



# DESIGN A BETTER FUTURE

## VISION OF RAIL 2030

November 2021



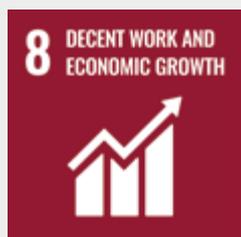
INTERNATIONAL UNION  
OF RAILWAYS



# CONTENTS

|  |    |
|--|----|
| Vision of Rail 2030 .....                            | 4  |
| TRANSFORMING CITIES AND CONNECTING COMMUNITIES ..... | 6  |
| ENERGY, TECHNOLOGY AND INNOVATION .....              | 8  |
| INTERMODALITY AND THE SEAMLESS CONNECTION .....      | 10 |
| CUSTOMER EXPERIENCE.....                             | 12 |

# VISION OF RAIL 2030



By 2030, cars and lorries are being used less because more freight customers and passengers than ever are using the train. High-speed rail traffic has doubled globally from today's levels and is now competing well with aviation on

all short-haul and some medium-haul routes; many airlines have stopped running short-haul services and are working closely with rail to connect the two modes. Following a dip due to the coronavirus, rail passenger numbers have recovered and its market share has increased by 50% compared to pre-pandemic levels. Rail now accounts for 15% of global freight traffic and 12% of passenger traffic.

Mobility services take a systems-based approach led by a global decarbonation strategy built on the triptic of "avoid, shift, improve". Electro-mobility and automation have begun to change the way individual vehicles and fleets are used, and rail is the backbone of the e-mobility chain. Private ownership is decreasing, and shared fleets of electrical vehicles are interconnecting smoothly with logistics and public transport systems that adapt to demand in real time.

The increased popularity of trains and public transport has created millions of new skilled jobs, and people have been retrained and redeployed from fossil fuel industries, which are being phased out. The railways are working in collaboration with the entire supply chain with a clear sustainable procurement policy to reduce emissions, save natural resources and provide good working conditions.

Frugality is a central concern that drives policies for energy, land use and the lifecycle of vehicles and infrastructure. Rail remains the most frugal mode of transport. By improving sustainability reporting and governance, an increasing number of rail and public transport organisations, including those in the global South, are accessing sustainable financing such as green bonds as safeguarded measures to achieve carbon neutrality before 2050. Private and public stimulus finance is proving a sound investment and is funding improvements to infrastructure, rolling stock and services, as well as innovation to decarbonise operations. There are now incentives and coherent fiscal frameworks to encourage passengers and freight customers to use the railways, providing a level playing field for public transport and rail. Individual countries and public transport authorities have their own pathways to support the shift to greater use of public transport and rail freight as part of their wider national strategies to meet the objectives of the Paris Agreement.

Rail's global emissions have continued to drop throughout the 2020s. With investment and the increased market share of rail, along with other forms of public and active mobility, global greenhouse gas emissions from transport have peaked and the rail sector is on track to reach net zero before 2050.

# How will we achieve this?

**TRANSFORMING CITIES AND  
CONNECTING COMMUNITIES**

**ENERGY AND TECHNOLOGY  
INNOVATION**

**SEAMLESS INTERCONNECTIVITY**

**CUSTOMER EXPERIENCE**



# TRANSFORMING CITIES AND CONNECTING COMMUNITIES

## TRANSPORT-ORIENTED DEVELOPMENT, LIGHTER TRAINS AND GREEN CITY LOGISTICS CREATING LIVEABLE CITIES AND CONNECTED COMMUNITIES



By 2030, railway stations and logistics depots are starting to transform into multimodal mobility hubs. Connecting cities more effectively and reducing car use, railway stations are gateways to cities that are less congested and in which people can breathe cleaner air.

Stations are the obvious choice for mobility hubs in large cities and foster sustainable urban development. They are seamlessly connected to shared mobility systems and offer the best possible mobility options for all customers.

Stations are preferred areas for urban development and are a location of choice for business, retail, social activities and housing, where appropriate. Rail is helping to create 'smart cities' by being part of the smart grid and sharing renewable energy and heat or water reuse systems.

