

Driving the Change for Good: The EV Boom

Analysis of EU CO₂ emissions in 2021

Low emissions vehicles are finally having a positive impact on average CO₂ emissions in Europe

Driving the change for good: The EV boom

Fewer cars and lower emissions

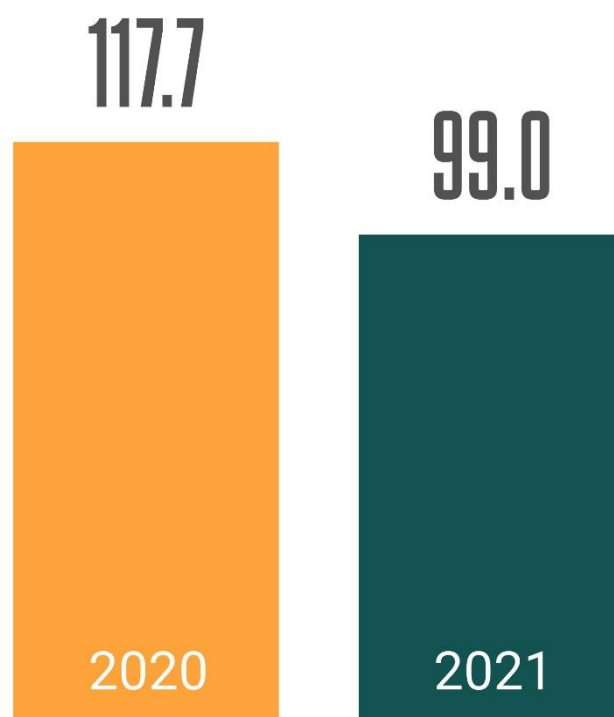
2021 was a difficult year for Europe's automotive industry. The market experienced a sudden drop in demand due to lockdowns introduced in response to the pandemic. And once consumers were allowed to move freely again, many OEMs failed to absorb the surge in demand, creating supply struggles for consumers and manufacturers across the continent.

The difficulties that many people encountered when trying to purchase a brand-new car forced many to consider second-hand alternatives. The immediate consequence of this being a hike in the price for both new and used vehicles. Due to these circumstances, many brands decided to focus on their most profitable and best-selling models. In most cases this meant SUVs and EVs, but for very different reasons.

