BRIEFING



JUNE 2023

# Electric vehicles market monitor for light-duty vehicles: China, Europe, United States, and India, 2022

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This is ICCT's second Major Markets Electric Vehicle Monitor.[1] It analyzes the electric vehicle (EV) market development and fleet carbon dioxide ($CO_2$) emissions trends of manufacturers of light-duty vehicles (LDVs) in China, Europe, the United States, and India in 2022. These four markets made up approximately 66% of global LDV sales in 2022. Relevant definitions and details about the data sources, methodology, and assumptions that underlie the analysis are in the appendices.

## THE GLOBAL MARKET

Global sales of light-duty EVs reached approximately 10.4 million in 2022, and EVs were nearly 13% of the approximately 82 million new light-duty vehicles (LDVs) sold worldwide. About 76% of global EV sales were in the four largest markets: China, the United States, Europe, and India.

In 2022, **China** was the world's largest EV market, both in terms of EV share of new sales and absolute sales of EVs. It sold approximately 4.6 million EVs, about 24% of all new LDVs sold in the country and nearly double the 13.5% EV share in 2021. In **Europe**, EVs were 21% of all new LDVs sold in 2022, an increase over the 17% EV share in 2021. The **United States'** EV share remained in the single digits, 7.3% in 2022, but that was an increase over the 4.8% share in 2021. **India's** share increased slightly in 2022, to 1.2%, and it still significantly lagged the other major markets in terms of both absolute number of EVs sold and EV market share.

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1 The first was published earlier this year and covered 2020 and 2021. Ilma Fadhil et al., "Electric Vehicle Market Monitor for Light-Duty Vehicles: China, Europe, United States, and India, 2020 and 2021," (ICCT: Washington, DC, 2023), https://theicct.org/publication/ev-ldv-major-markets-monitor-jan23/ .

**Acknowledgments:** We thank ClimateWorks Foundation for generous support and Atlas Public Policy for providing and processing the U.S. data. Thanks also to Stephanie Searle, Zifei Yang, Ashok Deo, Lingzhi Jin, Yuntian Zhang, and Arijit Sen for helpful reviews.

In **Figure 1**, the EV share of LDV sales is on the y-axis, the total number of EV models sold is on the x-axis, and the size of the circles represents the number of EVs sold for each region. As the figure also shows, in 2022, battery electric vehicles (BEVs) still dominated EV sales in terms of absolute numbers, but the split between BEVs and PHEVs changed compared to 2021 in all four markets. Both Europe and the United States saw a lower share of PHEVs in 2022, 40% and 20% of the total EVs sold, respectively.[2] The share of PHEVs increased slightly in China from 18% in 2021 to 22% in 2022. PHEVs started entering the market in India, but the share was negligible, and they were less than 1% of total EVs sold in 2022. Although all four major markets saw an increase in EV model availability in 2022, the United States and India continued to lag China and Europe on this metric.

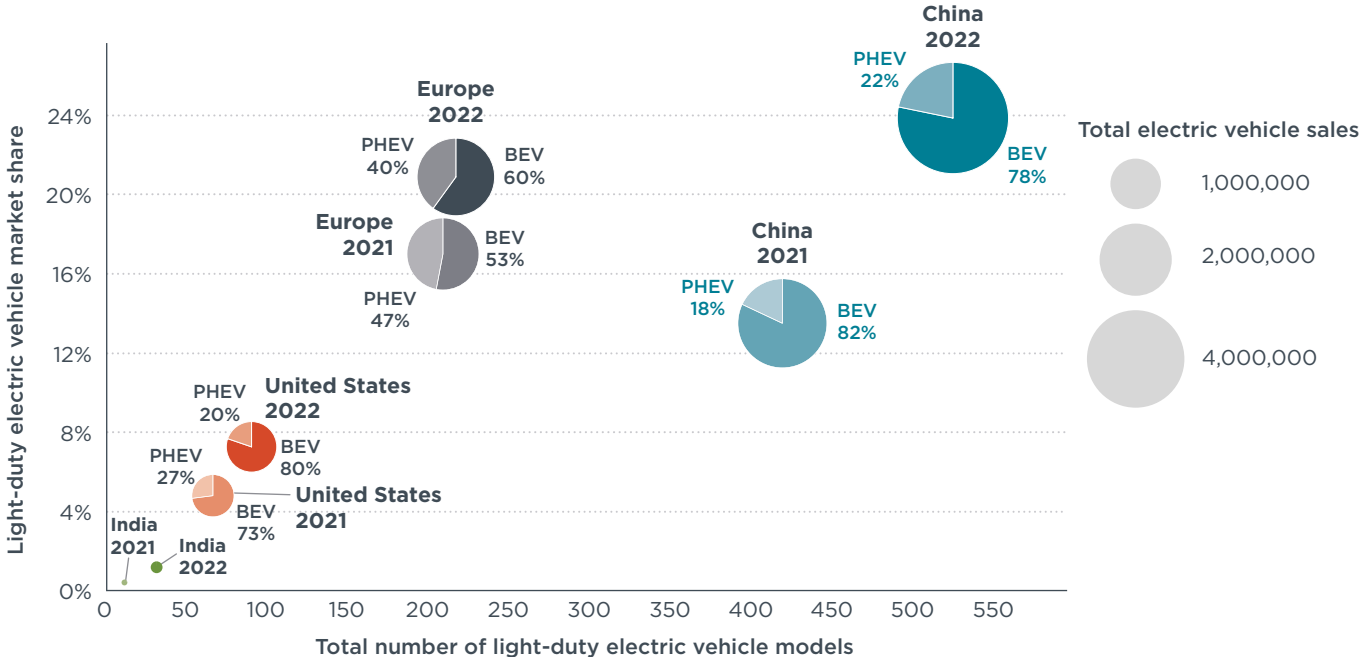


**Figure 1.** Light-duty EV market share, number of EV models for sale, and technology mix in the four regions, 2021 and 2022.[3]

**Figure 2** presents the 10 best-selling BEV models and their corresponding shares of the market in each of the four regions in 2022. The green bars reflect the absolute number of sales for each model and the teal circles reflect their combined market share starting from the number one bestseller to the tenth most popular model. While the 10 best-selling BEV models accounted for approximately 40% and 55% of the total BEV sales in Europe and China, respectively, they were a larger portion of BEV sales in the United States (83%) and almost all of the BEV sales in India (98%). In China, sales were dominated mainly by three manufacturers: SAIC Motor (which produces the Wuling Hongguang Mini), Tesla, and BYD. The two Tesla models on the list had about 440,000 in combined sales and BYD sold approximately 403,000 EVs in China in 2022. In the United States, more models became available in 2022, but Tesla still recorded the most sales of any manufacturer; its Model Y and Model 3 together accounted for 55% of all BEV sales, a drop from 70% in 2021. The Model Y and 3 together also recorded the most sales in Europe and were 12% of BEV sales in the region in 2022.

2 The potential of PHEVs to reduce fuel consumption and greenhouse gas emissions depends on their real-world use in electric driving mode. A recent ICCT study found that the average real-world fuel consumption of PHEVs in Europe is three to five times higher than the WLTP type-approval values. See the full report: Patrick Plotz et al., "Real-World Usage of PHEVs in Europe: A 2022 Update on Fuel Consumption, Electric Driving, and $CO_2$ emissions," (ICCT: Berlin, Germany, 2022), https://theicct.org/publication/real-world-phev-use-jun22/.

3 We set a minimum threshold of 10 sales and above when counting EV models to exclude models that are not available to the mass market. Particularly for China data, this is an effective way to minimize data-entry errors in the raw vehicle registration database.

Among legacy automakers, Volkswagen (VW) Group fared well in Europe in 2022. Four of its models under three brands, VW (ID.4 and ID.3), Škoda (Enyaq IV), and Audi (Q4 E-Tron), were among the top 10 bestsellers. Stellantis, Renault, and Hyundai also produced top-selling BEV models in Europe. In India, the second-largest auto manufacturer, Tata Motors, sold the most BEVs in 2022; it scored the top three in sales, based on strong sales of its Nexon and Tigor models, and a new model, the Xpres-T. The Tata Nexon alone was 60% of BEV sales in India in 2022, and other models trailed, including the MG ZS (9%) and Hyundai Kona (2%).

