

Can railway networks help decarbonise the transport sector, solve global supply chain issues, and provide urban passengers with a green travel solution?



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From the vast adventures of the Trans-Siberian Railway to the romance and grandeur of the Orient Express, train travel has been crucial to human transportation for over two centuries. And now, despite struggling infrastructure, it seems the world's railways might offer a solution to transport's sustainability problems.

Electrifying progress

The climate emergency has arrived, bringing with it the urgent need to significantly reduce global carbon emissions. International efforts to reach net zero targets require significant shifts in the approach to mobility – for both passengers and cargo. Transport emits 37% of CO₂ emissions from end-use sectors and has a high reliance on fossil fuels¹.

So, why could railways play a pivotal role in decarbonising the transport sector?

The electrification of the rail network began in the 1900s, and today, approximately 50% of European railways are electric; some countries, such as Switzerland, operate all-electrified rail routes². The industry aims to run trains

entirely on electricity from renewable sources by the 2030s³.

Challenges in electrification are varied and include the high capital cost of upgrading the technology, the vulnerability to power outages and mechanical failures, and the economic viability of the systems on lower-trafficked routes⁴. Plus, improvements still need to be made to ensure all energy on electrified routes is derived from green or low carbon sources.

However, the overall case remains strong. On average, railways require 12 times less energy per passenger/kilometre travelled than private vehicles or aeroplanes⁵. They're more energy efficient, lighter, quieter, and substantially kinder to the planet.

In the near-term, proven hybrid locomotives, operating a dual combination of electricity and diesel, could offer one solution to the mechanical challenges of electrification. Other alternative technology includes the use of hydrogen fuel cells and battery-powered vehicles – particularly suited to shorter routes⁶.

Cargo's carbon footprint

The COVID-19 pandemic has had a lasting impact on global supply chains. Widespread disruption and a scramble for parts has led to a shift from just-in-time strategies (JIT), towards just-in-case (JIC) approaches to inventory. This has encouraging repercussions for the return of the rail freight sector.

While the JIT approach – which emphasises lean production and minimal inventory – demands short shipping times, exact delivery locations, and sophisticated communication, JIC allows for larger, less frequent deliveries. It puts rail back on the map⁷.

Combine this with today's demand for high-speed delivery of goods, and there is a notable shift in warehouse infrastructure. Operators are using delivery drivers for 'the last mile', utilising the agility of road transport to take products to doorsteps. But, prior to this, freight rail can supply the warehouses springing up all over the country. Some UK supermarkets, for example, have increased their

use of freight rail by as much as 50% in the last few years, as efficiency improves and business sustainability becomes more of a concern. No longer can big business ignore the carbon footprint of their supply chains⁸.



Trains usually travel up to 80% faster through open country than HGV vehicles⁹, but investment is still required to improve rail terminal options and loading times: unmodernised networks struggle to cope with cargo demand. Single track railways are also still an issue, becoming congested and slowing delivery times.

However, there is heavy investment in the sector around the world. International rail routes are returning and schemes such as the EU's Sustainable and Smart Mobility Strategy, alongside plans to further utilise the Channel Tunnel capacities, all suggest that sustainable transportation of goods is becoming a significant priority. The rail freight sector aims to triple its overall volumes by 2050¹⁰.

All aboard

On our journey towards net zero, shifting passenger travel to railways is key. Railways could offer a solution to the growing consumer demand for efficient, clean travel, and solve the issue of inner-city road congestion.

Spikes in the appeal of rail travel can be evidenced through the gradual return of sleeper services across Europe¹¹. Offering a comfortable alternative to airport queues and security, the night rail sector is growing steadily. Passenger comfort and convenience is a factor in rail travel in general, as today's approach to the value of time is shifting. Plugged in and entertained while on the go, consumers are starting to prioritise the nature of the journey over its efficiency.

However, investment in infrastructure is vital if this transport sector is to shift travel behaviour overall. The rail industry remains under-digitised, and unreliable. There's a lack of budget train price points or alternative pricing structures, and while nations such as China have led the way on high-speed rail implementation, most networks remain conventional¹². While modernisation is imperative, the investment required is high.

However, rail travel does have the potential to significantly decarbonise the transport sector, particularly with the continued rise of electrified railway networks¹³. With today's rapidly changing supply chain demands, alongside growing climate risks, both passengers and business operators are beginning to see the benefits of the railways. With the right investment, this could be a real solution to some of transportation's sustainability challenges.

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¹ ['Transport – improving the sustainability of passenger and freight trains', International Energy Agency, 2021.](#)

² ['RMT Press Release', National Union of Rail, Maritime and Transport Workers, 2021.](#)

³ ['Is Tesco on the right track with its supply chain trains?', The Grocer, 2022.](#)

⁴ ['Why rail electrification is key to keeping the UK's climate progress on track', Rail Engineer, 2020.](#)

⁵ ['Rail', International Energy Agency, 2021.](#)

⁶ ['Rail', International Energy Agency, 2021.](#)

⁷ ['Just in time by rail: enabling rail freight to return to the city', Coventry University.](#)

⁸ ['Is Tesco on the right track with its supply chain trains?', The Grocer, 2022.](#)

⁹ ['Just in time by rail: enabling rail freight to return to the city', Coventry University.](#)

¹⁰ ['Rail', International Energy Agency, 2021.](#)

¹¹ ['The dream ticket: sleeper trains could soon run from London to Europe's cities', The Guardian, 2021.](#)

¹² ['Rail', International Energy Agency, 2021.](#)

¹³ ['Decarbonising transport key to delivering on net-zero target', Institution of Civil Engineers, 2021.](#)



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