SLOCAT
Partnership on Sustainable, Low Carbon Transport

SLOCAT
Transport, Climate and Sustainability Global Status Report - 3rd edition

Module 3 Climate and Sustainability Responses in Transport Sub-Sectors and Modes
Key Insights

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Module 3

Climate and Sustainability Responses in Transport Sub-Sectors and Modes

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3.1

Integrated Transport Planning

The COVID-19 pandemic created an opportunity to rethink transport systems in cities.

Across regions, governments and the private sector have pursued more seamless and integrated systems, particularly in locations where public transport and active travel compete with private vehicles.

There is an emerging new paradigm to evaluable **transport system performance based on access** instead of automobile travel conditions.

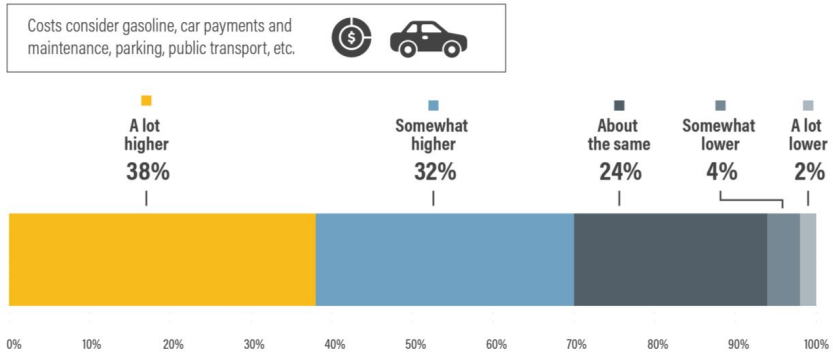
Accessibility measures have been fragmented and often incomplete.

Transport expenditures often make up a high share of household budgets, placing a burden on low-income users.

➔ LAC reported the highest share of household spending on transport (17% as of 2019,

Increased fuel prices and inflation have had only a minor impact on distances travelled but placed a growing financial burden on drivers and operators of transport services.

Average perceived increase in transport costs across 30 countries, 2021



By 2021, traffic congestion had returned to pre-pandemic levels in many cities, though globally it was still 10% lower than in 2019.

Integrated transport planning plays an important role in reducing transport emissions and resource use.

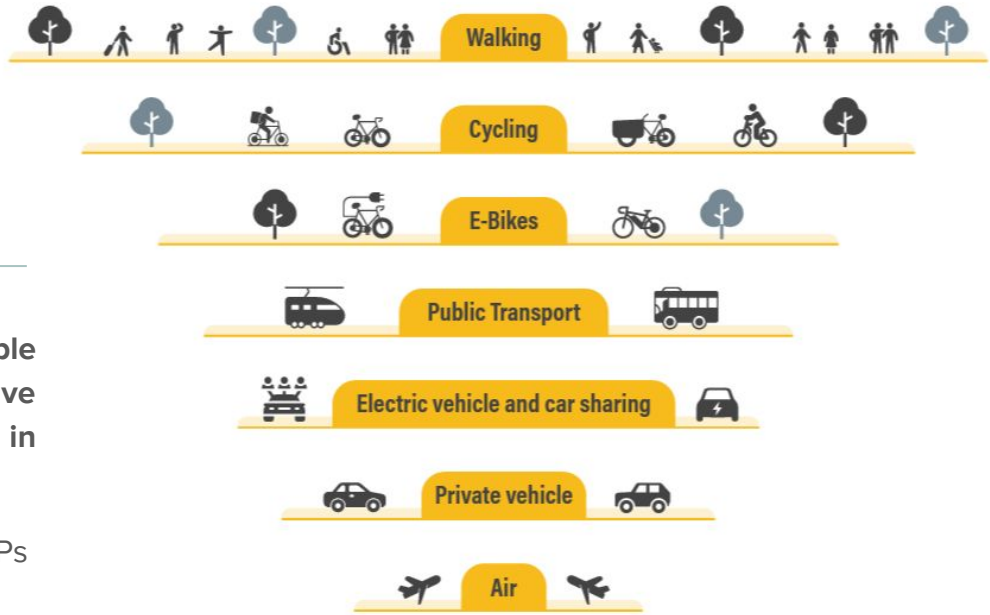
Increasingly in cities, **measures to promote sustainable transport modes and reduce urban mobility's negative impacts have been encapsulated and expanded on in sustainable urban mobility plans (SUMPs)**.

➔ The MobiliseYourCity Partnership had supported 31 SUMPs and 9 national urban mobility plans by the end of 2022.

It is urgent to reduce the need for motorised travel and to shift to more sustainable transport modes and fuels

FIGURE 3. Sustainable transport hierarchy

Source: See endnote 113 for this section.