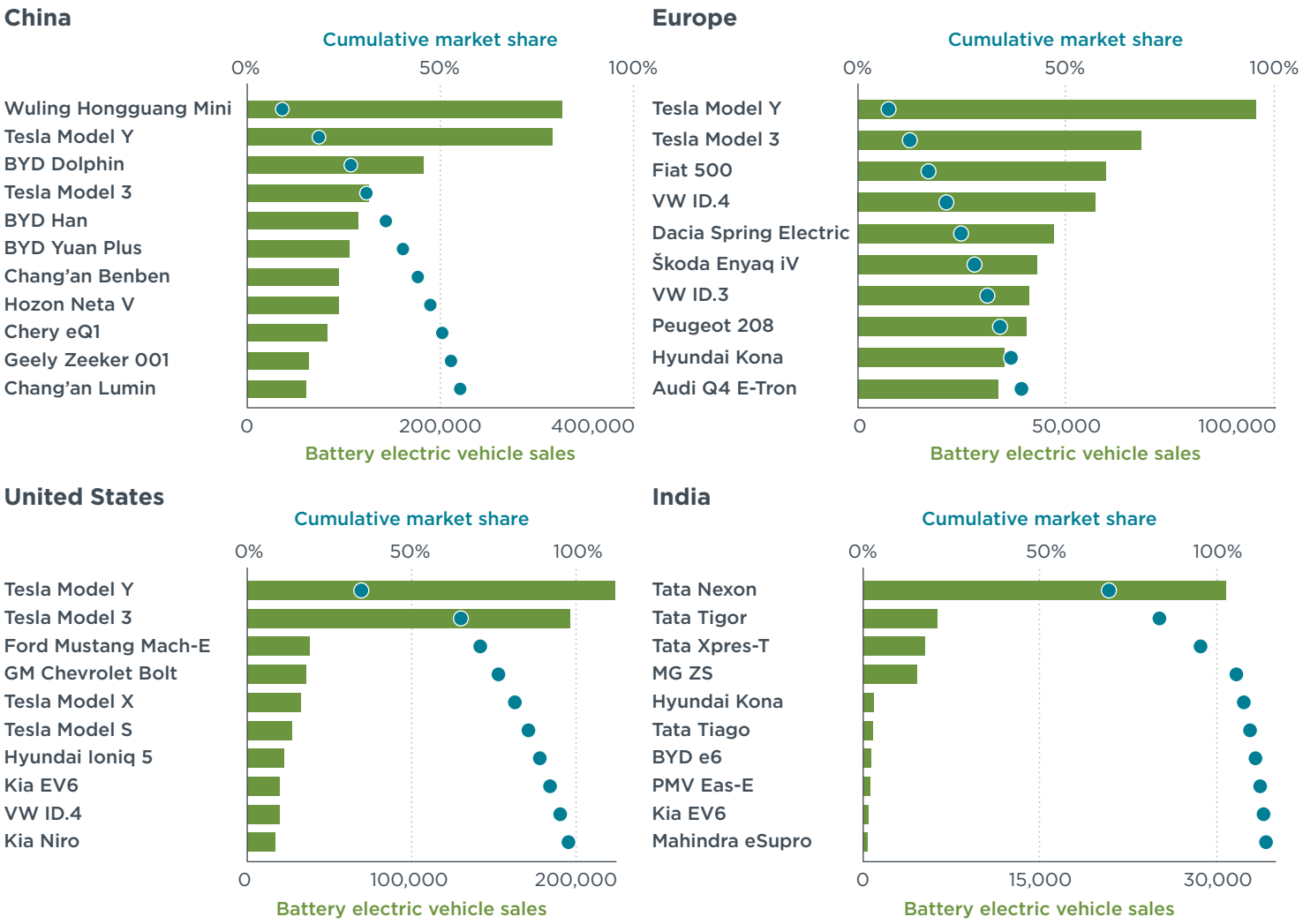


**Figure 2.** Top 10 best-selling battery electric vehicle models in the four regions in 2022.

## CHINA

In 2022, approximately 4.6 million new light-duty EVs were sold in China. That was a nearly 48% increase from 2021 and EVs were 24% of all new LDVs sold in the country. **Figure 3** shows the EV market trends in China at the manufacturer level. The left panel is the EV share of total LDV sales for each manufacturer, with the light blue portions of the bars representing the EV sales share in 2021 and the darker blue (or orange) portions representing the increase (or decrease) in sales share in 2022. The middle panel illustrates the technology mix of those sales, with BEVs in green and PHEVs in gray, and the right panel shows the manufacturer's 2022 share of overall LDV market, including conventional combustion engine vehicles. In **Figure 4**, we show the 2022 fleet-average $CO_2$ emissions of each manufacturer against the national fleet-average $CO_2$ emissions levels in both 2022 and 2021. The width of the bars represents the LDV market share of the manufacturer in 2022.

Key highlights for China in 2022 include:

- As shown in the left panel of **Figure 3**, nine out of 11 major manufacturers grew their EV sales share from 2021 to 2022.[4] Since BYD started to produce only EVs in March 2022, it had the greatest increase—26 percentage points—over 2021 and reached an EV sales share of 99%. Tesla and BYD had relatively low LDV market shares, though, 2% and 7%, respectively, as shown in the right panel of **Figure 3.** Chery and Geely also exhibited significant increases in EV sales share of more than 10 percentage points each and reached 27% and 21%, respectively. SAIC Motor, Chang'an, GAC Group, DFM, BAIC Group, and FAW Group, which accounted for more than half (65%) of total LDV sales, had growth in EV sales shares and concluded 2022 with relatively low EV sales shares ranging from 5%–16%. Great Wall and Brilliance Group were the only two manufacturers that experienced a decline in EV sales share; Great Wall had a slight decrease in both the number of EVs sold and EV sales share in 2022, and BAIC Group observed a negligible decrease in EV sales share despite a small increase in number of EVs sold.
- About 78% of EVs sold in 2022 were BEVs. All manufacturers except BYD sold more BEVs than PHEVs, and more than 95% of EVs sold by Chery and GAC Group were BEVs.
- With a 24% EV market share, China outpaced the 20% by 2025 EV target set in the China NEV Development Plan (2021–2035), which was issued in 2020.[5]
- Fleet-wide $CO_2$ emissions in China dropped from 149 g/km in 2021 to 130 g/km in 2022, measured under the Worldwide harmonized Light vehicles Test Cycle (WLTC). Tesla, BYD, Chery, and Geely, which were the top four manufacturers in terms of EV sales share, had sales-weighted $CO_2$ emissions below the national fleet average (**Figure 4**). The fleets of most of the remaining manufacturers had $CO_2$ emissions that were slightly above the national fleet average.

4 China groups manufacturers into auto groups according to joint ventures. See Appendix B for more details of manufacturer groups.

5 "New Development Plan for NEVs Unveiled," The State Council of the People's Republic of China, updated November 2, 2020, http://english.www.gov.cn/policies/latestreleases/202011/02/content_WS5f9ff225c6d0f7257693ece2.html.

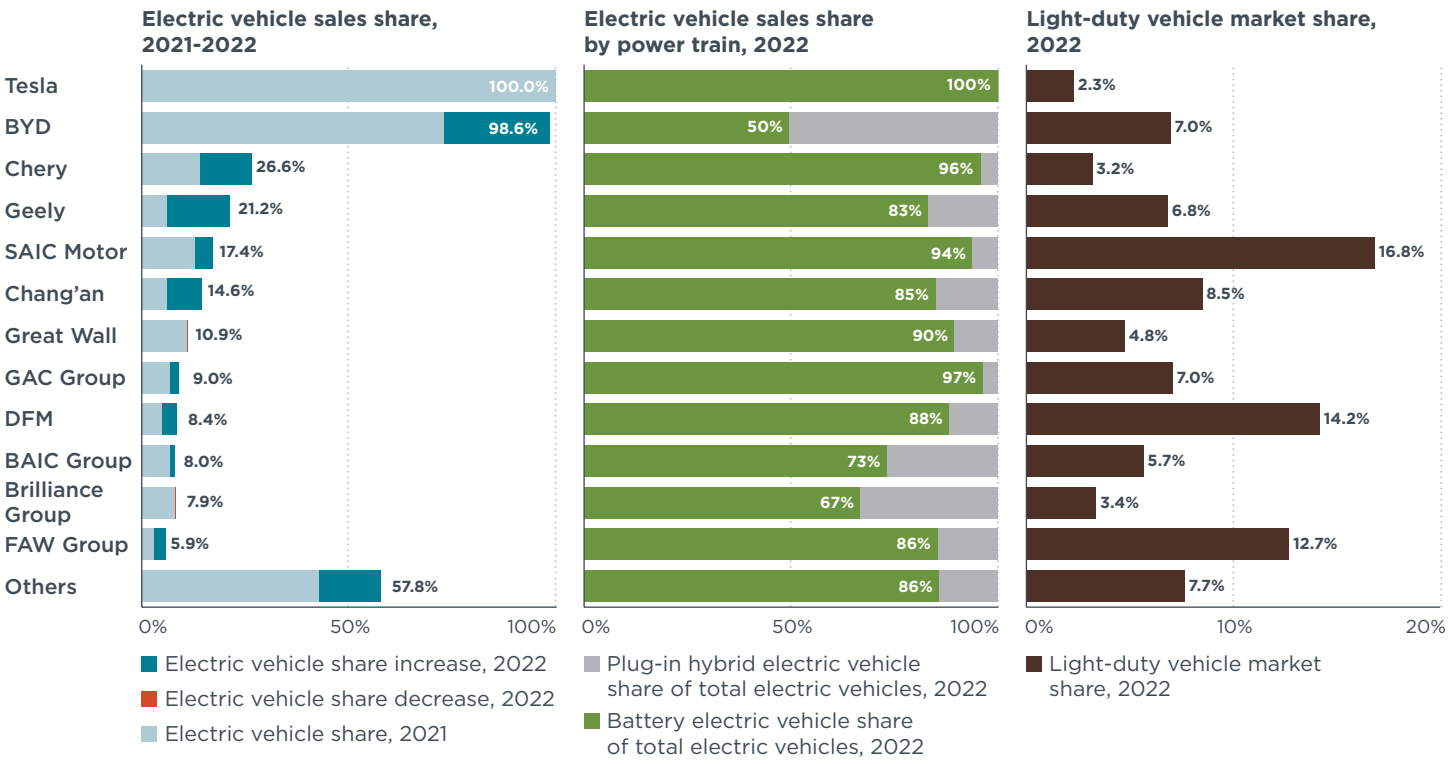


**Figure 3.** Light-duty electric vehicle sales share, technology mix, and market share by manufacturer in China, 2021 and 2022.

