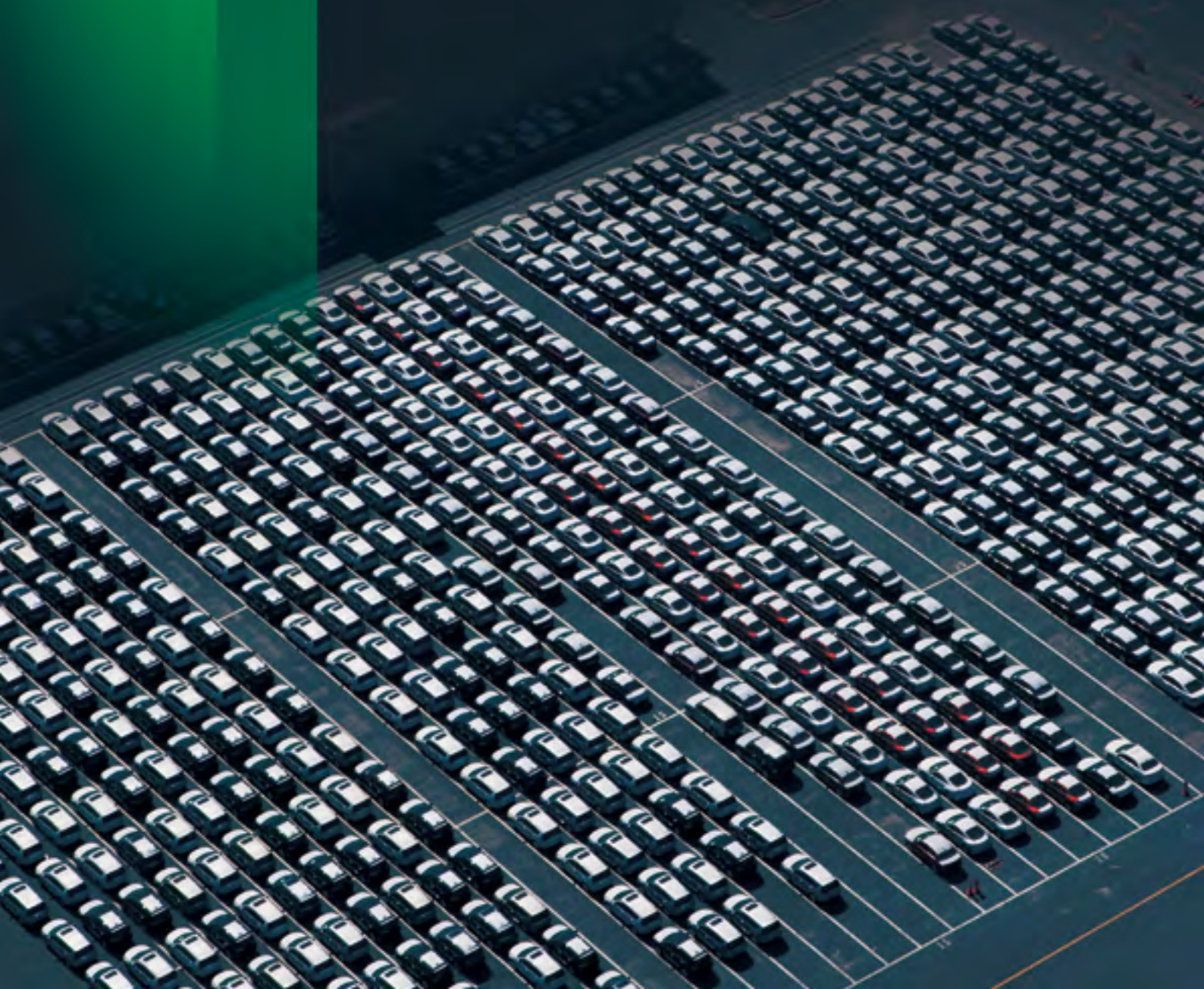


Driving Backward: How Hyundai Has Left Emerging Markets Behind

Hyundai-Kia's CO₂ emissions breakdown by market 2018-2023



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Executive summary

Hyundai Motor Group (Hyundai-Kia), the third largest automotive manufacturer globally, committed to achieving carbon neutrality by 2045. However, the company's emissions data suggest that Hyundai-Kia has not yet made substantial progress toward its goal, in large part due to significant increases in vehicle emissions in the Global South.

This report examines Hyundai-Kia's emissions data and electrification strategies, highlighting significant geographic disparities and their implications. In this report, we primarily focus on comparing per-vehicle tailpipe carbon dioxide (CO₂) emissions (grams per kilometer, g/km) across markets rather than total emissions, aiming to establish an index that reflects Hyundai-Kia's progress toward transitioning to zero-emission vehicles, independent of fluctuations in sales over time or across markets.

Our analysis suggests that while Hyundai-Kia has made some progress on emissions reduction in Europe and South Korea, progress elsewhere has been limited. India, the fourth largest market for Hyundai-Kia and the fastest-growing market, experienced a 9.4% increase in per-vehicle emissions between 2018 and 2023. This rise is attributed to Hyundai-Kia's

minimal electrification efforts (0% to 0.2%) in the country and increased sales of larger vehicles such as sport utility vehicles (SUVs). Europe has progressed in vehicle emission reductions due to strong measures to transition to EVs. The European Union (EU) has a 0 g/km fleetwide tailpipe emission standard imposed on automakers by 2035. South Korea has government subsidies and substantial charging infrastructure for BEVs. In the absence of such strong internal initiatives to drive electrification in India and other markets, Hyundai-Kia continues to prioritize internal combustion engine (ICE) vehicles. Consequently, the total emissions reductions achieved in Europe during this period are offset by the increases in India by a factor of 4.6. The rise in emissions across India and other Global South markets not only undermines Hyundai-Kia's progress towards its carbon neutrality targets but also hampers the ability of countries in the Global South to meet their climate commitments under the Paris Agreement. Additionally, the increase in concentration of harmful air pollutants such as particulate matter (PM) and nitrogen oxides (NO_x) is a significant risk to public health.

This report suggests that Hyundai-Kia's approach is primarily reactive, responding

to regulatory requirements and pre-existing favorable market conditions rather than proactively committing to a global electrification strategy. The company's future targets reflect this disparity: while Hyundai aims for EV rates of 71% in Europe and 53% in the US by 2030, targets for other markets, which made up 41% of sales in 2023, are non-existent. Kia's goals are similar, with 79% electrification in Europe and 40-53% in major markets (South Korea, North America, and China) but no targets elsewhere. The fact that Hyundai and Kia's global electrification targets are 34% and 38%, respectively, which are significantly lower than their major market targets, indicates that other markets have even lower targets. This strategic gap highlights that the disparity in emissions

between markets with relatively aggressive electrification targets and those without is not incidental, but rather the product of selective goal-setting by the automaker.

Key recommendations include accelerating the phase-out of ICE vehicles globally and establishing ambitious electrification targets in markets beyond Europe, the US, and South Korea. Additionally, this report advocates for a stronger emphasis on BEVs rather than hybrids, given that BEVs offer zero tailpipe emissions and present a viable path for significant emissions reductions. By implementing these measures, Hyundai-Kia can align its global operations with its carbon neutrality ambitions and contribute more effectively to global emissions reduction efforts.

Key findings

- In 2021, Hyundai-Kia pledged to achieve carbon neutrality worldwide by 2045; however, the automaker has made minimal progress towards achieving this goal. Between 2021 and 2023, Hyundai-Kia's emissions decreased by only 0.8% worldwide. If Hyundai-Kia continues to reduce its emissions by the same average amount each year, it will achieve carbon neutrality in 2280.¹
- During the period 2018 to 2023, Hyundai-Kia's per-vehicle tailpipe emissions decreased in Europe and South Korea due to electrification progress in these markets. By contrast, Hyundai-Kia's per-vehicle tailpipe emissions rose in all other markets: 'India' (+9.4%), 'Russia and CIS countries' (+4.5%), North America (+1.3%), the 'Middle East and Africa' (+1.3%), China (+1.1%), and 'Central and South America (+1.0%)', and Asia Pacific (+0.2%).