City logistics concepts are increasingly part of the city planning process, with many cities providing innovative responses to customer demands. Increased bundling enables frequent, short-distance rail freight to connect to city hubs. Some passenger trains take smaller deliveries straight to the heart of many of our cities. The city hubs dispatch goods around the city area using sustainable transport means such as small electric vans and cargo bicycles. Heavy trucks are neither allowed nor need to enter most city centres.



Many cities are becoming much easier to get around on foot, with little need to own a car, and so space once used for car parks is being used as green recreational space. Rail infrastructure improvements are accelerating sustainable land-use planning – including outside cities – thanks to lighter trains in particular. Railway and station operators are working hand-in-hand with city leaders and local authorities to co-design public spaces. Densification of urban development around stations is helping to protect natural and built cultural areas and is creating thriving businesses and cleaner, quieter and more pleasant spaces.

The rural-urban infrastructure divide is starting to be better addressed, with balanced regional prosperity as a central objective of rail investment. The investments made provide better linkage for customers in rural areas, smaller communities and towns.



# ENERGY, TECHNOLOGY AND INNOVATION

## A LEADING ROLE IN THE RACE TO ZERO CARBON AND THE RENEWABLES REVOLUTION

By 2030, the innovation cycle in railways has been shortened due to digital modelling, a shared vision of the railway system architecture, and modular design of railway components.

Institutional, legal, standardisation and regulatory frameworks are in place to drive sustainable and climate-resilient mobility technologies and generate outcome-oriented investments and incentives.

Diesel trains are fast becoming a thing of the past, with a large-scale programme of electrification of main lines continuing and the use of bi-mode vehicles common. In many countries, the railways have already been declared as net zero in terms of greenhouse gas emissions and are running entirely on renewable energy. There are no diesel-only trains running on electrified lines. Batteries charged on renewable energy and green hydrogen trains are well developed and are running passenger services in several countries. Non-diesel work trains and freight trains are also being developed. Both logistics and passenger transport customers prefer the climate-friendly alternative, and the shift from road and air transport to rail is happening quickly.

In spite of the rapid advance of electric road vehicles, rail has kept its edge as the greenest mode of mass transport by far. On track to be carbon neutral

before 2050, the railways are working more closely than ever with the energy sector. In some countries, railways are installing more dedicated renewable energy generation and storage on the railway estate, including on buildings and on the lineside. Rail is using its influence as a consumer of electricity to buy and encourage the expansion and accelerate the development of renewable power and alternative green fuel generation. Regenerative braking is now common in leading regions, allowing trains to recover energy through their braking systems. Hyperloop and permanent magnet synchronous traction systems are being developed in some countries, providing a new generation of energy-efficient train traction systems for high speed, connecting into conventional rail.

Frugal eco-design is the guiding principle for railway buildings, infrastructure and rolling stock. Through innovative design, technology and circular processes, railway operations, maintenance, station buildings and offices are all using and wasting fewer resources and less energy and water and are therefore also spending less. There are now working examples of zero carbon or climate-positive stations in several leading countries.