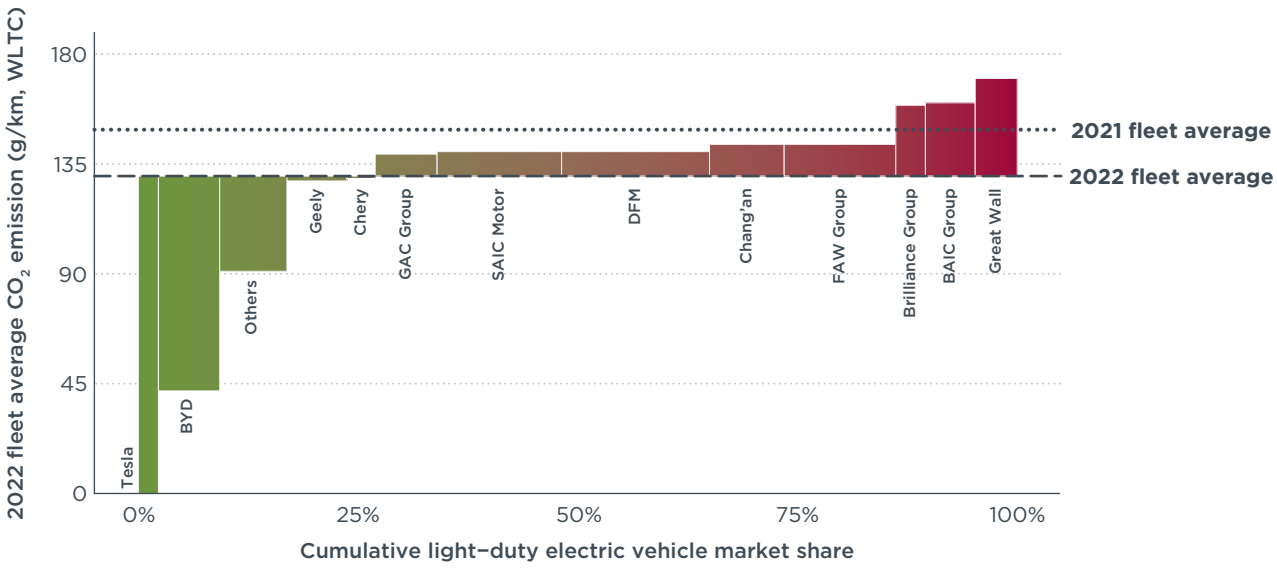


**Figure 4.** Fleet-average type-approval $CO_2$ emissions in g/km (WLTC) by manufacturer in China, 2022.

## EUROPE

In 2022, Europe trailed behind China in terms of market share. Approximately 21% of LDVs sold in Europe were electric, an increase from 17% in 2021. **Figure 5** shows the 2022 EV market trends in Europe at the manufacturer level. The left panel is the EV share of the total LDV sales for each manufacturer in 2022. The light blue portions of the bars represent the EV sales share in 2021 and the darker blue (or orange) portions represent the increase (or decrease) in sales share from 2021 to 2022. The middle panel illustrates the technology mix of the sales, with BEVs in green and PHEVs in gray, and the right panel reflects the manufacturer's 2022 share of the overall LDV market. In **Figure 6** we show the 2022 fleet-average $CO_2$ emissions of each manufacturer against the region's fleet-average $CO_2$ emissions levels in both 2022 and 2021. The width of the bars represents the market share of the manufacturer in 2022.

Key highlights for Europe in 2022 include:

- As shown on the left panel in **Figure 5**, most auto manufacturers had a higher EV sales share in 2022 than in 2021; the exceptions were Honda and Nissan, which saw a slight drop both in absolute EV sales and EV share. Aside from Tesla, with 100% EV sales share, Volvo and Mitsubishi led with EV sales shares of 62% and 46%, respectively; this was attributable to the large volumes of PHEVs sold in 2022. Smaller manufacturers categorized under "Others," including Iveco, SsangYong, and Isuzu, followed close behind with nearly 23% of sales being electric on average. Three major manufacturers with the highest LDV market shares were VW Group, Stellantis, and Renault; the first two saw moderate increases in EV shares to approximately 21% and 15% of sales, respectively, from 19% and 10% in 2021, and there was no change for Renault.
- The PHEV sales share of the whole Europe market declined in 2022, as PHEVs were 40% of the total EVs sold, down from 47% in 2021. However, manufacturers with the highest EV sales shares, including Volvo, Mitsubishi, BMW, Mercedes-Benz, and Jaguar Land Rover, had higher PHEV sales than BEVs, as indicated in the middle panel of **Figure 5**. In 2022, VW Group, Stellantis, and Hyundai sold mostly BEVs.
- As shown in **Figure 6,** fleet-wide $CO_2$ emissions dropped by 2% in 2022 to 117 g/km (WLTC). Several manufacturers with larger LDV market shares, including VW Group, Renault, and Mercedes-Benz, had higher-than-average $CO_2$ emissions.
- The implementation of new $CO_2$ standards for LDVs was a key driver of EV growth in Europe in 2021. EV growth then slowed in Europe in 2022. Automakers met their 2021 $CO_2$ targets, and the next target will not take effect until 2025; thus, automakers had no immediate regulatory pressure to accelerate EV sales in 2022.