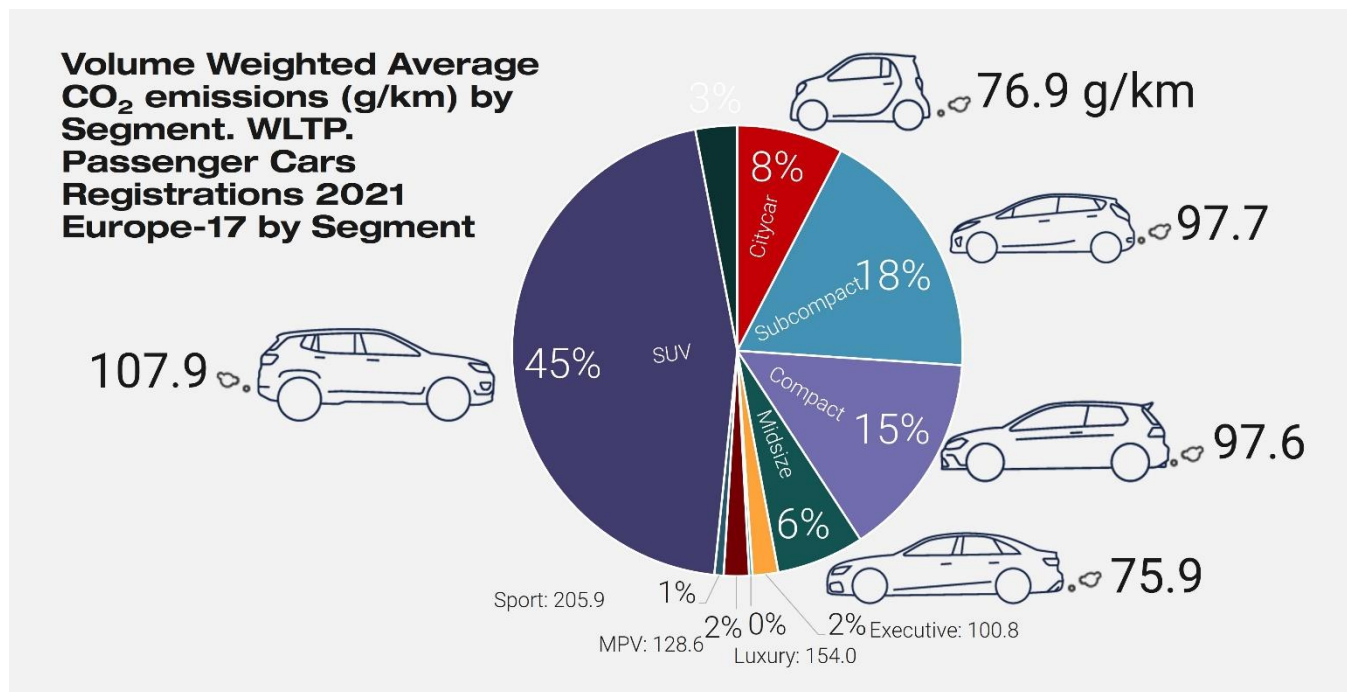
Mixed impact from SUVs

SUVs have been a driving growth over the last 10-15 years as more and more consumers around the world have made the switch away from traditional segments such as sedans, hatchbacks, wagons, and MPVs. Last year, these vehicles accounted for 45% of all passenger car registrations in Europe, 52% of light vehicle sales in the USA, and 46% of all passenger car sales in China. The combined volume increasing by 8.8% to almost 23.1 million units from 2020.

Volume weighted Average CO₂ emissions (g/km). WLTP. Passenger Cars Regs. 2021 Europe-17



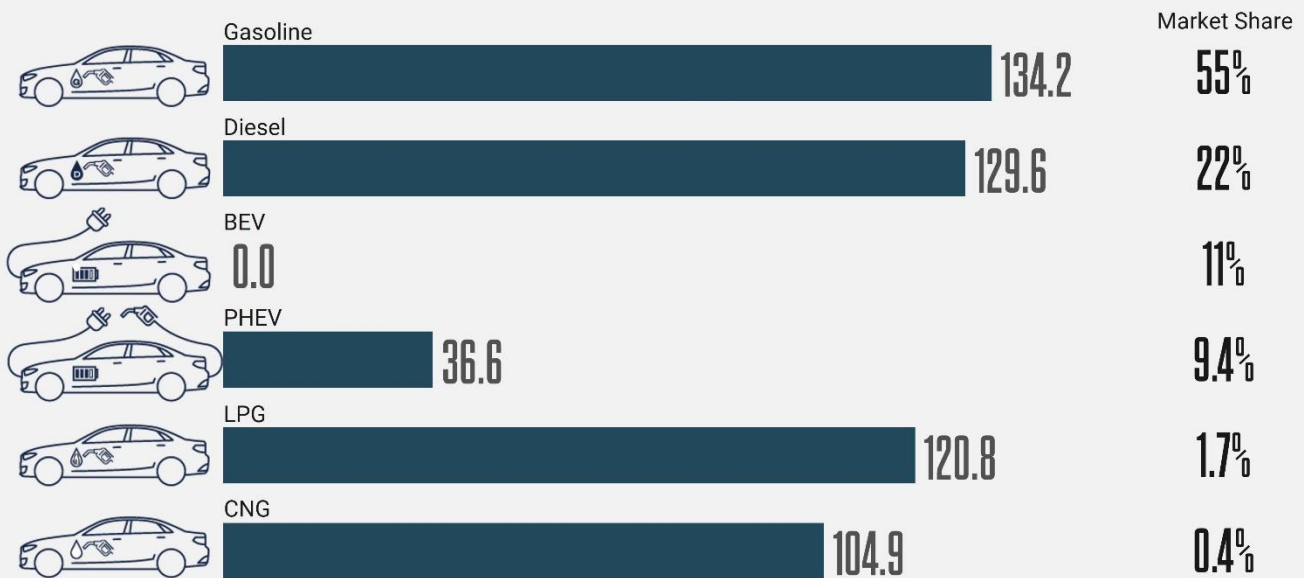
This impact of this trend on CO₂ emissions has been varied. On the one hand, SUVs are usually bigger and heavier than hatchbacks, sedans, and wagons, leading to a higher level of emissions output. In fact, the volume weighted average emissions for SUVs was 13% higher than for traditional vehicles. On the other hand, SUVs have seen more progress in reducing CO₂ emissions than any other segment. The market's acceleration towards electrification has been largely possible because of the arrival of more electric and plug-in hybrid SUVs. Last year, 35 of the 85 fully electric models available in Europe were SUVs. That equates to 41% of the offer and represents a significant jump from the 24% seen in 2019. This focus did however come at the expense of the traditional big volume segments.