¹ In this report, we assume Hyundai-Kia will achieve carbon neutrality by reducing tailpipe emissions to 0 g/km. If the automaker continues reducing total tailpipe emissions at the same rate as observed between 2021 and 2023 (a reduction of 1,750,000 tons over two years), it would reach zero tailpipe CO₂ emissions by the year 2280.

Per-vehicle tailpipe emissions of different markets, as defined by Hyundai

Market (as defined by Hyundai)	2018 per vehicle emissions (g/km)	2023 per vehicle emissions (g/km)	5-Year Difference (g/km) (2018 - 2023)	Percentage Difference (2018 - 2023)
India	155.3	169.9	+14.6	+9.4
Russia and CIS countries	175.5	183.5	+8.0	+4.5
North America	183.0	185.3	+2.3	+1.3
Middle East and Africa	168.7	170.9	+2.1	+1.3
China	170.2	172.1	+1.9	+1.1
Central and South America	151.7	153.2	+1.5	+1.0
Asia Pacific	190.3	190.6	+0.4	+0.2
South Korea	199.0	181.3	-17.7	-8.9
Europe	153.0	129.1	-23.9	-15.6

- Hyundai’s rising emissions in India are endangering the automaker’s global carbon neutrality targets.** India, the fourth largest market for Hyundai-Kia, saw a 9.4% increase in per-vehicle tailpipe emissions between 2018 and 2023, the highest increase of any region. Hyundai-Kia’s per-vehicle tailpipe emissions increase in India is attributed to the automaker’s minimal electrification efforts (0% to 0.2%) in the country and increased sales of larger vehicles, such as SUVs. Hyundai-Kia’s total emissions in India increased 70.5% between 2018 and 2023, to 29.1 million metric tonnes of CO₂ in 2023, equivalent to New Zealand’s annual emissions (Ritchie and Roser 2024).
- Between 2018 and 2023, Hyundai-Kia’s total emissions increase in India was 4.6 times more than the emissions reduction in Europe. In 2023, Hyundai-Kia reported 34% lower

sales in India than in Europe (857,000 versus 1,145,000), but its total emissions in India were comparable to its emissions in Europe (29.1 million vs 29.6 million). The difference reflects Hyundai-Kia’s slow ICE phase-out in India and the sale of larger vehicles in the Indian market.

- Hyundai-Kia has set relatively ambitious electrification plans for Europe, in which the EU will impose a fleetwide 0 g/km target by 2035 on all automakers. Hyundai and Kia’s BEV sales targets in Europe by 2030 are 71% and 79% of total sales, respectively. But for markets other than North America, Europe, South Korea, or China, Hyundai-Kia did not set an electrification sales target. This suggests that Hyundai-Kia reacts to market conditions rather than positioning itself as a “first mover” in electrification across markets as it claims.

1. Introduction

1.

Introduction

The Hyundai Motor Group (Hyundai-Kia), the third largest automotive group globally, committed in 2021 to achieving carbon neutrality by 2045, positioning itself as a “first mover” in the transition to electrification (Hyundai Motor Company 2023). However, Hyundai-Kia’s total carbon dioxide (CO₂) emissions over the past five years do not show a substantial reduction in emissions despite the commitment. This is despite some improvements in per-vehicle emissions in markets including Europe. In this report, we seek to identify the factors that are holding back Hyundai-Kia from progress towards carbon neutrality, comprehensively considering sales volume, per-vehicle tailpipe emissions, and powertrain compositions by market.

Hyundai-Kia’s progress toward carbon neutrality—has been uneven across markets. Hyundai-Kia targets 100% electrification in Europe by 2035 and in other major markets (North America and South Korea) by 2040. However, Hyundai aims to make 34% of its global fleet electric vehicles (BEVs) by 2030 and Kia 38%, in contrast to plans to sell EVs in Europe at a rate of 71% and 79%, respectively, over the same time period. Other markets, including India, which is Hyundai-Kia’s fourth largest market and constituted 41% of Hyundai-Kia’s sales in 2023, are lagging behind in electrification. This unequal approach has implications for emissions globally, particularly in emerging markets of the Global South, which could struggle to meet their nationally determined contributions (NDCs) in greenhouse gas emissions under the Paris Agreement. Also, the internal combustion engine vehicles will inevitably emit other air pollutants such as particulate matter (PM) and nitrogen oxides (NO_x), exacerbating air pollution problems and putting public health at risk.

Hyundai-Kia’s annual Sustainability Reports do not break down tailpipe emissions by individual markets, making it difficult to identify which markets contribute most to the company’s overall emissions. Our analysis addresses this gap by providing a detailed breakdown of tailpipe emissions from 2018 to 2023, categorized by market groupings as defined by Hyundai. This analysis highlights where emissions have stagnated or increased and identifies the underlying factors. Tailpipe emissions account for the largest portion of a vehicle’s total emissions. We exclusively analyze tailpipe emissions because this is 79% of total emissions

produced by Hyundai-Kia and estimating other emissions (for example, Scope 1 and 2 emissions) requires business knowledge to which we do not have access. By providing market-by-market breakdowns, the report pinpoints problem areas and suggests actionable recommendations. In doing so, we also provide a realistic tailpipe emission number to close the gap between Hyundai-Kia's self-reported emissions data and real-world estimates, using previous studies on the gap between type-approval values and real-world values (Dornoff, Valverde Morales, and Tietge 2024).

In this report, the emissions data of Europe, South Korea and India will be examined for their significant share of the market to Hyundai-Kia and the difference in the emissions impact due to the company's geographically selective electrification strategies. In this report, we primarily focus on comparing per-vehicle emissions across markets rather than total emissions, aiming to establish an index that reflects Hyundai-Kia's progress toward transitioning to zero-emission vehicles, independent of fluctuations in sales over time or across different markets.

2. Data and Methods

2.1. Scope

2.2 The estimation method for carbon dioxide emissions

2.3 Market grouping

2.1. Scope

This research includes Hyundai, Genesis (Hyundai's premium brand), and Kia as the automakers. In this report, we refer collectively to Hyundai (Hyundai + Genesis) and Kia.

We focus exclusively on tailpipe emissions (a component of Scope 3 emissions, specifically tank-to-wheel emissions) from vehicle sales. Tailpipe emissions from vehicles sold account for 79% of Hyundai-Kia's total emissions, including Scope 1, 2, and 3. Achieving 100% fleet electrification would eliminate this largest emissions category, presenting the greatest opportunity for emission reduction. Additionally, estimating other components of Hyundai-Kia's emissions would require detailed, inside knowledge of their operations, which is unavailable to third parties. Therefore, concentrating on tailpipe emissions is the most feasible and effective option for third-party analysis aimed at promoting change.

The vehicles included in our emissions analysis are light-duty vehicles, as defined by the United States Environmental Protection Agency (EPA). Specifically, these are vehicles with a gross vehicle weight rating (GVWR) under 8,500 lbs (approximately 3,856 kilograms). This category covers sedans, SUVs, small vans, and light trucks, and excludes buses and medium- to heavy-duty trucks.

However, for sales and electrification targets, we used Hyundai-Kia's official numbers, which include heavier trucks and buses, to align with the company's future targets that cover these vehicle categories. As a result, discrepancies between sales and emissions figures may arise due to the broader vehicle classifications in Hyundai-Kia's official reports.