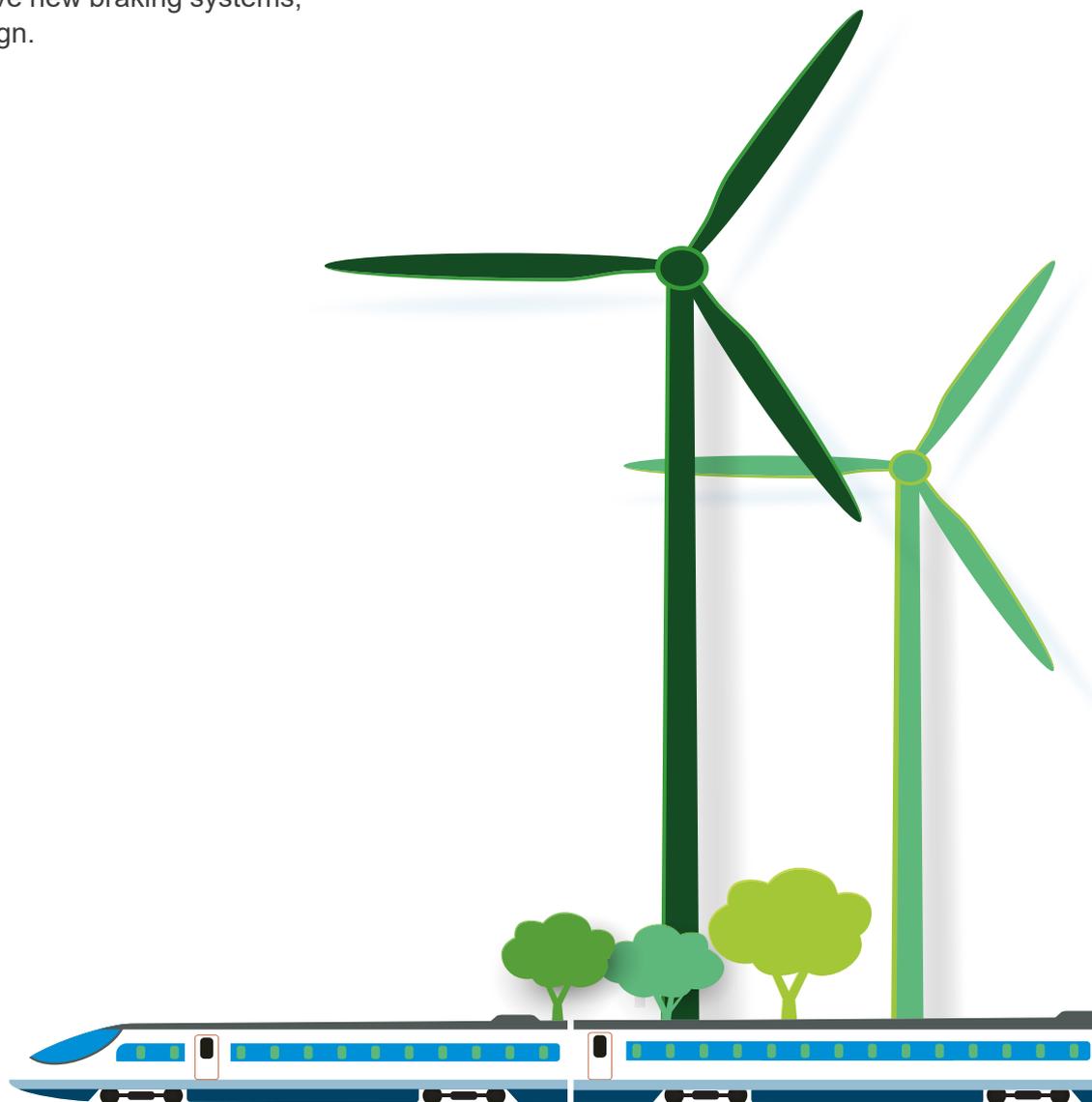


Automated train operations, robotics, modern communications based on 5G and artificial intelligence have dramatically improved the efficiency of the railways, enabling railway operators to meet the growing demand and allowing passengers to access real-time information.

Digitalisation in rail freight has unlocked the potential of autonomous driving and train assembly automation to deliver greater reliability, reduce labour costs and provide the most economical operation of feeder networks. Telematics and added wagon intelligence have opened routes to new innovative services and increased fleet availability and have allowed for optimised preventive and curative maintenance. The digital freight train enhances operational efficiency and safety. The position and condition of cargo and rolling stock are known and can be controlled from anywhere.

Railways are a good neighbour, running more quietly, and public support is at an all-time high. Trains are quieter for both passengers and lineside neighbours due to innovative new braking systems, rolling stock and track design.