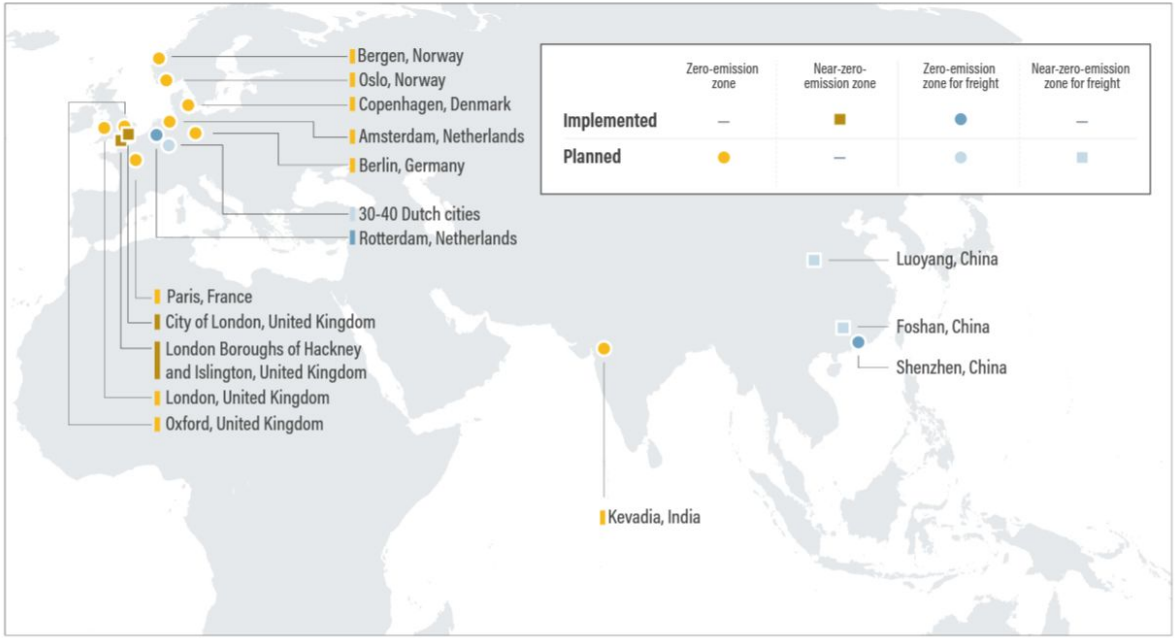
Growing number of cities and countries deploying **low-emission zones (LEZs)**, **ultra-low-emission zones (ULEZs)** and **zero-emission zones (ZEZs) for passenger and freight vehicles.**

LEZs in Europe increased 40% from 2019 to 2022 and are projected to grow another 58% by 2025. Developments in LEZs elsewhere have been less extensive.

Transit-oriented development is in place in many regions to create compact, walkable and mixed-use cities that minimise car ownership and use.

FIGURE 5. Implemented and planned zero-emission zones and variants as of July 2022

Source: See endnote 154 for this section.



→ **Public transport-focused development and mixed land use can reduce GHG emissions 23-26% by 2050**, according to IPCC's AR6

3.2

Walking

Walking is not sufficiently valued, planned for or invested in across the world.

Ironically, it is the countries where people walk the most – in the low- and lower-middle income countries – where the value, commitment, policy and budgets are often lowest.

An estimated **20-30% of all trips globally are walked**, as are **85% of all trips to and from public transport**.

Between 2020 and 2050, the **share of walking, cycling and scooter use for trips of <10km is expected to surge**.

Walking has the potential to replace a large share of trips and to replace the associated transport emissions.

Without investing to improve walkability, the situation in Africa will mirror that across Asia and Latin America, which have similarly high levels of walking and increasing motorisation.

➔ In many parts of the world, the amount of walking is likely to decrease as soon as a viable and affordable alternative transport mode is available.

3.2 Walking

Walking (and cycling) delivers more UN Sustainable Development Goals than any other transport mode.

However, as of 2021, only 25% of Nationally Determined Contributions (NDCs) mentioned walking.

In 2022, only 42% countries had a national walking policy. 52% countries had sub-national policies.

Development of a **new global indicator system for walking**:

1. Amount of walking I Activity
2. Risk I Safety and security
3. Proximity to public transport I Accessibility
4. Available infrastructure for walking I Comfort

Since the pandemic, there has been **significant and sustained behaviour change in commuting patterns** due to digital accessibility and remote work.

Places with walking policies were more likely and more quickly able to respond to the increase in demand.

