Oil companies in disguise

On a ticking ‘carbon bomb’ called ‘Scope 3 emissions’ mandatory reporting’. And why investors should avoid car stocks and cars’ ESG ratings.

September 2022

A study by TRANSPORT & ENVIRONMENT

Transport & Environment

Published: September 2022

Author: Luca Bonaccorsi, Enrico Ferraro, Manassé Massuama
Special thanks to Thomas Earl and Yoann Gimbert for their guidance and multiple revisions.

Editeur responsable: William Todts, Executive Director

To cite this report
Oil companies in disguise: the impact of mandatory reporting of indirect emissions on car companies' valuation. T&E, 2022.

Further information

Luca Bonaccorsi
Director of Sustainable Finance
Transport & Environment
luca.bonaccorsi@transportenvironment.org
Mobile: +44(0)7930-135653
www.transportenvironment.org | @transenv | fb: Transport & Environment

Acknowledgements

The findings and views put forward in this publication are the sole responsibility of the authors listed above.

Executive Summary

Asset managers are faced with the double challenge of decarbonising their portfolios and mainstreaming sustainability frameworks, such as the environment, social, and corporate governance rating, ESG. But do they have the right tools?

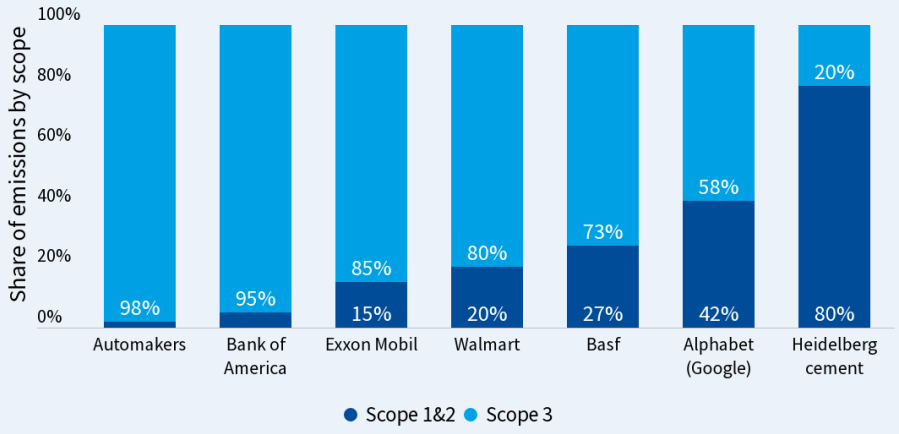
This paper looks at various tools to assess the environmental sustainability of individual assets in one specific sector, the car industry, and with a focus on climate mitigation. We look at some of the market's top players (Toyota, Volkswagen, Renault-Nissan-Mitsubishi, Stellantis, Ford, Honda, Hyundai-Kia, Mercedes and BMW) and in particular at: the Scope 1, 2 and 3 emissions, the E pillar in ESG ratings of some of the major rating agencies, and at the latest arrival, the EU taxonomy.

In particular, we look at the potentially disruptive implications of the new mandatory disclosures for funds and corporations in the EU, starting from 2023-24: Scope 3 emissions and Taxonomy alignment.

Our conclusions can be summarised as follows:

1. **Car companies' true carbon intensity will be revealed in 2023**, thanks to mandatory Scope 3 disclosure (both in the Sustainable Finance Disclosure Regulation and in the Corporate Sustainability Reporting Directive). Unlike most other economic sectors, about **98% of the total emissions of a car manufacturer** are only captured when scope 3 emissions - primarily the use of cars - are included. **Every new internal combustion engine car generates a demand for 17,000 litres of fuel in the EU and 30,000 litres in the US.** The most widely used

Only 2% of carmakers' emissions are covered by scopes 1 & 2

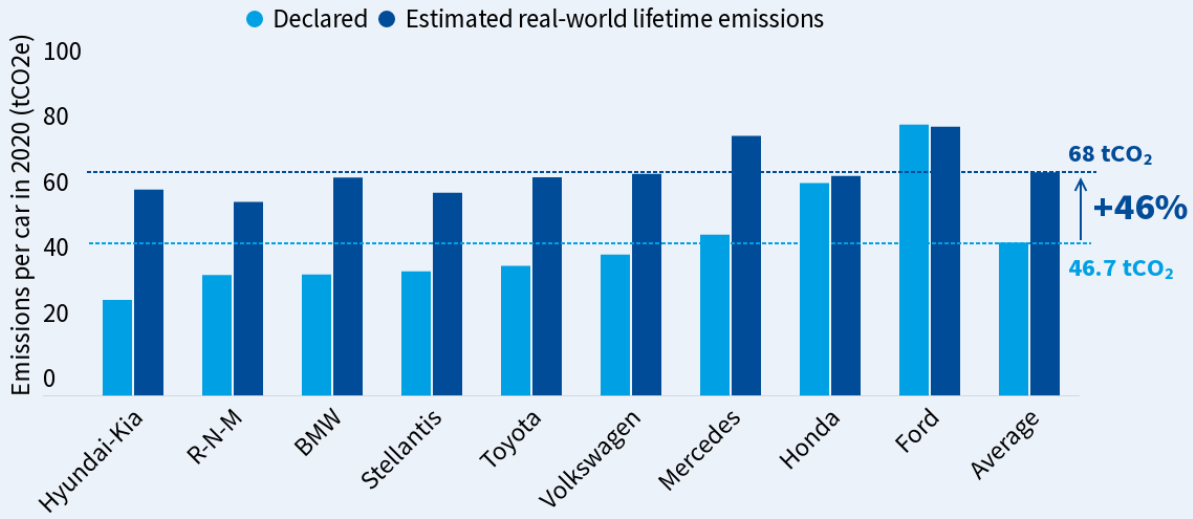


Source: S&P, FY 2020

methodology to compute indirect emissions is represented by the GHG protocol and Scope 3 emissions. **Scope 3 mandatory disclosure will have a major impact on the sector as carbon intensity is set to boom.**

2. **Car manufacturers under-estimate their life-cycle emissions.** Assessing Scope 3 emissions is not without challenges and uncertainties. One variable in particular, the estimated average total distance a car will cover in its lifetime, can vary substantially and, unsurprisingly, manufacturers seem to underestimate it. Average declared emissions stand at **46.7 tonnes of CO_2e per vehicle** sold. According to our calculations, **they are on average 46% higher** (at 68.2 tonnes CO_2e per vehicle). But the average doesn't really tell the story. In some cases our estimates are considerably higher: +115% for Hyundai-Kia, +80.5%% for BMW, +68.5% for Toyota, +61.5% for Mercedes and +57.3% for Volkswagen. Stellantis has one of the worst scores at 62 tCO_2e per vehicle but, as it discloses only Scope 3 data for its European sales, the global comparison is missing.

