



Completing the trip

ESTABLISHING A GLOBAL QUANTIFIED CLIMATE GOAL FOR THE TRANSPORT SECTOR

Yiqian Zhang-Billert and Ben Welle

Executive summary

Transport is a major contributor to global CO₂ emissions, at nearly 8 gigatonnes (Gt) in 2022—over a third of emissions from end-use sectors and one-third of global energy consumption (IEA n.d.; REN21 2024). Transport emissions must decline by at least 59 percent by 2050 compared to 2020 levels to meet commitments in the Paris Agreement, which aims to limit global warming to “well below” 2 degrees Celsius (°C), and “preferably” to 1.5°C, above preindustrial levels (IPCC 2023).

At the 28th Conference of the Parties (COP28) in December 2023, the first global stocktake (GST)—sought to track progress toward the Paris Agreement’s goals and inform enhanced climate action—calling for countries to transition away from fossil fuels across all sectors. Further, it asked countries to accelerate emission reductions in road transport through a range of pathways (UNFCCC 2023; IEA 2024c). Although the GST identified some quantified goals, such as tripling renewable energy capacity and doubling the rate of energy efficiency by 2030, it did not establish a quantified transport target. Meanwhile, the International Energy Agency (IEA) indicated that a quantified global goal for 2030 and beyond could accelerate action to decarbonize the road transport sector (IEA 2024c). The lack of such a goal leaves countries without a collective understanding of the pathways needed to meet commitments.

This expert note explores the IEA’s analysis for developing global quantified goals for road transport and beyond. We present a proposed sectorwide goal for transport decarbonization that encompasses a transition away from the internal combustion engine through electrification and scaling up low-emission fuels; modal shifts bolstering efficiency through public transport, active mobility, and rail; and broader renewable energy policies to facilitate integration with transport. A sectoral goal stitches together existing subsectoral agreements and should be agreed on by countries, particularly by transport and related ministries, with a view to informing development of countries’ climate commitments, known as nationally determined contributions (NDCs).

CONTENTS

- 1 Executive summary
- 2 Establishing a quantified global climate goal for the transport sector
- 3 Policy implications and recommendations for transport subsectoral strategies and climate action
- 6 Endnotes
- 6 Final considerations
- 6 References
- 8 Acknowledgments
- 8 About the authors

Suggested Citation: Zhang-Billert, Y., and B. Welle. 2025. “Completing the trip: Establishing a global quantified climate goal for the transport sector.” Expert Note. Washington, DC: World Resources Institute.

Expert notes provide timely, focused, and concise information for urgent challenges, based on expert perspectives.

Establishing a quantified global climate goal for the transport sector

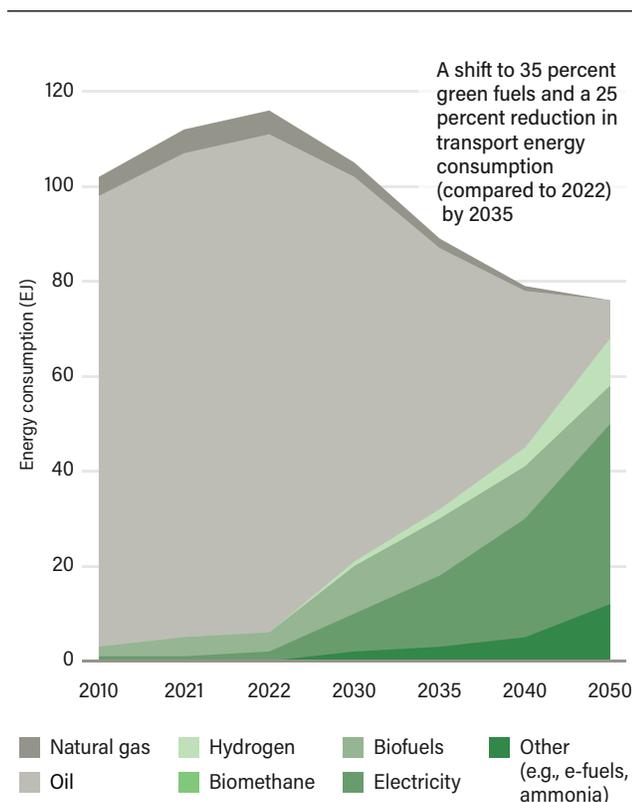
At COP28, as part of the first global stocktake (GST), countries called for a transition away from fossil fuels across all sectors. The GST recognized transport as a major contributor to emissions and highlighted solutions through multiple pathways.