Note on Powertrain classification on hybrids

In this report's powertrain classification, the term "internal combustion engine" (ICE) refers specifically to traditional ICE-only vehicles and does not include hybrids or plug-in hybrids. While we recognize that ICE technology is present in all traditional ICE vehicles as well as in hybrids, plug-in hybrids, mild hybrids, and extended-range electric vehicles (EREVs), we refer to traditional ICE vehicles when we say ICE.

For the purposes of this report, we classify hybrids as a separate powertrain category. This is because hybrid vehicle shares showed different trends in

emission-increasing and emission-reducing markets. Although their impact on overall emissions is minor, their inclusion helps explain the market-by-market divergence in emissions trends and increase in powertrains other than ICE.

Specifically, we classify hybrids further into regular hybrids (HEV) and plug-in hybrids (PHEV), whose carbon emission difference we will discuss in Section 4.4.

2.2.

The estimation method for carbon dioxide emissions

Our analysis estimates emissions from vehicle sales across different markets and years, using model-specific CO₂ emissions data. Hyundai and Kia do not publish market-by-market emissions data, therefore we estimated emissions from available sources: (i) sales data by model and (ii) per-model emission average by market. We assume that each vehicle sold operates for 200,000 kilometers over its lifetime and estimate total tailpipe emissions based on this mileage and the standard CO₂ emissions per kilometer for each model. If CO₂ emissions data for a specific model is unavailable, we convert fuel efficiency (for example, miles per gallon, liters per kilometer) into CO₂ emissions using standard formulas outlined at the end of this section.

A key contribution of this report is our effort to align emissions estimates more closely with real-world conditions. Type-approval CO₂ emissions figures (for example, the New European Driving Cycle (NEDC) and the Worldwide Harmonized Light Vehicles Test Procedures (WLTP)) often underestimate real-world emissions. To address this, we applied a correction factor based on previous research to adjust our estimates, ensuring they accurately reflect emissions produced by vehicles in everyday use.

Vehicle sales numbers per model per year were sourced from MarkLines (<https://www.marklines.com/>), an automotive industry portal. CO₂ emissions information for Hyundai and Kia models was obtained from the following: (1) the European Environmental Agency (EEA) database, which records CO₂ emissions for all newly registered passenger cars and vans in the EU, Iceland, and Norway (European Environment Agency 2024); (2)

the United States Environmental Protection Agency (EPA) Fuel Economy Guide, which provides annual CO₂ emissions data for vehicle models in the US; (3) official Hyundai and Kia regional websites, which offer CO₂ emissions or fuel economy information; and (4) user-uploaded fuel efficiency data platforms such as Carwale.com or Autocarindia.com.

We prioritized these data sources based on the level of detail they provide, with EEA data given precedence due to its enabling of sales-weighted averages for each model at the trim level. This approach allows for more precise estimates by accounting for variations in specifications, such as engine size, drivetrain type (for example, front-wheel drive versus all-wheel drive), and other performance characteristics that influence emissions. In contrast, EPA data provide average emissions for each model across all trims available in the US because trim-specific sales-weighted data are not available. The other sources were used only when EEA or EPA data were unavailable. If no specific information was available for a model, the average emissions level for its vehicle segment was used.

The collected CO₂ data were adjusted to reflect real-world emissions by applying the known gap between type-approval figures (NEDC, WLTP) and user-reported mileage, based on data from the International Council on Clean Transportation (ICCT). EPA-derived CO₂ emissions were used directly, because the difference between EPA estimates and real-world figures is minimal. If only fuel economy data (e.g., km/L) were available, it was converted into CO₂ emissions using the following formulas (grams per kilometer is presented as g/km):

- **Gasoline:** CO₂ (g/km) = 2,392 / (km/L)
- **Diesel:** CO₂ (g/km) = 2,640 / (km/L)

2.3.

Market grouping

The markets (regions and countries) included in this analysis align with the sales data from the MarkLines database. The market groupings are based on the classifications by Hyundai in its official sales statistics as of 2023 (Hyundai Motor Company 2024a). We chose Hyundai's groupings because although Hyundai and Kia had mostly identical groupings, Hyundai has historically had more market presence. The difference

between Hyundai and Kia is in relation to how the companies incorporate China into their figures. Hyundai lists China as a separate market, whereas Kia includes China in the Asia Pacific region.

As highlighted in the Introduction, we used per-vehicle emissions as the primary index for comparing markets and tracking changes within the same markets over time (2018–2023). This approach was essential due to significant differences in sales volumes between markets and fluctuations within markets over time (for example, a substantial increase in sales in India versus a decline in China).

Table 1. Market grouping and country classifications used in the analysis.

Market (as defined by Hyundai)	Countries included
North America	United States, Canada, Mexico, Puerto Rico, and US territories
Europe	European Union, Iceland, Norway, Switzerland, Turkey, Ukraine, and United Kingdom
South Korea	Korea (Republic of)
India	India
China	China
Asia Pacific	Japan, Pakistan, Australia, New Zealand, other Asia Pacific countries and territories, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam
Central and South America	Argentina, Brazil, Chile, Colombia, Uruguay, and other Central and South American countries
Russia and CIS countries	Russia, Kazakhstan and other CIS (Commonwealth of Independent States ²) countries
Middle East and Africa	Islamic Republic of Iran (Iran), Kuwait, Oman, Saudi Arabia, United Arab Emirates, Israel, and other Middle Eastern countries Egypt, South Africa, and other African countries

² Post-Soviet Union countries in Eurasia

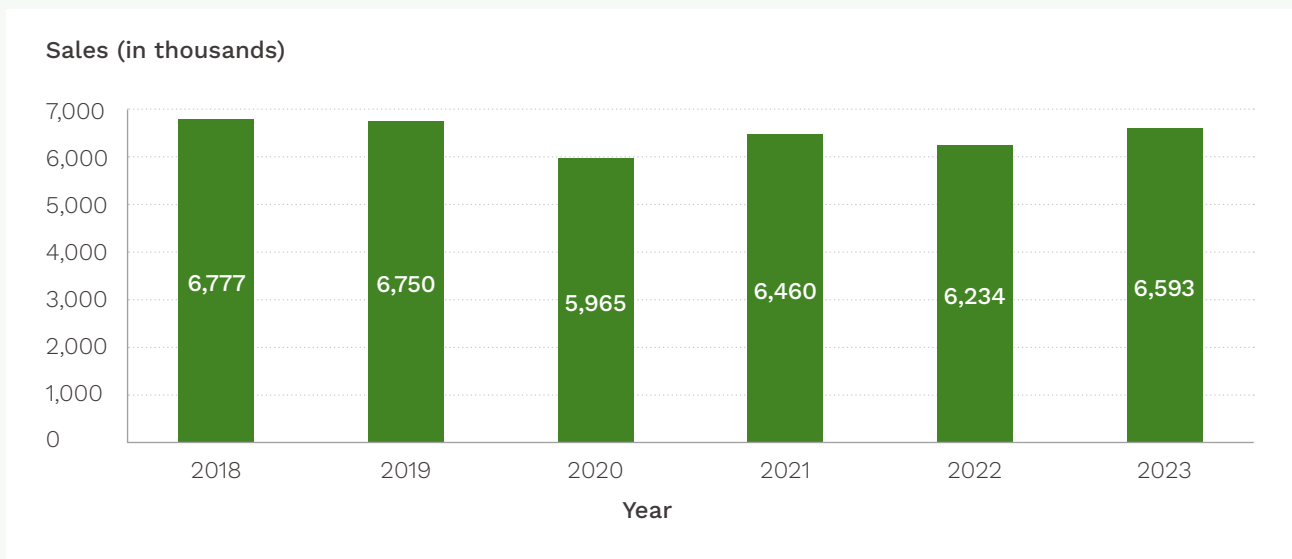
3. Background

3.