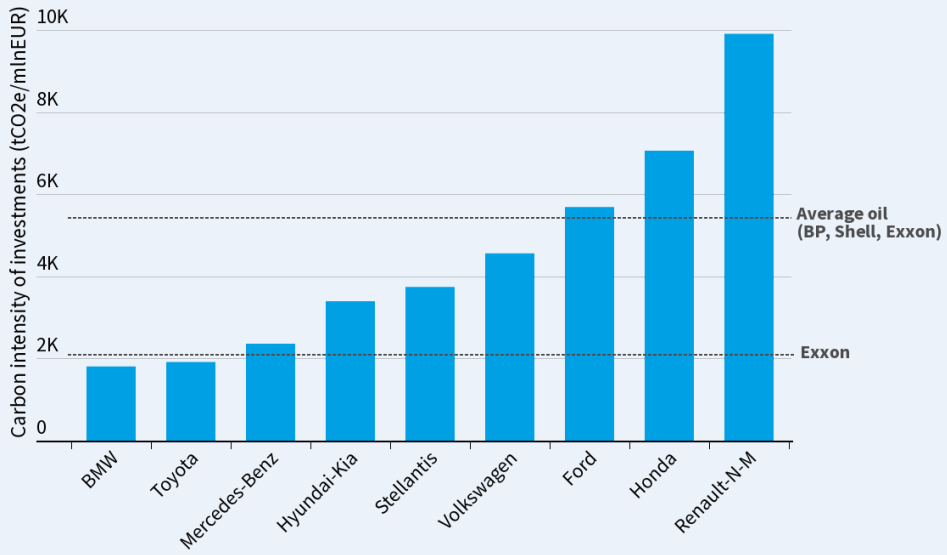
Carmakers' lifetime global emissions 46% higher than reported



Source: T&E analysis and carmaker annual reports. R-N-M is the Renault-Nissan-Mitsubishi Alliance

3. **From a financial viewpoint, an investment in a car company is generally just as carbon intensive, or worse, than one in oil companies**. For example, at today's prices, and before adjusting car companies emissions with more realistic parameters, one million euro invested in Exxon Mobil finances about 2,000 tonnes of CO_2e, but the same sum finances more than 4,500 tonnes of CO_2e in the car sector. In some cases the carbon intensity is two or three times higher: nearly 10,000 tonnes if invested in Renault-Nissan-Mitsubishi, 7,000 tonnes if invested in Honda and 5,000 tonnes if invested in Ford. Leading to the adage used in our title that **'car companies are just oil companies in disguise'**.

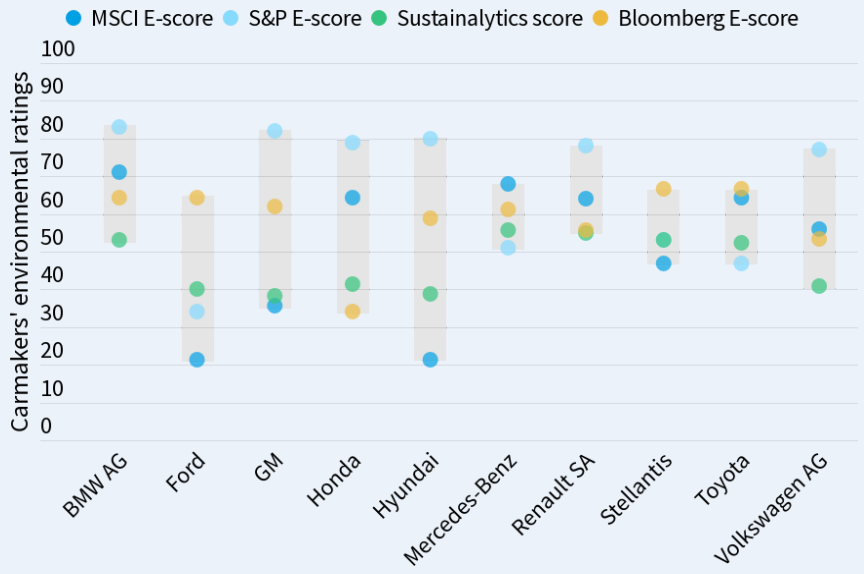
Carmakers' investments are as carbon-intensive as oil companies'



Source: Carmaker and oil major annual reports

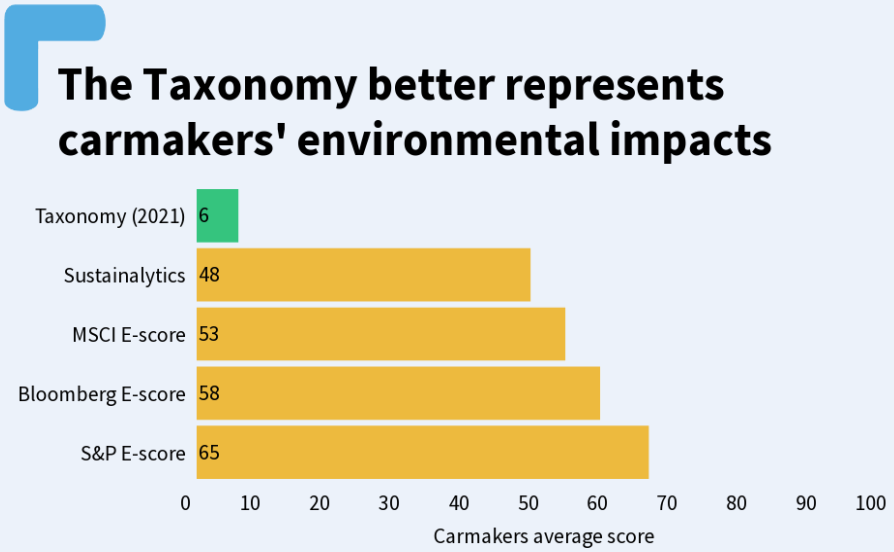
4. **ESG ratings show no correlation and fail to capture the sector's true impact.** Despite CO_2 emissions, together with air pollution, being possibly the most relevant of environmental KPIs for the sector, this specific parameter **only represents, for example, 0.6% of the ESG rating for S&P and a similar % for MSCI.** Unsurprisingly, despite transport being Europe's largest CO_2 emitter, car manufacturers score very high with ESG raters on environmental grounds.

Normalised Environmental ratings (0-100)



Environmental part of ESG scores rescaled to a 0-100 score where low values are less sustainable.

5. **The EU taxonomy is a much better benchmark.** Taxonomy scores (Green Asset Ratio and Green Investment Ratio), being computed following an impact based methodology, seem to represent a better estimate of the environmental performance of a car manufacturer. The average Taxonomy score for the companies examined is 6.2/100 compared to the E score of MSCI, S&P and Bloomberg at about 66/100. As an example, Volkswagen is rated 77/100 whilst being only 8.9/100 taxonomy aligned, according to 2021 data.



Source: T&E calculations of the taxonomy alignment of 9 carmakers based on 2021 sales.

Recommendations

- ESG ratings in the car industry are leading to the wrong capital allocation and need urgent re-basing with, at least, a fifty-fold increase of the weight assigned to Scope 3 emissions (e.g. from 0.6% to 30% of the total ESG rating). As a consequence, ESG indexes and benchmarks should also be rebased.
- It is time for the EU to legislate ESG ratings. The current wild west of conventions is leading to greenwashing and is no longer sustainable.
- In order to address the issue of the substantial under-representation of the company's life-cycle emissions, Scope 3 calculations at corporate level need stricter guidance from relevant institutions to reduce the room for interpretation.
- Whilst these changes are implemented, the EU taxonomy should be used as an E score, instead of that provided by ESG assessments.
- To limit the impact of the 'ticking carbon bomb', asset managers with climate/ESG ambitions will have to **drastically underweight** the car sector and **consider divestment when it comes to the worst performers.**

Table of contents

Introduction

The growth in sustainable investing keeps accelerating. It is estimated that one third of total assets under management, the world's financial wealth, is invested in sustainability's most popular proxy: ESG themed funds. It's a whopping $41 trillion in 2022 and, according to Bloomberg, the total is expected to hit the $50 trillion mark in 2025.
Investors and ESG[1] analysts need good sustainability data from corporations to make their call. These data are currently lacking in quantity, quality and comparability. For this reason the EU will hit the business and financial communities with a phenomenal amount of new mandatory sustainability disclosures. One of the most challenging is scope 3 emissions as defined in the GHG protocol. These so-called indirect or lifetime emissions play a key role in providing the true assessment of the carbon intensity in the transport sector, where the majority of the emissions happen during the lifetime, rather than the production of, the vehicle, aircraft, or ship.