Although it stopped short of identifying a quantified target for the sector, the GST set other quantified global goals, namely, tripling renewable energy capacity and doubling the rate of energy efficiency by 2030. While it did not explicitly state why no sectoral target for transport was included, the absence suggests a lack of consensus on the right metric, diversity in transport systems and their governance across countries, and a possible lack of direct engagement of decision-makers—such as transport ministries or cities—in the COP negotiations.

The IEA’s 2023 Net Zero Roadmap outlines alignment of the sector with a 1.5°C trajectory, tracking developments in policy, technology, investment, innovation, and costs (IEA 2023). This pathway requires a shift to 35 percent green fuels and a 25 percent reduction in transport energy consumption (compared to 2022) by 2035 (Figure 1) (IEA 2023). The drop in demand is driven by electrification of road vehicles, improvements in energy efficiency (e.g., better fuel economy), and shifts toward sustainable travel modes, including public transport, walking, and cycling. The shift to green fuels includes moving to electricity from diesel and gasoline (petrol), interim and limited use of biofuels, and innovation in e-fuels for aviation and shipping.

The IEA finds that such actions could reduce road transport emissions alone by around 25 percent by 2030 and more than 50 percent by 2035 (IEA 2024c). Road transport accounts for 73 percent of transport-related emissions (Boehm et al. 2023).

FIGURE 1 | Transport energy consumption by fuel in IEA’s Net Zero Emission scenario (2022–50)



Notes: EJ = exajoule; hydrogen includes hydrogen-based fuels; e-fuels are fuels obtained from electrolytic hydrogen; ammonia is the primary low-emission fuel used to decarbonize shipping.

Source: WRI authors, adapted from IEA 2023.

Establishing a quantified global climate goal for transport would stitch together existing subsectoral pledges (Figure 2) and fill gaps to ensure that key subsectors and opportunities are covered. These pledges include the Zero Emission Vehicles Declaration of more than 31 countries committed to zero-emission new car and van sales by 2040 (A2Z 2021) and the Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles (MHDVs) of 35 countries to pledge zero-emission new truck and bus sales by 2040 (Breakthrough Agenda 2025; Drive to Zero n.d.). UN High-Level Champions have developed targeted roadmaps, or *breakthroughs*, to support the sectoral transition. For example, the Avoid and Shift Breakthrough aims to “double the share of energy-efficient, fossil-free land transport through greater use of public transport, walking, cycling, and rail” (UNFCCC 2024).

Transport targets could accelerate sectorwide decarbonization (IEA 2024c) by providing signals to policymakers and industry and enhancing accountability. The development of transport targets would also encourage the integration of sector-specific targets into NDCs. Research on national transport strategies underscores how international pledges and goals can anchor domestic policies, institutionalize climate action, prompt national legislation, and enhance investor confidence (IEA 2024c; Zhang et al. 2023; Agora Verkehrswende and GIZ 2023).

FIGURE 2 | Select transport pledges and declarations driving global climate ambition and action

| | |
|-------------|---|
| 2021 | <p>COP26</p> <ul style="list-style-type: none"> ▪ <i>Zero Emission Vehicles Declaration</i> launched; countries pledged to work toward all sales of new cars and vans being zero-emission by 2040.^a ▪ <i>Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles</i> launched; countries agreed toward 100% zero-emission new truck and bus sales by 2040.^b ▪ <i>The Breakthrough Agenda</i> launched by 45 world leaders committing to work together to accelerate innovation and deployment of clean technologies this decade. The <i>Road Transport Breakthrough</i>, co-led by the United Kingdom, the United States, and India, aims to make zero-emission vehicles the new normal by 2030.^c |
| 2022 | <p>COP27</p> <ul style="list-style-type: none"> ▪ <i>Low Carbon Transport for Urban Sustainability initiative</i> launched, focusing on improving access to low-carbon and resilient urban mobility solutions and strengthening the foundational enablers of change as the first-order priorities.^d |
| 2023 | <p>COP28</p> <ul style="list-style-type: none"> ▪ The <i>First Global Stocktake</i> outcome calls on countries to align their next NDCs with 1.5°C and accelerate the reduction of emissions from road transport on a range of pathways, including through development of infrastructure and rapid deployment of zero- and low-emission vehicles.^e ▪ A group of organizations and countries called for doubling the share of energy-efficient and fossil-free forms of land transport by 2030.^f |
| 2024 | <p>COP29</p> <ul style="list-style-type: none"> ▪ <i>Avoid and Shift Breakthrough</i> launched, calling on countries to double the share of energy-efficient and fossil-free forms of land transport for people and goods by 2030, by focusing on shifts to public transport, walking, cycling, and rail freight, as well as electric vehicles and railways.^g |