Walking policy responses to the pandemic:

- Reallocating road space
- Improving accessibility of public transport interchanges
- Defining walkable networks

Reinvigorated momentum for proximity planning e.g. “15-minute city” in Paris, “super blocks” in Barcelona and “low traffic neighbourhoods” in London.

3.3

Cycling

COVID-19 pandemic was a primary catalyst for the surge in cycling, leading to sharp increases in new routes and bicycle sales.

However, the **vast majority of roads worldwide are not safe for cyclists**.

➔ 41,000 cyclists died in road traffic-related crashes worldwide in 2019.

There are **more than 1 billion bicycles in the world**, and **42% of households worldwide own at least one bicycle**.

➔ Global bicycle market grew 14% between 2021 and 2022, from USD 38.4 billion to USD 43.8 billion.

Countries with the largest bicycle fleets in 2023:

➔ China (500 million units)

➔ The USA (120 million units)

Per capita:

➔ The Netherlands (1 bicycle/person)

➔ Denmark and Germany (0.75 bicycles/person)

E-bikes are booming. Global sales are expected to reach USD 62.3 billion in 2030.

➔ Asia had the largest market in 2019 with 90% of global revenue and production.

Bike share was among the most resilient shared mobility modes, expanding and rebounding soon after the first year of the pandemic.

Worldwide, cities expanded their cycling networks during pandemic.

➔ Over 100 European and North American cities, 28 Indian and several in LAC among many others.

3.3 Cycling

3% of global road traffic deaths were cyclists in 2019.

➔ 25% of the global cyclist deaths occur in Africa.

➔ Bicycle deaths in the USA rose 5% in 2021.

Nonetheless, **mortality benefits related to bike use outweighed mortality risks.**

➔ +1,000 premature deaths in car traffic could be avoided in Austria, the USA and Indonesia, in high bike-use scenarios.

A large gender gap in cycling exists in cities across the world.

Women and girls cycle much less than men due to lack of consistent access to bicycles, cultural and/or religious acceptance and lack of safe cycling knowledge or infrastructure.

Cycling has the lowest life-cycle CO_2 emissions among all wheeled transport modes.

➔ Only 8 g CO_2 per kilometre

Switching from driving to cycling for just one trip per day can:

➔ Reduce individual CO_2 footprint by half a tonne over a year; saving the emissions equivalent of a one-way flight from London to New York.

E-bikes have the capability to reduce CO_2 emissions, particularly in rural areas where people are more care dependent.

Cargo bikes are increasingly recognised as a more climate-friendly and economical substitute for delivery vans.

They could replace up to 51% of all freight journeys in European cities.

3.4.1

Public Transport

The pandemic revealed that **public transport is a necessity** not only for mobility and social equity but also to reduce emissions and to prevent a shift to private vehicles.

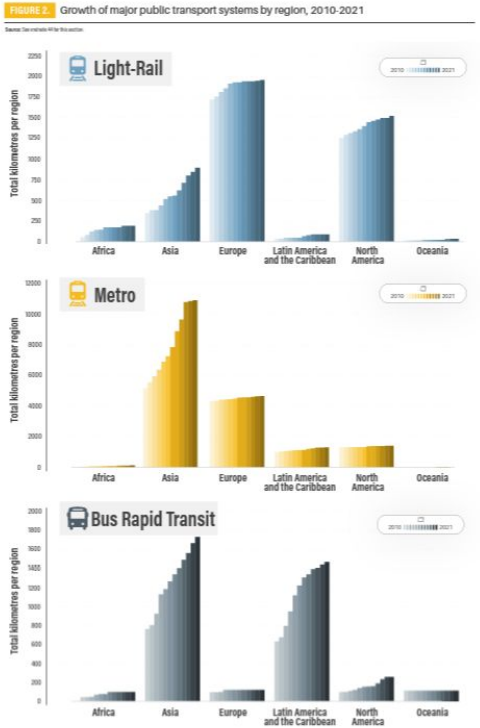
The COVID-19 pandemic has had ongoing detrimental impacts on public transport systems, particularly in low-income countries.

➔ Ridership on public transport worldwide dropped 90% between March and August 2020.

➔ During 2020-2022, public transport ridership rebounded in Asia, South America and Africa, even surpassing pre-pandemic levels.