In the EU, the disclosure of scope 3 emissions will be mandatory as of 1 January 2023. Since most asset managers are trying to decarbonise their portfolios, it is likely that total emissions - or lifecycle assessments - will become the common language of the investment community. **"How much carbon are you funding?"** is the question that clients and investors will be asking asset managers. To shed light on this question, we analyse the scope 3 emissions of carmakers (otherwise known as original equipment manufacturers, OEMs). While most, but not all, OEMs disclose scope 3 emissions, our analysis has revealed inconsistency in their reporting and what appears to be the use of accounting flexibility to underestimate them, sometimes significantly. The indirect emissions of the world's largest car manufacturers suggest that investments in them will be hard to sustain for asset managers that aim to decarbonise their portfolio.

ESG investing is rapidly going from being a market niche to mainstream. By the end of 2022, Morningstar estimates that some 50% of all new financial products sold will be ESG based. With the increase in popularity of ESG assessments has come increased scrutiny and, recently, a sea of criticism. It's a positive process, since investors need reliable ESG assessments. And they're not getting them, for the time being.

The European Union is in the process of legislating ESG ratings after an intense season of stakeholders' consultations. T&E was an active player in this process and this paper was produced in this context: to expose glaring problems with ESG ratings and offer alternative solutions to fix them. In particular, our paper focuses on a sector in which ESG ratings fail spectacularly: car manufacturing. And it proposes a very simple fix.

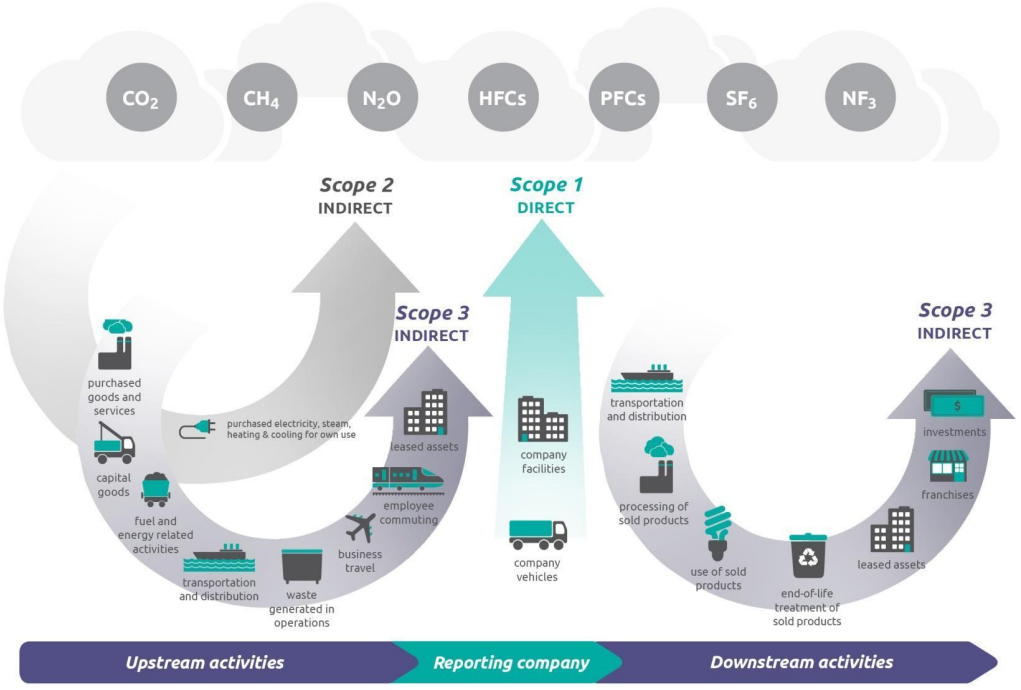
[1] ESG analysis computes sustainability scores to environment, social and governance factors as opposed to traditional financial analysis that focuses on profitability and financial sustainability.

1. Life cycle analysis, the GHG protocol and scope 3 emissions

A life cycle analysis provides a climate impact for the entire life cycle of the product. Greenhouse gas (GHG) emissions are measured or estimated at every phase. These include the sourcing of raw materials, the production phase, the usage or consumption phase, and the end of life. For the car industry, which is still dominated by fossil fuel burning internal combustion engine vehicles, the greatest climate impact occurs during the usage phase.

To assist companies in making their organisations more sustainable, methodologies have already been designed to quantify these greenhouse gas emissions. The most widely used proxy for direct and indirect emissions, the Greenhouse Gas Protocol, was launched in 1998 by the World Resource Institute and the World Business Council for Sustainable Development. The Protocol provides standards and guidelines for companies and other organisations to prepare life cycle GHG inventories. The GHG Protocol covers the accounting and reporting of seven GHGs and converts them into the CO_2 equivalent (CO_2e)[4]. Emissions are then reported using three scopes: scope 1 measures the direct emissions of a company, which is equivalent to UNFCCC accounting; scope 2 accounts for indirect emissions, typically covering the emissions associated with the energy used or purchased by a company, and scope 3 encompasses all of the indirect emissions related to the value chain of a company (see Info Box for details).

Figure 1.1: GHG Protocol involves three scopes for the companies' reporting of direct and indirect emissions



Info box 1: Life cycle assessment scopes

Scope 1 (Direct Emissions) covers direct emissions from owned or controlled sources such as: generation of electricity, heat, or steam, physical or chemical processing, transportation of materials, products, waste, and employees, fugitive emissions.

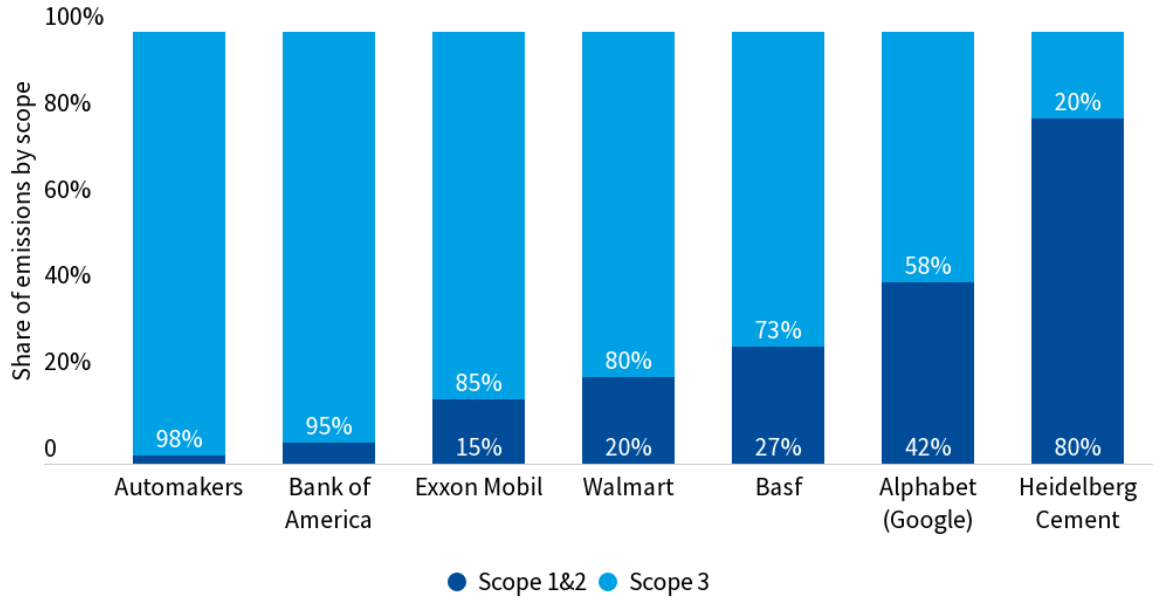
Scope 2 (Indirect Emissions) covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company.