Notes: COP = Conference of the Parties; COP26 = 26th Conference of the Parties to the UN Framework Convention on Climate Change; NDC = nationally determined contribution.

Sources: a. A2Z 2021; b. Drive to Zero n.d.; c. Breakthrough Agenda n.d.; d. Embassy of Egypt 2022; e. UNFCCC 2023; f. SLoCaT n.d.; g. UNFCCC 2024.

Nevertheless, setting a global transport goal is only one step. Sector-specific goals may limit countries' flexibility in choosing cost-effective mitigation pathways and raise questions about how the burden should be shared equitably. National implementation depends on diverse starting points, economic conditions, and transport needs; a goal should provide a shared direction that allows countries to tailor their contributions.

Achieving a quantified global climate goal for transport requires a system approach. Below we present an overarching recommendation, followed by a set of policy implications and subsectoral needs.

Recommendation: Countries should collectively commit to a quantified goal for transitioning away from fossil fuels in the transport sector. We propose a sectoral target of a shift to 35 percent green fuels and a 25 percent reduction in transport energy consumption (compared to 2022) by 2035. Such a goal encompasses all transport modes and embodies a comprehensive approach that includes a range of technologies, among them electrification and shifts to more sustainable travel such as rail and public transport.

Policy implications and recommendations for transport subsectoral strategies and climate action

Scaling up electrification and truly low-emission fuels

Electrification is one of the most significant drivers away from fossil-propelled transport, particularly when coupled with decarbonization of the energy supply (IEA 2024a; Fulton et al. 2021). A range of actions are needed.

- Global electric car sales reached 14 million in 2023, accounting for 18 percent of car sales, with China (45 percent), Europe (25 percent), and the United States (11 percent) leading the market (IEA 2024a). The growth is driven by falling battery prices, technological innovations, and continued policy support (IEA 2024a). To reach mass-market adoption of electric vehicles (EVs) while ensuring an equitable transition, continued policy support is essential, including charging infrastructure expansion, targeted subsidies, and measures to phase out internal combustion engine vehicles.

