The CER Essay series

Where academic analysis meets business insight

Rail's contribution to green transport policy

by Professor Ottmar Edenhofer, PIK and Richard Lutz, DB

CER
The Voice of European Railways

DB

PIK
Potsdam Institute for Climate Impact Research

CER Essays

The CER Essays initiative features a series of essays that show the rail sector as contributing not only to EU transport policy, but touching on different aspects of society at large. Topics covered by the initiative will range from modal shift, climate policy, infrastructure investment, high-speed rail, demography and more. Each essay will feature a different topic and be co-authored by a CER member CEO and a leading academic from the same country and will be used to spark debate among political stakeholders on the role of rail in the EU.

Follow the whole series

Contents

About the authors . . . 3

Executive Summary . . . 4

Introduction . . . 5

Rail's contribution to green transport policy . . . 6

Rail transport can and must play a key role in reducing greenhouse gas emissions . . . 7
Climate impacts hit rail transport infrastructure: the case of Germany . . . 8
EU climate action can help reduce transport emissions by sound CO_2 pricing . . . 9
An intelligent policy mix is needed to set the right framework . . . 10
Railway's environmental commitment . . . 12
Making rail transport a driver of green change . . . 12

Key facts . . . 14

References . . . 15

About the authors

Professor Ottmar Edenhofer

Potsdam Institute for Climate Impact Research (PIK)

Ottmar Edenhofer is a leading expert in the field of the economics of climate change. His main research interests cover the impact of technological change on the costs and strategies of climate change mitigation, public finance, distributional effects of climate policy instruments, scientific policy advice and the science-policy-interface as well as inequality research.

Among his many obligations he is member of the German National Academy of Science and Engineering acatech as well as member of the German National Academy of Sciences Leopoldina, Section Economics and Empirical Social Sciences. From 2008 to 2015, Edenhofer served as Co-Chair of Working Group III of the Intergovernmental Panel on Climate Change (IPCC) and contributed heavily to the shaping of the Fifth Assessment Report on Climate Change Mitigation which provided the scientific basis for the Paris Agreement. Its analysis on the feasibility of the 2°C-target was groundbreaking and provided essential information for decision makers.

Edenhofer has published articles in Science, PNAS, Nature, Nature Climate Change, European Economic Review, Resource and Energy Economics, Energy Economics, Macroeconomic Dynamics, World Development, Journal of Environmental Economics and Management as well as other peer-reviewed journals and authored a number of books. His work has been heavily cited, which is illustrated by an h-index of 43 in Scopus, 42 in ISI Web of Science.

Richard Lutz

Chairman of the Management Board of Deutsche Bahn AG

After studying business administration, Richard Lutz worked as a research assistant to the chair of business administration at Kaiserslautern University, where he earned his doctorate in 1998.

Lutz joined Deutsche Bahn AG in 1994. In the years that followed, he held a variety of management and strategic project management positions in the Finance/ Controlling Division.

Lutz served as Head of Corporate Controlling starting in 2003. He then became the Management Board Member for Finance/Controlling in April 2010, a position which he held until the end of 2018.

Since March 2017, Richard Lutz has served as Chairman of the Management Board and CEO of Deutsche Bahn AG. Together with his Management Board team, he is pressing ahead with Group-wide implementation of DB's overarching "Strong Rail" strategy. The aim is to make Deutsche Bahn more robust, more powerful and more pioneering, thereby facilitating the shift of traffic to climate-friendly rail. This is not only an important contribution to achieving climate targets, but also to improving people's mobility, logistical services for businesses as well as European integration.

Executive Summary

The transport industry is one of the sectors with the highest carbon emissions. In stark contrast to decreasing emissions in the EU overall, transport emissions have increased over the past years. Against this background, a reduction of 90 percent of transport emissions until 2050, as is the aim of EU's transport strategy, seems like an impossible task.