Scope 3 (Indirect Emissions) come in different categories based on whether they are internal to the reporting company or exist upstream or downstream of the company along its value chain. Scope 3 includes all other indirect emissions that occur in a company's value chain.

1.1 Computing scope 3 emissions in the car sector

The GHG Protocol leaves significant room for interpretation or individual assessments of materiality. Therefore the methodologies used to calculate the climate impact are not homogeneous for all companies within a sector. Based on the activities and products of companies, there are also significant differences across sectors. While the average scope 3 emissions accounts for 98% of a carmakers life cycle emissions, for Google, Microsoft or ExxonMobil they are, respectively, 58%, 70% and 85% of the total.

Figure 1.2: Highlighting the contribution of CO2 emissions from Scope 1&2 and Scope 3.



Source: S&P, FY 2020

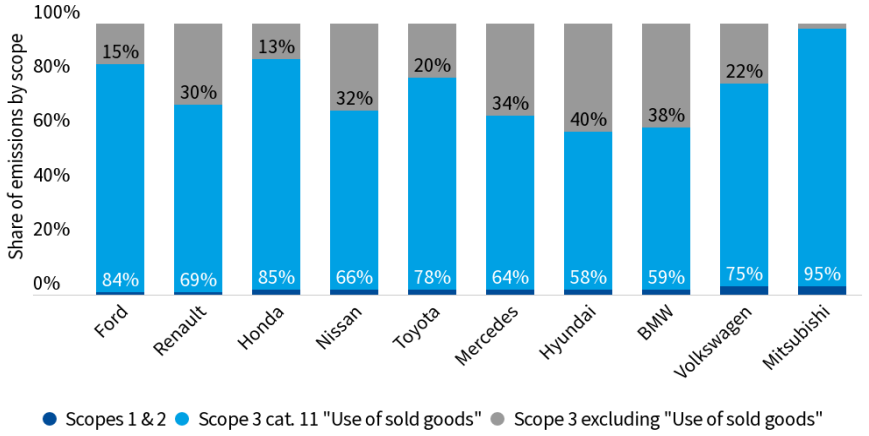
Scope 3 emissions are computed considering the contribution of 15 categories (see Figure 1.1). In computing scope 3 emissions, corporations have the freedom to take into account only those considered relevant given the value-chain. In practice, OEMs use a variable mix of categories and different methodologies to evaluate the contribution of the same category [5]. To mitigate these differences we have used the values computed by S&P on the basis of the CDP[6] questionnaire that companies submit voluntarily. These values have been somewhat normalised.

In order to analyse the scope 3 emissions of the car market, we focused on a select number of OEMs that, collectively, represent the majority of the world's automotive market: Toyota, Volkswagen, Renault-Nissan-Mitsubishi Alliance, Stellantis, Honda, Ford, Hyundai-Kia, Mercedes and BMW.

We focused in on only one, but the most significant, of the scope 3 emission components for carmakers: the use of sold goods. This component refers to the lifetime emissions of the cars sold based on the fuels they burn[2]. All OEMs consider lifetime emissions as relevant, yet a significant number of corporations will only report it for certain markets. For example, Stellantis only reports its lifetime emissions for the cars it sells in Europe but not in the US, where it sells nearly half of its cars. This flexibility is allowed and other OEMs make use of it[6].

As a result of this interpretative freedom, lifetime emissions from the use of sold goods as a percentage of total scope 3 range between 60% and 90% of total scope 3 emissions. The remaining 10%-40% includes a variable combination of the other upstream and downstream categories of indirect emissions. We suspect these values have more to do with companies' accounting policies rather than genuine differences, with normalised values possibly in a range between 80% and 90%. Figure 1.3 reports global GHG emission data of the three Scope scores of each of the selected companies (data for Stellantis and Kia are not available). This highlights one of the many examples of how difficult it is to find standardised and coherent data on indirect emissions in the sector.

Figure 1.3: GHG emissions distribution of the three Scopes for automotive OEMs and the proportion of the contribution of the usage phase of the vehicles (Scope 3 Use of sold goods)



Source: Scope 1, 2, 3 from S&P 2020 data, Scope 3 "use of sold goods" from OEM 2020 Sustainability or Annual reports

[2] All estimates were made using traditional fuels parameters and do not include biofuels. On a WTW assessment most biofuels are more carbon intensive than the fossil fuels they replace. Had biofuels been taken into account our estimates would have diverged further from the declared values.

The lifetime emissions for any single internal combustion vehicle depends on two main parameters: the fuel efficiency, which has a linear relation to GHG emissions, and the lifetime mileage[3]. But since these parameters, made public by some OEMs but often not in line with other data sources on car use, we calculated them from scratch.

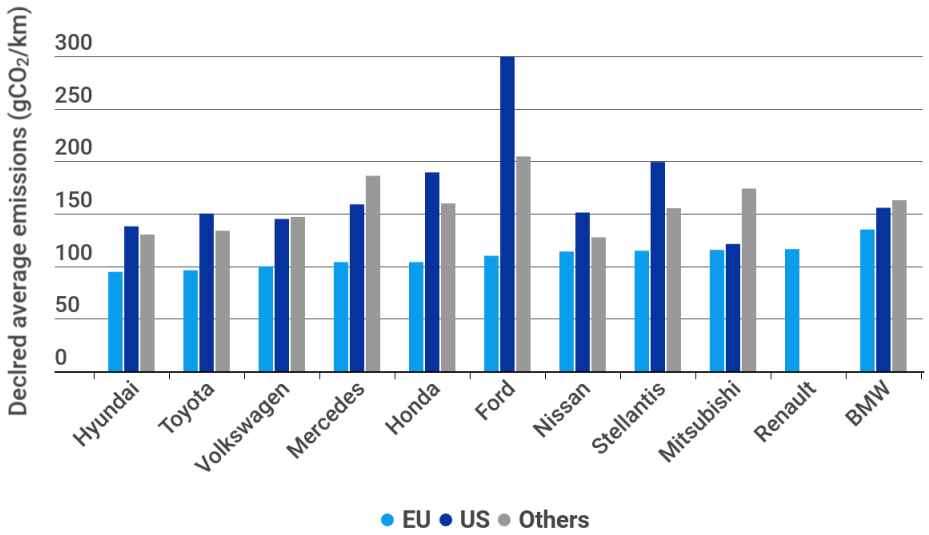
In doing so, we had to take into account several complexities. For starters, there is no global standardised segmentation of car models as sales data are expressed according to different categories in the various geographic regions. For example, in Europe cars are classified in segments A-E according to their size, whilst in the US segments follow a different denomination (sedan, car SUV, truck, SUV). To overcome this, we reconciled the various classifications to have one consistent set of categories to encompass all global sales.