The view from the train is pleasant, with exciting cityscapes or landscapes and a view of a mosaic of natural habitats, including semi-natural drainage ditches and more pollinator plants. The way that railway property is managed is changing to consider value to communities; some land is being opened up to provide green spaces. Railway lineside space is managed in a way that is helping biodiversity to thrive again; better bio-control processes are being used and increasing numbers of insects are already being observed. Leading railways use integrated management systems, including digital monitoring and reporting methods, to systematically standardise the positive and negative impacts of railways on biodiversity. The new railways being built and designed today have incorporated ways to ensure the safe passage of animals. Railway lineside planting is being used as a nature-based solution to offset difficult-to-avoid emissions and is helping to make the infrastructure more resilient to flooding and landslips.



# INTERMODALITY AND THE SEAMLESS CONNECTION

## RADICAL INNOVATIONS IN PHYSICAL AND DIGITAL CONNECTIVITY WITH OTHER MODES FOR A DOOR-TO-DOOR SERVICE

### 17 PARTNERSHIPS FOR THE GOALS



By 2030, most passengers arrive at train stations on foot, by bicycle, in shared cars or on public transport, and not always just to take a train! People spend time in stations to use co-working spaces or meeting rooms, hotels, for shopping, entertainment or to eat or have a social drink, or even to access medical services, fitness centres, nurseries, postal services or community spaces such as libraries. The station feels like part of the city or community it serves.

Most passenger journeys are made with multimodal e-tickets, and passengers can move seamlessly between different modes of transport. Digital systems for



both freight and passenger services, together with mobile applications, allow shippers and passengers to plan, check availability and hire an e-bike, e-scooter or electric shared car to complete their door-to-door journey in a single, flexible transaction. Some passengers bring their e-scooters or e-bikes onboard the train and charge them while they travel. Passengers are reliably connected online, with many attending online meetings uninterrupted. Outside the station, passengers can link to increasingly diverse forms of active and public mobility, including shared mobility. Railways and public transport link well to most airports, with very few people still driving to and parking at airports. Aviation and rail coordinate well together for long-haul flights, with passengers able to check in their luggage for their flight at some railway stations.

On a systemic level, the challenges of the first and last mile of transport are understood and being addressed. The largest logistics hubs are now multimodal and digitalised, and it is getting easier to use rail as part of a multimodal logistics chain. Rail hubs are electrified and well linked to road, canal and seaports. Integrated multimodal solutions with innovative loading systems provide attractive solutions for truckers with standard trailers. Paperwork is much reduced, language barriers are overcome and goods can travel across international borders with minimal delay. Empty wagons are becoming a thing of the past thanks to more flexible and smart logistics planning.



# CUSTOMER EXPERIENCE

## THE CULTURAL TRANSFORMATION FOR RAIL TOWARDS A MORE CUSTOMER-FOCUSED SERVICE FOR THE CHANGING NEEDS AND BEHAVIOURS OF FREIGHT AND PASSENGERS



By 2030, we are all benefiting from the improved efficiency and inclusivity of transport systems and increased mobility equity and accessibility, as well as fewer road fatalities and injuries and less local air

pollution. In the recovery from the pandemic, rail operators adapted to new travel behaviours and became increasingly aware of customers' needs, catering to new working patterns and listening to the voices of a wider range of people. There are fewer downsides to living or working by the railways as they are becoming quieter, cleaner and greener.

The station is a comfortable and pleasant place for passengers to dwell, with modern seating spaces equipped with charge points. It is managed in a visibly sustainable way and is cleaner thanks to automated sanitation. Many station retailers have removed single-use plastic packaging and cutlery. There are easy-to-use recycling points, and bottle deposit machines give passengers carbon credits that can be used to buy food and drink at the station and on the train. The passenger's app and e-ticket tells them how many greenhouse gas emissions are associated with their journey, and they can use this information to make well-informed modal choices.

Those who go to work only two or three days a week can buy flexible season passes and travel at a time that suits them best. They can predict which services and carriages will be busy and plan to avoid them. There are more services to choose from as signalling systems and telecommunications have allowed for more trains to run. Being more

conscious of their carbon footprint, many of the passengers travelling in 2030 go on holiday by rail, with families and backpackers alike getting excited about using new night train services and high-speed intercity lines. Train transport is considerably more popular for those travelling to major events, including sports fixtures, without disturbing daily commuting journeys.