In addition to SUVs, manufacturers also invested significant energy in the promotion and sale of EVs, in part because they continued to benefit from a range of government-led incentives that are more attractive than ever. As a result, the few available semiconductors were largely used in the construction of EVs, making it far easier to buy a brand-new EV than an ICE model. Thanks to the enhanced offering, good deals, and better availability, demand for these cars reached record levels in 2021.

As could be expected, this had a positive impact on average emissions across the continent. According to JATO data for 17 markets in the region, the volume weighted average CO₂ emissions fell from 117.7 g/km in 2020 to 99.0 g/km last year, following the introduction of WLTP (Worldwide Harmonised Light Vehicle Test Procedure). Marking a significant reduction of 16% and outpacing the 12% drop posted between 2020 and 2019 under NEDC (New European Driving Cycle). This reduction comes as a result of the improved sales mix containing more low emissions cars, less pollutant SUVs, and the general drop in sales seen as a result of the pandemic.

Volume Weighted Average CO₂ emissions (g/km) by Fuel-Type. WLTP. Passenger Cars Registrations 2021 Europe-17



WLTP vs NEDC

While previous JATO reports used NEDC to calculate emissions averages, this year we use WLTP – the current standard for measuring vehicle CO₂ emissions – for 88% of the vehicles registered across 17 markets.

There are interesting differences between WLTP and NEDC which make WLTP values higher than their NEDC equivalents. This makes the 99.0 g/km average seen in 2021 even more remarkable. For example, in Greece where 98% of WLTP and 93% NEDC data was published, the difference in emissions was 15.3 g/km – indicating that under the previous standard the average would have been even lower last year.

2021 Volume Weighted Average CO₂ emissions (g/km) differences between the NEDC and WLTP methodology

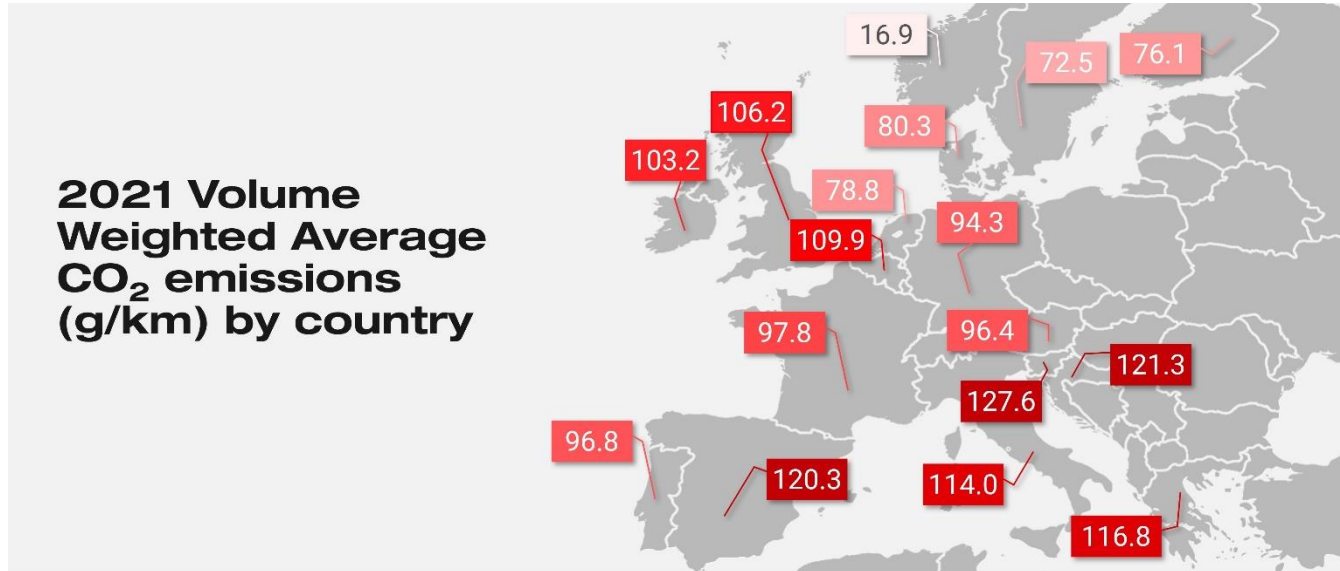
NEDC	% Published		% Published	WLTP	Gap WLTP vs NEDC g/km	%
91.8	89%	Germany	70%	94.3	+2.5	+3%
101.5	93%	Greece	98%	116.8	+15.3	+15%
98.7	89%	Belgium	78%	109.9	+11.2	+11%
98.2	73%	Italy	90%	114.0	+15.8	+16%