Another complexity involves the attribution of average emissions to each market segment. Owing to the varying type approval standards used across world regions, the given car is estimated to have different emissions in Europe and in the US, for example.

A four cylinder, 1.8 litre, petrol Toyota Corolla, for example, will emit 167.3 gCO_2/km in the US according to the Environment Protection Agency (EPA), whilst it will only emit 137 gCO_2/km, or 21.5% less, in Europe, according to the world light duty testing protocol (WLTP) used there.

At aggregated level the divergence in measuring protocols is illustrated in fig. 1.4.

Figure 1.4: Average emissions per vehicle in different geographical regions/markets in 2020



Source: Declared carbon intensity extracted from OEM annual reports when available or from other sources[7-10]

[3] For battery electric vehicles, the lifetime emissions from an OEM accounting perspective is zero-counted. This is not completely representative of the climate impact given that electricity generation has a varying climate impact depending on the source of energy, although it is consistent with the ICE methodology which does not consider the extraction and refining emissions of fossil fuels.

According to the ICCT (2020)[11] the European WLTP methodology underestimates real driving emissions by an average of 14%. However this still doesn't fully explain the EPA-WLTP gap, which can also be attributed to different shares of driving cycles in one region or the other, such as a higher highway share or faster urban speeds in the US. Another key difference is the significantly greater lifetime mileage of vehicles in the US compared to the EU. Essentially one could say that the same car can have three different estimated emissions: WLTP, WLTP-adjusted and EPA.
We sourced our data for emissions from authoritative and reliable sources: the European Environment Agency (EEA) database[12] and from the annual report of the US EPA[13]. The EEA database contains the emission data of each registered vehicle in the EU, measured using the standard protocol WLTP. From the database it is possible to evaluate the weighted average emissions (in gCO_2/km) for each car segment (see all car segments in Table 1.1).

The EPA report contains average emission data derived from fuel economy values (miles/gallon) of all cars sold in the US, converted into CO_2 using a conversion factor (e.g. CO_2 per gallon of petrol or diesel)[13]. Car segment definitions in the EPA report are designed for the US market and involve more classes of high emission cars, and longer estimated lifetime as reported in Table 1.1. In particular due to the all popular pickup trucks.

Table 1.1: Car segments and corresponding average lifetime in the EU and in the US

CAR SEGMENTS			LIFETIME (km)
EU (source:data elaborated on ref. 14)			
A	Mini cars		150,000
B	Small cars		170,000
C	Medium cars		225,000
D	Large cars		250,000
E	Top-class cars, Luxury, Sport		270,000
LCV	Vans, Pickup		240,000
USA (source: EPA)			
CARS	Sedan/wagon	Minicompact, subcompact, compact, midsize, large, two-seater cars, hatchbacks, station wagons	314,180
	Car SUV	Vehicles that are considered SUV in the fuel economy labelling and considered simply as cars in the CAFE standards	
TRUCKS	Truck SUV	Vehicles that are SUV under the fuel economy labelling and trucks under the CAFE standards	363,417
	Minivan/Van		
	Pickup		

The measures collected in the EEA for each segment are generally lower than those obtained in the EPA protocol, reflecting in part the difference between European and American markets and in part the methodological differences. Both estimates represent a reliable point reference and define a confidence interval within which real emission values are bound to be.

Methodologically, we decided to compare like with like, and estimate all segments for all manufacturers with these two main methodologies: WLTP and EPA for both emissions per segment and lifetime mileage. These will represent an upper and lower bound of lifetime emission estimates. We were thus able to obtain average emission per km at OEM and car segment level.

Similarly, we estimated the lifetime mileage of vehicles in each segment. These depend on a number of variables, given a fundamental relationship between engine size (and car quality) and durability, whereby bigger and better lasts longer. The EPA has estimates of the average lifetime mileage of US cars generally higher than those used in Europe (table 1.1) that probably reflect the US market specifics too (larger cars on average and bigger spaces). In Europe we've used estimate computed by Ricardo (2020)[14] (see table 1.1) and allocated lifetimes based on the assumption that larger vehicles in the high-end segment are more robust and have the ability to drive more[4]. The average lifetime mileage is key to a good estimate of the lifetime emissions. A number of OEMs do disclose transparently their hypothetical lifetime mileage when they disclose their scope 3 estimates (Fig. 1.5).

Figure 1.5: Lifetime mileage used in LCA analysis by OEMs as declared in sustainability reports.[5]

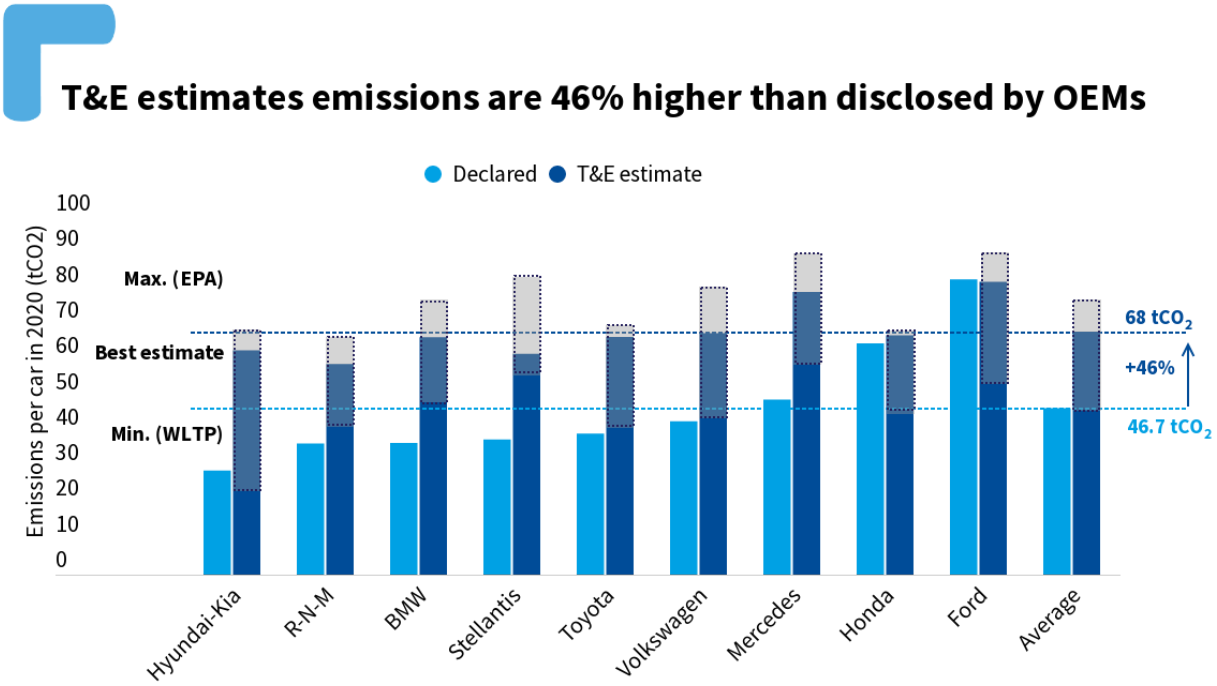
OEMs use values that supposedly reflect the "statistical" life of a car. These parameters clearly underestimate the real lifetime of a car, in particular for those segments containing larger than small-medium cars. Figure 1.5 reports the OEMs chosen values as can be known by the companies' sustainability reports. Most parameters shown above do not seem to reflect reality. In some cases (e.g. Toyota) it isn't even clear what is the actual parameter used as it varies across reports.

