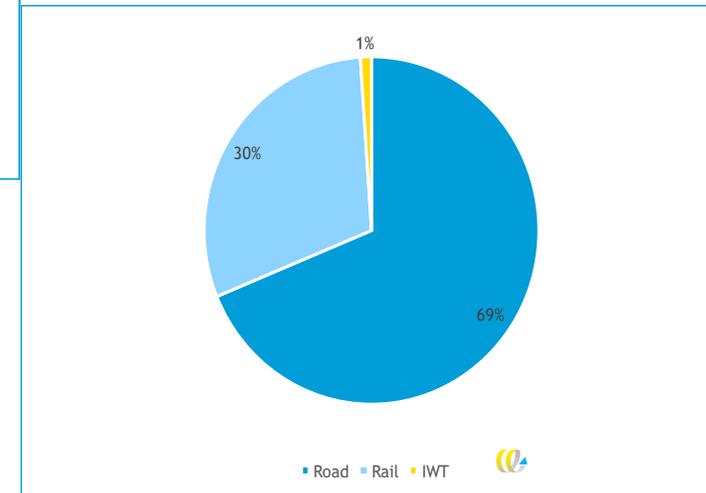
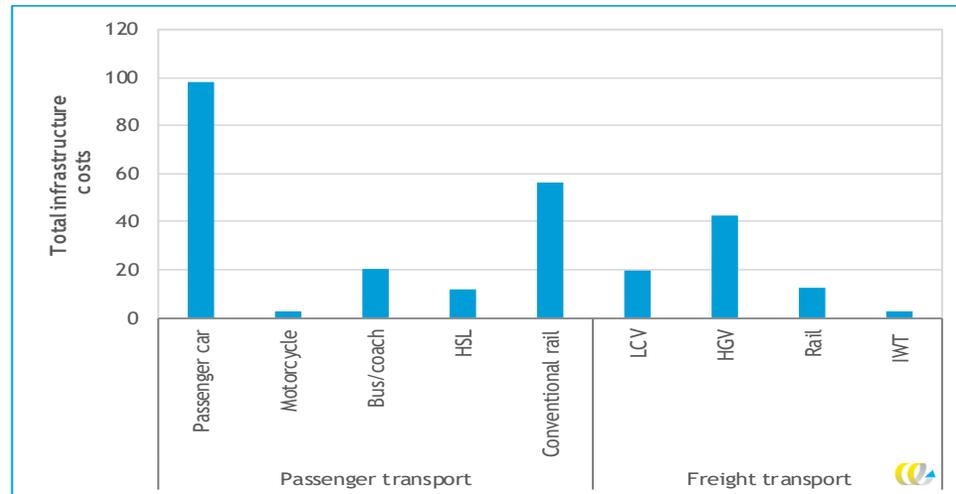
- **Construction and enhancement (fixed)**
- **Operational (fixed)**
- **Maintenance and renewal (partly variable and partly fixed)**

## Majority of infrastructure costs are fixed

Transport mode	Share of fixed costs
Road	83%
Rail	87%
IWT	93%
Aviation	67%
Maritime	97%