Yet, with its "Fit for 55" package, the European Commission has proposed several instruments to reduce greenhouse gas emissions. One of the key levers is a sound carbon pricing, for example through a separate emission trading system (ETS) for road transport and buildings. Pricing carbon emissions leads to better internalisation of external costs in the road transport sector. A decreasing cap for this new ETS would also virtually guarantee target achievement and force the road transport sector to finally reduce its emissions. As the ETS price will be felt particularly hard by poorer households, additional measures – financed by ETS revenues through the EU Social Climate Fund or national measures – can address distributional concerns raised by more ambitious climate goals.

Rail transport can also be an important part of the answer to this challenge: Due to its already high degrees of efficiency and electrification, it is responsible for less than 1 percent of EU transport emissions. Additionally, rail already internalises its climate externality: since 2005, when the ETS was first launched, electrified rail transport has had to pay for its CO_2 emissions – unlike other transport modes. An intelligent policy mix is needed: Increased investment in railways and public transport, together with faster planning and approval processes as well as policies to make up for the shortage of skilled workers are necessary. Moreover, improved interoperability and the further use of digital tools like the European Rail Traffic Management System (ERTMS) and digital capacity management are important.

With extreme weather events and temperature records increasing, there is an overwhelming acceptance that more climate action is necessary. The "Fit for 55" package is a historical opportunity.

With extreme weather events and temperature records increasing, there is an overwhelming acceptance that more climate action is necessary. The "Fit for 55" package is a historical opportunity.

Alberto Mazzola

CER Executive Director

Introduction

Mitigation of climate change clearly requires the decarbonisation of passenger and freight transport. It is high time that we increase efforts to reduce greenhouse gas emissions in the transport sector, which accounts for around 25% of the EU's emissions. These emissions from transport continue to grow while rail's emissions have fallen by 32% during the last three decades. The challenge of transport decarbonisation was widely acknowledged during COP26, which also showed that the number of countries that propose concrete measures to decarbonise their transport sector has risen significantly.

Decarbonisation of transport is indeed possible by bringing more passengers and freight onto European rails. This is why the EU Sustainable and Smart Mobility Strategy already proposed ambitious targets on modal shift. It is now time for a speedy implementation of the strategy by shaping the EU's climate and energy legislation as guided by the EU Fit for 55 package.
Rail must be recognised as the most energy efficient transport mode and an intelligent policy mix agreed that puts a price on carbon and uses the revenues from emissions trading to improve sustainable mobility as explained in this CER Essay.

Regarding the reform of the EU's carbon market, the EU Emissions Trading System (ETS), its extension to road emissions and implementation of full auctioning for aviation emissions will contribute to setting a comparable carbon price applicable to all transport modes. This will level the playing field with electric rail, which has already been fully paying the carbon price under the ETS for many years. In addition to greening more polluting means of transport, ETS revenues and the new Social Climate Fund should be used to invest in rail and low-emission multimodal infrastructure and rolling stock for passengers and freight, providing additional funding to match the costs required by the EU modal shift targets. As a result, a better and zero-emission transport offer will be provided to EU citizens, including vulnerable households, which do not have financial means to invest in electric vehicles.

In addition to greening more polluting means of transport, ETS revenues and the new Social Climate Fund should be used to invest in rail and low-emission multimodal infrastructure and rolling stock for passengers and freight.

Rail's contribution to green transport policy

We need a meaningful CO_2 pricing scheme incorporating the transport sector. Together, policymakers and the transport sector can drive the change.

Climate change is a fundamental risk to our modern way of life – a way of life in which the mobility of people and goods is an essential element. From heat waves to torrential rains, weather extremes affect our societies already today. And, if greenhouse gas emissions continue in an unmitigated manner, it will get worse. The science is clear about that. This means that the transport sector must adapt to the climate crisis. Most importantly, the transport sector can and must reduce CO_2 emissions and thus contribute to limiting any global temperature increase. Yet to be able to do this, it requires the right policy framework set by the EU and national governments. We need a meaningful CO_2 pricing scheme incorporating the transport sector. Together, policymakers and the transport sector can drive the change.

