PRIME

Platform of Rail Infrastructure Managers in Europe

PRIME 15 - Brussels, 18 November 2019

DISCUSSION PAPER

Infrastructure Managers' contributions to climate change mitigation

This paper explores initiatives and ongoing projects by members of the Platform of Rail Infrastructure Managers in Europe (PRIME), in the context of **climate change mitigation and the transition to a climate-neutral economy by 2050**. Taking into account the rising demand for sustainable transport, the paper aims to foster strategic discussions about how infrastructure managers can contribute to decarbonising infrastructure, tackling capacity challenges, and adapting to the circular economy. Presenting rail's business perspective in the context of the Commission's public policy perspective, the paper explores how infastructure managers can innovate, modernise, and boost a modal shift to rail. In particular, it zooms in on how the rail sector can achieve better network performance and carbon performance.

Introduction

President-elect Ursula von der Leyen established climate change as the key priority for her European Commission, promising to deliver a European Green Deal to make Europe the first climate-neutral continent by 2050.

To achieve this ambitious target, **rail has to become the backbone of sustainable mobility**. From the business perspective of infrastructure managers, the EU Green Deal is both a challenge and an opportunity. A deep decarbonisation of transport requires IMs to improve their performance and invest in innovation and research, in order to gain market shares (I) with a better carbon performance (II).

In this context, the issue of climate change mitigation was discussed at the 14th PRIME Plenary in Bern in June 2019, following the publication of the EU strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050, in November 2018. The discussion concluded that, on the one hand, rail, as a comparatively clean mode of transport, has a natural role to play in implementing the climate neutral vision; on the other hand, rail has to step up its efforts in becoming greener and contributing to the circular economy.

The objective of this paper is to foster strategic discussions within PRIME and with interlocutors of infrastructure managers in the European institutions regarding climate change mitigation, with the ultimate goal of presenting rail's business perspective in the context of the Commission's public policy perspective. To this aim, the paper presents some of the main relevant initiatives and ongoing projects of PRIME members[1].

I. Improving railway network performance to boost modal shift

Transport accounts for a quarter of the EU's greenhouse gas emissions and demand for it continues to rise. Estimates suggest that European passenger and inland freight transport will increase by 35% and 53% respectively over 2015-2050. Rail is among the most efficient and lowest emitting modes of transport[2]. The recent study of the European Commission on transport cost internalisation confirms rail's leading role in complying with the 'user pays' and 'polluter pays' principles[3], as demonstrated by the figures in the Annex. A modal shift from road and air traffic to rail would contribute to reducing transport-related emissions.

a. Increasing infrastructure capacity

Absorbing passengers and freight traffic that shift from road and planes to rail will be challenging, at least in some parts of the network. In addition, market opening and the growing demand for commuter transport are expected to increase the overall demand for rail infrastructure capacity. To offer new services within a reliable network, capacity constraints and ageing infrastructure will need to be addressed. IMs have to make significant and strategic investments to **modernise and further develop the infrastructure.** The installation of reliable and robust signalling systems allows to increase the capacity of the lines concerned. In this context, the swift deployment of ERTMS is paramount.

The removal of bottlenecks and adaptation of infrastructure to allow for longer trains would also bring important capacity gains. Similarly, increasing load factors (number of passengers or number of tons per train) would bring immediate capacity gains.

[1] The examples listed in this paper are not exhaustive.

[2] See the last report of the International Energy Agency, prepared in cooperation with the International Union of Railways: EIA-UIC, "*The Future of Rail, Opportunities for energy and the environment",* 30 January 2019.

[3] "*Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities*", EC DG MOVE, June 2019. The different parts and annexes of the study are accessible here. See the analysis provided by CER in the Position Paper "*Commission study results suggest greater role for European railways*", 14 October 2019, accessible here.

Optimising capacity

SBB has developed a traffic control system (RCS) including the adaptive control (ADL) that enables rail services to operate with minimum energy and maximum capacity. ADL has two core functions: 1) To reduce the impact of signals by scheduling clashes between trains and calculating the ideal speed for trains to travel at, allowing them to get to their destination without unscheduled stops ('green wave'). 2) To reduce ahead-of-schedule train operations by detecting when a train is set to arrive ahead of schedule and calculating the speed to ensure that the train arrives at its next stop on time.