# Infrastructure costs

- Total infrastructure costs for road, rail and IWT  
**€ 267 billion**



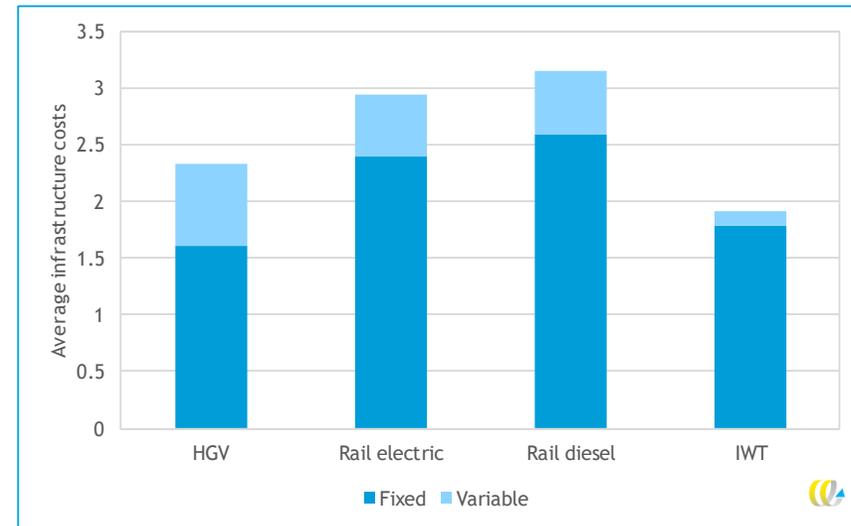
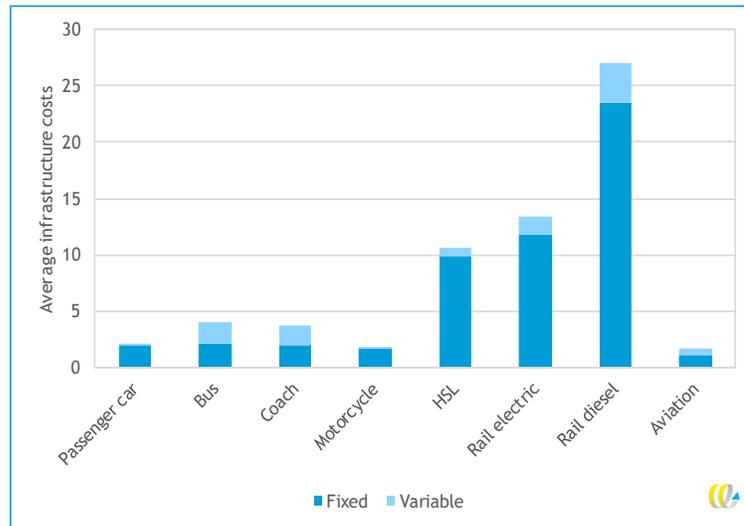
# Infrastructure costs

- **For aviation and maritime the study presents results for 33 airports and 34 ports**
- **Estimates infrastructure costs**
  - **34 EU ports € 1.4 billion**
  - **33 EU airports € 14 billion**

**EU28 ports: Antwerp, Varna, Rijeka, Split, Limassol, Arhus, Helsingør, Tallinn, Helsinki, Calais, Le Havre, Marseille, Hamburg, Bremerhaven, Travermünde, Piraeus, Dublin, Genova, Trieste, Venice, Riga, Klapeida, Marsaxlokk, Rotterdam, Gdansk, Sines, Constanta, Koper, Algericas, Barcelona, Bilbao, Valencia, Goteburg, and Felixstowe**

# Infrastructure costs

- **Average infrastructure costs of passenger transport significantly higher for rail than for road: (i) higher fixed costs (construction) and (ii) (on average) lower utilisation rate (fixed costs allocated to less p-km)**
- **Average infrastructure costs of freight transport are mainly fixed and the highest average costs are found for rail**



# External costs

*“... when the effect of production or consumption of goods and services imposes costs on others which are not reflected in the prices charged for the goods and services being provided” (OECD)*

## External costs considered<sup>(\*)</sup>

External cost	Road	Rail	IWT	Maritime	Aviation
Accidents	✓	✓	✓	✓	✓
Air pollution	✓	✓	✓	✓	✓
Climate change	✓	✓	✓	✓	✓
Noise	✓	✓			✓
Congestion	✓				
Well-to-tank emissions	✓	✓	✓	✓	✓
Habitat damage	✓	✓	✓		✓

**(\*) other externalities caused by transport can be identified, including soil and water pollution, up- and down-stream emissions, separation impacts in urban areas, etc. They are discussed, but not monetised in this study**