So far, CO_2 emissions have kept on increasing globally. The disruptions caused by the COVID-19 pandemic reduced emissions to levels comparable to those of a couple of years ago – which by far was not enough to reverse the climate change trend. CO_2 accumulates in our atmosphere if we use it as a free waste dump for fossil fuel emissions. In contrast to emissions such as soot, it stays in the air for centuries. This illustrates that only a bold change to zero-emission technologies can limit global warming. Reducing transport or other economic activities, or increasing process efficiency, will not do the job. We need to change the way we run transport towards clean power. And we need to do so quickly.

Rail transport can and must play a key role in reducing greenhouse gas emissions

The numbers are well-known: About 25 percent of total CO_2 emissions in Europe are caused by the transport sector. Emissions are generally decreasing in the EU, but that decrease needs to be accelerated to meet the Paris agreement target of limiting worldwide warming to well below 2 degrees Celsius. Moreover, the European Climate Law from 9 July 2021, agreed on by Member States, the European Commission, and the European Parliament, enshrines in law the EU's objective of becoming climate neutral by 2050 and the intermediate target of reducing net greenhouse gas emissions by at least 55 percent by 2030, compared to 1990.

The resulting challenge for the EU transport sector is unparalleled. In stark contrast to decreasing emissions in the EU overall, transport emissions have increased over the past years. However, the current EU Sustainable and Smart Mobility Strategy aims at a 90 percent emission reduction in the transport sector until 2050 (compared to today). Rail transport can be an important part of the solution to this contradiction: Due to its already high degrees of efficiency and electrification, it is responsible for less than 1 percent of EU transport emissions.

This means a threefold task: strongly decarbonising road transport, shifting a considerable part of road transport to clean rail transport, and making sure that electrified rail transport is powered by renewable sources (since otherwise, indirect emissions – from fossil-fuelled power generation for electrified rail transport – would further increase climate change). Rail transport can play a major role in curbing emissions because it is already largely electrified, and further electrification is possible, for example through different innovative technologies.

Rail transport can play a major role in curbing emissions because it is already largely electrified, and further electrification is possible, for example through different innovative technologies.

Climate impacts hit rail transport infrastructure: the case of Germany

New evidence on how climate impacts affect rail transport is provided by a recent study by the Potsdam Institute for Climate Impact Research for Deutsche Bahn. In unprecedented detail, it illustrates the link between weather extremes and disruptions in rail traffic for the 34 traffic regions of Deutsche Bahn – and in fact projects such disruptions to increase.

Hot days are one key example here – they have already increased and will continue to do so, the analysis shows. It is worth to have a look at the concrete numbers: While Germany experienced an average of 3.6 days per year with temperatures reaching more than 30 degrees Celsius between 1960 and 1990, this number more than doubled to 8.1 days between 1991 and 2020 and will likely reach 10.9 per year in the period 2031 to 2060. Importantly, temperature levels are quite different from one region in Germany to another. The northern region of Kiel, for example, is projected to experience, in the best case, maybe just one of those hot days per year by mid-century. At the same time, the southern region of Karlsruhe might, in the worst case, suffer from 30 hot days per year.

While there are of course regions in Europe which have had to deal with high temperatures in the past, in Germany, these have been associated with a substantial amount of traffic disruptions. Days with temperatures over 30 degrees Celsius result in roughly one quarter more reported traffic disruptions. Thus, the projected increase of hot days in Germany is critically relevant for rail transport. And it calls for adaptation measures. However, there are limits to what rail transport and in fact societies in general can adapt to. While these limits are hard to identify, it is obvious that with unmitigated greenhouse gas emissions and the resulting warming, we will overstep these limits and enter unknown climatic territories.

The uncertainties involved are substantial. Notably, compared to hot days, it is less clear what change we must prepare for with regard to other weather extremes. Local short-term rainfall events for instance are expected to increase in Germany, yet it is not necessarily the number of days bringing heavy rains but rather the amount of rainfall on these days, potentially leading to local flooding that of course can affect rail traffic. As for stormy days, the uncertainties are even bigger. Their number might not increase at all in Germany. Yet due to higher temperatures, the vegetation period starts earlier in the course of the year and lasts longer. Thus, strong winds for instance in the fall could hit trees that still have their leaves, increasing the risk of making some of those trees fall on railway infrastructure and causing disturbances.