Progress across the board

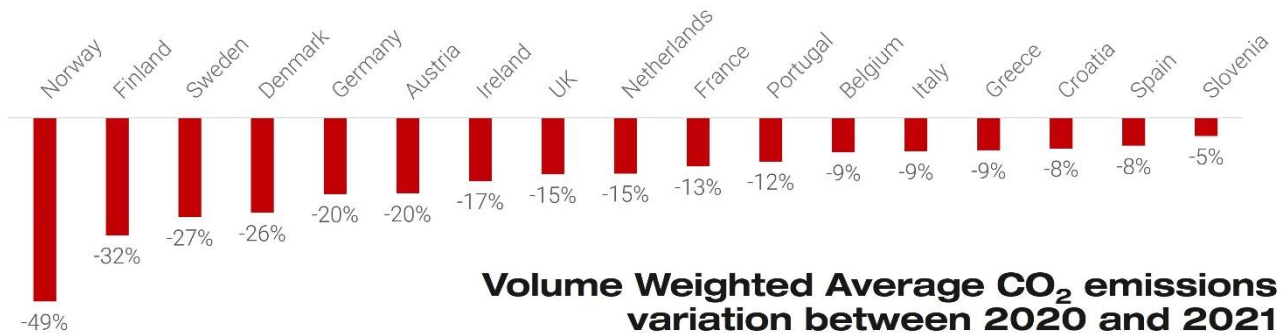
Despite notable differences, progress was recorded in all the 17 markets analysed. Average emissions fell between 5% in Slovenia, all the way up to 49% in Norway which continued to lead in both lowest average emissions and market share of pure electric cars.

In 2021, the average CO2 emissions produced by new cars registered in Norway totaled just 16.9 g/km – the best result in Europe. This is owed to the popularity of low emissions vehicles, with almost two in three passenger cars registered in 2021 pure electric, or with the addition of PHEVs, a staggering 85%.



Norway is however a leading exception. While EVs are also very popular in Sweden, with the country seeing a significant reduction in total average emissions of 27%, their progress has not matched its Scandinavian neighbor. It is perhaps notable that SUVs are also particularly popular in these markets, with a 65% share in Norway, and 49% in Sweden – well above the region’s average of 45%.

Average emissions in some countries have however remained at high levels. In markets such as Slovenia, Croatia and Greece – where average income per capita is lower than many Northern European countries – the lack of purchasing power means that many cannot afford more expensive, low emissions models. This is also



compounded by the limited charging infrastructure in these markets, alongside the more modest incentives on offer to consumers.

As a result, the penetration of low emissions vehicles in these markets remains very low with BEVs between 2.2% and 3.3%, and PHEVs between 4.2% and 7%. While the region's average was 10.3% for BEVs and 8.8% for PHEVs.