[4] Ricardo estimated a lifetime between 150,000 and 270,000 for passenger cars. For LCV between 200,000 to 300,000 with default value at 240,000. We've worked under the assumption that Ricardo's lowest bound would be segment A, and segment E would be the higher bound. And segment C would be the default. For LCV, we used the default value.

[5] Toyota doesn't disclose explicitly the lifetime mileage used in its scope 3 estimates. In an example in its 2021 sustainability report they refer to a calculation based on 100,000 km. But the data, and informal sources, suggest that the actual parameter used is closer to 200,000km.

Once these considerations and adjustments are made it is possible to estimate the average tonnes of CO_2 per vehicle for each manufacturer and compare it with the data reported. In particular what we will call 'T&E Best Estimate' is calculated as follows: 1) real world emissions from all sales in the EU are derived using WLTP data[6] and the lowest estimate from Ricardo for the lifetime mileage[14]; 2) emissions from sales in the US are calculated using EPA data and methodology[13]; 3) emissions from sales in the rest of the world are calculated using US EPA parameters for both fuel efficiency and mileage. This choice seemed more appropriate when considering that the majority of markets outside the EU and the US have lower average income and higher average lifetime mileage when compared to the EU. The data is summarised in fig. 1.6.

Figure 1.6: Same sales, four different methodologies: 1) OEM's declared data, WLTP applied to all sales, EPA applied to all sales and T&E best estimate.



Source: T&E estimate of OEM emissions are based on inhouse modelling. EU car segment distribution from LMC Automotive, lifetime mileage from Ricardo and EPA, WLTP emissions from the EEA database, US emissions and segment distribution from EPA, OEM global sales distribution and declared emissions from annual reports.

**Stellantis only reports its Scope 3 emissions in Europe*

*** The declared average, per vehicle, is 46.7 tCO2. T&E's best estimate is 68 tCO2 (+46%)*

Averages, however, were never as deceiving as in this case given the great diversity of cases and contexts, shown with more granularity in the following table.

[6] Based on ICCT findings[3], a 1.14 factor is used to convert WLTP emissions to real-world emissions.

Table 1.2: Declared emissions vs. estimates (WLTP, WLTP adjusted, EPA and T&E best estimate)

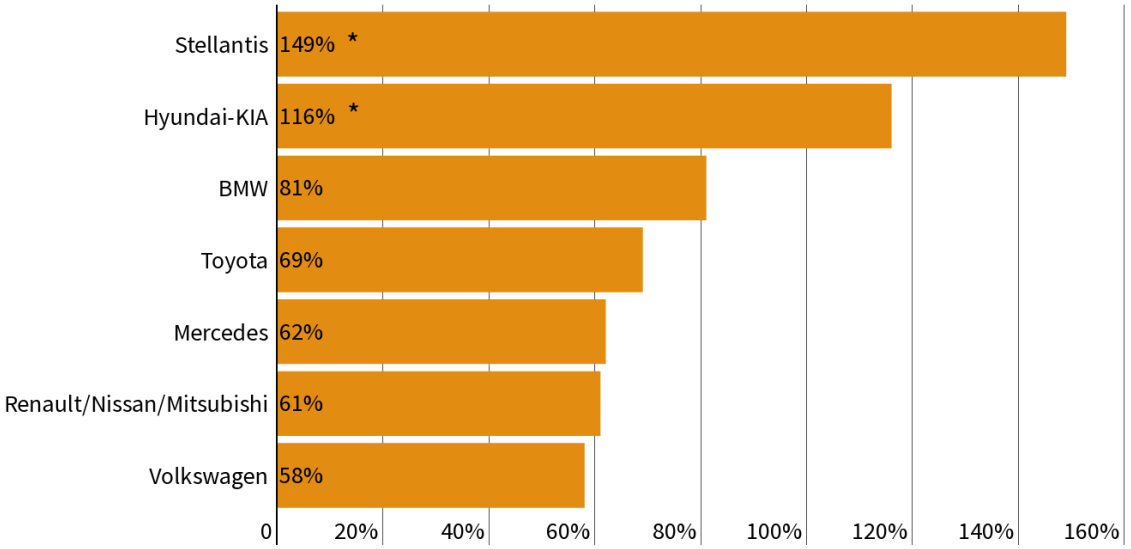
	DECLARED	T&E estimate from WLTP data	DELTA	T&E estimate from WLTP+RW data	DELTA	T&E estimate from EPA data	DELTA	T&E BEST ESTIMATE	DELTA
Toyota	39.6	41.1	4%	45.4	14.8%	70.2	77.5%	66.7	69%
Volkswagen	43.0	43.6	1%	48.1	11.9%	81.4	89.5%	67.7	57%
Renault-Nissan-Mitsubishi	36.8	37.9	3%	42.1	14.4%	66.9	81.6%	59.1	61%
Stellantis	37.9	38.1	1%	42.9	13%	83.8	121%	61.9	63%
Honda	64.9	43.9	-32%	48.2	-25.7%	67.9	4.6%	67.1	3%
Ford	82.8	53.1	-36%	59.0	-28.7%	90.6	9.4%	82.1	-1%
HYUNDAI-KIA	29.2	43.2	48%	48.2	65.3%	68.6	135.1%	62.9	116%
Mercedes	49.1	59.1	20%	64.6	31.6%	90.7	84.8%	79.3	62%
BMW	36.9	49.3	34%	54.3	47.1%	77.1	109.0%	66.6	81%
averages	**46.7**	**45.5**	**5%**	**50.3**	**16.0%**	**77.5**	**79.2%**	**68.2**	46%

A more granular analysis, case by case and by methodology, helps.

- Volkswagen, for example, a European OEM with most sales in Europe, clearly discloses its lifetime emissions applying WLTP across the board, using parameters not too different from those contained in Ricardo. Based on our calculations, its divergence from a WLTP centric estimate is very small (+1%). Its estimated lifetime emissions increase to 48.1 tCO_2 (+12%) with the real world adjustment and to 81 tCO_2 (+90% when compared to declared values) with EPA parameters. T&E's best estimate is that VW's most likely emissions per vehicle is equal to 67.7 tCO_2, or +58% higher than declared.
- Ford, on the other hand, a predominantly US based OEM, discloses its emissions using EPA parameters and appears to overestimate its emissions when WLTP standards are applied. Our analysis indicates that Ford and Honda, that sell predominantly outside Europe and use mostly EPA parameters for their disclosures, report the highest emissions.
- Stellantis doesn't disclose global scope 3 emissions, but just for EU sales, so we miss a proper term of comparison. Our estimates suggest that its global emissions are in line with the sector's average.
- All remaining OEMs have total emissions per vehicle higher by at least 50% than their declared emissions, with BMW and Hyundai showing a significant +81% and +116% difference, respectively. BMW, in particular, would have emissions 47% higher than those declared even if one was to use the more conservative WLTP+RW parameters.

Who under-represents its emissions the most?

Figure 1.9: Declared emissions vs. T&E's best estimate. A 'cheat(ers) sheet'.



* The indicated values are affected by the OEMs underestimation of emission data. Hyundai declares average emissions ranging from 94.7 (EU) to 138 (USA) and to 149 (China) gCO_2/km (Source: Environmental section of 2021 Sustainability report) against an average WLTP measure of 143.6 gCO2/km, WLTP+RW correction of 163.6 gCO2/km (Source: EEA and ICCT) and of 223 gCO2/km from EPA (USA). Stellantis disclose SCOPE 3 2020 emissions only for EU market, which represents the 51% of the global sales.

