

Executive Summary

On November 12, 2021, the COP26 Joint Declaration (or Glasgow Climate Pact) established the goal of achieving carbon neutrality by 2050. OICA and its member associations – representing the global automotive industry – appreciate the importance of this goal and are working diligently to contribute to the decarbonization of road transport in support of this broader objective. We also recognize no single government policy or industry commitment alone will achieve this ambitious goal. We must work collaboratively – at all levels of government and across all economic sectors – to identify the range of approaches necessary to establish sustainable pathways to carbon neutrality across sectors and the unique circumstances of individual nations around the world.

The auto industry understands the important role it plays in decarbonizing road transport as a way to help achieve this broader goal. According to the International Energy Agency¹, transport as a whole contributed in 2020 to 37 percent of the global CO₂ emissions from end-use sectors. It is also generally recognized that road transport (cars, trucks and buses) accounts for about 75 percent of the total transport sector.

To that end, the automotive industry is planning to invest more than \$1 trillion globally by 2030² to help facilitate the transition to an electrified future (including battery, plug-in hybrid and fuel cell electric vehicles), while simultaneously continuing to innovate on the broad array of powertrain technologies necessary to meet the broad and diverse needs of a global market. This includes, for example, internal combustion engines (ICE) with low carbon or carbon neutral fuels, such as hydrogen, bioethanol, biomethane, biodiesel, HVO (Hydrotreated Vegetable Oil), and synthetic fuels. This is valid for all vehicle segments.

While the long-term trajectory certainly embraces a shift toward electrification, the industry recognizes, at present, no single technology is capable of achieving carbon neutrality across the global automotive industry. Individual nations need the flexibility to adopt multiple technologies and policies best suited to their unique realities, including geography, socioeconomic, and geopolitical considerations. Technology neutral and multiple approaches provide more practical and sustainable pathways to carbon neutrality for all nations.

¹ International Energy Agency - <https://www.iea.org/topics/transport>

² <https://www.reuters.com/technology/exclusive-automakers-double-spending-evs-batteries-12-trillion-by-2030-2022-10-21/>

In order to maximize EV acceptance and adoption, policymakers and industry investments must focus on improving vehicle affordability, increasing consumer awareness and confidence, developing vital charging and refueling infrastructure, accelerate decarbonization of the electric grid, and building reliable and resilient supply chains to support the manufacture of EVs.

Electrical charging and hydrogen fueling infrastructure: All stakeholders must work together on public policy efforts, such as incentives, grants, rebates and other mechanisms, along with private investment, to spur significant electric charging and hydrogen refueling infrastructure development to support three key areas: homes (especially multi-unit dwellings and areas with higher residential densities), workplaces and highway and other public locations, with an emphasis on those lacking public transport.

Existing research shows charging needs will vary substantially by country and region, housing stock, average distance travelled, population density and EV mix.⁷ For example, home charging is currently the most important charging option in most countries for the current type of EV customers and will remain a critical option where conditions support home charging. Other countries, regions, and customer segments are seeing an increasing importance of public and workplace charging. Further, individual countries will have different demands for DC fast charging depending on geography, demographics and other factors. In short, there is no set playbook for optimizing charging infrastructure and individual nations must make decisions based on their national interests and needs.”⁸

Regardless, achieving the right charging infrastructure mix will require a massive and coordinated investment between the public and private sectors. For example, according to Alix Partners, it is estimated that around a \$300 billion infrastructure investment would be required by 2030 to support automaker-projected growth in EV parc globally.⁹ According to IEA, globally there were nearly 1.8 million publicly accessible charging points in 2021, a third of which were fast chargers. In addition, the number of fast chargers installed in 2021 (500,000) was greater than the total number of global chargers available in 2017.¹⁰ In other words, while progress has been made over the last five years, there is still significant investment necessary to meet the needs of a diverse set of EV drivers.

⁷ International Energy Agency, [Global EV Outlook 2022](#), 2022

⁸ Simon Árpád Funkea, Frances Spreib, Till Gnanna, Patrick Plötza, [“How much charging infrastructure do electric vehicles need?”](#), Transportation Research

Part D: Transport and Environment, 2019

⁹ Michael Wayland, “Biden wants to build a national EV charging system under \$2 trillion infrastructure plan, but it won’t be easy,” [CNBC](#), 2021-03-31

¹⁰ International Energy Agency, [Global EV Outlook 2022](#), 2022

In sum, both industry and government have a role to play in increasing the availability and affordability of new vehicle technologies.

R&D: To increase EV market share, the focus should not be simply on strengthening fuel-efficiency and other regulations. These must be complemented by additional government policies that facilitate the transition to an electric future, including support for critical R&D. Automakers have committed \$255 billion to EV R&D activities in 2023.¹¹

In order to increase EV penetration and provide EV owners the same cost benefits as those provided by internal combustion engines, governments must continue to work proactively with industry to identify and support critical R&D opportunities, programs and initiatives. Despite tremendous progress in advancing EV technologies, R&D remains essential to addressing challenges from EV battery-pack prices to secure stable access to critical components and supply chains.