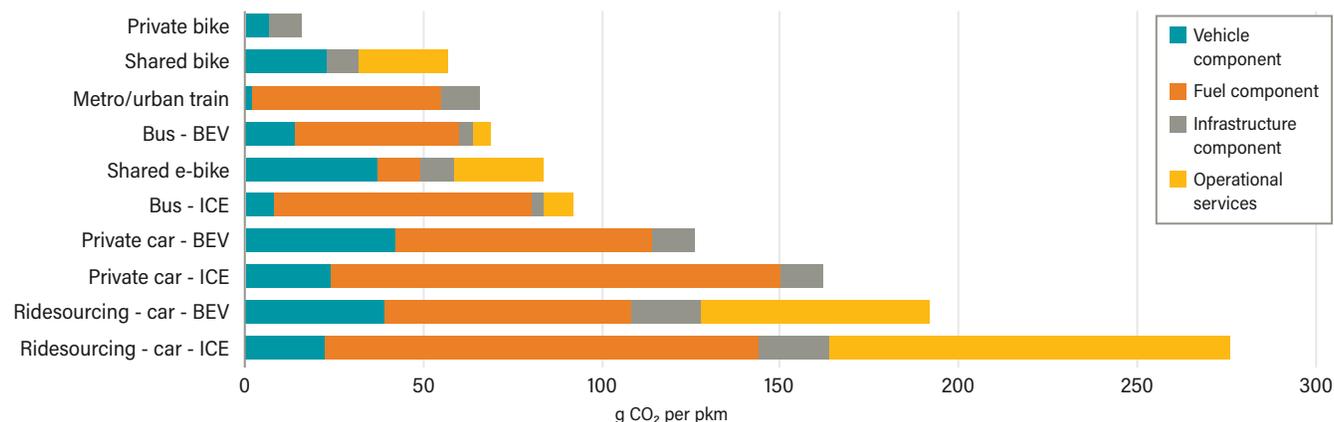
- In many parts of Asia, Latin America, and Africa, two- and three-wheelers (2/3Ws) predominate transport. Electrifying these vehicles could improve air quality and foster domestic EV industries (Zhang et al. 2023). In 2023, electric 2/3Ws comprised 13 percent of global sales, with India, China, and Southeast Asia leading (IEA 2024b). The reduced costs and charging needs of these vehicles make them ideal for rapid deployment, supported by tax rebates, battery swapping solutions, and supply-side incentives.
- Electrification of buses and trucks is also gaining momentum, though this varies by region. In 2023, nearly 50,000 electric buses (e-buses) were sold globally, or 3 percent of total bus sales, increasing the total stock to 700,000 (IEA 2024b). There has been encouraging progress in European markets such as Belgium and Norway, and emerging markets such as Latin America. China's percentage of global e-bus sales has shrunk from 90 percent to 60 percent between 2020 and 2023 (IEA 2024b). Electric truck sales reached 57,000—roughly 1 percent of total truck sales—driven largely by China, Europe, and the United States. By 2030, the IEA NZE scenario projects that e-buses will exceed 50 percent of new sales and e-trucks will reach 33 percent (IEA 2024a). To sustain this, governments must implement emission standards, expand charging networks, and support financial mechanisms to reduce upfront costs. Ambitious sales targets—such as those under the global Memorandum of Understanding on Zero-Emission MHDVs—combined with increased manufacturer supply will further drive market development.
- For “hard-to-abate” segments like aviation and shipping, electrification remains limited due to technological and cost constraints (ITF 2023). While small electric aircraft and ferries exist, aviation emission reductions will primarily rely on sustainable aviation fuel, which is expected to supply 25 percent of aviation fuel by 2030 and 85 percent by 2050 (Crownhart 2023; Anner 2022; IEA 2023). Caution is needed, as alternatives to petroleum jet fuel derived from soy and corn can drive higher food prices, deforestation, and land-use emissions (Lashof and Denvir 2025). Policy should prioritize e-fuels made from low-emission hydrogen,¹ and captured CO₂, while promoting efficiency measures such as managing demand for air travel. In shipping, electrification of cargo handling equipment—already underway at ports globally—presents a near-term opportunity to reduce port-related emissions by 15 percent or more (RMI 2024). Ammonia, methanol, and hydrogen fuel cells are in early deployment, but the high carbon intensity of producing these fuels presents a major challenge (IEA 2023). Stricter fuel standards and investment in zero-emission propulsion technologies are needed to scale adoption across the supply chain. While the International Maritime Organization has taken steps to establish a fuel standard and global emission pricing mechanism, the measures fall short of what is needed to meet its own 2030 targets, underscoring the need for stronger national targets for decarbonizing shipping (IMO 2025; WRI 2025).

Recommendation: EVs and targeted approaches to alternative fuels are essential to decarbonize transport. Policymakers should accelerate electrification across light- and heavy-duty vehicles through CO₂ and fuel economy standards, financial incentives, and charging infrastructure investments. Meanwhile, production and distribution of sustainable fuels—such as advanced biofuels, e-kerosene, and green ammonia—must be scaled up to decarbonize aviation and shipping.

Moving in efficient ways and for people and goods and connecting to land use: Setting goals for public transport, rail, and active mobility

To fully implement the COP28 commitments, the IEA estimates that energy efficiency improvements across sectors must average 4 percent annually through 2030—twice the 2022 rate—potentially reducing global energy demand by 10 percent, despite continued economic growth. In transport, beyond large-scale electrification, critical levers to improve energy efficiency include rail and reducing reliance on cars, particularly in cities.

By 2050, global passenger transport demand could grow by 79 percent, and freight demand could nearly double (ITF 2023). Public transport, particularly when electric-propelled, emits roughly half the emissions per passenger-kilometer of private cars (Figure 3) (ITF 2020). Yet only 6 in 10 urban residents have convenient access to public transport,² and fewer than 4 in 10 have access in least developed countries, highlighting the need for improved services and quality (UN 2024). Bicycling and walking offer greater environmental and health benefits, and the provision of high-quality infrastructure and planning that offer safety and comfort can keep people using these modes or motivate them to switch.