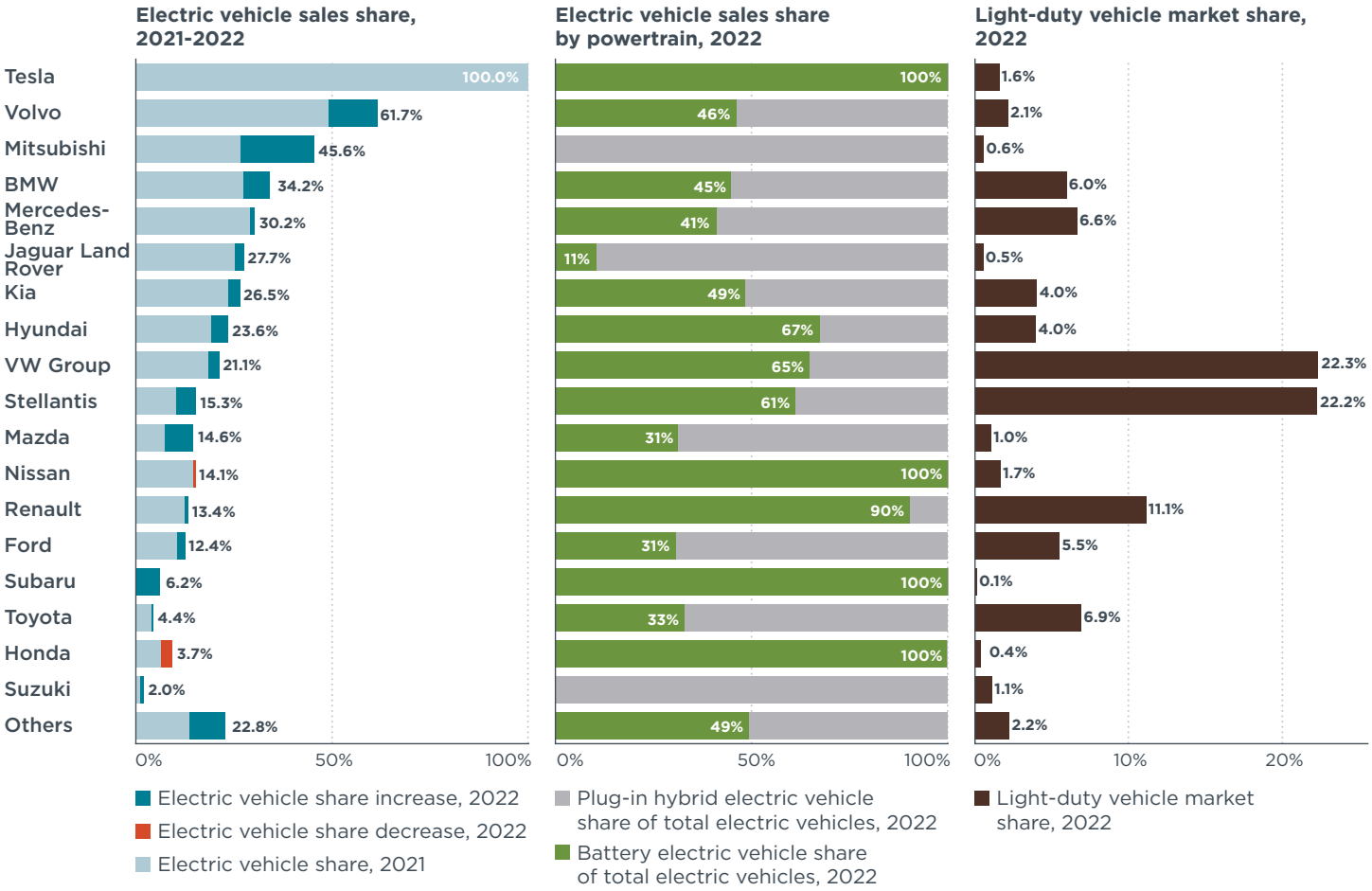


**Figure 5.** Light-duty electric vehicle sales share, technology mix, and market share by manufacturer in Europe, 2021 and 2022.

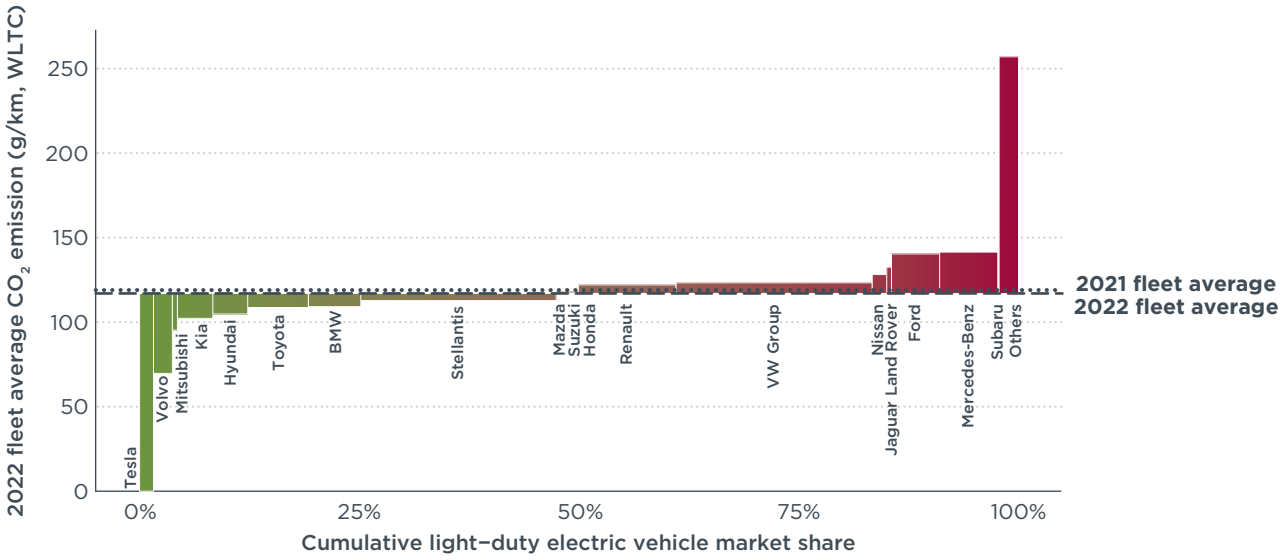


**Figure 6.** Fleet-average type-approval $CO_2$ emissions (g/km, WLTC) by manufacturer in Europe, 2022.

## UNITED STATES

The approximately 950,000 EVs sold in the United States in 2022 were 7.3% of total LDV sales in the country. EV sales increased from both legacy automakers, which are gradually electrifying existing models, and newer all-electric manufacturers such as Tesla and Rivian, both of which continued to ramp-up production. **Figure 7** shows the 2022 EV market trends in the United States at the manufacturer level. The left panel shows the EV share of total LDV sales for each manufacturer in 2022, with the light blue portions of the bars representing the EV sales share in 2021 and the darker blue (or orange) portions representing the increase (or decrease) in sales share from 2021 to 2022. The middle panel illustrates the technology mix of the sales, with BEVs in green and PHEVs in gray bar, and the right panel reflects the 2022 LDV market shares of each manufacturer. In **Figure 8**, we show the 2022 average $CO_2$ emissions of each manufacturer against the national fleet-average $CO_2$ emissions level in both 2022 and 2021. The width of the bars represents the market share of the manufacturer in 2022.

Key highlights for the United States in 2022 include:

- Volvo remained a top player in the U.S. market and was second only to Tesla in terms of EV sales share. Volvo's approximately 34% share was more than triple those of VW Group, Kia, and BMW, the next three highest-ranking manufacturers, as shown in the left panel of **Figure 7**. New all-electric vehicle manufacturers including Lucid, Rivian, and Karma, categorized under "Others" in the figure, continued to accelerate sales in 2022. Only Jaguar Land Rover and Toyota saw a slight decline in EV share from 2021 to 2022. GM, Ford, and Stellantis, all major manufacturers with high LDV market shares, saw EV sales increase, however their EV sales shares remained low at 2%, 2%, and 4%, respectively.
- Most manufacturers sold more BEVs than PHEVs. Nonetheless, Stellantis and Mitsubishi sold entirely PHEVs, and Toyota sold nearly all PHEVs (97%), as shown on the middle panel of **Figure 7**. High-end manufacturers including Volvo and BMW also sold more PHEVs than BEVs. For Tesla, GM, Nissan, and Mazda, their EV sales in 2022 were all BEVs.
- As shown in **Figure 8**, fleet-wide $CO_2$ emissions dropped from 189 g/km in 2021 to 183 g/km in 2022 (WLTC). While the fleet-average $CO_2$ emissions were below-average for manufacturers that make up about half of the LDV market, emissions were above average for a few larger manufacturers: Ford, GM, and Stellantis.
- The EV growth in the United States in 2022 is likely to continue because of a number of recent supporting measures, including the 50% by 2030 EV target announced by the Biden Administration in 2021, the 2023–2026 greenhouse gas and fuel efficiency standards for LDVs released in 2021, and the Advanced Clean Car II regulations adopted in 2022.[6] It is also too early to see the impact of the Inflation Reduction Act (IRA),[7] which became law in 2022, but it is also expected to speed up U.S. EV uptake.

6 United States Environmental Protection Agency, 86 Fed. Reg. 248, (December 30, 2021), "Final Rulemaking: Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards," https://www.govinfo.gov/content/pkg/FR-2021-12-30/pdf/2021-27854.pdf; California Air Resources Board, "Advanced Clean Cars II Regulations," accessed on May 10, 2023, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii

7 Peter Slowik et al., "Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States," (ICCT: Washington, DC, 2023), https://theicct.org/publication/ira-impact-evs-us-jan23/.