Despite budget cuts, delays and low ridership at the onset of the pandemic, **public transport expansion projects continued during 2020-2021 in all major regions.**

Many changes in working habits have become permanent, **affecting people's travel patterns and threatening funding for public transport.**

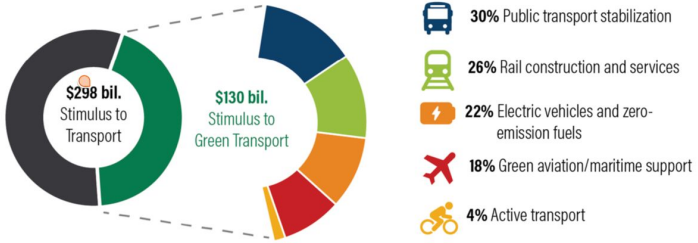


3.4.1 Public Transport

Strong subsidies in recovery policies: USD 130 billion in stimulus funding was leveraged globally to support green transport, 30% was for public transport.

FIGURE 6. Allocation of green stimulus funding, March 2020 to February 2021

Source: See endnotSe 76 for this section.



Growing momentum for electrifying public transport: In 2021, electric bus sales grew 40%, representing 4% of the global bus fleet.

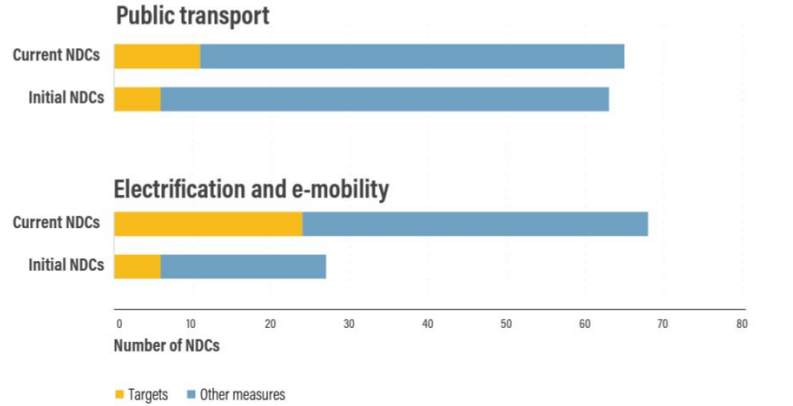
➔ China was home to 90% of the global electric bus fleet and expanded its fleet by 100,000 every year.

Many governments reduced transport fares to combat low ridership rates and improve social equity.
e.g. Brazil allocated 22% of subsidies to cover fare costs and make public transport more accessible in over 150 cities.

Increasing recognition to leveraging public transport as a climate tool: 70% of first- and second-round NDC included public transport-related measures.

FIGURE 7. Number of initial and updated Nationally Determined Contributions that included public transport, as of end-2022

Source: See endnote 85 for this section.



3.4.2

Informal Transport

Informal transport **moves millions of people, employs hundreds of thousands and supports urban economies**.

However, there is a **tendency to ignore or eliminate** informal transport, which has generated **large gaps in policy, knowledge and data**.

If integrated well into policy and planning, it has **great potential to accelerate the transition towards sustainable transport systems**.

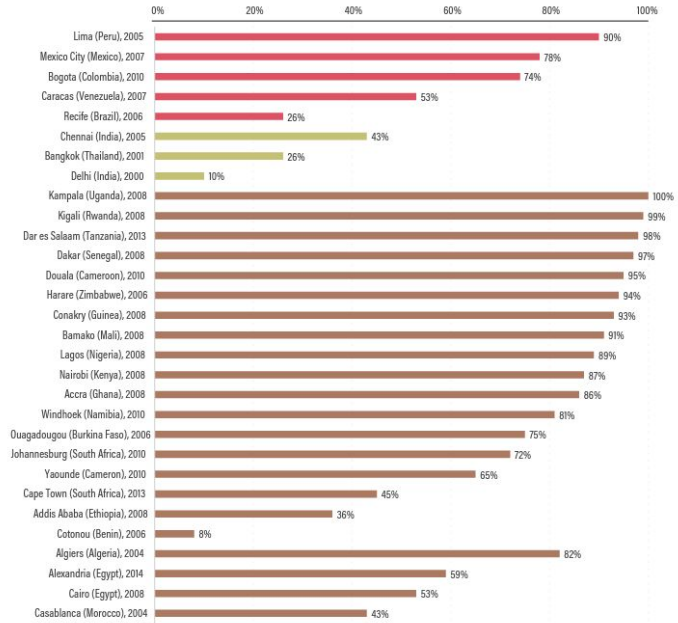
Informal transport services are present in nearly every city and town in low- and middle-income countries.

➔ **In some African cities, up to 95% of all motorised trips** are informal transport.

➔ **In some LAC cities**, minibuses and collective taxis fleets are **similar in size to or even larger than public bus fleets.**

FIGURE 1. Market shares of informal transport in 30 cities among motorised trips, selected years

Source: See endnote 5 for this section.