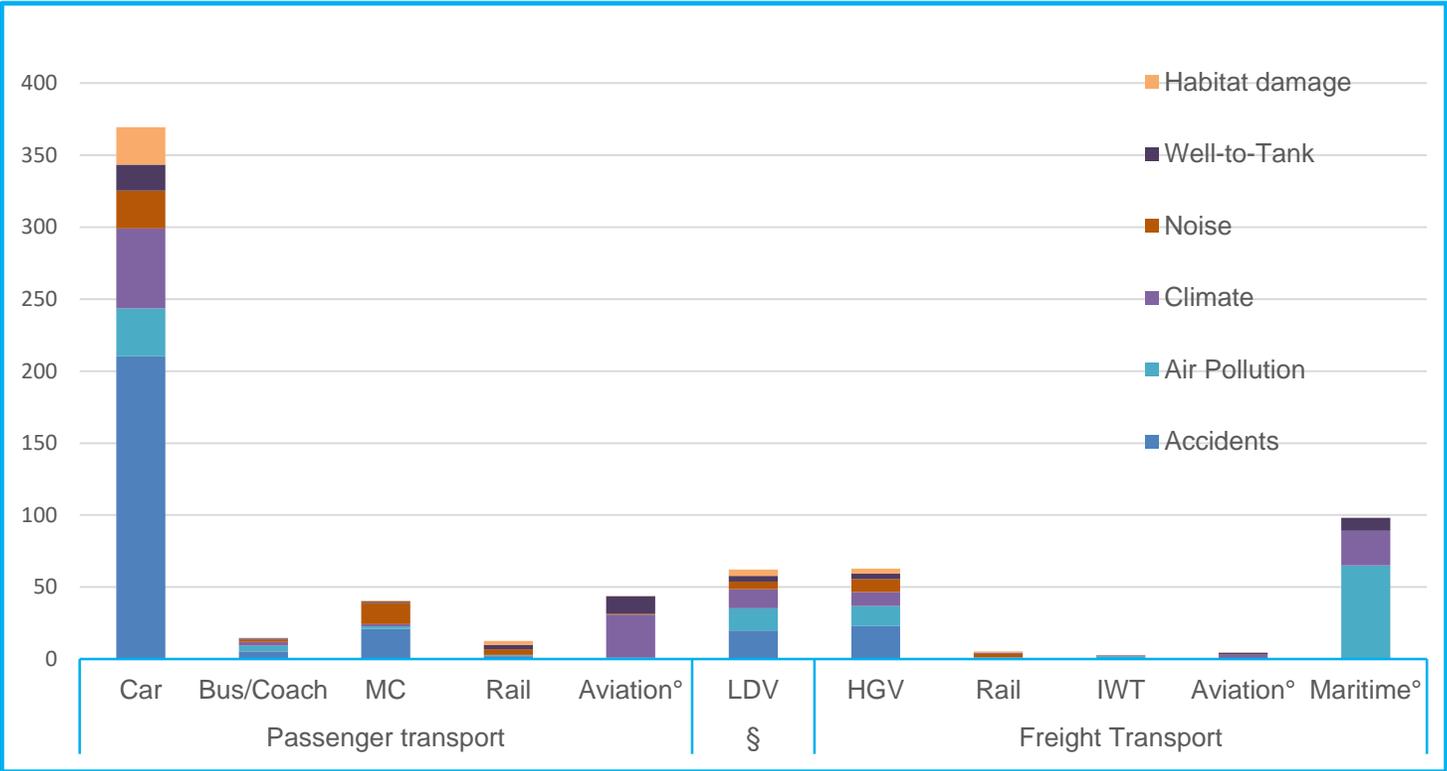
# External costs

- **Total external costs for road, rail, IWT, aviation and maritime € 716 billion (i.e., 4.8% EU28 GDP) (excluding congestion)**
  - **Total external costs for aviation and maritime estimated(\*) at about € 48 billion and € 98 billion**
  - **External costs for selected airports and ports € 33 and € 44 billion**
- **Congestion costs only for road modes € 271 billion (delay cost)**
- **Total annual external costs almost € 1,000 billion**
  - **of which road transport € 800 billion**
  - **of which passenger road transport € 600 million**

**(\*) based on extrapolation of the values for the selected (air)ports assuming that the transport to/from the selected (air)ports (in terms of aircraft, ships and distances) are representative for the entire EU28.**