FIGURE 3 | Life-cycle greenhouse gas emissions of urban transport modes per passenger-kilometer

Notes: g CO₂ per pkm = grams of carbon dioxide per passenger kilometer traveled; ridesourcing consists of on-demand ride services delivered by platforms such as Didi, Uber, Grab, and Lyft; ICE = internal combustion engine; BEV = battery electric vehicle; e-bike = electric bike.

Source: ITF 2020.

Building communities around public transport and active mobility also requires coordinated land-use policies. Fostering development around transit nodes, shorter trip distances, and connected street networks can curb car dependency and support broader Sustainable Development Goals (Ewing and Cervero 2010). Further, policies like congestion charging, parking restrictions, and levies on frequent flyers can reinforce sustainable travel choices. The IEA's NZE scenario suggests that behavioral changes reducing private car use and shifting from short-haul flight to high-speed rail could cut emissions by nearly 1 Gt by 2030 (IEA 2023).

Freight transport accounts for nearly half of transport-related emissions. Improving logistics performance of supply chains, increasing load factors, and reducing empty trips offers the potential to cut emissions (ITF 2023). Freight rail consumes one-tenth of the energy per tonne-kilometer that trucks do, while passenger rail uses only 18 percent of the energy per passenger-kilometer relative to cars (REN21 2024). Rail's low energy and CO₂ intensity makes it a promising strategy to reduce emissions, though it remains underutilized in many countries and will require investment and policy support to realize its potential.

Recommendation: Policymakers must curb transport emissions by prioritizing public transport, walking, and cycling, making them convenient, safe, affordable, and accessible. Improving logistics performance offers the potential to reduce freight emissions. Expanding energy-efficient rail systems is critical for passenger and freight transport. Sustained behavioral shifts—supported by well-designed policies and urban planning—can significantly reduce energy demand and help meet climate targets.

Bolstering the integration of renewables across the transport sector

Transport has the lowest share of renewables among energy end-use sectors, at only 4 percent of final energy consumption (REN21 2024). Electricity generated from renewable sources, green hydrogen, sustainably sourced biofuels, and synthetic fuels can support transport decarbonization. In the IEA's NZE scenario, renewables are expected to generate nearly 60 percent of global electricity by 2030 (IEA 2023).

Governments have already adopted policies to encourage the integration of renewables and transport, including blending mandates,³ EV targets, and financial incentives such as subsidies and tax rebates. However, as of 2023, only 49 countries had specific renewable energy targets for transport (REN21 2024).

More comprehensive action is needed, ensuring that EV adoption and other efforts align with renewable energy strategies. Smart charging and vehicle-to-grid technologies enable EVs to interact with power grids, providing flexibility and enhancing the integration of variable renewable energy sources.

Recommendation: Governments must ensure that transport electrification is powered by clean energy. This includes aligning EV targets with renewable energy goals, supporting grid modernization, and incentivizing technologies that facilitate renewable integration in transport systems.

Final considerations

Setting global targets for transport will be crucial for catalyzing political will and coordinated emission reductions. While the connection among global targets, policy alignment, and investment responses is recognized, a more in-depth analysis of these dynamics is needed.⁴ Since the announcement of high-level pledges on renewable energy capacity and energy efficiency, political momentum toward energy transitions has grown (IRENA 2024). Understanding these effects would aid discussion on implementing a global transport goal. The low-emission transport transition relies on a mix of efficient vehicles, low-carbon travel modes, and renewable energy sources, with each country developing its own transport decarbonization pathway in line with the global targets.

Endnotes

1. "Low-emission hydrogen" refers to hydrogen produced from water electrolysis or fossil fuels with high levels of carbon capture and storage (IEA 2023).
2. Access to public transport is considered convenient if a recognized stop is within 500 meters walking distance via the street network for low-capacity systems (e.g., bus, bus rapid transit), or within 1 kilometer for high-capacity systems (e.g., rail, metro, ferry), from key locations like homes, schools, or workplaces (UN 2025).
3. "Blending mandates" refers to government policies that require a certain percentage of renewable fuels—typically biofuels or synthetic fuels—to be blended with conventional fossil fuels (such as gasoline or diesel). Worldwide over 60 countries have biofuel blending mandates. For example, Brazil has implemented a mandatory biodiesel blend of 14 percent (B14) in diesel fuel since April 2024 (REN21 2024; Reuters 2025).
4. As highlighted by Weitzman (1974), the choice between setting quantitative targets (e.g., emission caps) versus using price-based instruments (e.g., carbon pricing) under uncertainty depends on the relative slopes of marginal costs and benefits.