Global data on informal transport size, reach and ridership are lacking, although research is attempting to close this knowledge gap.

➔ e.g. GPS data research on e-minibus taxis in Sub-Saharan Africa helped to reduce energy consumption.

3.4.2 Informal Transport

During the pandemic, **informal transport services experienced up to 50-70% losses in demand and income** with little to no support from government.

Attempts to incorporate informal transport into global and local decarbonisation efforts have been hampered by the lack of consolidated and robust information.

➔ No countries had included measures to reduce emissions from informal transport in NDCs as of early 2023.

➔ Angola is the only country to acknowledge emissions by informal vans in its NDC.

Key indicators for informal transport data

Characteristics of vehicle fleet - Modal share + no. of daily trips taken

Operational characteristics - Workforce characteristics -

Organisation dynamics

Data on emissions trends for informal transport is lacking and **few countries collect disaggregated data for the sector. However, this does not mean that there is no progress towards decarbonisation.**

➔ Across Asia, initial steps are taken towards electrifying informal transport (e.g. China, Bangladesh, India, Indonesia and Vietnam).

The electrification potential of informal transport is enormous.

➔ Fuel economy of informal transport vehicles in Africa is 2-3 times worse than in the countries the vehicles are imported from.

➔ In South Africa, each electric minibus could reduce 13 tonnes of CO_{2eq} per year.

3.4.3

App-Driven Shared Transport

Demand for app-driven shared mobility services **is trending upwards.**

Although generally promoted as a sustainable alternative to cars, **more evidence is needed** to show how these services contribute to alleviate congestion, reduce pollution, provide equitable access to opportunities and improve efficiency.

Growing demands and opportunities:

➔ In 2022, **on-demand transport services** had 1.28 billion users worldwide and are expected to reach 1.45 billion by 2027.

➔ In 2021, **carsharing** had 86 million users worldwide and is expected to reach 224 million users by 2026. The services are offered in 4,100 cities, a 31% growth from 2019.

➔ After a small lull due to the pandemic, **shared micromobility services** experienced an uptick, operating in more than 1,000 cities worldwide as of the end of 2022.

FIGURE 1. Number of bike-sharing systems worldwide, 1995-2022

Source: See endnote 33 for this section.

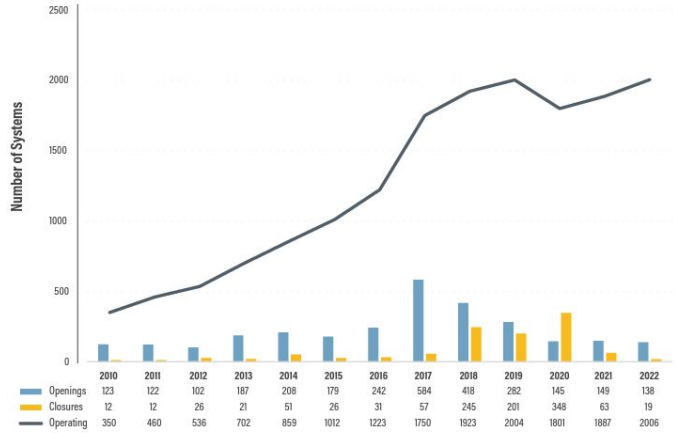
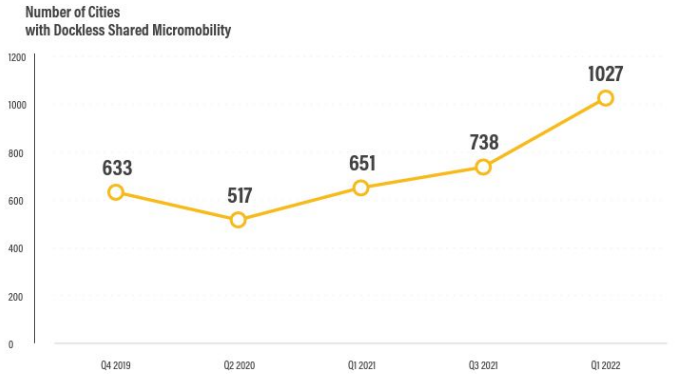


FIGURE 2. Number of cities with dockless shared micromobility operations, 2019-2022

Source: See endnote 34 for this section.



3.4.3 App-driven Shared Transport

Estimating the mitigation potential of shared mobility is challenging, as analyses often focus only on individual services and fail to account for a combined effect.

The true impact of shared mobility depends mainly on the modes they are replacing.

➔ An e-scooter is more energy efficient than a car. However, if an electric scooter replaces a walking trip, the reverse may be true.