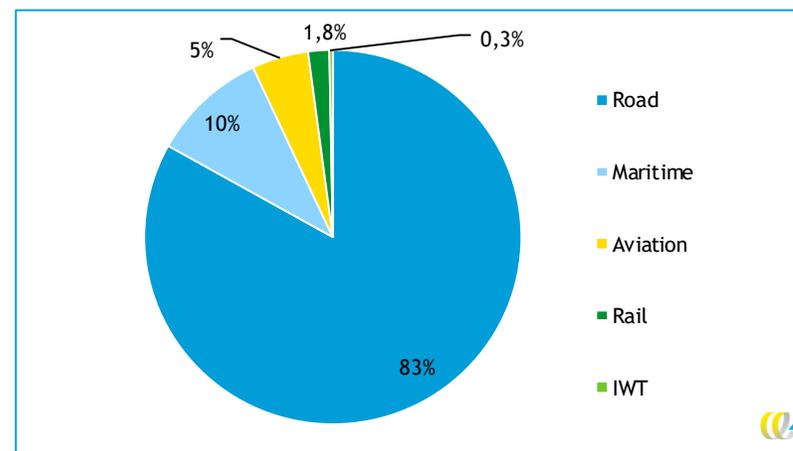
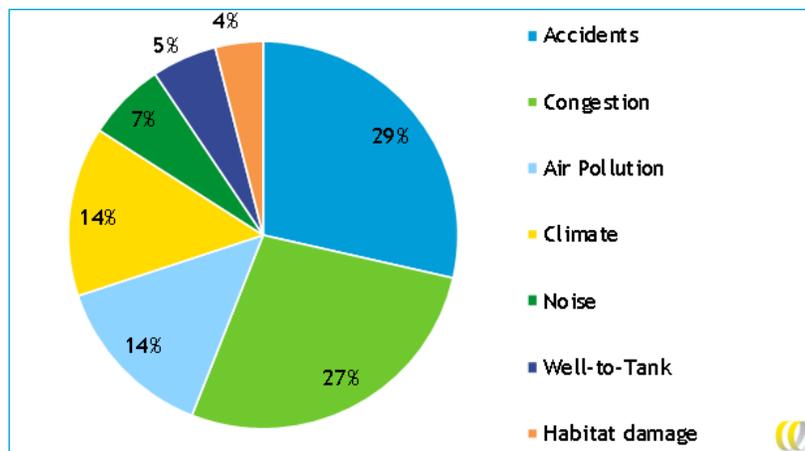
# External costs

- **Total annual external costs by category and mode (billion per year)**



# External costs

- Share of annual external costs by category and mode

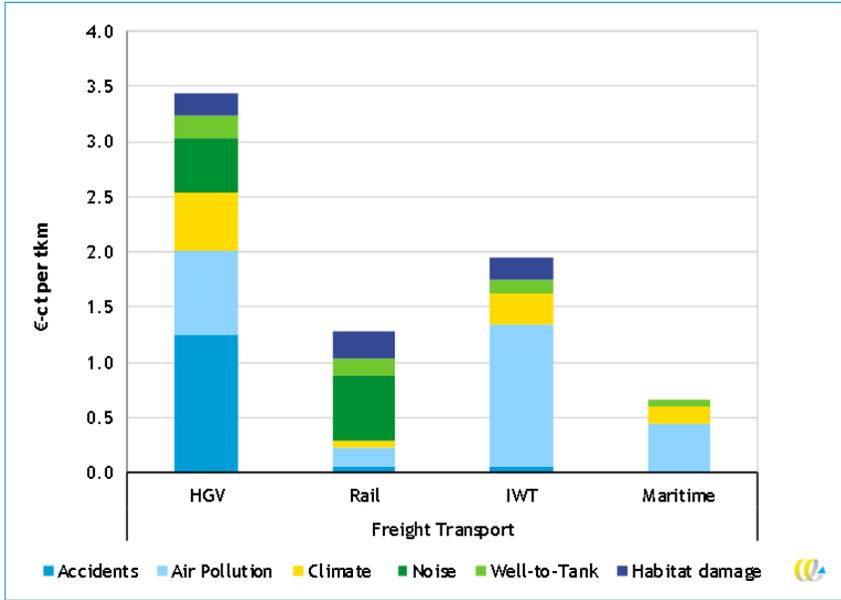
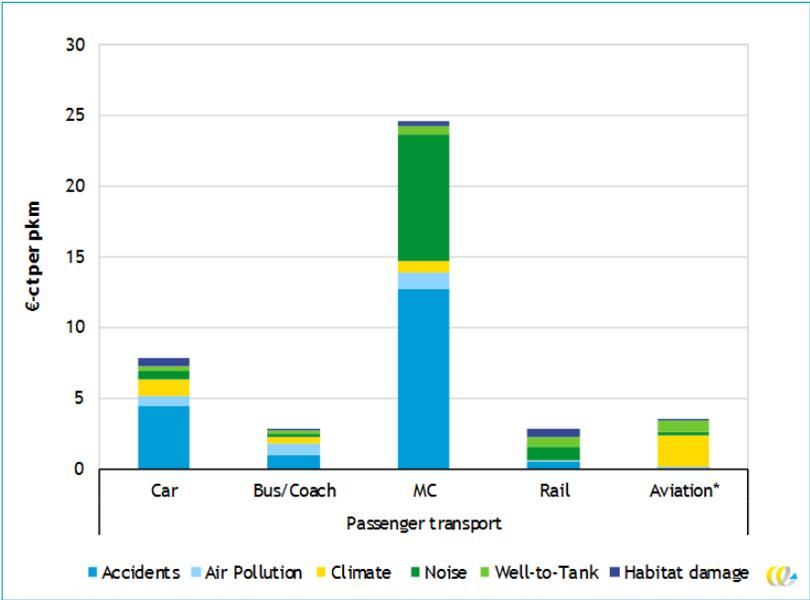