Background

The Hyundai Motor Group (Hyundai-Kia) was the third largest automotive group in the world by sales in 2023, following the Toyota Group and Volkswagen Group. With its headquarters in South Korea, Hyundai vehicles are sold in more than 200 countries (Hyundai Motor Company 2024b) and Kia vehicles are sold in 172 countries (Kia Corporation 2024).

Figure 1. Hyundai-Kia global sales (2018-2023, all light duty vehicles)

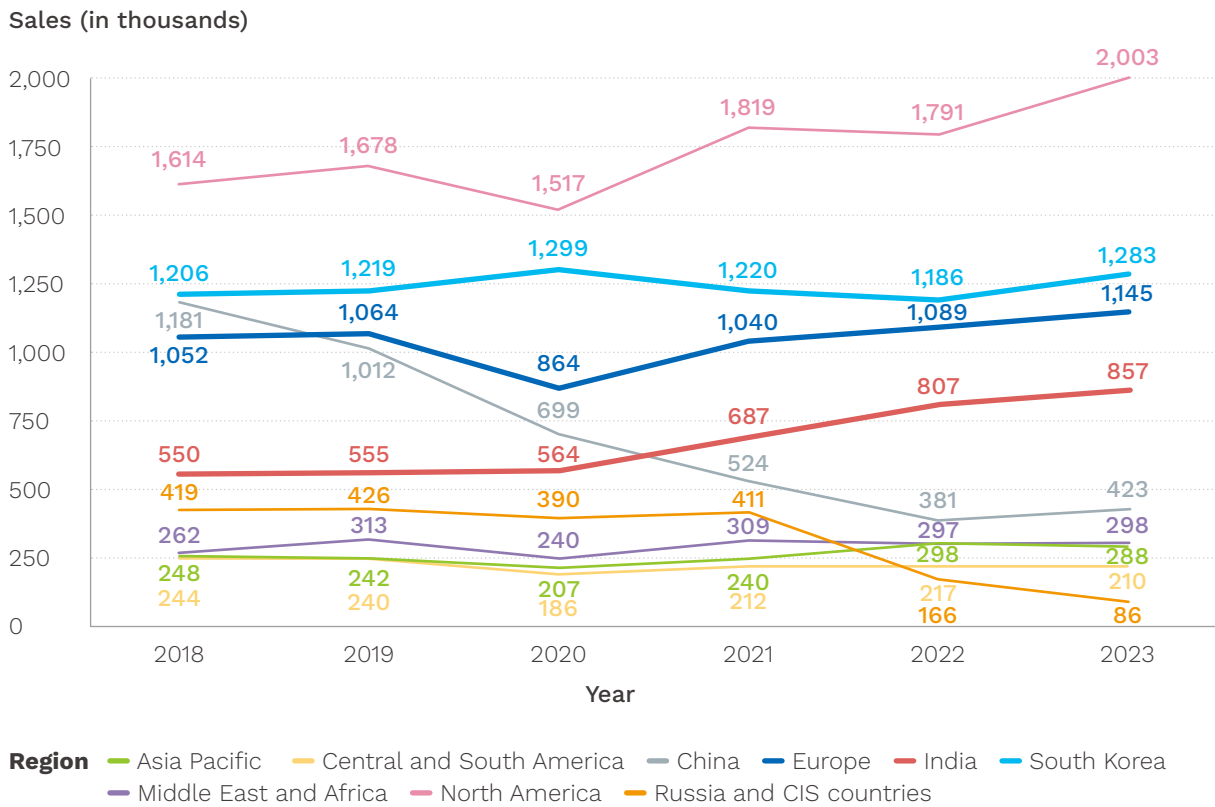


Hyundai-Kia’s global sales have shown fluctuations from 2018 to 2023. In 2020, their total sales volume dropped by 11.7%, from 6,750 thousand units in 2019 to 5,965 thousand units, primarily due to the COVID-19 pandemic. The pandemic disrupted the automaker’s production lines, strained supply chains, and reduced consumer demand globally. However, as economies began to recover and restrictions eased, Hyundai-Kia’s sales rebounded. By 2021, their sales increased by 8.3% to 6,460 thousand units. This upward trend continued, with sales reaching 6,593 thousand units in 2023, marking a recovery closer to pre-pandemic levels.

Analyzing the sales volume by market provides crucial insights into the trends of CO₂ emissions associated with Hyundai-Kia’s global markets. Typically, the trend in sales volume aligns closely with the trend in emissions; higher vehicle sales generally translate into higher total emissions, given that the majority (80.5% as of 2023 globally) of

Hyundai-Kia’s fleet still relies on traditional internal combustion engines (ICE). Therefore, understanding the market-by-market sales dynamics is essential to accurately assess the impact of Hyundai-Kia’s emissions reduction efforts.

Figure 2. Hyundai-Kia sales by market (2018–2023)



For instance, as in Figure 2, ‘North America (pink line)’ exhibited substantial growth in vehicle sales, increasing by 24.1% from 1,614 thousand units in 2018 to 2,003 thousand units in 2023, indicating a likely corresponding rise in CO₂ emissions. In contrast, markets such as ‘China (grey line)’ and ‘Russia and CIS countries (orange line)’ saw a marked decrease in sales over the same period, which would generally contribute to a decline in total emissions from these areas.

4. Analysis

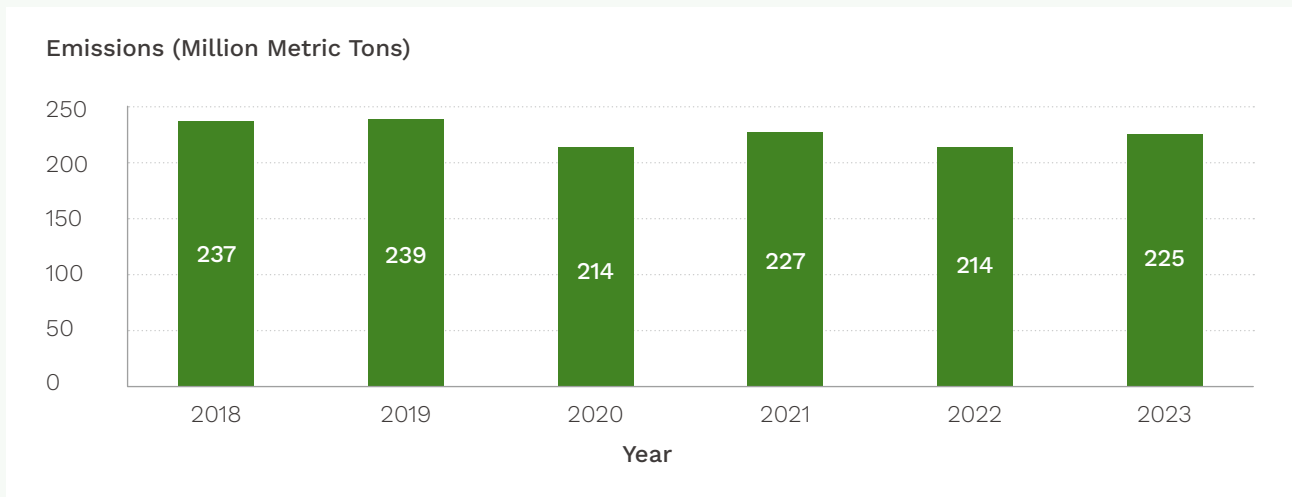
- 4.1. Total emissions (global)
- 4.2. Per-vehicle emissions (market-specific)
- 4.3. Powertrain compositions of key markets of per-vehicle emission change
- 4.4. Reasons behind per-vehicle emission disparities and implications by market

4.1.

Total emissions (global)

Despite Hyundai-Kia’s public commitment to achieving carbon neutrality by 2045, the total global emissions data from 2018 to 2023 suggests no substantial reduction in emissions since the announcement in 2021.