Because inclusive and universal design is being considered to a greater extent in all aspects of railway operations, more people are confident and able to travel by rail and, in most cases, can autonomously access

the train without needing to book assistance in advance. Customers can check the accessibility of their journey in advance, and there are more stations with step-free access from the pavement to the train carriage. Stations are easier to navigate for everyone. Improved safety measures for women using public transport have started to address the issue of harassment faced by female users. All passengers feel safer and more secure. These actions are supported through a more diverse transport workforce with a better gender balance.

Rail travel and logistics are being designed for a changing climate: rail infrastructure and rolling stock are more resilient against extreme weather conditions and other forms of disruption, including

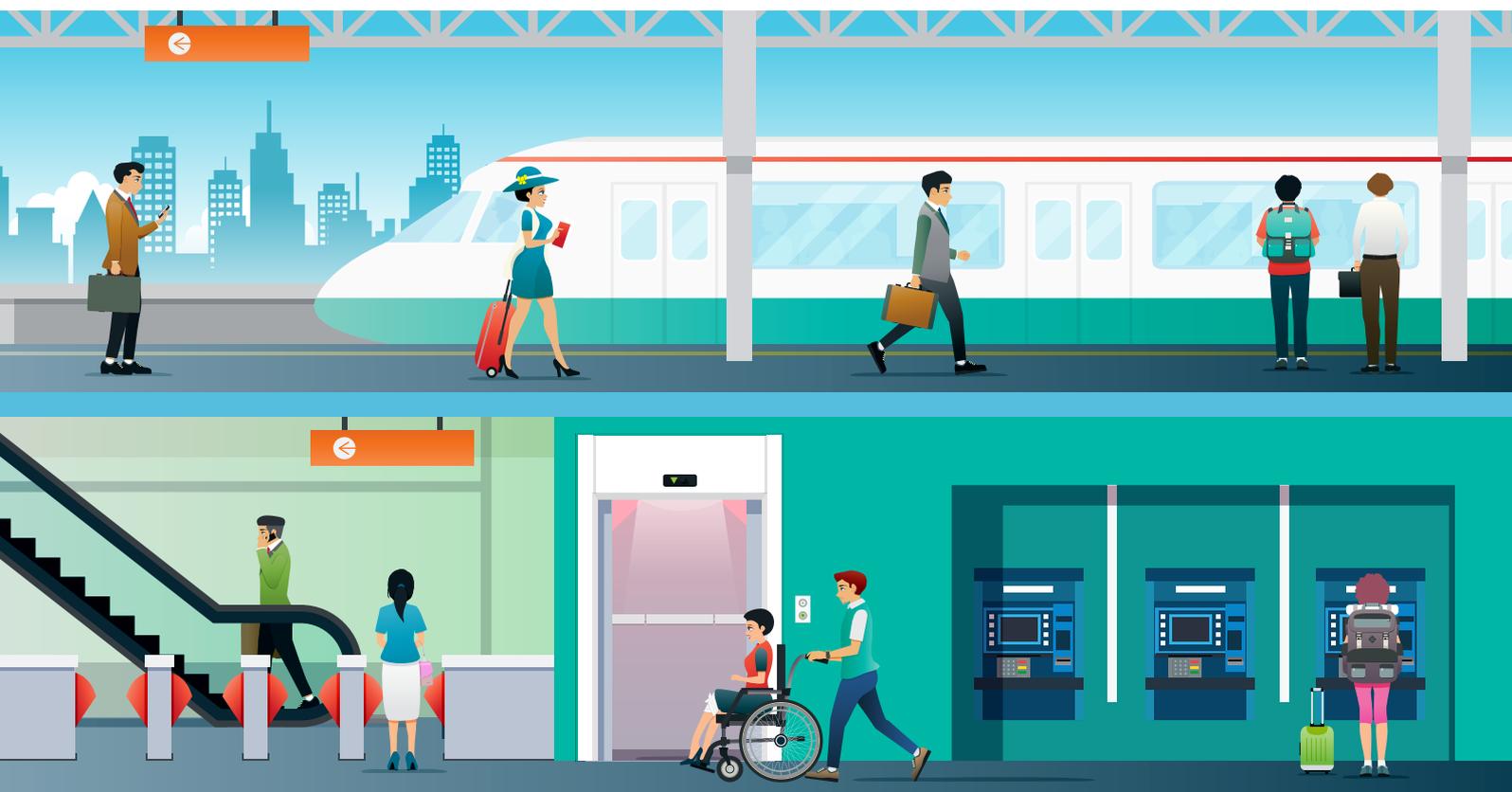


pandemics or technological changes. Particularly vulnerable infrastructure owners have accessed the finance and technology they need for climate change adaptation and resilience-building. New and renewed infrastructure and rolling stock have now been built to updated engineering standards that are adapted to a changing climate.

Predictive maintenance technology allows for better operational resilience, extreme weather warning systems and contingency plans are in place, and mitigation measures are designed to speed up the recovery of infrastructure and rolling stock after disruption. Interdependencies are better understood, with all modes and the energy sector working together to better coordinate in crisis management. Transport operators now share information, knowledge and data in times of disruption. Railways are more flexible in sharing information, and mobile applications and the railway

workforce can propose alternative solutions in the event of disruption during the journey. Artificial intelligence is being trialled to help make quick, automatic changes in times of disruption.

Optimised supply chain networks have improved the efficiency of freight transport. The rail freight operating sector is working on speeding up the journey by offering superior, innovative products for the benefit of the customer so as to ensure greater flexibility and reliability. Freight operators are now taking care of the entire supply chain for customers by offering door-to-door services. Through the deployment of high-tech monitoring and control systems, customers can rely on 'just-in-time' delivery and use 'track and trace' systems providing accurate data on estimated time of arrival. Freight users can now tell their customers and investors just how much they have saved in CO2 emissions by using rail.