In Spain, **ADIF** developed a new 131 km length high speed line dedicated to both freight and passengers, from Barcelona (connecting Barcelona Port) to the French border: the number of transported tons rose by 120% from the first year of freight operations (2012) until 2018, and is expected to grow an additional 27% during 2019, and an additional 70% in 2020 (according to demands for train paths already received).

A rail motorway running on the conventional line between Calais and Turin was inaugurated in November 2018. This service is expected to allow an annual shift of 31,000 trucks from road to rail and a saving of more than 37,000 tCO2 emissions.

Ianrod Eireann (**IrishRail**) is advancing a rail development programme in the Greater Dublin Area, known as the DART Expansion Programme (DEP).

The programme will increase peak hourly passenger capacity from 26,000 currently to 70,000 by 2035. The project includes resignalling of part of the Dublin commuter rail network, elimination of level crossings and the expansion of city centre station and junction capacities, allowing to increase service frequencies.

The need for investment raises the need to secure adequate funding schemes. Railways modernisation projects are eligible for **sustainable financing**. The issuances of green bonds will facilitate a more detailed assessment and following results of the selected projects and their expected metrics (external cost and time savings; modal shift results and GHG emission reduction), and attract socially responsible investors.

Green bonds

ADIF and **SNCF Réseau** have positive experiences with issuing green bonds. ADIF had three successful cases over the last three years, 600 million EUR each. Since 2016, SNCF Réseau has obtained 5.7 billion EUR within five green bonds issues.

b. Increasing railway integration

Increasing modal shares also means increasing connectivity and multimodal integration. That means improving interoperability and mobility as a service, as well as promoting faster deployment of the TEN-T network and freight corridors. For example, a key factor in facilitating multimodal transport, both for freight and passengers, is improving the predictability of rail services for other modes. The provision of estimated arrival times and improvements to the traceability of cargo are important in this context.

Increasing connectivity & improving cross-border rail traffic

In Italy, the **RFI** project **"**Station Project – towards more sustainable mobility" aims to improve the **planning of the existing and new rail stations** within the framework of the development of the surrounding territory. To this end the project will include close cooperation with local authorities to ensure an integrated design and co-planning of station/local public transport/urban environment (including Urban Sustainable Mobility Plans and Stakeholder Engagement methodologies). RFI is developing a specific system based on the use of the GIS technology for analysing the mobility needs and supporting the strategic decisions.

IMs have been working together and building fruitful partnerships to offer **direct high-speed connections across the EU** (*for instance, HS1, Eurotunnel, SNCF Réseau and Lisea are proposing a direct link from London to Bordeaux*) as well as to rebuild international night trains services (*among others: ÖBB, Trafikverket, Prorail).* To the same aim, Prorail is calling for European operators to run special festival trains to the Eurovision song contest and other international events.

Furthermore, also following increased societal debate about the climate impact of travelling ("*flygskam*"), IMs are reflecting on concrete actions and **innovative digital solutions** for **supporting European cross-border rail traffic**. Digitalisation is opening up unheard-of potential for rail transport to optimise mobility offers for its customers, improve its networking with other modes of transport, and make the overall rail system more efficient while improving its performance.

A key element of digitialisation is the digital **European Train Control System** (ETCS). For example, in Germany, the use of ETCS and the digitalisation of the system is estimated to increase the capacity of Germany's railway network by as much as 35%. A coordinated rollout of ETCS in Europe and European co-financing – including of ETCS equipment for locomotives – should therefore be a core component of the European rail transport agenda in the years to come.

II. Improving the carbon performance

Some infrastructure managers have set up comprehensive climate action plans or environmental policy plans, or have integrated sustainability into the business model. Voluntary measures are being progressively implemented and efforts are being deployed in research and development of innovative solutions, also in the context of the Railway Climate Responsibility Pledge proposed by UIC[4]. Some companies have committed (or are in process of committing) together with the railway operators to achieve carbon neutrality, in the context of government climate strategies.

In Italy, the **RFI** project "CLEVER Cities Milan" aims to implement innovative and natural interventions in Milan's neighbourhoods, to demonstrate the feasibility and effectiveness of nature-based solutions on facing climate change and to promote them throughout the city. The CLEVER Cities Milan project is planning to re-design the railway station of "Milano Tibaldi" through green and innovative elements, which will make the infrastructure not only responsive to the needs of mobility, but also fully harmonized with its urban environment. These innovative elements will include green walls, natural elements on embankments, noise barriers in the structures and embankments of the station, controlled irrigation, temperature and humidity, and external green spaces such as waiting areas.