Fuel Cell: In addition to battery and plug-in EVs, hydrogen fuel cell EVs represent an important technology on the path to decarbonizing road transportation. This is particularly important for heavy duty vehicles, where battery technology may present challenges related to weight, cost and charging.

Hydrogen should be priced at affordable levels, and hydrogen fuels made more conveniently available to users. Accordingly, government support measures are needed in the areas of fuel cell and hydrogen storage R&D, and hydrogen production and station infrastructure development. For example, in South Korea the government has committed substantial resources to both hydrogen energy projects, as well as the establishment of a public-private hydrogen-powered FCEV market.¹² This type of public and private sector collaboration and investment reflects the type of national strategy and technology flexibility necessary to achieve broader decarbonization goals.

Mineral Extraction and Supply Chain: Realizing widescale adoption of EVs will require a substantial increase in the identification and responsible extraction of resources critical to the battery supply chain, as well as battery end-of-life policies that minimize environmental harm and support robust and resilient supply chains for battery materials.

According to the IEA, “demand for EV batteries will increase from around 340 GWh today, to over 3500 GWh by 2030.”¹³ Others place this estimate higher – up to 9,300 GWh by 2030, a more than 1600 percent increase from 2020 levels.¹⁴ This will apply tremendous pressure on existing supply

¹¹ Alix Partners, “[Betting Big in Electrification and Autonomous](#),” AlixPartners Global Automotive Outlook 2018

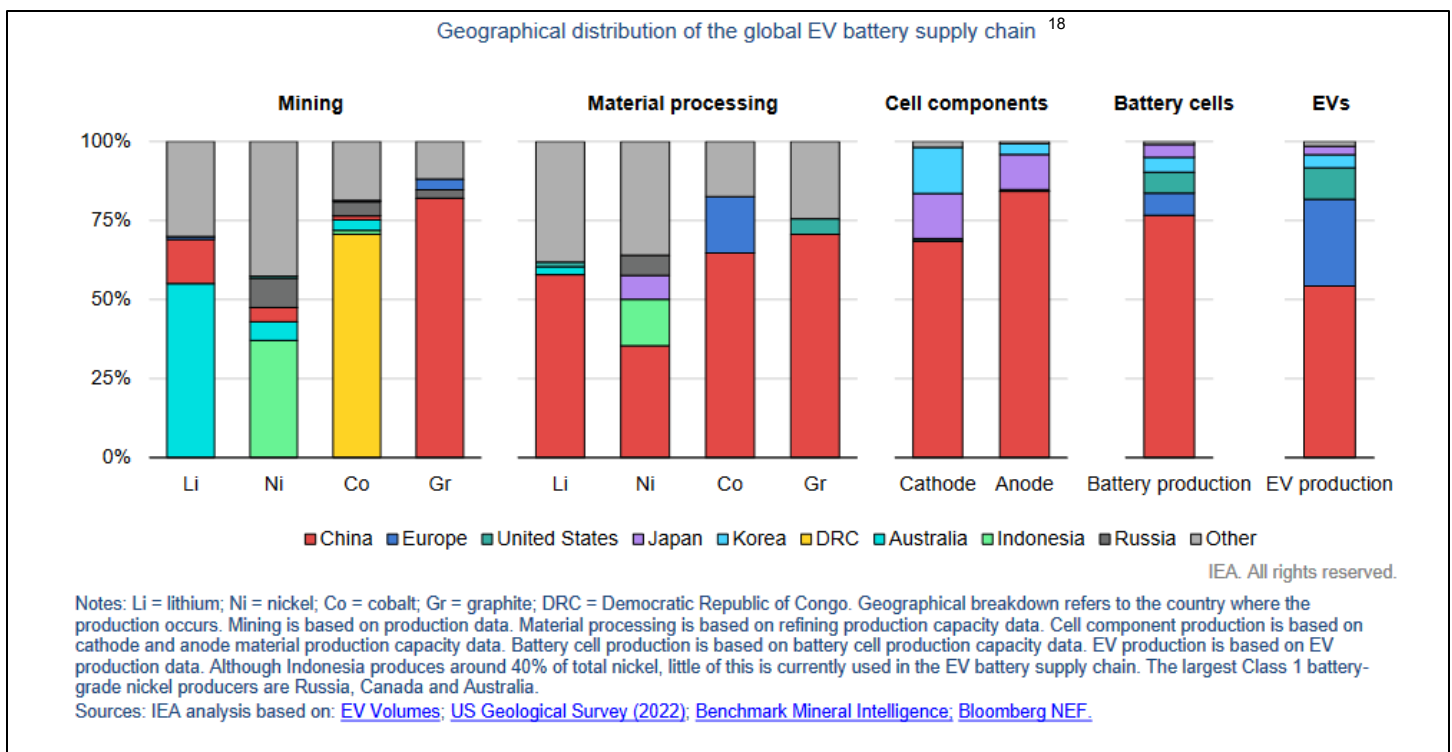
¹² <https://www.macquarie.com/au/en/perspectives/a-clean-start-south-korea-embraces-its-hydrogen-future.htm>