# TO ACHIEVE THIS VISION OF 2030, THE FOLLOWING ACTIONS MUST HAPPEN NOW:

In the 2020s, rail is the only viable option to significantly reverse increasing emissions from transport while improving equity and quality of life. Rail will play its part and needs the support of policymakers and national governments, as well as investors, international (financial) institutions, regional development banks and other supranational bodies to:

## DEMAND

1. Set binding and ambitious targets for modal shift and decarbonisation in nationally determined contributions, backed up by localised city, regional and sectoral strategies with 'bottom-up' reporting on the Sustainable Development Goals.
2. Set policy that employs push and pull approaches in tandem to incentivise the use of rail logistics and public transport, pricing in the external environmental costs of transport while creating social tariffs and reducing administrative restrictions on cross-border travel.
3. Set clear requirements for passenger and workforce accessibility and inclusivity.

## INVEST

4. Support public investment in public transport, rail logistics infrastructure and rolling stock, as well as research and innovation programmes focusing on enhancing customer service and modal shift while accelerating the cycle of innovation.
5. Support transformational projects capable of reshaping the current mobility paradigm with a major impact on customer experience and efficiency in the short term, such as digitalisation, seamless interconnection between modes and capacity increases on existing infrastructure.
6. Use public contracts to enable stronger linkage between land use and transport planning and provide station managers with the flexibility to adapt stations to changing customer requirements and behaviours.
7. Use post-pandemic recovery stimulus packages and redirect public spending on road and aviation to support investment in rolling stock/modern fleets and infrastructure.

## PROMOTE

8. Significantly scale up capacity development programmes to inform, raise awareness and engage public officials on the development of zero-carbon public transport systems.
9. Launch campaigns to encourage people to use rail freight and public transport, highlighting the benefits of more sustainable consumer behaviour .



This vision has been produced by the UIC Global Rail Sustainability Taskforce with representation from members in the following regions: Europe, North America, Middle East, Africa and Asia-Pacific. This vision reflects the IEA's Net Zero Emissions Pathway and the Marrakesh Partnership Climate Action Pathway for Transport 2050 vision.



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