Railways are using this scientific data to develop a sound resilience strategy and, above all, prepare infrastructure, vehicles, and stations to an even greater extent so that they can withstand the impact of climate change more effectively. One example is the further ramping up of vegetation maintenance on the tracks. In the case of DB, with more personnel, greater expertise, digital tools, and greater expenditures, rail has become more weatherproof. Storm damage caused by trees has fallen by about 25 percent since 2018. Rolling stock has also been included in precautions, such as the high-speed train ICE 4, which is equipped to withstand outside temperatures of up to 45 degrees Celsius. Older series are being completely overhauled so that they can be used longer, and they are being fitted with climate-resilient systems. It is evident that those – necessary – measures cause a considerable financial burden for the railway sector.

EU climate action can help reduce transport emissions by sound CO_2 pricing

The European Commission has proposed major changes to European climate policy in its "Fit for 55" package. One of the key proposals includes a new, separate emissions trading system (ETS) for road transport and buildings set to start in 2026.

A decreasing cap for this new ETS would virtually guarantee target achievement and force the road transport sector to finally reduce its emissions. The effect of the ETS will be to set a price on carbon emissions and therefore incentivise passengers and logistics companies to invest in and use climate friendly transport modes. As the ETS price will be felt particularly hard by poorer households, additional measures – financed by ETS revenues through the EU Social Climate Fund or national measures – can address distributional concerns raised by more ambitious climate goals. After 2030, the two ETS (the new, separate ETS for road transport and buildings and the existing ETS for industry and the electricity sector) could be integrated into one ETS covering the largest part of the EU economy.

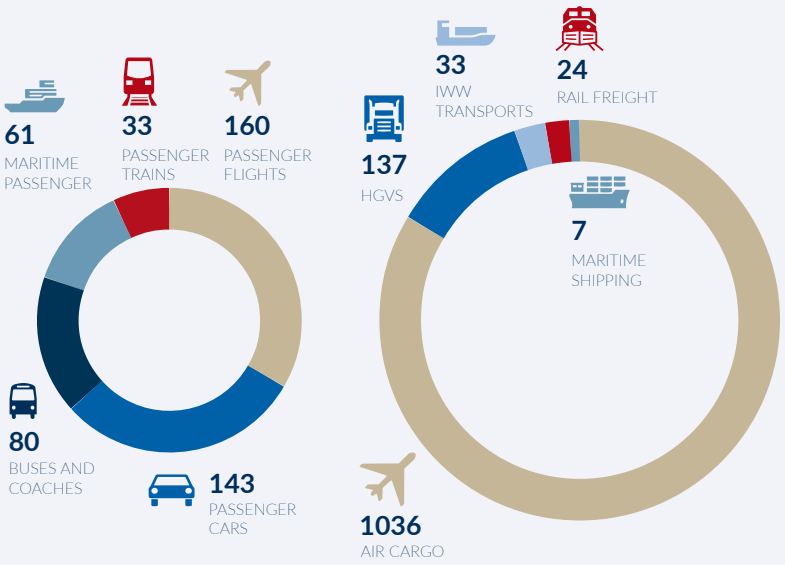
Complementary instruments can be necessary to address issues that cannot be solved by the ETS alone. For example, the European Commission has suggested to tighten the emission standards for new cars and vans to ensure that car manufacturers develop more efficient vehicles. For 2035, a 100 percent emission reduction is proposed. Infrastructure rollout will also be necessary to support the transition in the road transport sector, as regulated, inter alia, under the Alternative Fuels Infrastructure Directive.

In February 2021, the European Commission adopted its new EU strategy on adaption to climate change, outlining strategies to become climate resilient by 2050 and adapt to the unavoidable impacts of climate change. The strategy aims to make adaptation measures smarter, more systemic, and faster. The EU aims to expand knowledge about the impacts of climate change, increase the availability of data helping to understand climate-related risks, and better understand available options for adaptation. The European Commission wants adaptation strategies to be developed at all levels of government and climate resilient considerations mainstreamed in all relevant policy fields.