¹³ International Energy Agency, “[Global Supply Chains of EV Batteries](#),” 7/22

¹⁴ Govind Bhutada, “[Mapped: EV Battery Manufacturing Capacity, by Region](#),” Visual Capitalist, 2022-02-28

chains for critical minerals, components and materials. For example, some estimates suggest that global demand for lithium from battery factories “could hit 3 million tonnes by 2030, requiring a massive increase over the 82,000 tonnes produced in 2020.”¹⁵ Benchmark Minerals Intelligence estimates that over 300 new mines for graphite, lithium, nickel and cobalt will need to be built over the next decade to meet EV and energy storage battery demands.¹⁶

As a result of surging demand and tight supply chains, “[p]rices of raw materials such as cobalt, lithium and nickel have surged. In May 2022, lithium prices were over seven times higher than at the start of 2021.”¹⁷



Grid Reliability/Decarbonizing: Decarbonization of road transport is firmly linked to decarbonization of the electric grid (both for BEVs as well as FCEVs). Thus, realizing the full potential of EVs and their charging infrastructure will require careful but urgent consideration and evaluation of upgrades to electric grid infrastructure, as well as the accelerated transition to clean and renewable sources of energy. A critical factor in the widescale adoption of EVs is ensuring the grid infrastructure is clean, reliable, resilient, affordable and able to accommodate various charging needs (not limited only to light-duty vehicles). We must work collaboratively to understand how widespread adoption of EVs will

¹⁵ Govind Bhutada, “[Mapped: EV Battery Manufacturing Capacity, by Region](#),” Visual Capitalist, 2022-02-28

¹⁶ Benchmark Mineral Intelligence, “[More Than 300 New Mines Required To Meet Battery Demand by 2035](#),” 9/22

¹⁷ International Energy Agency, Press Release, “[Global Electric Car Sales Have Continued Their Strong Growth In 2022 After Breaking Records Last Year](#),” 2022-05-23

¹⁸ International Energy Agency, “[Global Supply Chains of EV Batteries](#),” 7/22

increase demand on existing infrastructure and plan for the necessary investments required to maintain grid reliability.

Further, realizing the benefits of electric and fuel cell vehicles makes decarbonizing the electric grid increasingly important. In order to truly achieve the bold ambition of COP26, especially decarbonization of road transport, the power used to charge EVs will need to come from clean and renewable sources – while also maintaining the reliability necessary to meet demand.

A Global Approach – A Path to Decarbonization for All Nations

In the near-to-medium-term, full-scale electrification may not offer a realistic or practical path for many nations around the world.

For example, Brazil is the world's largest producer of sugarcane ethanol and second largest soybean producer. Brazil has pioneered the use of energy crops as biofuel for the transport sector since the 1970's (Barros, 2019; CONAB, 2021).¹⁹ Biofuels have been proven to emit significantly lower greenhouse gas (GHG) emissions than petroleum-based fuels.²⁰ In 2021, 84 percent of new light vehicles sold in Brazil contained flex fuel engines.²¹ In contrast, EVs accounted for only 0.14 percent of vehicles sold and remain limited due to concerns around affordability, infrastructure and other factors.²² Due to the long distances to be travelled in Brazil and the limited size of its electrical recharging grid, the electrification solution for the heavy-duty vehicles segment is a complex endeavor, bringing the use of biofuels (biodiesel, biomethane and HVO) to the center of the country's decarbonization strategy.

For example, according to a scenario analysis contracted by the Japanese Automobile Manufacturers Association²³, as shown in the graph below, it will be possible for CO2 emissions reduction in the global road transport sector to be in line with the IPCC's 1.5°C climate scenarios for 2050, if electrification of powertrains (including BEVs, PHEVs, HEVs and FCEVs), is combined with the supply by 2050 of carbon-neutral automotive fuels (synthetic fuels and biofuels) at a level equivalent to approximately 30 percent of global automotive fuel consumption in 2020. Also, at least some supply of those fuels for in-use vehicles will be essential for advanced economies to achieve 2050 carbon neutrality in the road transport sector.

¹⁹ <https://www.sciencedirect.com/science/article/pii/S266678942200006X>

²⁰ U.S. Department of Energy, "[Ethanol vs. Petroleum-Based Fuel Carbon Emissions](#)," 6/23/22

²¹ [Electric cars in Brazil - May 2022](#)

²² Id.

²³ [Transitioning to Carbon Neutrality by 2050: A Scenario-Based Analysis](#)