References

- Agora Verkehrswende and GIZ (Gesellschaft für Internationale Zusammenarbeit). 2023. "Towards Decarbonising Transport 2023: A Stocktake on Sectoral Ambition in the G20." <https://www.agora-verkehrswende.org/publications/towards-decarbonising-transport-2023>.
- Anner, N. 2022. "The Electrification of Europe's Ferry Fleet." Siemens Energy, August 12. <https://www.siemens-energy.com/global/en/home/stories/the-electrification-of-europes-ferry-fleet.html>.
- A2Z (Accelerating to Zero Coalition). 2021. "Zero Emission Vehicles Declaration." <https://acceleratingtozero.org/the-declaration/>.
- Boehm, S., L. Jeffery, J. Hecke, C. Schumer, J. Jaeger, C. Fyson, K. Levin, et al. 2023. "State of Climate Action 2023." World Resources Institute, November. <https://www.wri.org/research/state-climate-action-2023>.
- Breakthrough Agenda. 2025. "Road Transport Breakthrough Priority Actions for 2025." <https://breakthroughagenda.org/wp-content/uploads/2024/11/Road-Transport-Breakthrough-Priority-Actions-for-2025-final-.pdf>.
- Crownhart, C. 2023. "The Runway for Futuristic Electric Planes Is Still a Long One." *MIT Technology Review*, March 14. <https://www.technologyreview.com/2023/03/14/1069724/futuristic-electric-planes-evtols/>.
- Drive to Zero. n.d. "Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles." Accessed February 26, 2025. <https://globaldrivetozero.org/mou-nations/>.
- Embassy of Egypt. 2022. "Four Initiatives Launched during COP27's Solutions Day." Embassy of the Arab Republic of Egypt, November 18. https://egyptembassy.net/news/cop_27/four-initiatives-launched-during-cop27s-solutions-day/.