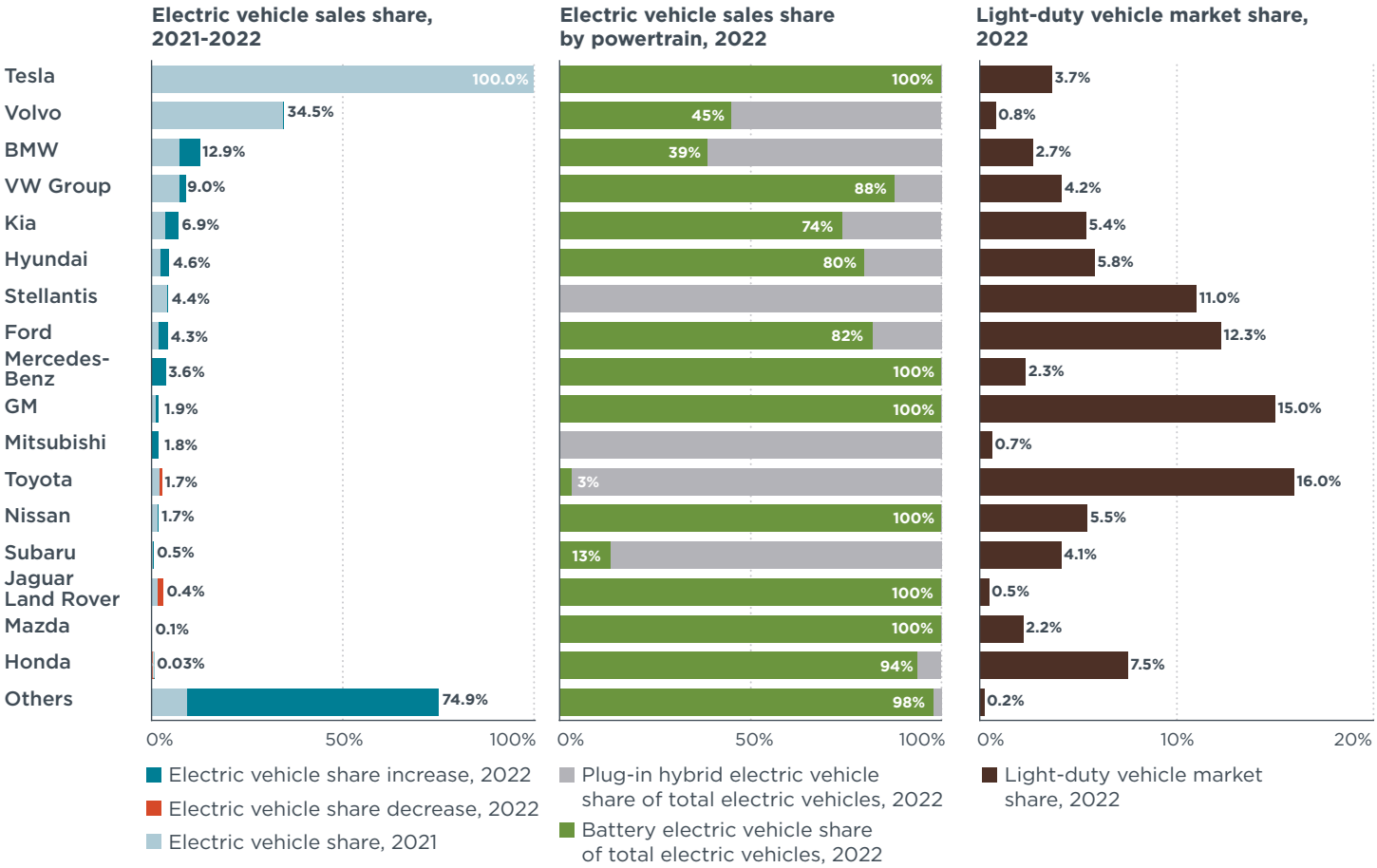


**Figure 7.** Light-duty electric vehicle sales share, technology mix, and market share by manufacturer in the United States, 2021 and 2022.

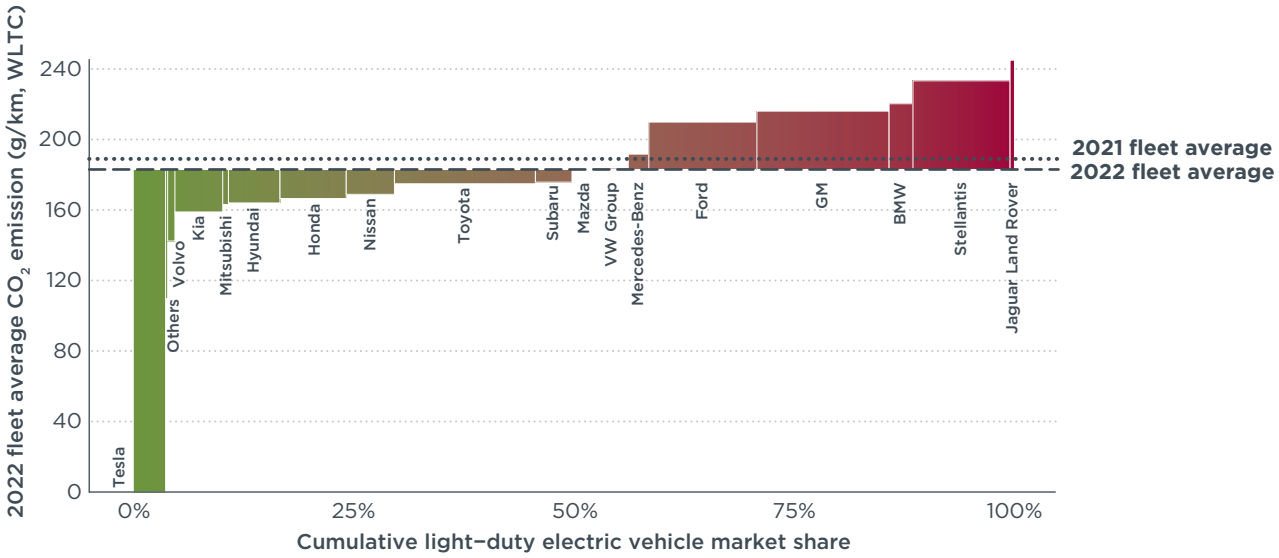


**Figure 8.** Fleet-average type-approval $CO_2$ emissions (g/km, WLTC) by manufacturer in the United States, 2022.

## INDIA

In 2022, approximately 52,000 EVs were sold in India. While this was more than double the number sold in the previous year, EVs were only 1.2% of the total LDV market in 2022. **Figure 9** shows the 2022 EV market trends in India at the manufacturer level. The left panel shows the EV share of the total LDV sales for each manufacturer in 2022. The light blue portions of the bars represent the EV sales share in 2021, and the darker blue (or orange) portions represent the increase (or decrease) in sales share from 2021 to 2022. The middle panel illustrates the technology mix of the sales, with BEVs in green and PHEVs in gray, and the right panel reflects the corresponding 2022 LDV market share of each manufacturer. In **Figure 10,** we show the 2022 fleet-average $CO_2$ emissions of each manufacturer against the national fleet-average $CO_2$ emissions level in both 2022 and 2021. The width of the bars represents the market share of the manufacturer in 2022.

Key highlights for India in 2022 include:

- Seven of the top 12 manufacturers had EV sales in 2022, as shown on the left panel of **Figure 9**. All of these manufacturers saw an increase in sales share from 2021 to 2022. MG led again with a 9.4% EV sales share in 2022. Tata Motors ranked second in terms of EV sales share at 6%, a jump from 2% in 2021. One of the largest manufacturers in India, Tata accounted for 83% of all electric LDVs sold nationally in 2022.
- While BEVs remained dominant in the market, PHEVs entered the Indian EV market in 2022, as shown on the middle panel of **Figure 9**; the PHEV share was small, less than 1% of the total EV sales share. In addition to high-end brands including Mercedes-Benz, BMW, and Volvo, newcomers BYD, PMV Electric, and Pravaig, which are categorized under "Others," sold EVs, and together the "Others" made up approximately 3.6% of the EV market in 2022.
- As shown in **Figure 10**, fleet-wide emissions dropped by 4% in 2022 to 138 g/km (WLTC). Most manufacturers remained above the fleet-average $CO_2$ emissions level, including those with the highest EV sales shares like Tata, Kia, and Mahindra.