Figure 3. Hyundai-Kia’s total tailpipe emissions (global, 2018-2023)



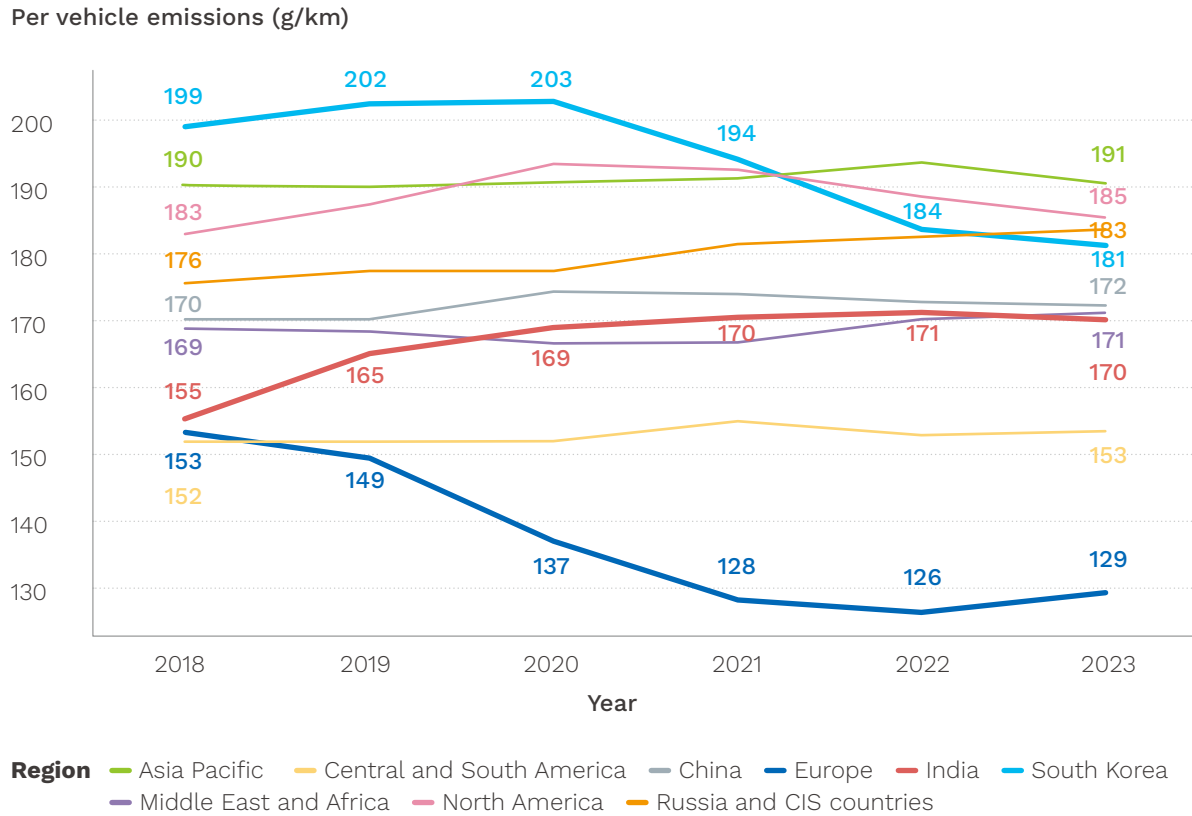
As shown in Figure 3, total emissions remained relatively stagnant from 2018 to 2023, with levels at 227 million metric tons in 2021 and 225 million metric tons in 2023, reflecting only a 0.8% decrease since the automaker’s 2021 announcement of its goal to achieve carbon neutrality by 2045. This minimal progress indicates that Hyundai-Kia’s current efforts have yet to yield substantial global emissions reductions.

4.2.

Per-vehicle emissions (market-specific)

To assess Hyundai-Kia’s emissions performance more accurately, per-vehicle emissions data were analyzed by market (Figure 4). Evaluating per-vehicle emissions allows the measurement of emissions independent of sales volume. A decrease in per-vehicle emissions would demonstrate that the automaker is effectively reducing the emissions impact per unit sold, even if total sales volumes increase.

Figure 4. Hyundai-Kia per-vehicle tailpipe emissions by market (2018–2023)



Between 2018 and 2023, the Hyundai-Kia sales in ‘Europe’ and ‘South Korea’ showed the most reductions in per-vehicle tailpipe emissions:

- **Europe:** Per-vehicle emissions decreased from 153.0 g/km in 2018 to 129.1 g/km in 2023, representing a 15.6% reduction.
- **South Korea:** Per-vehicle emissions dropped from 199.0 g/km in 2018 to 181.3 g/km in 2023, reflecting a 8.9% decrease.

Conversely, ‘India’ exhibited the most significant increase in per-vehicle tailpipe emissions:

- **India:** Per-vehicle emissions rose from 155.3 g/km in 2018 to 169.9 g/km in 2023, an increase of 9.4%.

All other markets also showed moderate to slight increases during the period 2018–2023. After ‘India’, the next largest rise was seen in ‘Russia and CIS countries’, where emissions increased by 8.0 g/km, a 4.5% rise from 2018 (Table 1).

Table 1. Per-vehicle tailpipe emissions of different markets, as defined by Hyundai

Market (as defined by Hyundai)	2018 per vehicle emissions	2023 per vehicle emissions	5-Year Difference (2018 - 2023)	% Difference (2018 - 2023)
India	155.3	169.9	+14.6	+9.4
Russia and CIS countries	175.5	183.5	+8.0	+4.5
North America	183.0	185.3	+2.3	+1.3
Middle East and Africa	168.7	170.9	+2.1	+1.3
China	170.2	172.1	+1.9	+1.1
Central and South America	151.7	153.2	+1.5	+1.0
Asia Pacific	190.3	190.6	+0.4	+0.2
South Korea	199.0	181.3	-17.7	-8.9
Europe	153.0	129.1	-23.9	-15.6

The remaining markets were relatively stagnant with only slight increases. 'North America', which includes the United States, Canada, and Mexico, saw a 2.3 g/km rise, reflecting a 1.3% increase. 'Middle East and Africa' followed with a 2.1 g/km increase, or 1.3%. 'China' recorded a 1.9 g/km increase, approximately a 1.1% rise. Similarly, 'Central and South America' saw a 1.5 g/km increase, also around a 1.0% growth. Lastly, 'Asia Pacific' followed with a 0.4 g/km increase, around a 0.2% growth.

4.3.

Powertrain compositions of key markets of per-vehicle emission change

The differences in per-vehicle emissions between Europe, South Korea, and India are strongly influenced by the evolution of their powertrain compositions from 2018 to 2023, as shown by both the raw number changes and the percentage shares of each powertrain type.