## Key message

- Congestion safety and environmental costs all play a significant part
- Road is the mode causing the biggest external costs (total and average)

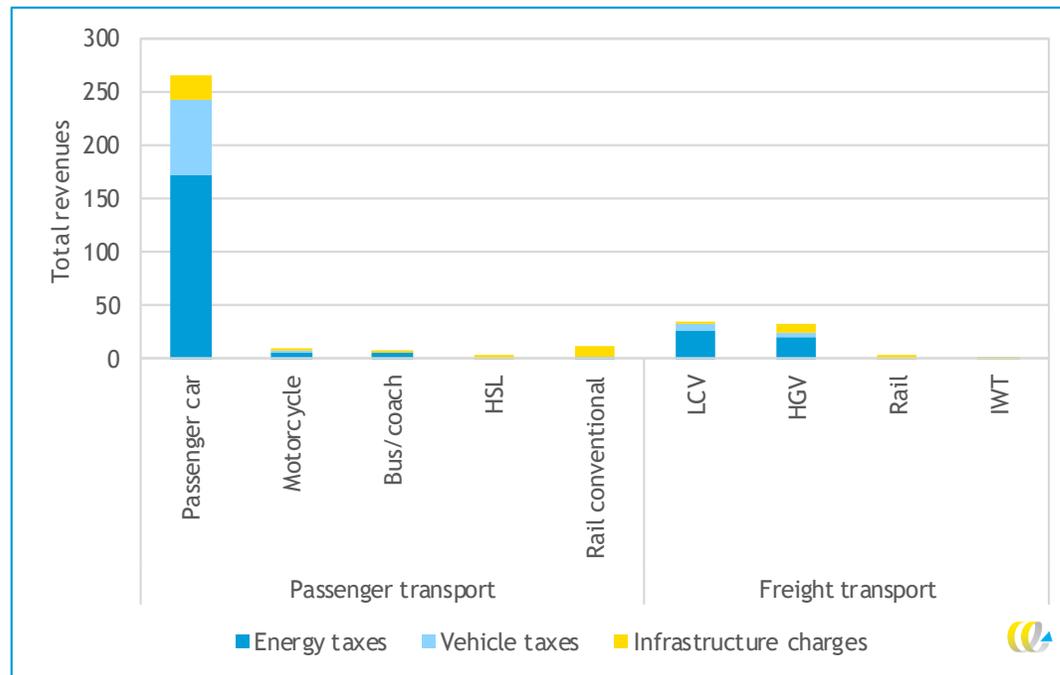
# External costs

- Average external costs of passenger (pkm) and freight (tkm) transport (excluding congestion)



# Transport taxes and charges

- **Total taxes and charges for road, rail and IWT € 370 billion (i.e., 2,5% EU28 GDP)**
- **Estimates for selected:**
  - **34 EU ports € 1.8 billion**
  - **33 EU airports € 13.5 billion**