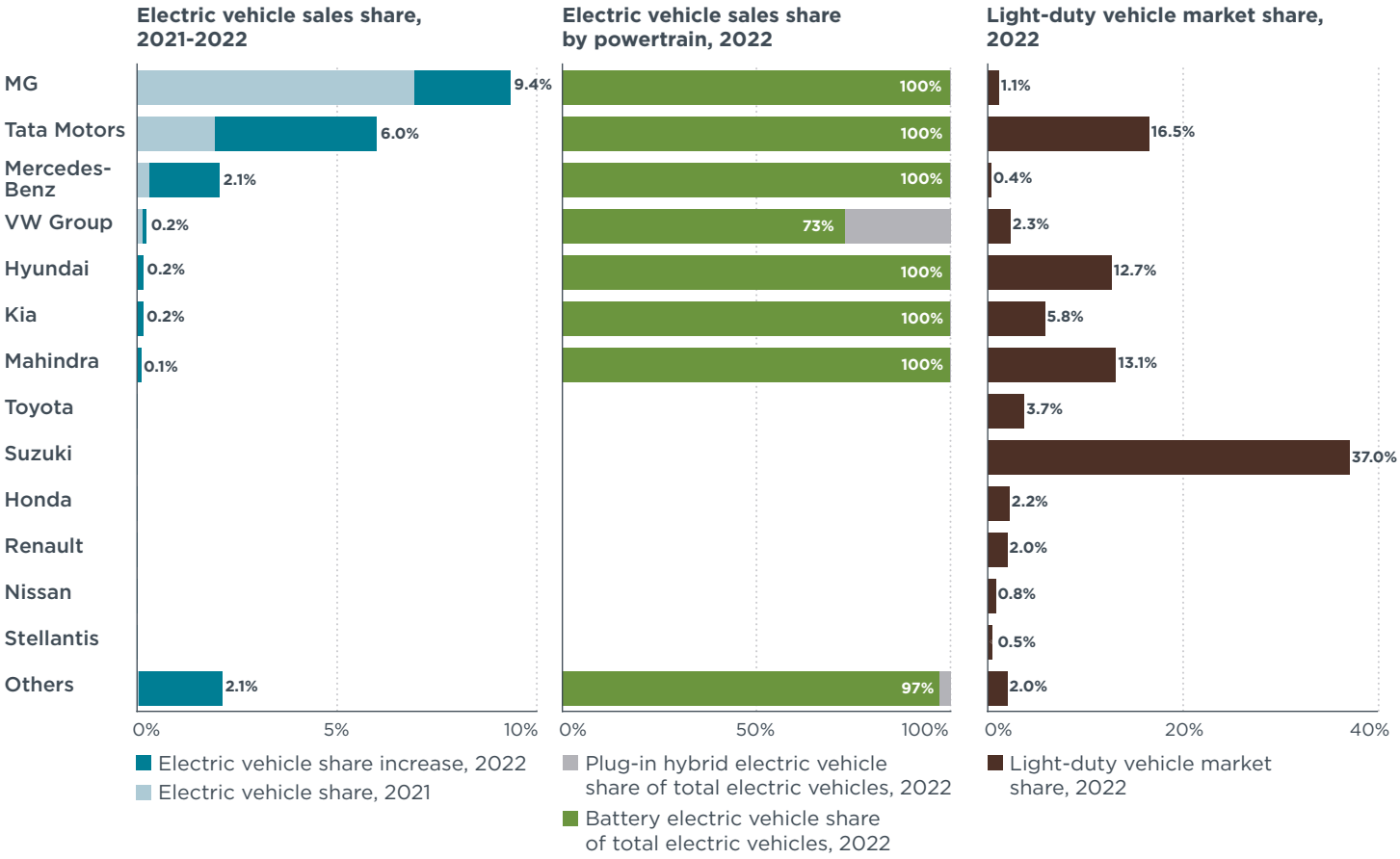


**Figure 9.** Light-duty electric vehicle sales share, technology mix, and market share by manufacturer in India, 2021 and 2022.

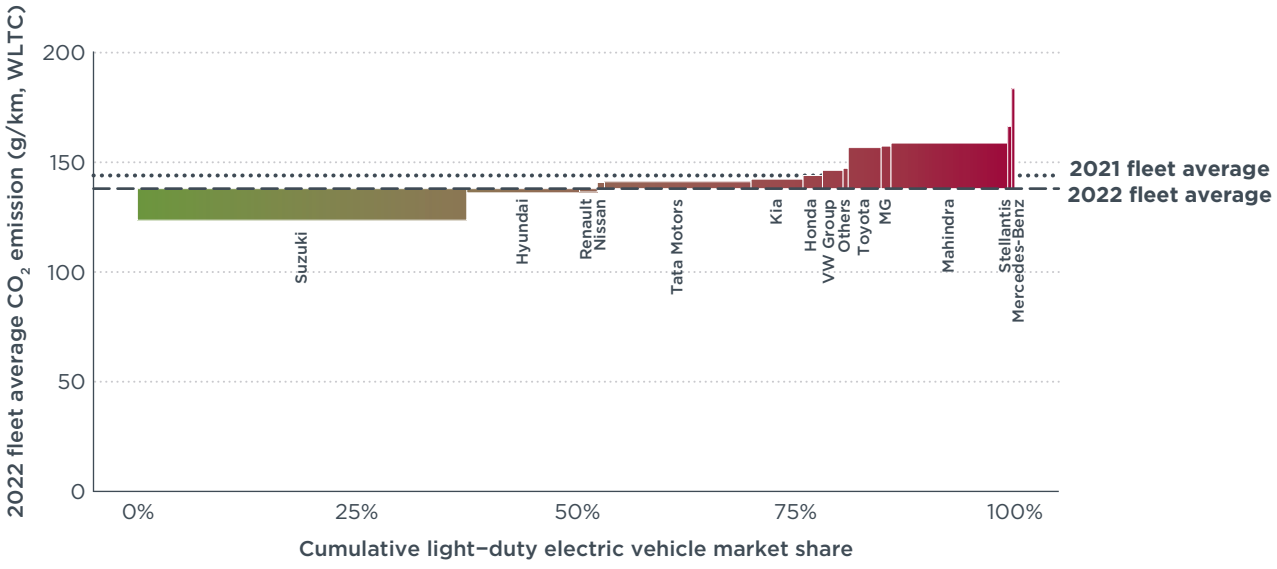


**Figure 10.** Fleet-average type-approval $CO_2$ emissions (g/km, WLTC) by manufacturer in India, 2022.

# APPENDIX A. LIGHT-DUTY ELECTRIC VEHICLE MARKET PERFORMANCE AND FLEET-AVERAGE $CO_2$ EMISSIONS BY REGION

Table A1 presents electric light-duty vehicle (LDV) market shares by segment and by technology in all four major markets for 2022 and 2021. PC is passenger car and LCV is light commercial vehicle. Note that the electric vehicle (EV) market share across technology and segment might not add up to the total LDV EV market share due to rounding. The subsequent tables, A2 through A5, show EV market performance and fleet-average $CO_2$ emissions across manufacturers in the four markets in 2022. Note that *EV sales share* refers to the EV percentage of the total LDV sales for each manufacturer. For example, Tesla's EV sales share is 100% because it only sells battery electric vehicles (BEVs). *EV market share* refers to a given manufacturer's EV sales share of the entire EV market in the region and *LDV market share* reflects the share of LDV sales of each manufacturer in each region. To illustrate, Tesla's sales are 11% of the EV market in China but are only 1% of China's broader LDV market. All $CO_2$ values shown are under the Worldwide harmonized Light vehicles Test Cycle (WLTC) and reflect the sales-weighted, fleet-average, type-approved $CO_2$ values; they do not account for manufacturer use of any of the performance credits and adjustments that are allowed as compliance mechanisms.

**Table A1.** Market shares of light-duty electric vehicles by region, segment, and technology

| Region | 2022 | | | | | | 2021 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PC | | LCV | | LDV | | PC | | LCV | | LDV | |
| | BEV | PHEV | BEV | PHEV | BEV | PHEV | BEV | PHEV | BEV | PHEV | BEV | PHEV |
| **China** | 20% | 6% | 8% | 0% | 19% | 5% | 12% | 3% | 4% | 0% | 11% | 2% |
| **Europe** | 13% | 10% | 5% | 0% | 13% | 8% | 10% | 9% | 3% | 0% | 9% | 8% |
| **United States** | 8% | 1% | 3% | 2% | 6% | 1% | 4% | 1% | 3% | 2% | 4% | 1% |
| **India** | 1% | 0% | 0% | 0% | 1% | 0% | 0.4% | 0% | 0.02% | 0% | 0.4% | 0% |
| **Global** | **11%** | **4%** | **3%** | **1%** | **10%** | **3%** | **8%** | **3%** | **2%** | **1%** | **6%** | **2%** |

**Table A2.** Light-duty electric vehicle market performance and fleet-average $CO_2$ emissions in China, 2022

| Manufacturer | EV sales share | | Percentage point change of EV sales shares from 2021 | | Number of EV models | | LDV market share | EV market share | Fleet average $CO_2$ (g/km) WLTC |
|---|---|---|---|---|---|---|---|---|---|
| | BEV | PHEV | BEV | PHEV | BEV | PHEV | | | |
| **Tesla** | 100% | 0% | 0 pp | 0 pp | 2 | 0 | 2% | 10% | 0 |
| **BYD** | 49% | 50% | +8 pp | +18 pp | 25 | 13 | 7% | 29% | 42 |
| **Chery** | 26% | 1% | +12 pp | +1 pp | 19 | 5 | 3% | 4% | 129 |
| **Geely** | 18% | 4% | +13 pp | +2 pp | 35 | 17 | 7% | 6% | 128 |
| **SAIC Motor** | 16% | 1% | +4 pp | +0 pp | 46 | 11 | 17% | 12% | 140 |
| **Chang'an** | 12% | 2% | +6 pp | +2 pp | 23 | 6 | 8% | 5% | 143 |
| **Great Wall** | 10% | 1% | -1 pp | +1 pp | 10 | 4 | 5% | 2% | 170 |
| **GAC Group** | 9% | 0% | +3 pp | +0 pp | 13 | 4 | 7% | 3% | 139 |
| **DFM** | 7% | 1% | +3 pp | 0 pp | 33 | 8 | 14% | 5% | 140 |
| **BAIC Group** | 6% | 2% | 0 pp | +1 pp | 36 | 4 | 6% | 2% | 160 |
| **Brilliance Group** | 5% | 3% | +1 pp | -1 pp | 4 | 1 | 3% | 1% | 159 |
| **FAW Group** | 5% | 1% | +3 pp | 0 pp | 22 | 6 | 13% | 3% | 143 |
| **Others** | 50% | 8% | +14 pp | +0 pp | 168 | 11 | 8% | 19% | 91 |
| **Fleet** | **19%** | **5%** | **+8 pp** | **+3 pp** | **436** | **90** | **100%** | **100%** | **130** |