In Germany, the national climate targets have been revised to be consistent with a ruling of the Federal Constitutional Court – which now also makes them consistent with the tightening of the European emissions reduction target to 55 percent. Consequently, the new Federal Ministry for Economic Affairs and Climate Action has proposed immediate measures to remove hurdles hindering the development of renewable energy and to significantly increase their share in the national energy mix (to 80 percent by 2030).

Regarding the national ETS for heating and transport fuels, the goal should be to establish effective emissions trading in the transport and heating sectors at the EU level as soon as possible (as is foreseen in the Fuel Emission Trading Act establishing the national ETS).

AVERAGE GHG EMISSIONS BY MOTORIZED MODE OF PASSENGER AND FREIGHT TRANSPORT, EU-27, 2018



Explanation: gCO_2e per pkm: Gramme of CO_2 equivalent for moving one passenger over one kilometre. gCO_2e per tkm: Gramme of CO_2 equivalent of moving one tonne over one kilometre. All values presented are 'well-to-wheel', meaning that both the emissions from the production and distribution of fuels and those from using them are accounted for.

Source: Fraunhofer ISI and CE Delft, 2020. In European Environment Agency, Rail and waterborne – best for low-carbon motorized transport, 21st March 2021, https://www.eea.europa.eu/publications/rail-and-waterborne-transport.

An intelligent policy mix is needed to set the right framework

Rail has the lowest emissions in motorised passenger and freight transport. Hence, a shift to rail can reduce overall emissions. It is also one of the most energy efficient modes, accounting for only 2 percent of total EU27 energy consumption in transport, while carrying 13 percent of goods and 7 percent of passengers of all transport modes.[1]

Although rail is clearly the most environmentally friendly form of transport, the development of rail's modal share in the transportation mix over the last decade does not reflect this. There are many reasons for this, including insufficient investment in Europe's rail infrastructure, somewhat patchy interoperability, and an uneven playing field with other transport modes.

In particular, investment in rail infrastructure needs to increase if rail is to achieve the ambitious goals of doubling high-speed rail traffic and increasing rail freight by 50 percent by 2030 and doubling rail freight by 2050, as set out in the EU Sustainable and Smart Mobility Strategy. Increased investments together with faster planning and approval processes as well as policies to make up for the shortage of skilled workers and the lack of capacity for construction would be a real step forward to completing the Trans-European Network for Transport (TEN-T). Funding should be concentrated on missing links and bottlenecks, but also on further electrifying rail tracks on the busiest part of the system. In this regard, the proposed revision of the TEN-T regulation is timely and necessary.

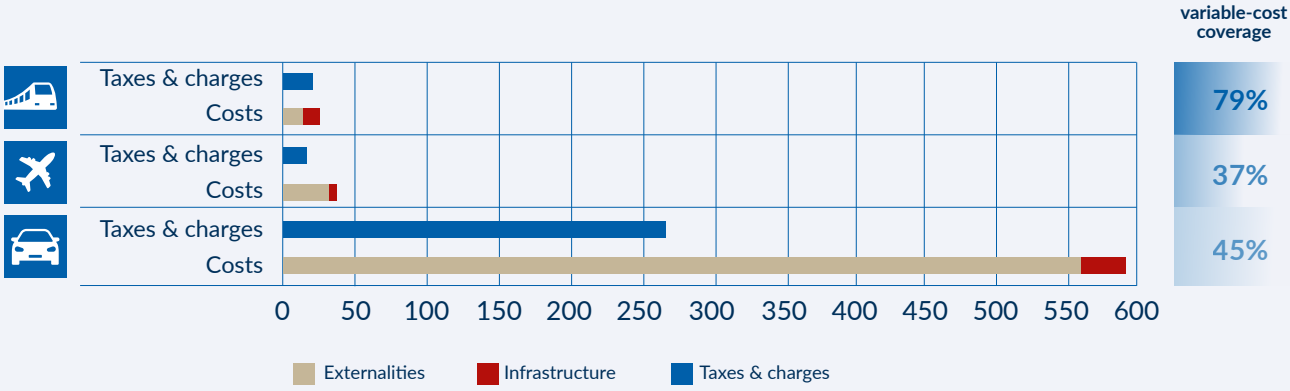
1 *Seventh monitoring report on the development of the rail market, European Commission, https://ec.europa.eu/transport/sites/default/files/swd20210001-7th-rmms-report.pdf*