[4] The pledge sets ambitious but achievable goals for finding some solutions to climate change. Proposed for sector's commitment in 2015, it is currently being extended (December 2019) for further commitment to achieve carbon neutrality by 2050.

a. A better carbon performance of infrastructure operation

Improving energy efficiency is at the core of IMs' action plans. A wide range of measures are being implemented by IMs to reduce energy consumption for railways operations, including feeding back energy from breaking into the system, but also for buildings and facilities, e.g.: LED-lighting, tunnel ventilation, phase out of speed limitations, real-time energy monitoring and smart technologies to avoid losses and support optimisation of energy consumption.

In Germany, **Deutsche Bahn** aims to increase its use of green power and wants to make this use more efficient. New trains use a system that feeds power from breaking maneuvers back into the overhead lines and train drivers use methods to drive more energy-efficiently and cut energy consumption by up to 10%. At DB stations, depots and other buildings, DB is gradually replacing conventional fluorescent lamps with LED technology. DB has already replaced the lights used at over 500 stations across Germany, thereby reducing energy consumption on a major scale.

IMs' experiences show that improving energy efficiency also makes financial sense. Additionally, taking energy efficiency criteria into account will play a decisive role in the development of services. Increasing energy efficiency is therefore of great strategic relevance for the railway sector, as it forms the basis for securing rail's environmental advantage over road in the long-term. IMs are also investing to **increase the share of electrified lines** and progressively abandon diesel traction.

Electrification & eliminating diesel: examples

In Portugal, **IP**'s electrification investment program will allow to increase the proportion of electrified lines from 64% to 80% by 2023 (all the main lines, representing more than 90% of the passenger traffic volume will be electrified). **CFR** plans the electrification and rehabilitation of the Romanian railway line Cluj-Napoca - Oradea - Episcopia Bihor (167 km) which will allow a direct and secure connection with Budapest, as a diversionary line of the EU corridors to/from Hungary (Orient/East-med and Rhine-Danube).

The above-mentioned programme in the Greater Dublin Area (DEP) will facilitate a transition to electrical traction power from 100 km to 300 km by 2027; in the Slovak Republic**, ZSR** plans a gradual change of DC traction (3kV) to AC traction (25 kV/ 50 Hz) due to the higher efficiency and elimination of adverse stray currents on metal devices in the ground (which subsequently corrode, leading to a reduced lifetime).

In Germany, for the first time in the world, a **hydrogen-powered train** (zero emissions) was commissioned in 2019: the train runs on a 100 km line between Cuxhaven, Bremerhaven, Bremervörde and Buxtehude. Other IMs are working with operators and public service operations authorities to prepare the commissioning of hydrogen services.

Renewable energy investments: examples

Increasing renewable energy investments is becoming a growing concern for IMs**. Infrabel** has been investing in renewable energy for several years, with the rollout of PV installations on its buildings (481,000 kWh production in 2018), but also with the participation in larger-scale projects such as the Greensky wind farm project, the largest wind farm in Belgium. Greensky today anticipates a production of 94,000 MWh / year (equivalent to the energy consumption of 26,000 households/year), thereby avoiding the emission of 42,000 tons of CO2.

Prorail works towards energy neutrality in 2030 with Photo Voltaic-panels on platforms (Eindhoven, Rotterdam, Driebergen-Zeist, Delft, Zwolle), PV-panels and wind turbines on grounds, innovation programmes for PV-panels on noise reduction screens and on bike racks. Prorail, jointly with the operators, already purchases 100% renewable electricity and 50% green gas.

SBB has an average of 90% hydro power in the traction power mix and a completely electrified network. By 2025, trains are set to run on electricity generated entirely from renewable energy sources. Within the framework of its energy strategy and energy saving programme, SBB is aiming to reduce its anticipated annual energy consumption for 2025 by 20%. This is equivalent to 600 gigawatt hours or the annual energy consumption of 150,000 average Swiss households.