When paired with public transport, shared bike and scooter services improve access to job opportunities. However, racial discrimination towards ride-hailing users c**ould worsen access for vulnerable populations.**

Mobility-as-a-service (MaaS) - multiple services bundled together and accessed via one app - **contributed to save USD 2.8 billion of global fuel cost in 2022, and is expected to save USD 10.8 billion by 2027.**

➔ **More empirical evidence are needed on its potential** for reducing CO_2 emissions, pollution and congestion.

➔ Commercial deployments remain limited, but **developments in Europe, China and the USA offer insights into new forms of public-private collaboration**.

Interest in pairing electric vehicles with carsharing programmes is rising

e.g. Zity in Spain, MILES Mobility in Germany, Zipcar in the USA.

The development of app-driven shared transport has introduced regulatory challenges to governments.

3.5

Rail

Rail transport is considered to be the cleanest mode of collective passenger transport, due to high rates of electrification and energy efficiency.

A modal shift to rail, stimulated by ambitious targets and policies, is crucial to achieve IEA's net zero pathway towards 2025.

Rail is highly vulnerable to global shocks and geopolitical instability.

➔ Global passenger rail activity grew 29% from 2010 to 2019 but dropped 38% in 2020 due to the pandemic.

➔ Global rail freight activity grew 12.5% from 2010 to 2019 and dropped 4% in 2020.

Russia's invasion of Ukraine had strong impacts on passenger and freight rail activity, as **rail freight between Asia and Europe dropped by a quarter in 2022.**

Modal share of rail is still limited. Despite growing demand from 2010 to 2020, only 6-7% of passenger journeys were made by rail.

High-speed rail has great modal share potential by replacing car trips and shorter flights.

The pandemic did not hamper its development, as the **global network expanded by more than one-third from 2017 to 2022.**

Operators around the world are upgrading their rail fleets.

Investments are expected to increase 6% per year from 2019 to 2024 across all geographies.

Rail has the lowest GHG and energy intensity of all transport modes.

➔ Emits on average 19g of CO_2eq/passenger-km in 2021, **one tenth of the emissions of a mid-sized passenger car.**

Greater use of rail could reduce global transport emissions by 11-16% in 2050 compared to a business-as-usual pathway.

➔ Potentially saves up to 300 million tonnes of emissions per year in China, India and North America.

➔ Hydrogen trains can avoid 700 tonnes of CO_2 emissions per year compared to regional diesel trains.

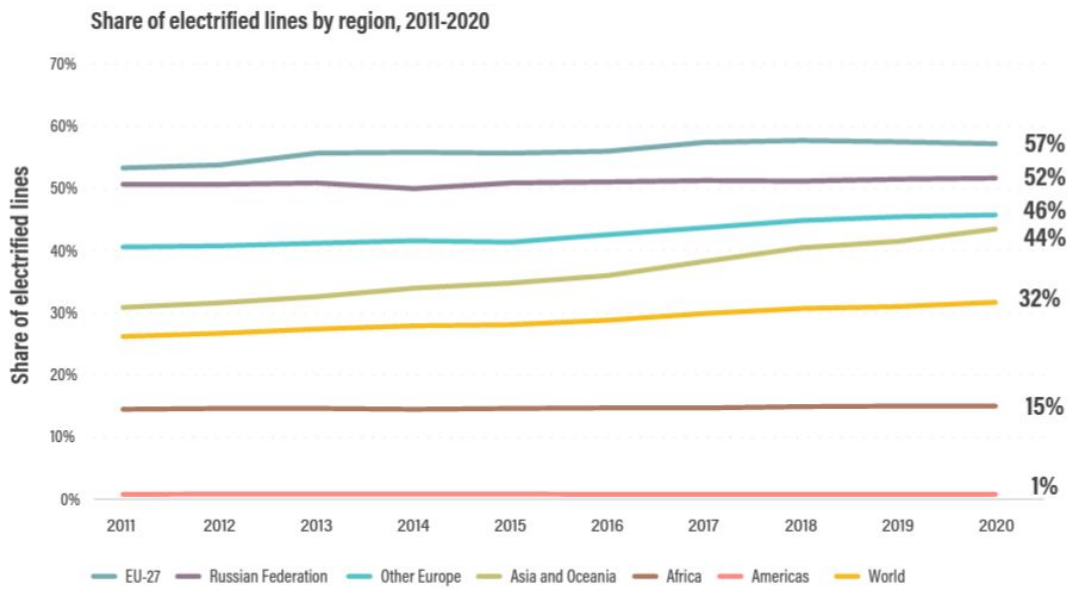
Rail is the most electrified mode of transport.

➔ 45% of its energy use comes from electricity in 2021.

➔ Expected to reach two-thirds by 2030 (particularly in freight).