Although Europe has already come far in terms of improving the interoperability of railways, especially on aligning operational rules, there is still some work to be done to achieve full technical interoperability. This includes consistent, European-wide deployment of ERTMS (European Rail Traffic Management System) on board and on track. ERTMS deployment improves operational efficiency and increases capacity (much faster than the construction of new railway lines). Combined with automated train operations (ATO) and other new technologies, such as artificial intelligence, embedded sensors, and telematics, it makes the rail system smarter and more capable.

Another driver is Digital Capacity Management. Through digital representation of infrastructure, including daily construction activity, and optimisation algorithms, train path capacity and quality can be maximised, hence allowing a higher capacity on the current infrastructure.

Finally, an important factor preventing more transport shifting to rail is the lack of a level playing field. A level playing field especially implies that externalities are internalised across all transport modes. Rail already internalises its climate externality: since 2005, when the ETS was first launched, electrified rail transport has had to pay for its CO_2 emissions – unlike other transport modes. A strong carbon price across all transport modes, as made possible by the introduction of a new separate ETS for road transport proposed by the "Fit for 55" package, as well as the possibility to account for CO_2 emissions as part of the recently revised Eurovignette Directive are major steps towards reaching a level playing field. Yet transport causes other external costs besides CO_2 emissions. These include congestion costs, air pollution, accidents, noise, up- and down-stream processes, costs for nature and landscape, or additional costs in urban areas.

TOTAL VARIABLE EXTERNAL AND INFRASTRUCTURE COSTS VS. TOTAL VARIABLE TAXES AND CHARGES (BN €)



Source: CER Fact Sheet https://cer.be/sites/default/files/publication/CER%20Factsheet%20EC%20Cost%20Study%202019.pdf based on the EU-Study "Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities (2019)". Variable costs are a good proxy for marginal costs, i.e. the cost of running an extra train or truck. It is these 'marginal' or additional costs on society, which need to be paid by users and polluters so that they do not override the social benefit of running extra services.

The "Fit for 55" package is a historical opportunity, it can and indeed must now be used to make a leap forward. This is not just about transport; it is about a safe future and a liveable planet for us all.

According to a study on external costs by the European Commission, rail has the lowest externalities and better coverage of its total variable external and infrastructure costs. In fact rail has a variable cost coverage of 79 percent compared to 37 percent for aviation and 45 percent for road. Proper consideration of external costs is necessary for passenger and freight users to make greener transport choices as well as for making sustainable transport investment decisions.

Railway's environmental commitment

As shown above, rail currently has a clear environmental advantage. This means that rail should be taking a larger share of transport to reach the climate goals for the transport sector. But what about the future? The "Fit for 55" package sets the framework for road, aviation, and maritime transport to continuously reduce their carbon footprint. For railways, the package is an encouragement to keep on improving environmental performance even further.

For DB, this implies making sure that environmental goals, set out in the Green Transformation strategy, are firmly anchored within the overall company strategy Strong Rail. With Green Transformation, DB takes a holistic approach, as all products, services, and the way that the company works become more environmentally friendly. To drive the Green Transformation forward, five fields of action were defined: Climate protection, nature conservation, resource protection, noise reduction, and social responsibility, in each of which clear goals were set.

DB as a group aims to be completely climate-neutral by as early as 2040. From a science perspective, this must include all the group's supply chains. To achieve this objective, depots, stations, and office buildings in Germany will be entirely powered with green energy from 2025. By 2030, specific CO_2 emissions will be reduced by at least 50 percent relative to 2006. Between 1990 and 2020, DB has already successfully managed to reduce its specific CO_2 emissions from rail transport in Germany by around 70 percent. By 2038, 100 percent of the power in the traction current mix will come from renewable sources. Today, already more than 90 percent of DB's rail transport volume is powered by electricity. For those parts of the network that cannot be electrified, DB will replace diesel trains with alternative drive systems, including battery-driven and hydrogen technology. In addition, heating supply will continuously be made more sustainable and gradually replace fossil fuels, such as heating oil and natural gas. Increased energy efficiency is also expected to reduce consumption.