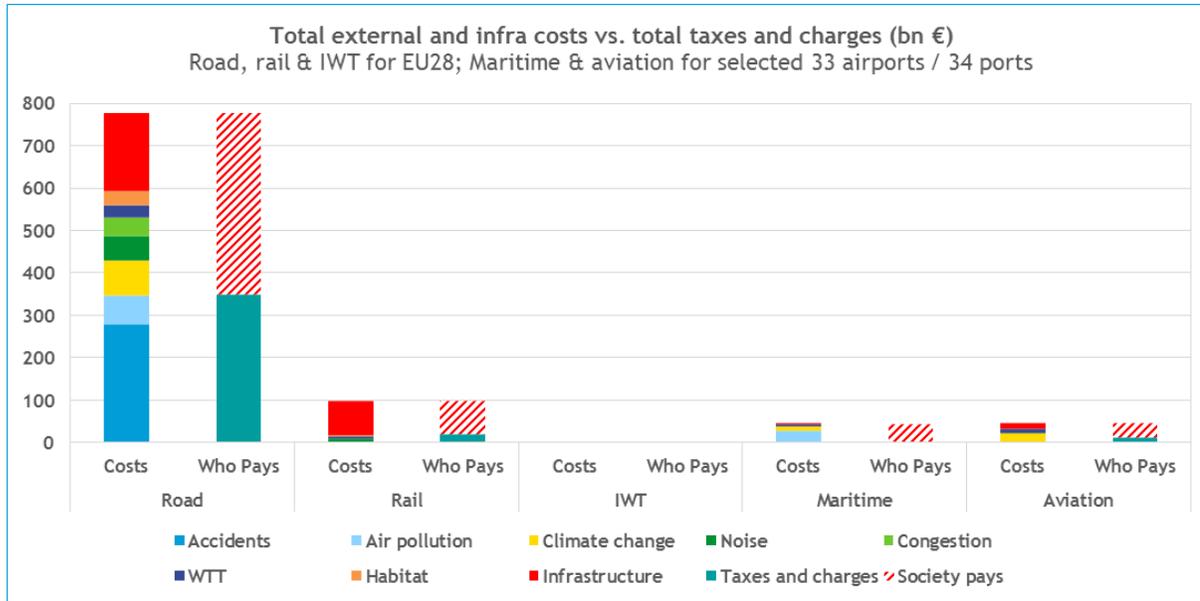


## By transport mode

- **95% road**
- **5% rail**
- **and 0.1% IWT**
  
- **81% from passenger transport, and remaining from freight transport**

# State of play of internalisation

## All taxes and charges vs all external and all infrastructure costs

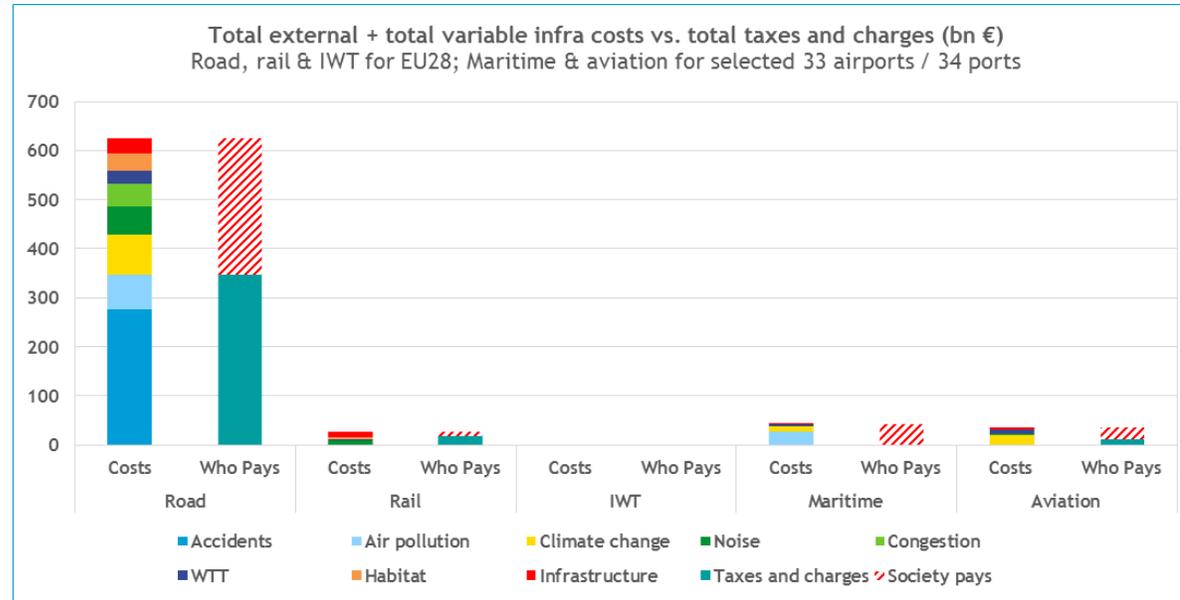


Transport mode	Cost coverage ratio
Road	45%
Rail	20%
IWT	6%
Aviation	29%
Maritime	4%