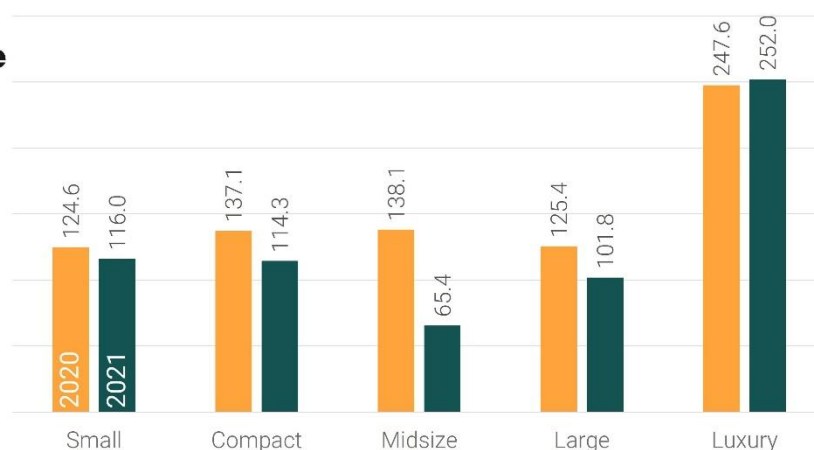
Midsized SUVs lead with lowest average

While it seems logical to assume that light city-cars or efficient subcompacts would lead the low emissions charge, midsize SUVs emerged as the greenest vehicles in Europe. With an average total of 65.4 g/km – the lowest across 14 segments – the positive result was largely due to how active the segment has been in introducing new EV models and versions.

According to JATO data, for the 39 different midsize SUV models available last year, 28 featured a BEV or PHEV powertrain. The segment has become the preferred testing ground for OEMs with new technologies due to the size of the vehicles and their presence across global markets.

Interestingly, the smallest SUVs, also known as B-SUVs, posted the second highest average among all the SUV subsegments, behind only the luxury models. As these vehicles are more price sensitive, it is difficult for OEMs to electrify them as it would mean charging consumers more for already expensive vehicles. Nevertheless, this is one of the fastest growing segments – already the third largest in Europe – therefore it is important that OEMs address this sooner rather than later.

2021 Volume Weighted Average CO₂ emissions (g/km) by SUV subsegment. WLTP.



There have also been interesting results across the traditional segments. For example, midsize cars (D-Segment) posted almost the same average as city-cars, with 75.9 g/km compared to 76.9 g/km. This success is due to the Tesla Model 3 – the most registered midsize car in Europe in 2021 – with a volume increase of 64% compared with 2020. Last year, almost one in five D-segment cars registered in Europe was a Model 3 and this has started to have a real impact on the average emissions of the segment. In 2017, before the Model 3 arrived in Europe, the segment's average was 120.1 g/km under NEDC.

Tesla leads the top 25 best-selling brands, overshadowing peers

According to JATO data for the top 25 best-selling brands in Europe, Toyota previously dominated in the region due to the success of its hybrid technology and relative popularity of its vehicles. As a consequence, the brand has typically been able to post well below the industry-standard average emissions.

However, as a result of Tesla's huge success since its arrival in Europe, we have seen a rebalancing of power. The popularity of the Tesla Model 3 and, more recently, the Model Y, pushed Tesla into the top 25 for the first time. With a record 165,700 units in Europe-17 and 169,200 across the whole region, last year Tesla became Europe's preferred brand for electric vehicles. Overall, it was the 20th most registered make in 2021 and unsurprisingly, led the ranking of emissions by brand with 0.0 g/km.¹

Volkswagen on the other hand, which registered almost the same number of electric cars as Tesla, occupied the 7th position in the average emissions ranking – weighed down by the sales of its ICE vehicles.

Far from the success of Tesla, Renault took second place with an emissions average of 86.7 g/km. Thanks to the success of the Renault Zoe, the brand managed to sell more electric than diesel cars, helping to reduce its average emissions. However, despite this progress, the majority of Renault vehicles sold were still powered by gasoline engines, producing an average of 123.4 g/km.

In Hyundai's case, demand for its zero emissions and plug-in hybrids cars grew by 26% and 246% respectively – accounting for 24% of its total registrations last year. Thanks to this increase, the Korean brand is now among the 10 most popular for those in the market for low emission vehicles.

Volume Weighted Average CO₂ emissions (g/km). WLTP. Top 25 best-selling brands in 2021. Europe-17.