Making rail transport a driver of green change

The need for climate action in the transport sector is evident. Sound CO_2 pricing is one key lever, widely underestimated in the public. Pricing emissions can in fact be a major factor for affordable rail transport. However, additional measures are needed to decarbonize transport, including the ramping up of renewable energy production and smart grids to distribute the huge additional amounts of clean power needed. Clearly, rail is not the only solution, decarbonising road transport is an equally important task to be tackled now. Yet the railway sector is clearly committed. The "Fit for 55" package is a historical opportunity, it can and indeed must now be used to make a leap forward. This is not just about transport; it is about a safe future and a liveable planet for us all.


Connecting Europe Express
Empfang in Berlin 29. September 2021
Gleis 8
Parkhaus Süd
193 360
DB
I am Europe

Key facts

1%
of EU transport emissions

Due to its already high degree of efficiency and electrification, rail transport is responsible for less than 1 percent of EU transport emissions.

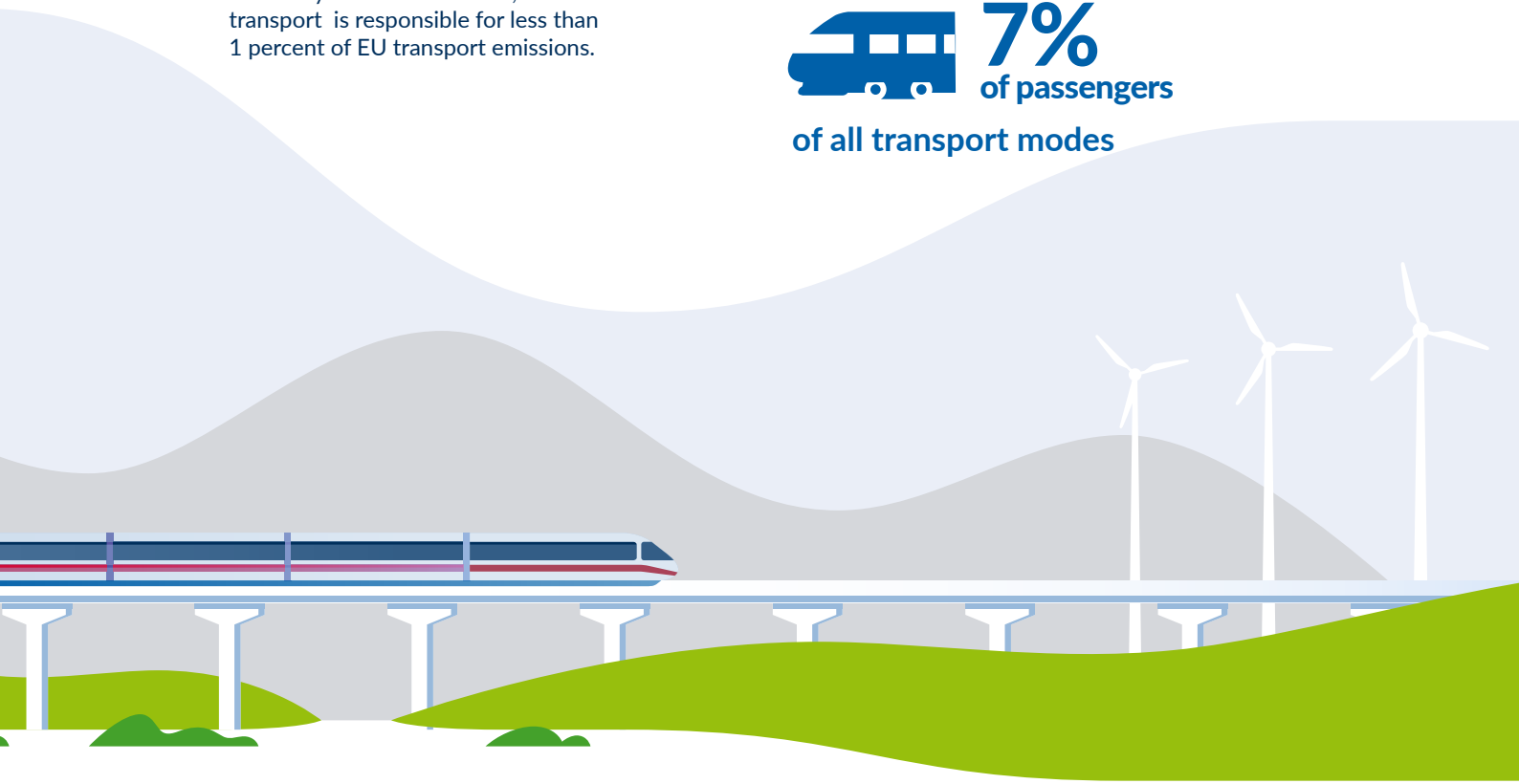
It is also one of the most energy efficient modes,