- Road is the mode paying back the most as share of total external and infrastructure costs. But it is also the mode where society pays the most in absolute terms

# State of play of internalisation

## All taxes and charges vs all external and variable infrastructure costs

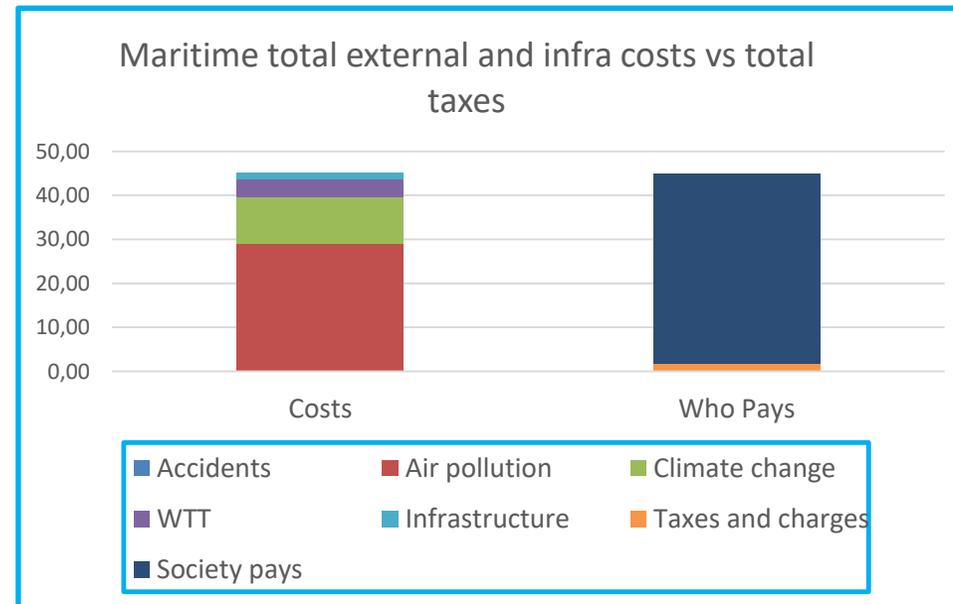


Transport mode	Cost coverage ratio
Road	56%
Rail	69%
IWT	12%
Aviation	36%
Maritime	4%

- There are good reasons for which the users should pay only for the direct costs (wear and tear)
- Excluding fixed infrastructure costs, rail pays back the most

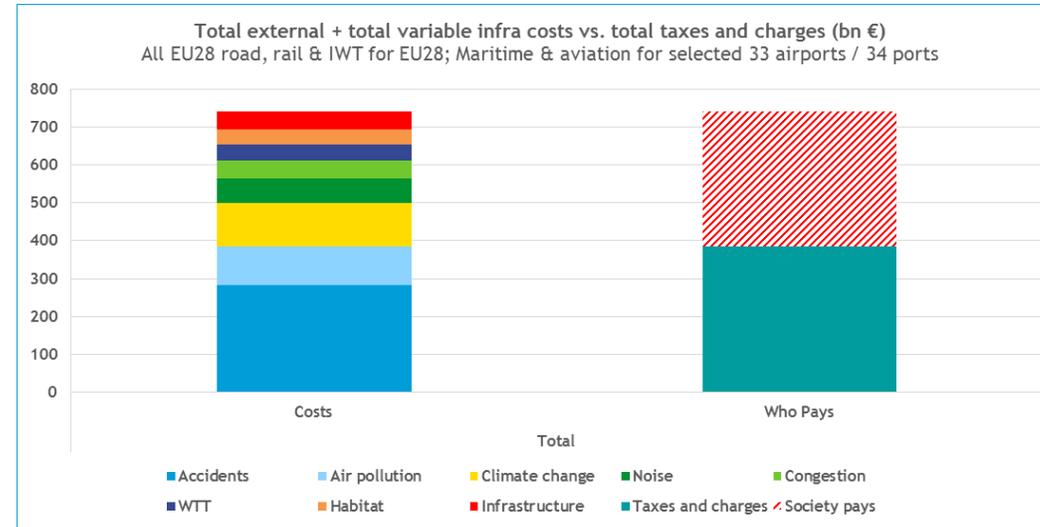
# State of play of internalisation maritime transport