# 2021		2021	2020	# 2020
1	Tesla	0.0	0.0	1
2	Renault	86.7	98.0	2
3	Hyundai	89.8	107.0	3
4	Mini	90.1	112.6	6
5	Kia	91.9	108.0	4
6	Fiat	92.8	114.7	9
7	Volkswagen	96.3	112.6	5
8	Peugeot	97.9	113.0	8
9	Skoda	101.0	129.9	20
10	Ford	102.3	121.6	12
11	Mercedes	102.4	124.1	13
12	Volvo	103.2	125.0	14
13	Nissan	105.0	120.9	10
14	Opel/Vauxhall	105.1	121.0	11
15	BMW	107.3	128.2	18
16	Toyota	108.8	113.0	7
17	Audi	109.8	133.2	22
18	Dacia	109.8	126.8	16
19	Citroen	111.9	126.5	15
20	Seat	116.4	131.1	21
21	Suzuki	117.7	127.7	17
22	Mazda	120.3	129.2	19
23	Jeep	122.8	159.8	24
24	Porsche	123.7	148.5	23
25	Land Rover	169.3	191.2	25



¹ This study excludes emissions produced by the production process, transport of the final car to the dealer, and the emissions produced by the electricity generation.

Mini – in fourth position – benefited from the introduction of the Mini Cooper SE, alongside having a relatively small line-up of cars. While its most favoured ICE products lost ground over the course of the year.

What’s clear is that there is often a strong relationship between brands taking top positions in the CO2 ranking, and those posting high percentages of low emissions cars within their sales mix.

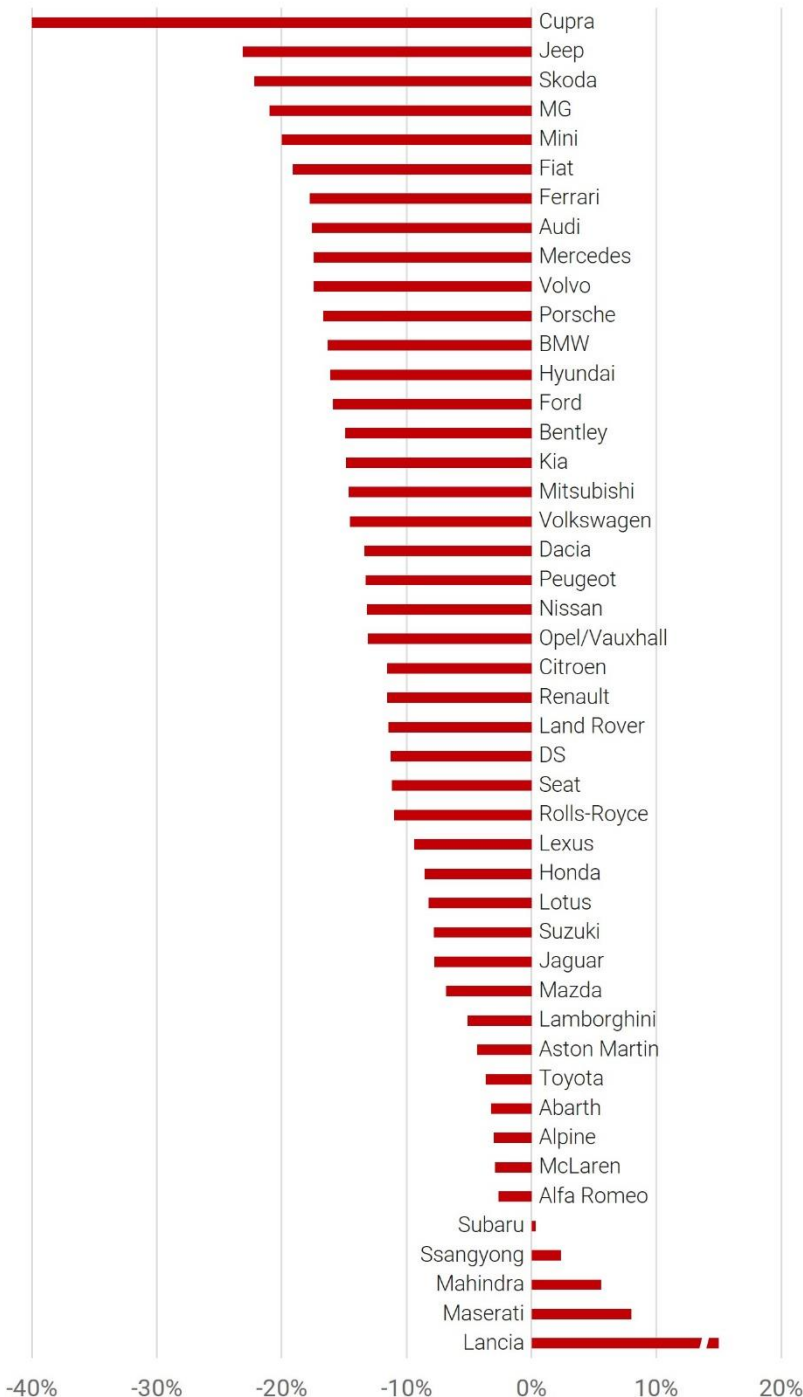
At the same time, some ICE cars have also seen progress with their emissions output thanks to improvements in technology and the mild-hybrid solution.