Since this year (2019), **ADIF** buys all the electric energy consumed in the Spanish railway system, both by ADIF and by the operators, with certificates of Guarantee of Renewable Origin. That is, 100% of the electricity consumed can be said to have a renewable origin.

In Austria, since mid-2018, trains have been powered exclusively by electricity from renewable sources. And since mid-2019, electricity exclusively from renewable energy is also used in all **OBB** operating facilities and offices.

In Germany, since 2018, trains carrying long distance passengers have been powered only by electricity from renewable sources. Starting in 2019, **Deutsche Bahn** has set up 15 of Germany's largest railway stations – in Berlin, Munich, Cologne and elsewhere – to use only electricity from renewable resources. Deutsche Bahn's climate protection goal is to be completely CO2-neutral by 2050. DB will have slashed CO2 emissions by over 50% by 2030 and is also working to switch the traction current exclusively to electricity from renewable sources by 2038.

b. A better carbon performance of infrastructure works

Infrastructure Managers have been progressively implementing methods and policies to improve the eco-design of projects, with the aim of reducing emissions from rail infrastructure in a lifecycle perspective.

Reducing the carbon footprint of infrastructure materials - Railway lines, in particular those with numerous tunnels, viaducts and bridges, use large amounts of concrete and steel. Several IMs are assessing and implementing policies to reduce the carbon impact of materials.

The topic is still largely on the move: definitions are being debated, research is ongoing, and reflections include not only carbon reduction but also scarcity of materials.

Some companies are starting to adopt a **circular economy** approach to encourage the reuse or recycling of the structural components of the infrastructure (rail, ballast, catenary, etc.).

A less carbon-intensive maintenance activity requires also the modernisation of the fleet of track maintenance heavy machines. To reduce the CO2 emissions linked to the fuel consumption of their fleet, IMs are working on the motorisation of vehicles, by acquiring more modern, hybrid or 100% electric vehicles.

Envision certification

RFI has been awarded the Envision Platinum certification – the highest achievable level – for the Naples-Bari HS / HC railway route. The railway project is designed to respond not only to mobility needs, but also to be integrated in a network of other transport modes and urban and logistics networks.

The "Envision Protocol", developed in 2012 by the Institute for Sustainable Infrastructure (ISI) and the Harvard University Graduate School of Design, is the independent international **rating system** that comprises 64 indicators to calculate the sustainability of an infrastructure project based on its entire life cycle, such as: improving quality of life, resilience with respect to the risks arising from climate and social change, stakeholder involvement, effectiveness of project management skills, and efficiency in the use of resources, such as construction materials, energy, and water resources protection. The Envision protocol generates value for local socio-economic systems, maximising community benefits and sustainability.

Carbon emissions assessment of railways projects

SNCF Réseau developed "TUVALU", a carbon calculator (commissioning planned for February 2020) which will cover all SNCF Réseau infrastructure projects. It allows: the calculation of the emissions induced and avoided by the project; the calculation of emissions at all phases of the project, from preliminary studies to project implementation; comparing the carbon emissions of the variants of a project. SNCF Réseau aims to reduce the carbon footprint of rail supply by 20% between 2018 and 2024. This includes increasing the share of recycled steel in the manufacture of new rail and reusing of the HSL rail.

Recycling

For Deutsche Bahn, protecting resources takes the form of scaling back consumption. Recycling is one of the main strategies for this: DB reuses material and so extends the lifespan of its products. DB's goal is to maintain a recycling level of 95% in 2019 and 2020, and DB has already surpassed that target with their 2018 results – it reached 98%. When possible, DB reconditions physical resources so that it can reuse them. Examples include concrete ties and sleepers, track ballast and even the paving stones used on station platforms.

Procurement requirements

Trafikverket has been implementing its goal of a climate-neutral infrastructure (2045 at the latest) through procurement requirements since 2016, by introducing requirements for climate performance in design and building investment projects. At the end of the project, the contractor must demonstrate that the requirement has been achieved through a climate declaration, and the performance of project specific materials has to be demonstrated: this is always the case for concrete (i.e. sleepers), reinforcement steel, construction steel (and fuels). In addition, a bonus model is presented in procurement for larger GHG reduction than required.

III. Possible steps forward

The overview shows that several initiatives are being implemented by infrastructure managers at national level to improve the sustainability of railway operations. With a view to the achievement of the Paris Agreement goals, the single efforts would deserve to be joined within a European, more systematic approach.