Figure 5-1. Hyundai-Kia’s sales by powertrain³ in Europe from 2018 to 2023

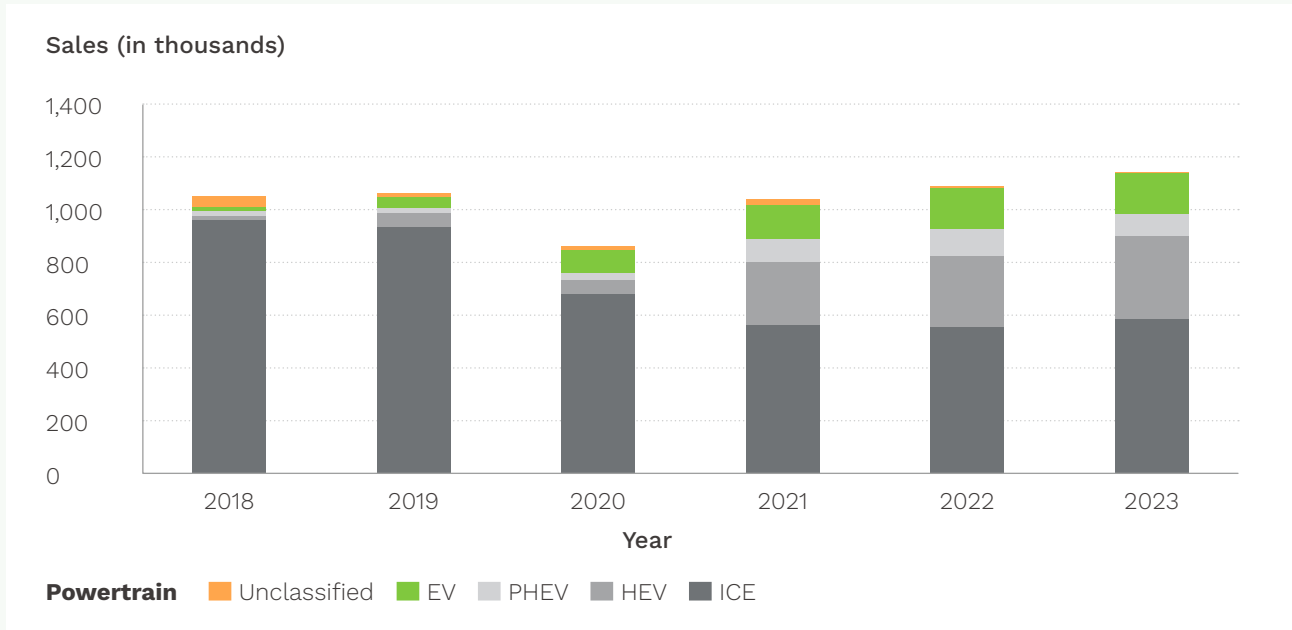
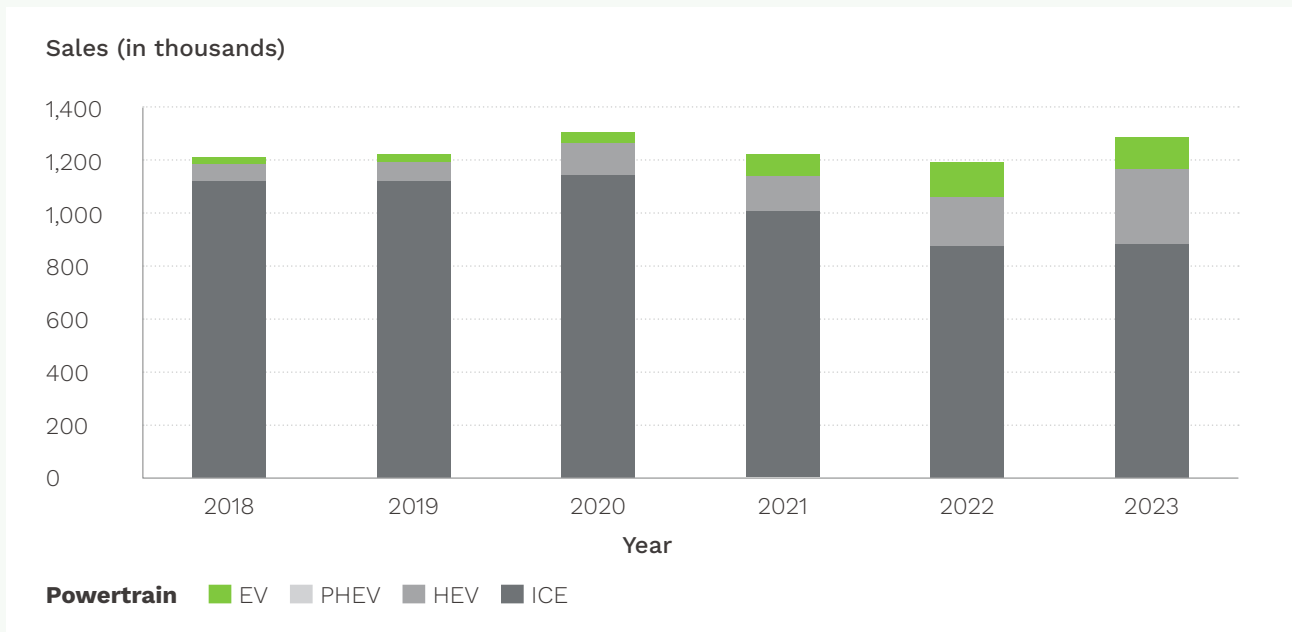
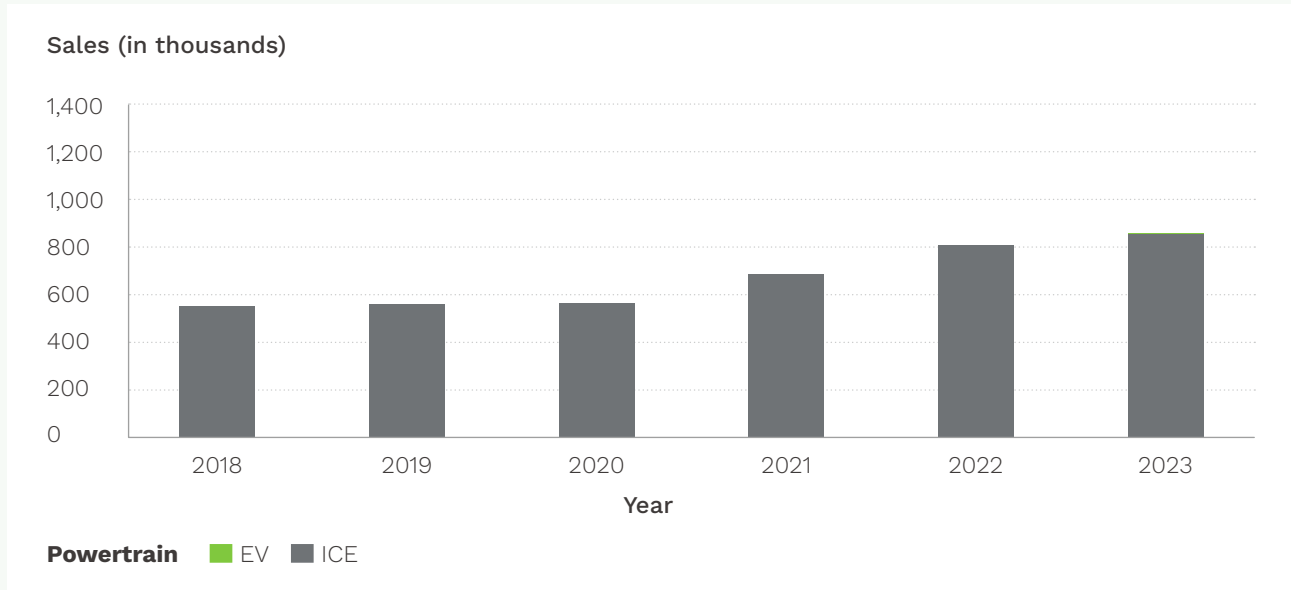


Figure 5-2. Hyundai-Kia’s sales by powertrain in South Korea from 2018 to 2023



³ EV: Battery Electric Vehicle and Fuel-Cell Vehicle / HEV: Regular Hybrid Vehicle (including mild hybrids) / PHEV: Plug-in Hybrid Vehicle / ICE: Internal Combustion Engine (Traditional ICE-only vehicle)

Figure 5-3. Hyundai-Kia's sales by powertrain in India from 2018 to 2023



In Europe (Figure 5-1), there has been a significant shift towards non-traditional ICE vehicles. In 2018, ICE vehicles dominated the market with 963,000 units, accounting for approximately 91.5% of total sales. By 2023, ICE vehicle sales had dropped to 588,000 units, reducing their market share to 51.4%. Simultaneously, EV sales (BEV and FCEV combined) greatly rose tenfold from 15,000 units in 2018 (1.5% of total sales) to 155,000 units in 2023, capturing 13.5% of total sales. HEV also expanded, growing from 24,000 units (2.3% of total sales) in 2018 to 316,000 units (27.6%) in 2023. Plug-in hybrids also rose about eightfold from 1.0% of the market to 7.1%. This substantial increase in non-ICE powertrains, explains the 15.6% reduction in per-vehicle emissions in Europe.