- **The overall cost coverage ratio calculated on total external and infrastructure costs and tax/charge revenues for the selected 34 ports is equal to 4,1%**



- **This reflects the limited number of tax/charge schemes in place – often only port charges are levied, a limited number of ports differentiate charges to environmental standards**

# Conclusions



- **Users pay back only half of the direct generated costs (excluding fixed infrastructure costs)**
- **Little evidence of marginal social cost pricing, as variable external and infrastructure costs generally are not covered by variable taxes and charges**

# Conclusions

- **Limited application of the “user pays” principle**
  - **for most vehicle categories only 15-30% of infrastructure costs are covered by infrastructure charges**
  - **maritime transport do meet the “user pays” principle: the total revenues from port charges are in line with the total infrastructure costs and the cost coverage ratio of is 127%**
- **Varying results with respect to earmarking of revenues**
  - **revenues from transport taxes and charges are partly earmarked for infrastructure expenditures**
  - **significant differences between modes (road 10%, rail 85%)**

# Policy applications

- **Road transport**
  - **distance-based road charges differentiated by vehicle characteristics, location and/or time to increase the overall internalisation rate**
  - **urban charging schemes to address relatively high external costs of urban transport**
- **Rail transport**
  - **mark-ups on rail access charges to cover fixed infrastructure costs (although arguments exist for not internalising)**
  - **introduction of noise-differentiated rail access charges to speed-up noise abatement measures**

# Policy applications

- **Maritime**
  - **environmentally differentiated port charges or fairway dues to further internalise air pollution and complement IMO emission standards for new vessels;**
  - **global actions (with IMO) to reduce GHG emissions and climate change effects (intrinsically global character of shipping)**
- **IWT**
  - **appliance of fairway dues on a larger share of inland waterways, based on air pollutant emissions (most important for this mode) to complement new vessels emission standards**
- **Aviation**
  - **environmentally differentiated airport charges or aviation taxes**

# Broader context for internalisation

- **In addition to transport taxes and charges, other policy instruments (command and control measures and subsidies) may contribute to achieving the objectives of internalisation**
  - **non-pricing measures can contribute to establish a level playing field for investment, and encourage investments in technologies**
  - **lack of social and political support for implementing or increasing taxes and charges may also provide the justification for implementing non-pricing measures**
  - **non-pricing measures are also key to addressing externalities which are not targeted by taxes and charges for example accident costs**

# Overview of key EU-level non-pricing measures - maritime

Non-pricing Measure	Relevant Modes	Description
<b>Climate change</b>		
Regulation on the monitoring and reporting of emissions	Maritime	Provides insight into robust and verified emissions data and stimulates the uptake of energy efficiency solutions.
<b>Air pollution</b>		
Ambient Air Quality Directive	Road, Rail, IWT, Maritime, Aviation	Defines ambient air quality standards which require Member States to adopt and implement air quality plans.
National Emission Ceilings Directive	Road, Rail, IWT, Maritime, Aviation	Sets national total emission reduction targets and requires Member States to develop National Air Pollution Control Programmes.
Emissions Standards	Road, Rail, IWT, Maritime, Aviation	Defines acceptable emission limit values covering NO <sub>x</sub> , carbon monoxide, unburned hydrocarbons and non-volatile particular matter emissions.
<b>Accidents</b>		
Technical vehicle/vessel/aircraft regulations	Road, IWT, Maritime, Aviation	Regulation on type-approval requirements sets out safety and environmental requirements.
Vehicle/Vessel Inspection	Road, Maritime	Periodic technical inspection of vehicles/vessels and minimum standards for testing facilities.
Professional Driving Regulations	Road, Rail, IWT, Maritime, Aviation	Several measures are in place, such as required training and qualifications, minimum standards for working conditions and requirements for the use of speed limitation devices.
Vessel Traffic Monitoring	Maritime	Establishes a vessel traffic monitoring and information system.
Passenger Safety Regulations	Maritime	Sets safety rules and standards for passenger ships, such that safety of life and property on new and existing passenger ships on domestic and international voyages is harmonised.
European Aviation Safety Agency	Aviation	Establishes the working methods of the European Aviation Safety Agency such that it can conduct standardised inspections.





**Thank you for your attention**  
**Comments are welcome**

**[maffii@trt.it](mailto:maffii@trt.it)**

**[www.trt.it](http://www.trt.it)**