FIGURE 9. Share of electrified rail lines by region, 2011-2020

Source: See endnote 55 for this section.



3.6

Road Transport

Road transport contributes the **largest GHG emissions among all transport modes**.

To reach the global goal of net zero greenhouse gas emissions by 2050, **road transport must also be net zero.** CO_2 emissions intensity must be reduced by more than 94% for trucks and 98% for cars compared to 2020 levels.

Global demand for passenger transport grew 6% between 2018 and 2022.

➔ **Two-thirds of passenger transport globally** was **in passenger cars**.

Rising road transport demand leads to traffic congestion with significant economic and public health costs.

➔ From 2010-2019, **the number of road deaths fell only 2% every year, well below the targeted 50% by 2020** set under the United Nations Decade of Action for Road Safety.

➔ **By 2021, congestion had returned to pre-pandemic levels** in many cities, and in some places it worsened.

Global freight activity grew 7% between 2019 and 2022.

➔ **Road transport** accounted for **22% of freight activity globally** in 2019.

Transport costs are rising and more unstable due to fluctuating oil and fuel prices since 2020.

➔ Highlighting the need to shift to more sustainable energy sources and modes of transport.

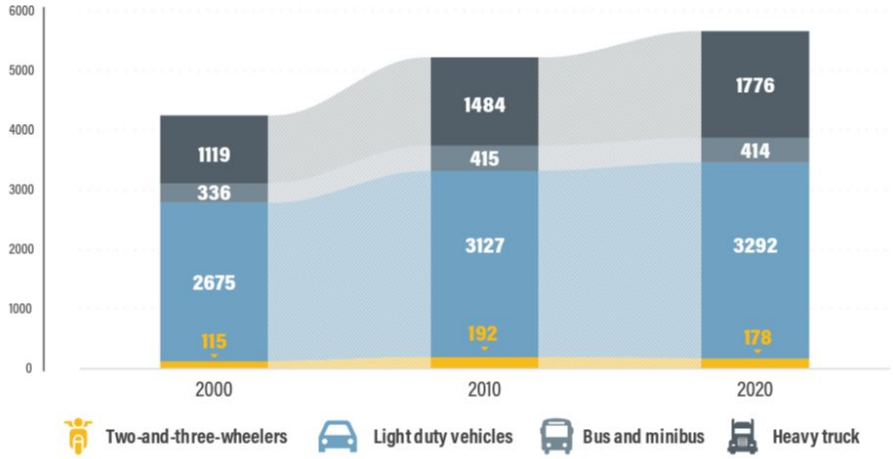
Effective speed management can help reduce congestion, leading to shorter travel times and reduced emissions from idling and stop-and-go traffic.

Despite decarbonisation efforts, road transport emissions continued to increase over the past two decades.

➔ Accounted for 78% of transport energy consumption in 2021, and for 40% of global oil demand.

FIGURE 5. CO_2 emissions from road transport, by vehicle type, 2000-2020 (in million tonnes CO_2)

Source: IEA. See endnote 86 for this section.



Successful strategies to reduce road transport emissions include a mix of "Avoid", "Shift" and "Improve" policies and measures.

➔ Combine carbon or fuel taxes with incentives for cleaner vehicles.

➔ Prioritising measures that incentivise active travel and public transport.

By 2022, **23 countries and 17 sub-national jurisdictions** had targets for **100% bans on sales of internal combustion engine vehicles**.

Some governments discouraged new roads (e.g. Austria, the UK and the USA).

Biofuel blending mandates are the most **common** policy **for incentivising renewables in road transport.**

Congestion pricing has only been implemented in a few cities around the world.

3.7

Aviation

Aviation exposes the blatant inequities in emissions and access.

1% of the global population accounts for a disproportionately high share of aviation emissions.

The **uptake of sustainable aviation fuels, hydrogen and electrification**, is **showing early promise but** remains **far from the required speed and scale**.

Aviation's post-pandemic rebound is alarming.

➔ Air passenger **demand was expected to rise 3%** above 2019 levels by the end of 2023.

➔ Rebounce in air travel caused **airlines and airports inefficiencies** that can greatly increase emissions yet are largely avoidable.

➔ **Regained nearly 1/3 of the emission drop** that occurred in 2020.

➔ Contributed more than 2% of global energy-related emissions in 2021, showing **faster emission growth than road, rail or maritime transport.**

Aviation imposes disproportionate impacts to the planet.

➔ Responsible for only 2.4% of annual global CO_2 emissions but **has contributed 4% to human-induced climate change to date**.

➔ Accounted for <1% of global freight activity in 2019 but was **responsible for 7% of freight emissions**.