accounting for **only 2% of total EU27 energy consumption in transport,** while carrying

13% of goods and

7% of passengers

of all transport modes



References

European Commission (2021), Seventh monitoring report on the development of the rail market.

European Environment Agency (2021), Rail and waterborne – best for low-carbon motorized transport.

Fraunhofer ISI and CE Delft (2020), Methodology for GHG Efficiency of Transport Modes.

Potsdam Institute for Climate Impact Research (PIK)

Advancing the scientific frontier on inter-disciplinary climate impact research for global sustainability and contributing knowledge and solutions for a safe and just climate future – this is the twofold mission of the Potsdam Institute for Climate Impact Research (PIK), a member of the Leibniz Association and a leader in its field. PIK integrates the latest understanding of the Earth's system with the assessment of climate risks, and with the exploration of policies and pathways towards a manageable climate future. A guiding framework for PIK's research is therefore the integration of Planetary Boundaries and Global Commons.

With more than 350 staff from all over the world, PIK contributes knowledge to the global scientific community by way of publications in high-ranking peer-reviewed international journals and engagement in numerous partnerships and networks. Its main methods are integrated and complex systems analysis and data integration; numerical simulations are run on our own super computer. The institute also actively provides insights to decision-makers in policy, business, and society as a whole.

PIK was founded in 1992 and is a non-profit organisation. The constitutional organs are the General Assembly, the Board of Trustees, the Board of Directors and the Scientific Advisory Board. At the end of 2020 PIK had 374 employees, of whom 248 were scientists. PIK is a member of the Leibniz Association and is funded to a roughly equal extent by the Federal Republic of Germany and the Federal State of Brandenburg.

Deutsche Bahn AG

DB Group is a leading provider in the mobility and logistics sector, and primarily consists of the integrated rail system and the two major international subsidiaries DB Schenker and DB Arriva. The integrated rail system includes our passenger transport activities in Germany, our rail freight transport activities, the operating service units, and the rail infrastructure companies (RIC) in Germany. DB Group, with its head office in Berlin, employs about 340,000 people. Our business operations are focused on rail transport in Germany.

Our primary concern is the shift from road traffic to climate-friendly rail. To this end, we rely on integrated operation of transport and railway infrastructure, the economically and environmentally intelligent linkage of all modes of transport, as well as cooperation in German and European networks. We operate Europe's longest rail network and are also one of the largest energy suppliers in Germany.

CER

The Community of European Railway and Infrastructure Companies (CER) brings together railway undertakings, their national associations as well as infrastructure managers and vehicle leasing companies. The membership is made up of long-established bodies, new entrants and both private and public enterprises, representing 79% of the rail network length, 77% of the rail freight business and about 90% of rail passenger operations in EU, EFTA and EU accession countries. CER represents the interests of its members towards EU policy makers and transport stakeholders, advocating rail as the backbone of a competitive and sustainable transport system in Europe.

CER
The Voice of European Railways

CER aisbl
COMMUNITY OF EUROPEAN RAILWAY AND INFRASTRUCTURE COMPANIES

Avenue des Arts, 53 1000 Bruxelles
Tel : +32 2 213 08 70
Fax : +32 2 512 52 31
contact@cer.be
www.cer.be
@CER_railways

Design inextremis.be