Conclusions

This analysis has only reviewed one component within scope 3 emissions, the 'use of sold goods' or lifetime emissions, so the estimated gap between our estimate and the declared value should be considered as a conservative estimate. The average gap between declared and estimated is 50.6% but the situation varies greatly from one OEM to the next.

In some cases, such as BMW and Mercedes, the deviation is far greater than the average with declared downstream scope 3 at respectively 22.9 and 29.7 tCO_2/vehicle whilst our estimates are twice as high. As a result BMW and Mercedes seem to underreport their emissions, respectively, by 81% and 62%. The reason for such divergence is explained by the low lifetime mileage, respectively 150,000 km and 200,000 used to estimate lifetime emissions.

A similar problem is observed with Toyota: despite the fact that the Japanese company produces a wide range of models that cover the entire set of vehicle segments, the calculation of the lifetime emissions contribution to Scope 3 uses only 100,000 km lifetime mileage, the lowest value to be used in such calculations. Toyota underestimates its emissions by about 69% according to our estimates.

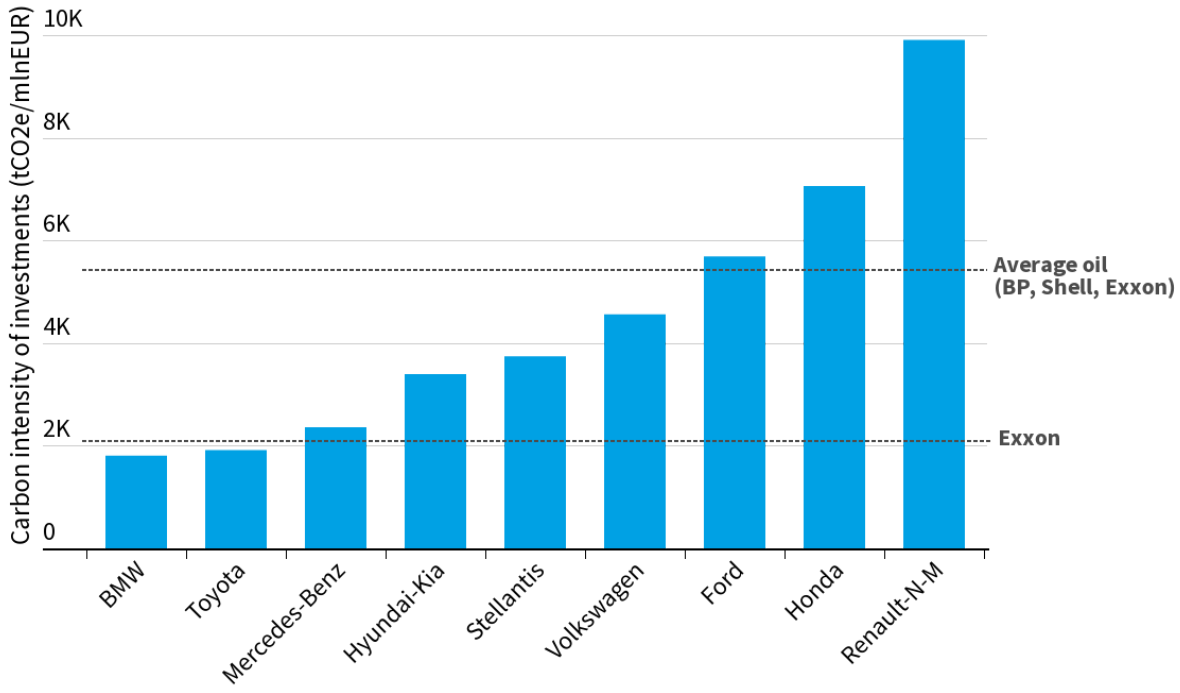
2. How much carbon are you funding?

With the European Commission's Regulatory Technical Standard C(2022)1931 supplementing the Sustainable Finance Disclosure Regulation (EU) 2019/2088, adopted on 6 April 2022, the EU has mandated the disclosure of Scope 1, 2 and 3 emissions for financial institutions in Europe.

The European Banking Authority, with its draft Implementing Technical Standard EBA/ITS/2022/01 on Pillar 3 disclosures of ESG risks published on 24 January 2022, has done the same for banks' portfolio of loans. Finally, the Corporate Sustainability Disclosure Directive will issue the same mandatory requirement for corporations based in the EU by the end of the year.

The life cycle CO_2 equivalent of activities and assets, as measured in scope 1, 2 and 3 will soon be the 'new normal'. The new normal will therefore expand KPIs such as financed emissions from being the voluntary initiative of a few, to a market standard. So, how many emissions is an investor financing when buying, for example, one million euro of shares or bonds issued by a car company? And how does it compare to other investments?

Figure 1.10: total emissions over market capitalisation (market close of 6/09/2022)[7]



Source: Carmaker and oil major annual reports

[7] This is based on the official scope 3 disclosures of carmakers and oil companies, not T&E's estimates. Oil companies are also likely to under-report their scope 3 emissions. However, we have no evidence to believe that the under-reporting is higher in any specific sector. On the contrary, in another analysis, evidence suggests the error must be rather homogeneous across sectors and is somewhat filtered out by the use of ratios. Furthermore, the chart does not compare companies' total emissions but the amount of emissions equivalent to a specific financial investment. This ratio is influenced by the appetite of the market for a specific company, so the higher the evaluation of the company, the lower the carbon intensity ratio.

The indicator we're looking at is expressed in ' tCO_2 per million euro of capital invested'. Since we haven't verified the emissions declared by other sectors, but simply taken those declared by the corporations and registered in the S&P database, we compare them with the declared emissions in the car sector, even if we have previously shown they seem to be underestimated.

The declared emissions have been compared to the market value of the corporations as of 6 September 2022 at 11 am (data reported in Table I.1, Annex I). A number of observations can be drawn from the table:

- The average of the car sector (4,524 tCO_2 per millionEUR) is twice as high as that observed for oil major Exxon Mobil, and close to the average of Exxon, Shell and BP. The dispersion around the average is large in the car sector but at least six out of the nine companies analysed have a higher carbon footprint than the average. And the three companies that are apparently below (Volkswagen, Stellantis and Hyundai) wouldn't be if the mid-of-the-range adjusted emissions were used.
- With the exception of the manufacturing of appliances and cement, none of the other analysed companies had such a high carbon footprint.
- This is probably the main reason why car companies trade with such low multiples. When charted against multiples, companies' carbon intensity seems to represent the main driver for modest evaluations. This relationship, that we call 'Carbon Trap' and that will be discussed in a separate article, would suggest that 1)a large part of the investors community is already pricing it in and 2) that, unless OEMs decarbonise their fleets fast, things can only get worse.
- In terms of relative value the comparison between giants VW and Toyota is quite intriguing. With virtually the same number of cars sold, emissions per car and revenues, Toyota enjoys a much more generous evaluation than its European counterpart. Hence the lower 'carbon per million' ratio. This is all the more puzzling as VW has plans to decarbonise its fleet whilst Toyota lags the market in every possible way. For investors sensitive to 'carbon intensity' there seems to be clearly more potential value in VW, should VW follow through with their announcements.