In South Korea (Figure 5-2), the pace of change has been slower. ICE vehicles, which accounted for 92.9% of the market in 2018 with 1,121,000 units, still dominated in 2023, albeit with a reduced share of 68.9% (884,000 units). Meanwhile, EV sales grew from 23,000 units in 2018 (1.9% of total sales) to 116,000 units in 2023, increasing their share to 9.1%. Hybrid vehicles saw an even more substantial rise, from 62,000 units (5.1% of total sales) in 2018 to approximately 283,000 units (22.1%) in 2023. The presence of PHEVs was minimal in this market. Despite this progress, the

slower decline in ICE vehicle dominance explains why South Korea's per-vehicle emissions reduction, at 8.9%, lags behind Europe.

In India (Figure 5-3), the reliance on ICE vehicles remains almost unchanged. In 2018, ICE vehicles accounted for virtually all sales, with 550,000 units, representing 100% of the market. By 2023, this number had increased to 855,000 units, maintaining a 99.8% share. EV sales, meanwhile, rose from 0 units in 2018 to only 2,000 units in 2023, capturing a mere 0.2% of total sales. This persistent dominance of ICE vehicles and the minimal growth in alternative powertrains explain the 9.4% rise in per-vehicle emissions in India, reflecting a continued dependence on conventional combustion engines.

The role of hybrid vehicles in a carbon-neutral future

An analysis of powertrain distribution suggests that Europe and South Korea maintain higher shares of hybrid (HEVs and PHEVs) and electric vehicles (EVs) compared to India. However, a focus on hybrids, rather than fully electric vehicles, is unlikely to achieve the emissions reductions necessary for a carbon-neutral future in alignment with the Paris Agreement's goal of limiting global warming to 1.5°C.

Data indicate that hybrids, whether standard hybrids (HEVs) or plug-in hybrids (PHEVs), offer only limited emissions reductions compared to traditional internal combustion engine (ICE) vehicles. Tailpipe emissions of HEVs are only 16% lower than those of traditional ICE vehicles (International Energy Agency 2024a). While PHEVs display significantly lower type-approval emissions values (for example, the Tucson plug-in hybrid has a rated 31 g/km CO₂ in WLTP testing, while Tucson ICE variants have 143-173 g/km), real-world driving conditions show that PHEVs often emit about three times more CO₂ than their type-approval figures suggest (International Council on Clean Transportation 2022). Additionally, in markets such as Germany, PHEV models tend to offer higher horsepower, which can offset potential emissions reductions. This evidence underscores that hybrids may provide small improvements but fall short as a long-term emissions reduction solution to achieve Hyundai-Kia's target of carbon neutrality by 2045.

In contrast, EVs generate zero tailpipe emissions, positioning them as the primary vehicle type for substantial emissions cuts. Consequently, this

report recommends that Hyundai-Kia prioritize the expansion of its EV sales to meet its emissions reduction commitments.

The limited role of hybrids in a carbon-neutral transport future has been acknowledged by both governments and independent organizations. The European Union's decision to phase out HEV and PHEV sales by 2035 highlights the recognition that hybrids have limitations in achieving full decarbonization. Greenpeace has recommended that the end date for ICE light-duty vehicle sales should be set to 2028 (Greenpeace European Unit 2018), especially in Europe, rather than 2035, to align with a 1.5°C goal. The 2035 target is seen as unrealistic, relying heavily and impractically on biofuels to meet emissions reduction goals.

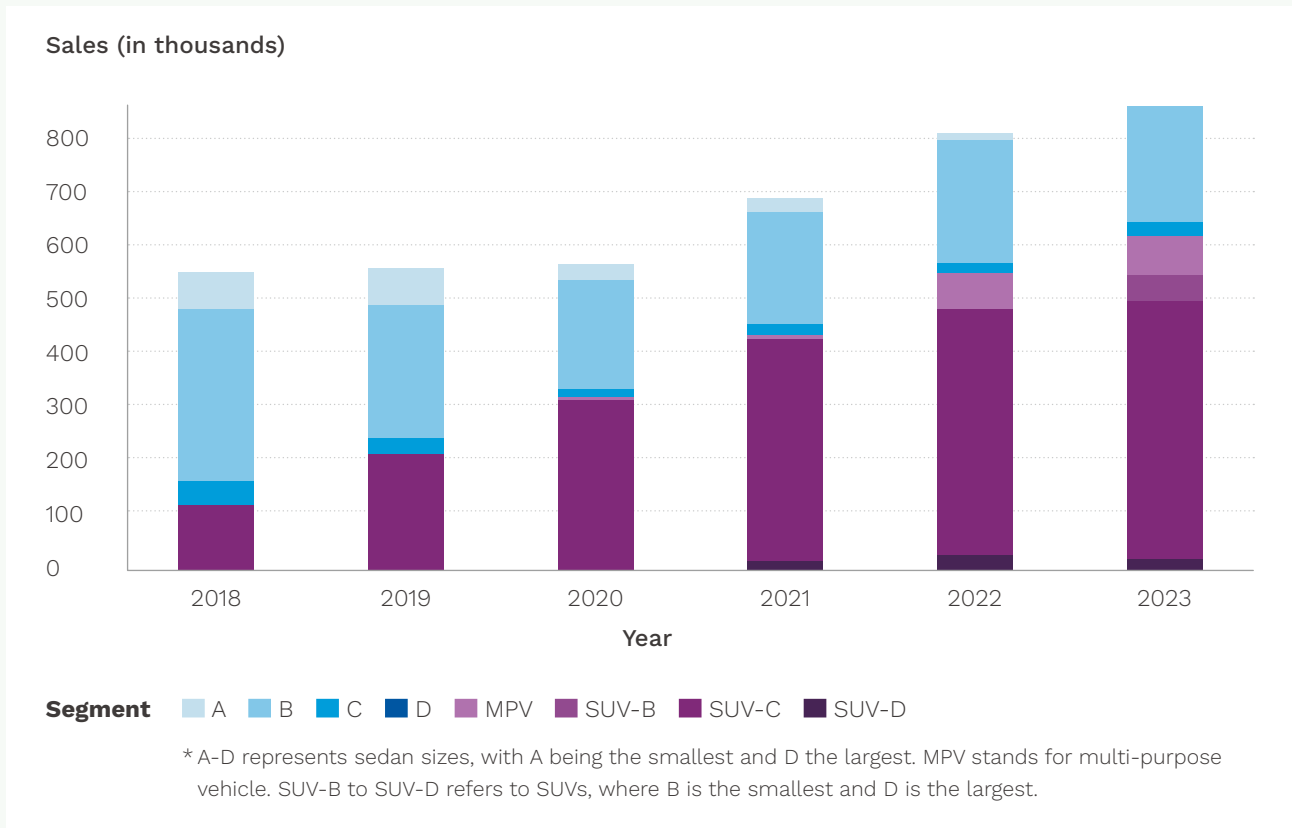
4.4.

Reasons behind per-vehicle emission disparities and implications by market

For Europe and South Korea, the per-vehicle emission reductions are primarily attributed to the adoption of cleaner vehicle technologies, including BEVs and hybrids. Europe has some of the strictest emissions regulations in the world, with the EU declaring 0 g/km fleetwide tailpipe emissions by 2035 (European Commission 2024) and the means to enforce the standard. South Korea provides EV subsidies and is one of the richest countries in terms of EV charging infrastructure, having one of the highest EV charging facilities to EV vehicle ratios in the world (International Energy Agency 2024b).