Mini, Skoda, and Jeep among the best performers

While the improved accuracy of WLTP in reflecting CO2 emissions has led to an increase in recorded averages, there was significant progress between 2020 and 2021, as 24 brands recorded reductions in averages, while zero emissions Tesla vehicles remained stable.

Across all 25 brands, Mini posted some of the most impressive results securing fourth place in the emissions ranking with 90.1 g/km. That’s 22.5 g/km less than the average registered in 2020, and 20% less CO2 emitted per vehicle. As the manufacturer explained, the fully electric Mini Cooper SE was “a key factor driving the growth of the brand” as its 34,900 units represented

**Volume Weighted Average CO₂ emissions (g/km).
WLTP. Variation 2020 vs 2021.
Excludes BEV-only brands**



around 32% of Mini's 3-door sales globally.²

Mini was however outperformed by Jeep which reduced average emissions by 23% to 122.8 g/km. Recording 37 g/km less than in 2020, this result can be linked back to the introduction of the PHEV models of the Jeep Renegade and Jeep Compass. Registrations of these vehicles accounted for 26% of the brand's total volume in Europe.

Volume Weighted Average CO₂ emissions (g/km) variation 2020 vs 2021 Fuel Type registrations variation 2020 vs 2021, and % of total 2021

	CO ₂ emissions 2021 vs 20	Gasoline		Diesel		MHEV		PHEV		BEV	
		2021 vs 20	as % 2021	2021 vs 20	as % 2021	2021 vs 20	as % 2021	2021 vs 20	as % 2021	2021 vs 20	as % 2021
Cupra	-40%	191%	52%	New	5%		0%	New	38%	New	5%
Jeep	-23%	+4%	38%	-30%	34%		0%	+298%	28%		0%
Skoda	-22%	-16%	51%	-31%	25%	+884%	3%	+63%	7%	+300%	11%
MG	-21%	+53%	36%		0%		0%	New	19%	+79%	44%
Mini	-20%	-9%	68%	-9%	6%		0%	+18%	9%	+82%	17%
Fiat	-19%	-61%	19%	-20%	11%	+128%	46%		0%	+584%	10%
Ferrari	-18%	0%	78%		0%		0%	New	10%		0%
Audi	-18%	-16%	26%	-47%	12%	+14%	37%	+70%	14%	+58%	10%
Mercedes	-17%	-39%	20%	-33%	36%	+12%	8%	+32%	25%	+140%	7%
Volvo	-17%	-26%	16%	-94%	2%	+80%	37%	+31%	39%	+234%	6%
Porsche	-17%	-9%	55%		0%		0%	+14%	21%	+44%	23%
BMW	-16%	-15%	30%	-52%	16%	+85%	25%	+55%	21%	+96%	7%
Hyundai	-16%	-29%	31%	-42%	4%	+186%	25%	+248%	6%	+25%	16%
Ford	-16%	-57%	25%	-46%	19%	+40%	34%	+106%	10%	New	4%
Bentley	-15%	-2%	82%		0%		0%	+58%	11%		0%
Kia	-15%	-6%	42%	-68%	2%	+171%	20%	+52%	12%	+59%	14%
Mitsubishi	-15%	-32%	65%	-9%	2%		0%	-18%	32%	-73%	0%
Volkswagen	-15%	-8%	51%	-28%	23%	+22%	3%	+43%	5%	+39%	14%
Dacia	-13%	-8%	45%	-37%	17%		0%		0%	New	7%
Peugeot	-13%	-10%	48%	-13%	34%		0%	+124%	7%	+61%	10%
Nissan	-13%	-18%	65%	-78%	5%		13%		0%	+10%	15%
Opel/Vauxhall	-13%	-2%	69%	-18%	20%		0%	+14%	2%	+120%	9%
Citroen	-12%	-3%	61%	-17%	29%		0%	+143%	3%	+349%	3%
Renault	-12%	-33%	40%	-60%	14%	New	7%	+103%	6%	-6%	15%
Land Rover	-11%	-7%	6%	-89%	6%	+55%	61%	+128%	26%		0%
DS	-11%	-11%	28%	-13%	35%		0%	+55%	29%	-24%	9%
Seat	-11%	-9%	67%	-40%	14%	+27%	5%	+260%	6%	+30%	3%
Rolls-Royce	-11%	-12%	55%		0%		0%		0%		0%
Lexus	-9%	+20%	1%		0%		0%	-40%	0%	+794%	7%
Honda	-9%	-61%	23%	-80%	1%		0%		0%	-17%	5%
Lotus	-8%	+5%	90%		0%		0%		0%		0%
Suzuki	-8%	-97%	1%		0%	+52%	94%	+6%	1%		0%
Jaguar	-8%	-43%	16%	-87%	8%	New	44%	New	8%	-41%	22%
Mazda	-7%	+5%	31%	-52%	5%	+6%	56%		0%	+20%	8%
Lamborghini	-5%	+12%	85%		0%		0%		0%		0%
Aston Martin	-4%	+12%	89%		0%		0%		0%		0%
Toyota	-4%	-23%	20%	-10%	2%		0%	+303%	4%		0%
Abarth	-3%	-3%	100%		0%		0%		0%		0%
Alpine	-3%	+88%	100%		0%		0%		0%		0%
McLaren	-3%	-8%	59%		0%		0%		0%		0%
Alfa Romeo	-3%	-37%	31%	-26%	68%		0%		0%		0%
Subaru	0%	+22%	47%		0%		0%		0%		0%
Ssangyong	+2%	+1%	72%	+4%	26%		0%		0%		0%
Mahindra	+6%	-23%	88%	-18%	4%		0%		0%		0%
Maserati	+8%	+22%	53%	-55%	16%	+894%	30%		0%		0%
Lancia	+185%	-97%	1%		0%	+160%	85%		0%		0%