In that regard, as a European network aiming to achieve the implementation of the single European railway area, PRIME has been naturally working to boost modal shift and make EU mobility more sustainable since its establishment in 2013, and should continue to play and improve this role.

Firstly, PRIME can help to improve and increase railways services.

Building new lines is very expensive and time intense. At the same time, if the EU wants to meet its objective of becoming climate neutral by 2050, transport patterns will need to change very rapidly. A strong focus should therefore be on existing lines, i.e. on **capacity increases that can be gained in particular from digitalisation and operational improvements, such as better cross-border coordination of timetabling, traffic management and works**. In this context, the work of the new PRIME subgroup on digital solutions for European rail capacity and traffic management would be very important.

To the same aim, the **evaluation of Regulation 913/2010 on Rail freight corridors** offers the sector an opportunity to better serve freight clients through more efficient processes and coordination.

Secondly, PRIME may contribute to improve IM's own processes to mitigate climate changes.

It would be important to gain a better common understanding of how IMs integrate environmental factors into their processes. The initiatives of infrastructure managers presented above (procurement requirements on climate performance, circular economy approach on infrastructure components and materials, Envision protocol) show that maximising the sustainability of projects is already an increasing concern for IMs and can feed a broader, European reflection.

IMs could consider to systematically assess the socio-economic impact and carbon footprint of at least their largest investments. Among other factors, this includes time saving, mobility benefits and reduction of CO2 emissions. One reference instrument in that regard could be the EU handbook on "Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities", commissioned by DG MOVE in 2018 and published in May 2019.

The PRIME infrastructure financing subgroup could take the opportunity of the preparation of the *Regulation on the establishment of a framework to facilitate sustainable investment* ('Taxonomy') and its related delegated acts to **propose common elements of methods for the assessment of the impact of projects on climate mitigation.**

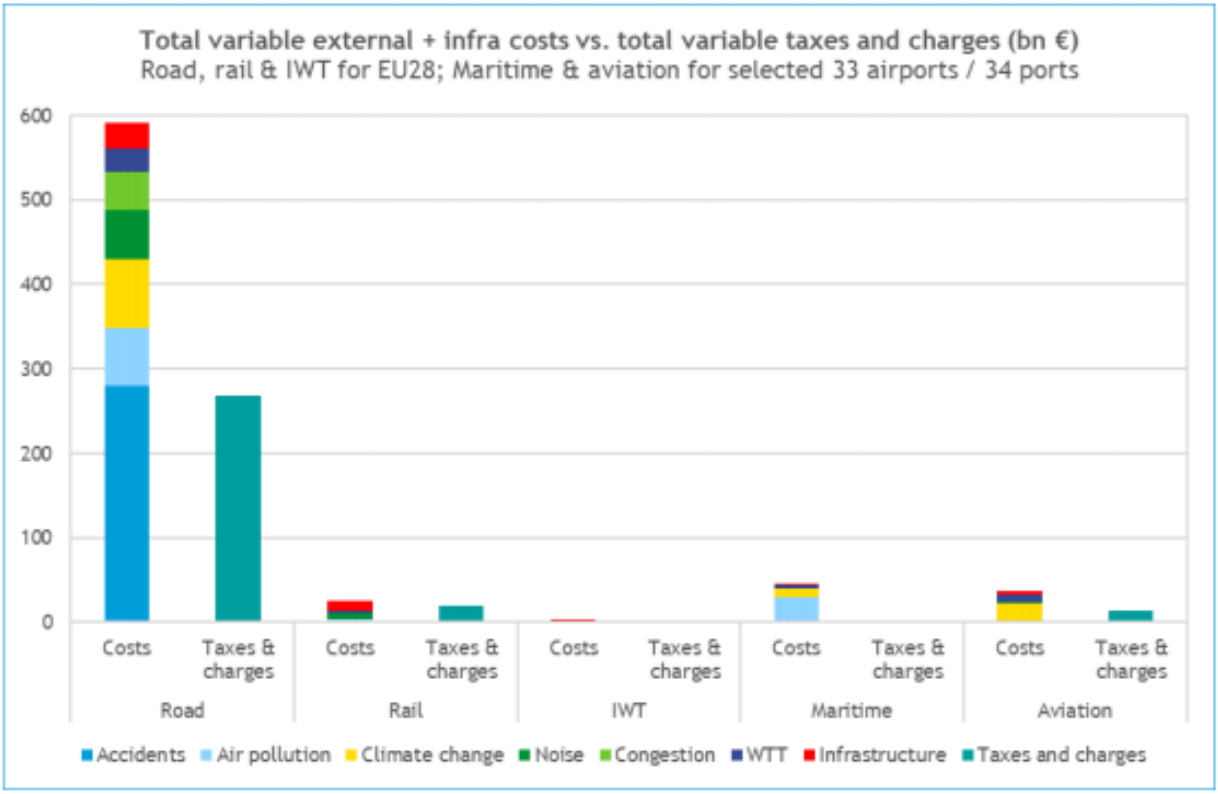
Circular economy approaches could be the subject of further exchange of best practice among IMs, with the aim of increasing the reuse and recycling of infrastructure materials. On 22nd July 2019, EC President-elect Ursula von der Leyen called for a "New Circular Economy Action Plan": PRIME members could proactively contribute to the Action Plan as well as to any new legislative initiative on this topic.