**Table A3.** Light-duty electric vehicle market performance and fleet-average $CO_2$ emissions in Europe, 2022

| Manufacturer | EV sales share | | Percentage point change of EV sales shares from 2021 | | Number of EV models | | LDV market share | EV market share | Fleet average $CO_2$ (g/km) WLTC |
|---|---|---|---|---|---|---|---|---|---|
| | BEV | PHEV | BEV | PHEV | BEV | PHEV | | | |
| Tesla | 100% | 0% | 0 pp | 0 pp | 4 | 0 | 2% | 8% | 0 |
| Volvo | 29% | 33% | +18 pp | -5 pp | 3 | 8 | 2% | 6% | 70 |
| Hyundai | 16% | 8% | +2 pp | +2 pp | 3 | 3 | 4% | 4% | 105 |
| BMW | 15% | 19% | +6 pp | 0 pp | 7 | 9 | 6% | 10% | 109 |
| Nissan | 14% | 0% | +1 pp | 0 pp | 3 | 0 | 2% | 1% | 128 |
| VW Group | 14% | 7% | +4 pp | -1 pp | 14 | 23 | 22% | 23% | 123 |
| Kia | 13% | 14% | +1 pp | +2 pp | 3 | 5 | 4% | 5% | 102 |
| Mercedes-Benz | 13% | 18% | +3 pp | -1 pp | 13 | 11 | 7% | 10% | 141 |
| Renault | 12% | 1% | +2 pp | -2 pp | 5 | 2 | 11% | 7% | 122 |
| Stellantis | 9% | 6% | +3 pp | +2 pp | 21 | 14 | 22% | 16% | 113 |
| Subaru | 6% | 0% | +6 pp | 0 pp | 1 | 3 | 0% | 0% | 170 |
| Mazda | 5% | 10% | -2 pp | +10 pp | 1 | 1 | 1% | 1% | 118 |
| Ford | 4% | 9% | +1 pp | -2 pp | 2 | 4 | 5% | 3% | 140 |
| Honda | 4% | 0% | -2 pp | 0 pp | 1 | 4 | 0% | 0% | 119 |
| Jaguar Land Rover | 3% | 25% | -1 pp | +4 pp | 1 | 7 | 1% | 1% | 133 |
| Toyota | 1% | 3% | 0 pp | 0 pp | 3 | 3 | 7% | 1% | 109 |
| Mitsubishi | 0% | 46% | 0 pp | +27 pp | 0 | 2 | 1% | 1% | 95 |
| Suzuki | 0% | 2% | 0 pp | +1 pp | 0 | 1 | 1% | 0% | 118 |
| Others | 11% | 12% | +3 pp | +7 pp | 28 | 4 | 2% | 2% | 257 |
| **Fleet** | **13%** | **8%** | **+3 pp** | **0 pp** | **113** | **104** | **100%** | **100%** | **117** |

**Table A4.** Light-duty electric vehicle market performance and fleet average $CO_2$ emissions in the United States, 2022

| Manufacturer | EV sales share | | Percentage point change of EV sales shares from 2021 | | Number of EV models | | LDV market share | EV market share | Fleet average $CO_2$ (g/km) WLTC |
|---|---|---|---|---|---|---|---|---|---|
| | BEV | PHEV | BEV | PHEV | BEV | PHEV | | | |
| Tesla | 100% | 0% | 0 pp | 0 pp | 4 | 0 | 4% | 50% | 0 |
| Volvo | 16% | 19% | +6 pp | -5 pp | 3 | 6 | 1% | 4% | 142 |
| VW Group | 8% | 1% | +1 pp | 0 pp | 5 | 4 | 4% | 5% | 184 |
| Kia | 5% | 2% | +3 pp | +1 pp | 2 | 3 | 5% | 5% | 159 |
| BMW | 5% | 8% | +4 pp | +2 pp | 6 | 7 | 3% | 5% | 220 |
| Hyundai | 4% | 1% | +3 pp | 0 pp | 5 | 3 | 6% | 4% | 164 |
| Mercedes-Benz | 4% | 0% | +4 pp | 0 pp | 3 | 0 | 2% | 1% | 192 |
| Ford | 4% | 1% | +2 pp | +1 pp | 3 | 3 | 12% | 7% | 210 |
| GM | 2% | 0% | +1 pp | 0 pp | 3 | 0 | 15% | 4% | 216 |
| Nissan | 2% | 0% | 0 pp | 0 pp | 2 | 0 | 5% | 1% | 169 |
| Jaguar Land Rover | 0% | 0% | -1 pp | -1 pp | 1 | 1 | 0% | 0% | 245 |
| Mazda | 0% | 0% | 0 pp | 0 pp | 1 | 0 | 2% | 0% | 183 |
| Subaru | 0% | 0% | 0 pp | 0 pp | 1 | 1 | 4% | 0% | 176 |
| Toyota | 0% | 2% | 0 pp | 0 pp | 1 | 3 | 16% | 4% | 175 |
| Honda | 0% | 0% | 0 pp | 0 pp | 1 | 1 | 8% | 0% | 167 |
| Stellantis | 0% | 4% | 0 pp | 0 pp | 0 | 3 | 11% | 7% | 233 |
| Mitsubishi | 0% | 2% | 0 pp | +2 pp | 0 | 1 | 1% | 0% | 163 |
| Others | 73% | 2% | +68 pp | -2 pp | 7 | 6 | 0% | 2% | 110 |
| **Fleet** | **6%** | **1%** | **+2 pp** | **0 pp** | **48** | **42** | **100%** | **100%** | **183** |

**Table A5.** Light-duty electric vehicle market performance and fleet average $CO_2$ emissions in India, 2022

| Manufacturer | EV sales share | | Percentage point change of EV sales shares from 2021 | | Number of EV models | | LDV market share | EV market share | Fleet average $CO_2$ (g/km) WLTC |
|---|---|---|---|---|---|---|---|---|---|
| | BEV | PHEV | BEV | PHEV | BEV | PHEV | | | |
| **MG** | **9%** | 0% | +2 pp | 0 pp | 1 | 0 | 1% | 9% | 157 |
| **Tata Motors** | **6%** | 0% | +4 pp | 0 pp | 4 | 0 | 16% | 83% | 141 |
| **Mercedes-Benz** | **2%** | 0% | +2 pp | 0 pp | 3 | 0 | 0% | 1% | 184 |
| **Kia** | **0.2%** | 0% | 0 pp | 0 pp | 1 | 0 | 6% | 1% | 142 |
| **Hyundai** | **0.2%** | 0% | 0 pp | 0 pp | 1 | 0 | 13% | 2% | 136 |
| **VW Group** | **0.2%** | 0.1% | 0 pp | 0 pp | 3 | 2 | 2% | 0% | 146 |
| **Mahindra** | **0.1%** | 0% | 0 pp | 0 pp | 2 | 0 | 13% | 1% | 159 |
| **Suzuki** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 37% | 0% | 124 |
| **Toyota** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 4% | 0% | 157 |
| **Honda** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 2% | 0% | 144 |
| **Renault** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 2% | 0% | 136 |
| **Nissan** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 1% | 0% | 141 |
| **Stellantis** | **0%** | 0% | 0 pp | 0 pp | 0 | 0 | 1% | 0% | 166 |
| **Others** | **2%** | 0.2% | +2 pp | 0 pp | 9 | 5 | 2% | 3% | 147 |
| **Fleet** | **1%** | **0%** | **0 pp** | **0 pp** | **24** | **7** | **100%** | **100%** | **138** |

# APPENDIX B. DEFINITIONS, DATA SOURCES, METHODOLOGY, AND ASSUMPTIONS

## DEFINITIONS OF LIGHT-DUTY VEHICLES

**China, Europe, and India**: LDVs are PCs and LCVs. PCs are motor vehicles with at least four wheels designed for the carriage of passengers that have no more than eight seats excluding the driver's seat and a maximum weight below 3.5 tons (these are the M1 category). LCVs are motor vehicles with at least four wheels designed for the carriage of goods (goods and passenger vehicles with more than nine seats for China) with a maximum weight below 3.5 tons; they are the N1 category in Europe and India and the N1 and M2 categories in China.

**United States**: LDVs are PCs, which are vehicles with gross vehicle weight rating (GVWR) below 6,000 lbs, and LCVs, which are vehicles with GVWR between 6,001 and 10,000 lbs (vehicle class 2) and SUVs with four-wheel drive.

## DATA SOURCES

EV refers to battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) in all regions.

**China**: Sales, model information, and $CO_2$ emissions data comes from insurance data from China EV100 and ZEDATA. Sales are based on new registrations of LDVs because the insurance data for new registrations is a close proxy for retail sales.