² <https://www.bmwgroup.com/en/report/2021/index.html>

Skoda also registered strong results reducing average emissions by 22% from 129.9 g/km in 2020 to 101.0 g/km in 2021. The Skoda Enyaq was the 7th best-selling BEV in Europe last year.

JATO data reveals a direct correlation between increased sales of low emission vehicles and reduced average emissions. In most cases, brands that launched and sold more BEVs, PHEVs, and MHEVs were able to post higher average emissions reductions between 2020 and 2021. SUVs were a key factor in this trend as for many of the brands that performed well in reducing average emissions, these vehicles accounted for a significant portion of total sales.

2021: A year of challenge and opportunity

Last year, many OEMs were forced to adapt their sales strategies, pivoting away from traditional segments to focus on the production of EVs and SUVs – the two most profitable segments across Europe.

While the appetite of European consumers for EVs has been gathering momentum, the lack of electrified SUV alternatives has, until now, been a limiting factor within the market. In 2021 however, the efforts of OEMs to meet consumer demand began to be realised. The enhanced offering of new and improved electrified SUV models has further fuelled demand while also having a positive impact in reducing average CO₂ emissions with midsize SUVs emerging as some of greenest vehicles in Europe.

The reduction of emissions has not however been constrained to the SUV segment. The continued success of Tesla's Model 3 - Europe's most registered midsize vehicle in 2021- has meant that the average emissions of D segment vehicles dropped to the same level as city cars.

When viewing average CO₂ emissions by country, there was expectedly a significant variance in the results, however it is encouraging to see progress across all markets analysed within the report. Brands that have developed their offering of low emissions vehicles have seen this reflected in notable drops emissions averages. And, as pressure from both governments and consumers to further enhance European EV offering increases, this trend looks set to continue throughout 2022.

About us

JATO Dynamics, founded in 1984, now has representation in over 51 countries around the world. We provide precision under pressure, providing the world's most timely, accurate and up-to-date automotive information on vehicle specifications, pricing, sales and registrations for over 30 years. We offer more than just data, as we have watched the world change, and consumer mindsets alter with it we have been able to offer insights that help inform the industry. We are able to react to short-term market movements, plan for long-term developments and ultimately to meet the needs of our clients. Visit JATO at www.jato.com for more information.

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