

Limiting Global Warming: Transport

▶ Electrification will play the key role in reducing emissions from land-based transport, but biofuels and hydrogen could play a role in decarbonisation of freight, and particularly in Shipping and Aviation.

THE BIG PICTURE

Emission Share & Breakdown



Emission Growth



Greatest Mitigation Potential

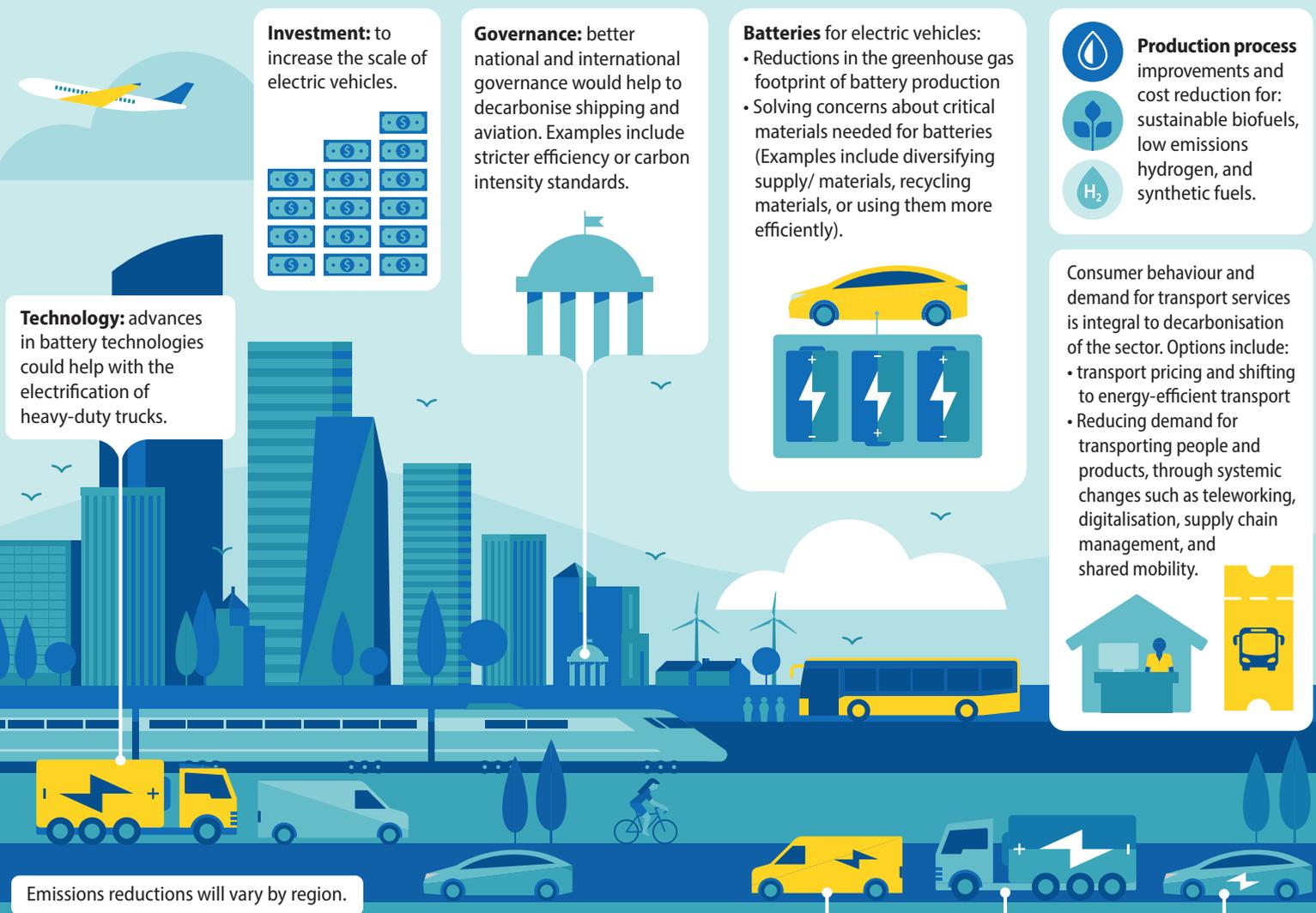


Net Zero

The transport sector is unlikely to reach net zero CO₂ emissions so carbon dioxide removal is likely needed to counterbalance residual CO₂ emissions from the sector.

- Limiting warming to 1.5C with no or limited overshoot likely requires a 40% to 70% reduction in transport emissions by 2050, compared to 2020.
- Limiting warming to 2C likely requires a 15% to 45% reduction in transport emissions by 2050, compared to 2020.

WHAT CAN BE DONE



Technology: advances in battery technologies could help with the electrification of heavy-duty trucks.

Investment: to increase the scale of electric vehicles.

Governance: better national and international governance would help to decarbonise shipping and aviation. Examples include stricter efficiency or carbon intensity standards.

Batteries for electric vehicles:

- Reductions in the greenhouse gas footprint of battery production
- Solving concerns about critical materials needed for batteries (Examples include diversifying supply/ materials, recycling materials, or using them more efficiently).

Production process improvements and cost reduction for: sustainable biofuels, low emissions hydrogen, and synthetic fuels.

Consumer behaviour and demand for transport services is integral to decarbonisation of the sector. Options include:

- transport pricing and shifting to energy-efficient transport
- Reducing demand for transporting people and products, through systemic changes such as teleworking, digitalisation, supply chain management, and shared mobility.

Emissions reductions will vary by region.

Developing countries: Technology transfer and financing can support developing countries transition or go directly to low emissions transport systems.

Electrification: In land-based transport, electric vehicles powered by low emissions electricity offer the largest decarbonisation potential

- Harder to decarbonise than other parts of transport sector
- Efficiency improvements include optimized vessel and aircraft design, mass reductions, and propulsion system improvements. However, these strategies are likely insufficient to limit emissions.
- Alternative, high energy density fuels are required
- Electrification could play a niche role for short trips and can reduce emissions from port and airport operations

Alternative shipping fuels include low-emission hydrogen, ammonia, biofuels, and other synthetics fuels.



- Alternative aviation fuels include liquid biofuels, low-emission hydrogen, and synthetic fuels.



BENEFITS AND TRADE-OFFS

Decarbonisation benefits include: air quality improvements, health benefits, and reduced congestion and travel times



Equitable access to transport services



Digitalization and dematerialization could reduce demand for materials (and associated transport). On the other hand, e-Commerce could increase demand for goods that need to be transported.



Electrification of transport will increase demand for lithium and other critical minerals.



LINKAGES

Cities

Supporting public transport, cycling, and walking can lead to large emissions savings. Making cities more compact and providing infrastructure that is less car-dependent can reduce emissions from transport fuel consumption by 25%!



Energy

Reducing emissions from the transport sector largely depends on power sector decarbonisation, and low emissions feedstocks (for biofuels) and production chains.



To read full AR6 Working Group III report, please visit www.ipcc.ch/report/ar6/wg3