**Europe**: Sales and CO2 emissions data are from Dataforce[8], model information is from MarkLines.[9] Sales are based on new registrations of LDVs. Europe covers the European Union (EU) countries except for Bulgaria and Malta, which are excluded due to data limitations, and Iceland and Norway are included. The United Kingdom is excluded from the analysis, and Liechtenstein is also excluded, due to limited data availability. Hungary, Lithuania, Poland, Portugal, and Romania are excluded from the $CO_2$ emissions values due to incomplete data.

**United States**: Sales, model information, and $CO_2$ emissions data are from Atlas Public Policy.[10] Sales numbers are based on new registrations, but we excluded vehicles that did not have matching fuel economy values.

**India:** Sales, model information, and $CO_2$ emissions data are from Segment Y.[11]

**Global**: Sales data is from the MarkLines database.[12]

## METHODOLOGY AND ASSUMPTIONS

**China, United States, and India**: The $CO_2$ emissions of individual models were converted from type-approval fuel economy or fuel consumption values using the conversion factors listed in Tables B1 to B3. Then the fleet-average $CO_2$ emission values were converted from the country-specific test cycle, the New European Drive Cycle (NEDC) in China and India (NEDC cycle capped at 90kmph) and Corporate Average Fuel Economy in the United States, to WLTC based on ICCT's conversion tool.[13]

8 Dataforce, (2023), https://www.dataforce.de/en/.

9 MarkLines, (MarkLines Automotive Sales Data Center, 2023), https://www.marklines.com/en/vehicle_sales/index.

10 Atlas Public Policy, (2023), https://atlaspolicy.com/.

11 Segment Y, (2023), https://www.segmenty.com/.

12 MarkLines, 2023.

13 ICCT conversion tool, https://theicct.org/wp-content/uploads/2022/03/Conversion-tool-20141121-Protect.xlsx

**Europe**: Conversion from NEDC to WLTC utilized manufacturer-specific factors based on the 2020 market data.[14]

**Table B1.** China $CO_2$ emission factors by fuel type

| Fuel type | $CO_2$ emission factor (kg/l) | Source |
|---|---|---|
| **Gasoline** | 2.37 | National standard GB 27999-2019[a] |
| **Diesel** | 2.6 | |
| **CNG** | 1.54 | U.S. Environmental Protection Agency (EPA)[b] |
| **Methanol** | 1.66 | *China Economic Weekly*[c] |

[a] Ministry of Industry and Information Technology of the People's Republic of China, "Fuel Consumption Evaluation Methods and Targets for Passenger Cars," December 2019, https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=A0D5C7C6DE851F1FB293B6CA09C757EB

[b] U.S. Environmental Protection Agency (EPA), "Emission Factors for Greenhouse Gas Inventories," (2021), https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf.

[c] Lv Jiangtao, "Will Methanol Cars Take Off After Battery Electric and Hydrogen Fuel Cell Cars in China?," China Economic Weekly, April 15, 2022, https://finance.sina.com.cn/chanjing/cyxw/2022-04-15/doc-imcwiwst2023519.shtml.

**Table B2.** U.S. $CO_2$ emission factors by fuel type

| Fuel type | $CO_2$ emission factor (g/gal) |
|---|---|
| **Gasoline** | 8,887 |
| **Diesel** | 10,180 |
| **Ethanol-85** | 6,226 |
| **CNG** | 8,887 |

*Source*: U.S. EPA, "The 2021 EPA Automotive Trends Report," November 2021, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013L1O.pdf.

**Table B3.** India $CO_2$ emission factors by fuel type

| Fuel type | $CO_2$ emission factor (g/l) |
|---|---|
| **Gasoline** | 0.04217 |
| **Diesel** | 0.03766 |
| **LPG** | 0.0165 |
| **CNG** | 0.03467 |

*Source*: Ministry of Power of the Government of India, "Ministerial Notification on Energy Consumption Standards for Motor Vehicles," April 2015, https://beeindia.gov.in/sites/default/files/Fuel%20Efficiency%20Notification%20%2823April2015%29.pdf

14 We applied the methodology outlined in Peter Mock et al., "Market Monitor: European Passenger Car and Light Commercial Vehicle Registrations, January–December 2022," (ICCT: Berlin, Germany, 2023), https://theicct.org/publication/market-monitor-eu-jan-to-dec-feb23/.

## MANUFACTURER GROUPS

**China**: For joint ventures, manufacturers are grouped under the name of the dominant shareholder. For example, two manufacturers, DFM and Nissan, are grouped under DFM in this analysis.

**Europe**: We no longer follow the European Commission's pooling list for $CO_2$ target compliance, as was done in the previous paper. Here we list each manufacturer individually.

**Others**: This group refers to manufacturers that make up a smaller share in the market and we do not list the brands sold under the listed manufacturers.

**Table B4.** Manufacturers and corresponding main brands in China

| Light-duty vehicles in China | |
|---|---|
| **Manufacturer** | **Main brands** |
| **BAIC Group** | Beijing, Foton, Heibao |
| **Brilliance Group** | BMW, Zhonghua |
| **BYD** | BYD |
| **Chang'an** | Chang'an |
| **Chery** | Chery, Jaguar, Jetour, Karry, Land Rover, Exeed |
| **DFM** | Dongfeng, Nissan |
| **FAW Group** | Hongqi, Audi, Volkswagen, Toyota, Jetta, Mazda, Bestune |
| **GAC Group** | Trumpchi, Honda, Fiat, Toyota, Jeep, Mitsubishi |
| **Geely** | Geely, Volvo Cars, Lynkco |
| **Great Wall** | Great Wall, Haval, Wey |
| **SAIC Motor** | Maxus, Shac, Wuling, Yuejing |
| **Tesla** | Tesla |

**Table B5.** Manufacturers and corresponding main brands in Europe

| Light-duty vehicles in Europe | |
|---|---|
| **Manufacturer** | **Main brands** |
| **BMW** | BMW, MINI |
| **Ford** | Ford |
| **Honda** | Honda |
| **Hyundai** | Hyundai, Genesis |
| **Jaguar Land Rover** | Jaguar, Jaguar Land Rover |
| **Kia** | Kia |
| **Mazda** | Mazda |
| **Mercedes-Benz** | Mercedes-Benz, Smart |
| **Mitsubishi** | Mitsubishi |
| **Nissan** | Nissan, Infiniti |
| **Renault** | Renault, Dacia |
| **Stellantis** | Alfa Romeo, Citröen, DS Automobiles, Fiat, Jeep, Lancia, Opel, Peugeot, Vauxhall |
| **Subaru** | Subaru |
| **Suzuki** | Suzuki |
| **Tesla** | Tesla |
| **Toyota** | Toyota, Lexus |
| **Volvo** | Volvo |
| **VW Group** | Audi, MG, Porsche, Seat, Škoda, Volkswagen |
| **Others** | Manufacturers include MG, Iveco, SsangYong, Isuzu |

**Table B6.** Manufacturers and corresponding main brands in the United States

| Light-duty vehicles in the United States | |
|---|---|
| **Manufacturer** | **Main brands** |
| **BMW** | BMW, MINI |
| **Ford** | Ford, Lincoln |
| **GM** | Chevrolet, GMC, Buick, Cadillac |
| **Honda** | Honda, Acura |
| **Hyundai** | Hyundai, Genesis |
| **Jaguar Land Rover** | Jaguar, Jaguar Land Rover |
| **Kia** | Kia |
| **Mazda** | Mazda |
| **Mercedes-Benz** | Mercedes-Benz |
| **Mitsubishi** | Mitsubishi |
| **Nissan** | Nissan, Infiniti |
| **Stellantis** | Jeep, Dodge, Fiat, Alfa Romeo, Chrysler, Maserati, RAM |
| **Subaru** | Subaru |
| **Tesla** | Tesla |
| **Toyota** | Toyota, Lexus |
| **Volvo** | Volvo |
| **VW Group** | Volkswagen, Audi, Porsche, Bentley |
| **Others** | Manufacturers include Karma, Rivian, Lucid, McLaren |

**Table B7.** Manufacturers and corresponding main brands in India

| Light-duty vehicles in India | |
|---|---|
| **Manufacturer** | **Main brands** |
| **Honda** | Honda |
| **Hyundai** | Hyundai |
| **Kia** | Kia |
| **Mahindra** | Mahindra & Mahindra, Mahindra electric |
| **Maruti** | Maruti, Suzuki |
| **Mercedes-Benz** | Mercedes-Benz |
| **MG** | MG |
| **Nissan** | Nissan, Datsun |
| **Renault** | Renault |
| **Tata Motors** | Jaguar Land Rover, Tata |
| **Toyota** | Toyota, Lexus |
| **VW Group** | Volkswagen, Audi, Škoda |
| **Others** | Manufacturers include Stellantis, BMW, Volvo, Ashok Leyland, Force |