Furthermore, PRIME should explore how the **KPI subgroup could address sustainability issues and focus on climate mitigation related indicators**, also taking into account existing works and indicators (e.g. The Envision Protocol). If feasible, one of these KPI could be about load factors (number of passengers or tons per train).

Several members raised the issue and shared contributions also on climate adaptation/resilience. The topic could be further explored and discussed at the next PRIME Plenary in 2020.

ANNEX[4]

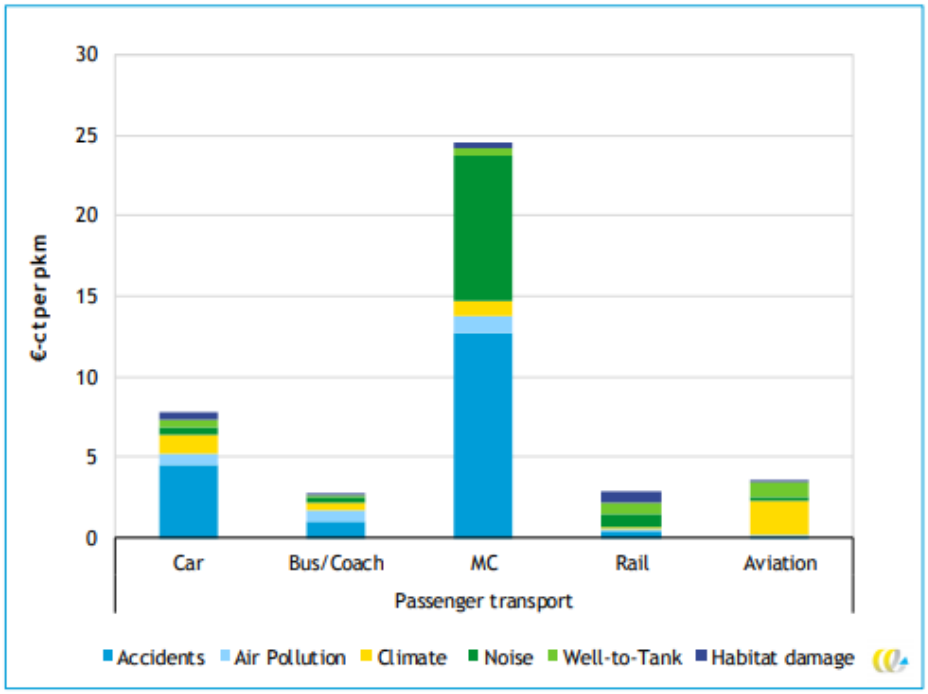
Total variable external and infra costs vs. total variable taxes and charges



The highest cost coverage ratio is found for rail transport: about 79% of the variable external and infrastructure costs (about € 25 billion) is covered by variable taxes/charges (about € 20 billion).