- Ewing, R., and R. Cervero. 2010. "Travel and the Built Environment: A Meta-analysis." *Journal of the American Planning Association* 76 (3): 265–94. doi:10.1080/01944361003766766.
- Fulton, L., D.T. Reich, M. Ahmad, G. Circella, and J. Mason. 2021. "The Compact City Scenario: Electrified." Institute for Transportation and Development Policy. https://itdp.org/wp-content/uploads/2021/12/EN_Compact-Cities-REPORT_SINGLEPAGE-1.pdf.
- IEA (International Energy Agency). 2023. "Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach." <https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach>.
- IEA. 2024a. "Global EV Outlook 2024." <https://www.iea.org/reports/global-ev-outlook-2024>.
- IEA. 2024b. "Global EV Data Explorer: Data Tools." <https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer>.
- IEA. 2024c. "From Taking Stock to Taking Action." <https://www.iea.org/reports/from-taking-stock-to-taking-action>.
- IEA. n.d. "Transport: Energy System." Accessed March 12, 2025. <https://www.iea.org/energy-system/transport>.
- IMO (International Maritime Organization). 2025. "IMO Approves Net-Zero Regulations for Global Shipping." April 11. <https://www.imo.org/en/MediaCentre/PressBriefings/pages/IMO-approves-netzero-regulations.aspx>.
- IPCC (Intergovernmental Panel on Climate Change), ed. 2023. "Transport." In *Climate Change 2022: Mitigation of Climate Change*, 1st ed., 1049–160. Cambridge: Cambridge University Press. doi:10.1017/9781009157926.012.
- IRENA. 2024. "Delivering on the UAE Consensus: Tracking Progress toward Tripling Renewable Energy Capacity and Doubling Energy Efficiency by 2030." *International Renewable Energy Agency*, October. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Oct/IRENA_UAE_Consensus_2030_trippling_renewables_doubling_efficiency_2024.pdf.
- ITF (International Transport Forum). 2020. "Good to Go? Assessing the Environmental Performance of New Mobility." OECD (Organisation for Economic Co-operation and Development)/ITF, September, 87. <https://www.itf-oecd.org/sites/default/files/docs/environmental-performance-new-mobility.pdf>.
- ITF. 2023. *ITF Transport Outlook 2023*. Organisation for Economic Co-operation and Development. doi:10.1787/b6cc9ad5-en.
- Lashof, D., and A. Denvir. 2025. "The United States Should Not Turn Food into Aviation Fuel." World Resources Institute, January. doi:10.46830/wrienv.24.00101.
- REN21 (Renewable Energy Policy Network for the 21st Century). 2024. *Renewables 2024 Global Status Report Collection, Energy Demand*. Paris: REN21 Secretariat. https://www.ren21.net/wp-content/uploads/2019/05/GSR2024_Demand_Full_Report.pdf.
- Reuters. 2025. "Brazil to Keep Mandatory Biodiesel Blend at 14%, Minister Says." February 18. <https://www.reuters.com/business/energy/brazil-keep-mandatory-biodiesel-blend-14-minister-says-2025-02-18/>.
- RMI (Rocky Mountain Institute). 2024. "The Time Is Now for Zero-Emissions Cargo Handling Equipment at America's Busiest Cargo Ports." July 10. <https://rmi.org/the-time-is-now-for-zero-emissions-cargo-handling-equipment-at-americas-busiest-cargo-ports/>.
- SLoCaT (Partnership on Sustainable, Low Carbon Transport). 2025. "Five Point Plan for Transport in New NDCs 2025 Recommendations." https://slocat.net/wp-content/uploads/2025/03/Five-Point-Plan-for-Transport-in-New-NDCs_2025-Recommendations-2.pdf.
- SLoCaT. n.d. "Call to Action on Fossil Fuel-Free Land Transport." March 14, 2025. <https://slocat.net/call-to-action-on-fossil-fuel-free-land-transport/>.
- UN (United Nations). 2024. *The Sustainable Development Goals Report 2024*. New York: United Nations. <https://unstats.un.org/sdgs/report/2024/The-Sustainable-Development-Goals-Report-2024.pdf>.
- UN. 2025. "SDG Indicator Metadata." <https://unstats.un.org/sdgs/metadata/files/Metadata-11-02-01.pdf>.
- UNFCCC (UN Framework Convention on Climate Change). 2023. *Report of the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement on Its Fifth Session, Held in the United Arab Emirates from 30 November to 13 December 2023. Addendum. Part Two: Action Taken by the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement at Its Fifth Session*. Geneva: UNFCCC. https://unfccc.int/sites/default/files/resource/cma2023_16a01E.pdf?download.
- UNFCCC. 2024. "Summary of Global Climate Action at COP 29." https://unfccc.int/sites/default/files/resource/Summary_Global_Climate_Action_at_COP_29.pdf.
- Weitzman, M.L. 1974. "Prices vs. Quantities." *Review of Economic Studies* 41 (4): 477. doi:10.2307/2296698.
- WRI (World Resources Institute). 2025. "Statement: Countries Agree to Global Fee on Shipping Industry's Emissions." April 14. <https://www.wri.org/news/statement-countries-agree-global-fee-shipping-industrys-emissions>.
- Zhang, Y., S. Castellanos, and B. Welle. 2023. "Visioning to Implementation: National Transport Decarbonization Policies That Match Climate Targets in China, India, and Vietnam." World Resources Institute, December. doi:10.46830/wriipt.22.00084.

Acknowledgments

The authors are grateful to Laura Van Wie McGrory, Sue Gander, Antonio Marques da Costa Ouro, Magdala Arioli, Anne Maassen, and Carlos Muñoz Pina, who provided valuable feedback for this expert note. The note benefited from conceptual inputs and review by Rabea Schmecht and Daniel Bongardt from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The authors alone are responsible for the views presented and any errors that remain. Special thanks also go out to the editorial and design team: Alex Martin, Shannon Collins, and Romain Warnault.

About the authors

Yiqian Zhang-Billert is Senior Manager of Climate and Electric Mobility at the WRI Ross Center for Sustainable Cities.
Contact: yiqian.zhang@wri.org

Benjamin Welle is Director of Integrated Transport and Innovation at the WRI Ross Center for Sustainable Cities.
Contact: benjamin.welle@wri.org

About WRI

World Resources Institute works to improve people's lives, protect and restore nature, and stabilize the climate. As an independent research organization, we leverage our data, expertise, and global reach to influence policy and catalyze change across systems like food, land and water; energy; and cities. Our 2,000+ staff work on the ground in more than a dozen focus countries and with partners in over 50 nations.