For India: This increase can be attributed to the absence of an aggressive push towards electrification through strict penalization and a growing preference for larger, higher-emitting vehicles such as SUVs, alongside lagging electrification (see Figure 6). Since surpassing Japan in 2022, India has become the world's third-largest automobile market and Hyundai-Kia's fourth (see Figure 2), making it a critical area for Hyundai-Kia's progress toward its climate goals. Without a proactive transition to electric vehicles, India's growing emissions will not only challenge Hyundai-Kia's global emissions targets but also hinder India's effort to keep its carbon reduction commitments and reduce air pollution to improve public health.

Figure 6. India’s vehicle sales by segment (2018–2023)



The per-vehicle emissions analysis underscores the disparity in Hyundai-Kia’s approach across different markets. In markets with robust EV-supporting environments, such as Europe and South Korea—where regulations, subsidies, and infrastructure favor electrification—Hyundai-Kia has made progress, leading to reduced emissions. However, in markets such as India, Hyundai-Kia’s per-vehicle emissions have even increased. In the Indian market, the company appears to prioritize conventional internal combustion engine (ICE) vehicles, with low rates of electrification. The geographical divergence in target-setting demonstrates that Hyundai-Kia’s electrification efforts are largely reactive, responding primarily to markets where EV adoption is already being driven by local policies, rather than being part of a proactive, global commitment to reducing emissions.

Furthermore, the data on Hyundai and Kia’s future electrification targets further emphasize that the current electrification disparity is not

accidental but rather a result of selective goal-setting. By 2030, Hyundai targets 71% electrification in Europe and 53% in the US, aligning with stringent regulations in these markets. However, in markets outside the US, South Korea, and Europe, the targets drop significantly, with other markets projected to reach only 16% electrification by 2030 in terms of the EV share of total production (Hyundai Motor Company 2024c). Similarly, Kia has set relatively ambitious targets for major markets such as Europe (79%) and all major markets (52%) including Europe, the US, South Korea, and China, but lacks specific plans for other markets. This divergence underscores Hyundai-Kia's selective focus on electrification only where the region's internal initiatives compel action.

The disparity in approach and emissions outcomes across markets carries significant implications. Rising emissions in India over-negate the progress made in Europe, with India's increase offsetting European reductions by a factor of 4.6. This discrepancy not only undermines Hyundai-Kia's global emissions targets but also challenges India's climate goals. From 2018 to 2023, Hyundai-Kia's emissions in India rose by 70.5%, significantly contributing to the nation's overall carbon emissions and releasing other potentially health-harming pollutants into the air.

The increase in emissions contrasts sharply with the Indian government's recent, intensified efforts to decarbonize its transport sector, including a 2024 investment of 109 billion rupees (approximately \$1.3 billion USD) aimed at promoting EV adoption (Reuters 2024). Indian consumers are also showing an increasing inclination toward EVs and greater awareness of sustainable choices (McKinsey & Company 2024). Given these favorable conditions, EV adoption in India could gain momentum rapidly in the near future.

If Hyundai-Kia maintains its dual approach, deprioritizing Global South markets such as India for electrification, it risks losing a strategic advantage. Proactive automakers are likely to seize this emerging opportunity, positioning themselves to capture India's accelerating demand for EVs and benefiting from the country's expanding infrastructure and government support for electrification.

5. Conclusion

5.

Conclusion

Hyundai-Kia has shown a significant geographic imbalance in its electrification strategy. This disparity has resulted in varied emissions outcomes across markets, as highlighted in this report. While Europe and South Korea have seen relative progress in reducing per-vehicle emissions—driven by strict regulations in Europe and EV infrastructure and subsidies in South Korea—other markets, such as India and ‘Russia and the CIS countries’, continue to experience rising emissions. In India, per-vehicle emissions rose by 9.4% between 2018 and 2023, with an overall emissions increase of 70.5%, effectively negating European reductions by a factor of 4.6.

This pattern underscores Hyundai-Kia's tendency to focus on compliance-driven or infrastructure-ready markets in its electrification strategy, which limits the company's progress toward global emissions reduction goals. To reach its 2045 carbon neutrality target and become a true “first mover” in the EV era, Hyundai-Kia must adopt a more proactive global approach rather than merely reacting to the favorable conditions of some markets. Expanding its electrification strategy beyond Europe, South Korea, and the US is essential, particularly in high-growth markets such as India, where government investments and consumer interest in EVs are increasing. Continued prioritization of internal combustion engine (ICE) vehicles in these areas not only risks undermining Hyundai-Kia's global emissions targets but could also see the company lose ground to competitors that capitalize on India's expanding infrastructure and newly favorable policies for electrification.

As the second largest automaker in India, Hyundai-Kia has a unique opportunity to support this transition, advancing both its carbon neutrality goals and India's climate and air quality objectives. India faces critical air quality challenges exacerbated by vehicle emissions. India should be instrumental in proposing a broader mobility vision that includes public transport improvements, reduction of emissions of carbon dioxide and other pollutants from private vehicles as well, making industry engagement essential. By aligning more closely with India's comprehensive approach to mobility, Hyundai-Kia can play a pivotal role in reducing pollutants that endanger public health and in supporting a cleaner, more sustainable future in one of its most important markets.

6. Recommendations

1.

Accelerate the phase-out of internal combustion engine vehicles

The transport sector is the second biggest emitting sector of all global CO₂ emissions, accounting for 20%, of which road transport accounts for 74.5% (Ritchie 2020, International Energy Agency 2024c). Automakers are responsible for actively reducing emissions from the transportation sector. As an industry-leading automaker, Hyundai-Kia must prioritize the rapid and comprehensive phase-out of ICE vehicles across all markets and achieve its carbon neutrality goal. This report urges Hyundai-Kia to stop the sale of ICE vehicles by 2030, with 2028 as the more aggressive target year for Europe (Greenpeace European Unit, 2018; Greenpeace Germany, 2023).

With tailpipe emissions accounting for 79% of Hyundai-Kia’s total emissions, the shift to zero-emission vehicles (BEVs) must be prioritized in their carbon reduction strategy. This transition should occur in tandem with broader business decarbonization efforts, including emissions reduction across their supply chain, notably in steel production.

2.

Establish electrification goals across all markets

This report highlights that in markets where Hyundai-Kia lacks clear electrification goals, emissions have increased. To become a true first mover in the transition to electrification and achieve its carbon neutrality goal by 2045, Hyundai-Kia must set and aggressively pursue ambitious electrification goals and plans in regions not only for major markets such as Europe, the US, and South Korea but also for emerging markets. India, the third-largest automotive market in the world and the fastest-growing market presents a considerable opportunity for the company to take proactive measures in driving EV adoption. Hyundai-Kia holds the position of the second largest automaker in India, which means that it has more responsibility for carbon reduction. By moving beyond reactive strategies, Hyundai-Kia should position itself at the forefront of EV growth in India and other Global South markets where government incentives and consumer demand are rising.

3.

Expand focus on battery electric vehicles (BEVs) over hybrids

While hybrid vehicles remain popular in markets like Europe and South Korea, they offer only limited emissions reductions compared to BEVs. According to the IEA (2024a), hybrid vehicles reduce tailpipe emissions by an average of just 16% compared to ICE vehicles. Although some governments and automakers label hybrids, including plug-in hybrids, as 'green', they ultimately share a key limitation with ICE vehicles: they cannot achieve the emissions reductions needed for the path to limiting global warming to 1.5°C. To meet its carbon neutrality goals, Hyundai-Kia should prioritize BEVs, which produce zero tailpipe emissions, across all markets. This shift is essential for achieving significant emissions reductions and ensuring alignment with global climate targets.

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