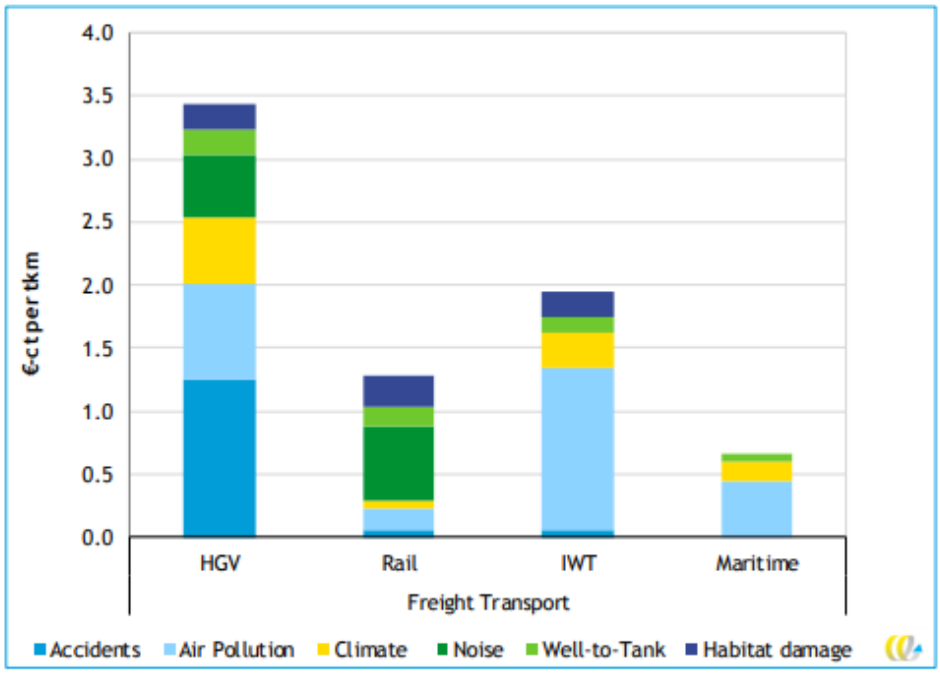
[4] Figures taken from State of play of Internalisation in the European Transport Sector and Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities: Main Findings, European Commission, 2019.

Average external costs 2016 for EU28: passenger transport (excluding congestion)



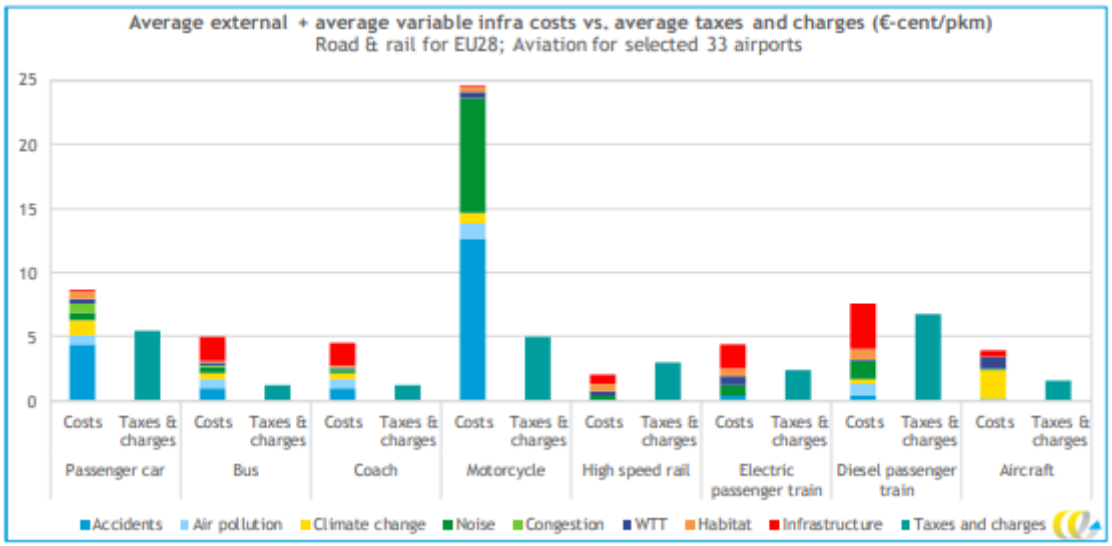
Note: The figures for aviation are averages for selected EU28 airports.

Average external costs 2016 for EU28: freight transport (excluding congestion)



Note: The figures for maritime transport are averages for selected EU28 ports.

Average external and average variable infrastructure costs vs. average taxes/charges for passenger transport



Average external and average variable infrastructure costs vs. average taxes/charges for freight transport