Russia's invasion of Ukraine significantly increased aviation emissions. 36 countries closed their airspace to Russian airlines in 2022.

➔ Longer-distance rerouting of flights will result in higher CO_2 emissions.

3.7 Aviation

Aviation was identified as **one of the "hard-to-abate" sectors for decarbonisation under the UNFCCC Mitigation Work Programme** adopted at COP27.

Incremental improvements in aircraft fuel efficiency have slowed over time.

New aircrafts are 20% more efficient than models they replace, but they are insufficient to compensate for rising demand.

Aviation can meet the decarbonisation targets of the Paris Agreement through:

➔ **Decrease in annual travel demand by 2.5%** (with current fuel composition).

➔ **Shift to 90% carbon-neutral fuels by 2050**.

Sustainable aviation fuels (SAF) could curb emissions 9% to 94% below 2019 levels by 2050.

➔ SAF **accounted for <1% of aircraft fuel in 2023**, but scaling up its production to meet global demand is possible by 2040.

Modest emission reductions can also happen with:

- Reduced demand due to fuel price increases
- Shift to high-speed rail
- Reduced business travel
- Levies on frequent flyers

The **International Civil Aviation Organization** aims to **achieve net zero carbon emissions by 2050**

➔ This goal **remains aspirational and is insufficient** to meet the targets of the Paris Agreement.

3.8

Shipping

Defying predictions of the pandemic driving a paradigm shift in container shipping, **global container shipping rates and international shipping emissions were almost back to pre-pandemic levels in 2023.**

Shipping continues to be a major player in international trade, although increasingly **vulnerable to geopolitical instability.**

Shipping remains a key player in international trade.

➔ Moves around 11 billion tonnes of goods annually, **roughly 300 times more than is moved by aircraft.**

➔ **Trade volumes increased 4-fold in the last 4 decades**, leading to more competitive rates.

Ageing global fleet leads to increasing pollution.

➔ Average age of global shipping vessels increased from 10.3 years (2011) to 13.7 years (2022).

Due to trade restrictions with Russia, shipping costs increased in 2022, causing many rerouted ships, additional delays, higher port charges and increased pressure on storage capacity.

40% of maritime trade consists of transporting fossil fuels from production to consumption.

By 2050, global fossil fuel **demand is projected to decline** 80% for coal, 50% for oil, and 25% for natural gas, **which could lead to stranded assets** for fossil fuel transport **in the shipping industry**.

Much work are ahead to decarbonise shipping.

➔ International shipping **emissions grew 5%** in 2021, reversing the 2020 decline and returning to 2017 levels.

➔ Emissions need to **reduce by 15% from 2021 to 2030 to enable net zero shipping by 2050**.

Transition to sustainable fuels remains challenging and must be accelerated.

➔ **Biofuels** only accounted for **less than 1% of total shipping energy use** in 2021.

➔ **Advanced biofuels are not yet widely commercially viable** for shipping as they cost 2-3 times as much as conventional fuel.

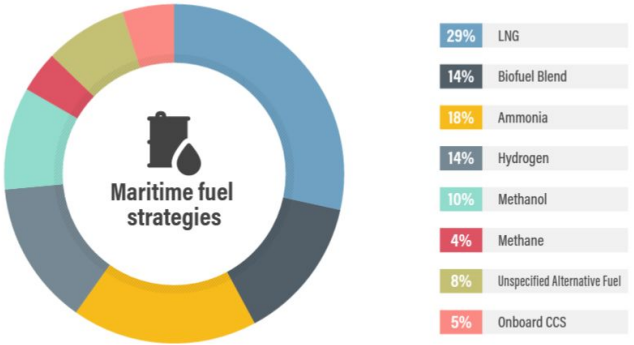
➔ **5% of maritime fuels must be zero carbon by 2030** to achieve the Paris Agreement targets.

Only 35% of shipping companies set net zero targets by 2050 and/or committed to the International Maritime Organization's (**IMO**) **target to reduce 50% of emission by 2050.**

In 2023, IMO raised the ambition to target a **70% emission reduction by 2040. This** places the sector **well within the carbon budget required to align with a scenario of keeping global temperature rise below 2°C compared to pre-industrial levels, but is insufficient to keep global temperature rise within 1.5°C.**

FIGURE 8. Proportion of fuel strategies in industry commitments on maritime shipping decarbonisation, as of 2022

Source



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Regional Trends in Transport Demand and Emissions, and Policy Developments

Module 3
Climate and Sustainability Responses in Transport Sub-Sectors and Modes

Module 4
Transport and Energy

Module 5
Enabling Climate and Sustainability Action in Transport: Finance, Capacity and Institutional Support

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