3. The Fallacy of ESG ratings

The mainstreaming of the ESG framework is the single most relevant change happening right now in the asset management industry. High ESG scores are mistakenly believed by many professional and non professional investors to be indicators of sustainability or *greenness* - companies that value and enact practices that put environmental and climate protection, social justice and inclusivity, and transparency in governance as a core of their business model. The truth is that the scores are heavily skewed towards the assessment of risks for the corporation and say very little on the impact the corporation has on nature and people.

The car sector represents possibly the most spectacular failure of ESG score to actually mean anything, particularly when considering environmental and climate protection.

S&P is a good example of the problem with ESG scores. The S&P Global ESG score is split into pillars that each carry a certain weight of the total score. For the Automotive sector the composition of the weights are:

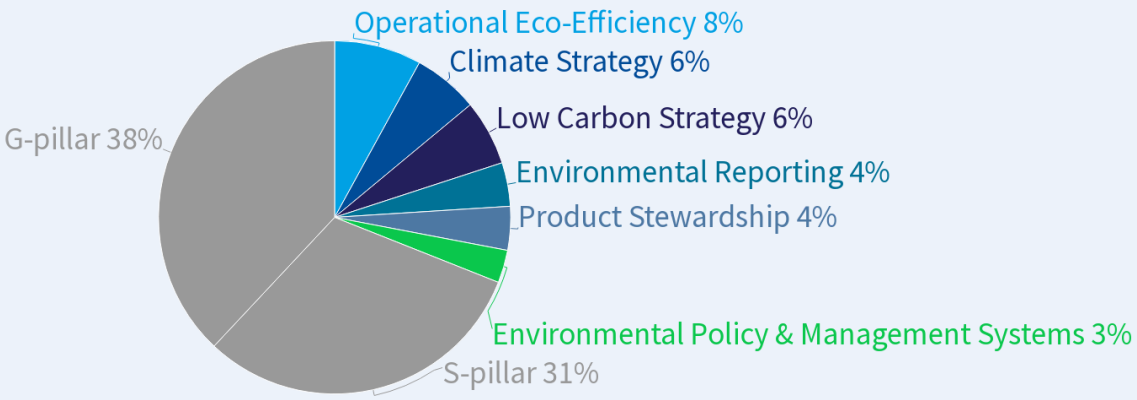
- E - 31 %
- S - 31%
- G - 38%

These weights are then split in sub-indicators determined by information that is self-reported by the companies. The Environmental's 31% is composed by the following:

- Operational Eco-Efficiency - 8%
- Climate Strategy - 6%
- Low Carbon Strategy - 6%
- Environmental Reporting - 4%
- Product Stewardship - 4%
- Environmental Policy & Management Systems - 3%

Info box 2: Unpacking the E pillar

Figure 1.11:

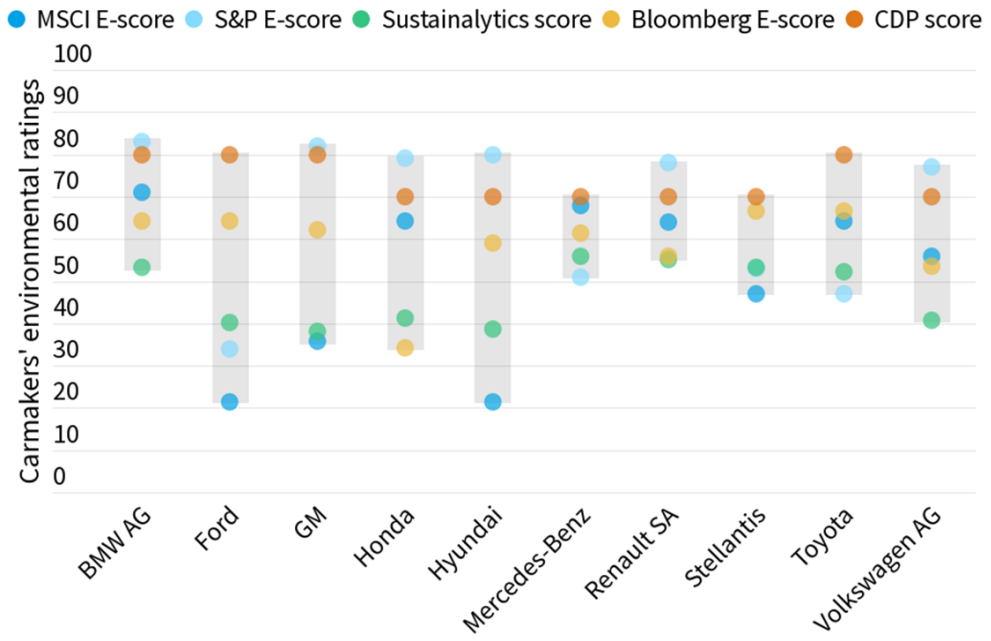


Scope 3 emissions only account for 10% of the 6% within the 'Climate strategy' sub-indicator. This means that scope 3 emissions in an emission heavy industry will only account for 0.6% of the total ESG-Score. This means that even if the score was 0 (and it never is) it would only detract 0.6 from 100.
So, despite CO_2 emissions, together with air pollution, being the most material of environmental KPIs for the sector, this specific parameter (emissions) is virtually ignored in the context of ESG ratings.
Let's repeat this and ponder the fact for a moment: emissions represent less than 1% of an ESG score in the car sector. Unsurprisingly, despite being one of the biggest sources of CO_2 in the world, car manufacturers score very high on environmental grounds.
The most obvious conclusion is that, for ESG ratings to retain any significance in the sector, the weight given to lifetime emissions needs to be substantially increased, to reflect the materiality of this specific KPI. For example, to represent 30% of the rating the weight of lifetime emissions over the total will need a fifty-fold increase.

3.1 Comparing various ESG ratings. Statistical comparison and re-basing

It is a well documented, and somewhat controversial, fact[15] that ESG ratings from different providers diverge substantially. The car sector seems to be no exception.
Correlations among the ESG ratings over the OEM sample show no meaningful relationships (except between MSCI and the inverted score of Sustainalytics). If we consider the E-pillar of MSCI, Bloomberg and S&P together with Sustainalytics and CDP ratings listed in the table for the car manufacturers and normalise them in order to obtain more homogeneous values (i.e. rescaling them to a range 0-100 and inverting Sustainalytics score which is a risk measure), we can express each car OEM with an ESG profile and each ratings with a distribution over the OEM sample. We can then compare how each OEM is assessed by the different providers and therefore how the OEM can be coherently interpreted in terms of its sustainability.
The E score of car manufacturers is generally hard to explain for us. In particular, it is hard to fathom how VW, for example, a company with the carbon intensity of an oil major, scores 77/100 for S&P or how Honda is rated 79/100 on environmental grounds.
Amongst the raters Sustainalytics seems to be the most 'severe'. MSCI, the most diverse in assessments with the highest variability. Overall it is hard to understand what utility would such a set of ESG ratings represent to an investor in this case.

Figure 1.12: Distribution of E scores according to various ESG raters (2020)



Environmental part of ESG scores rescaled to a 0-100 score where low values are less sustainable.

3.2 The impact of Scope 3 on ESG benchmarks. A spread too short?

Mandatory sustainability disclosures are about to enter a brave new era in the European Union. The combination of the disclosures mandated by the Taxonomy Regulation and the Sustainable Finance Disclosure Regulation will change things for good. Two key KPIs will bring the car sector to a rude awakening: Scope 3 emissions and Taxonomy alignment.

Given that the average ratio between Scope 1 and Scope 3 emissions is 98/2, the disclosure of Scope 3 emissions will multiply by nearly 100 car companies' CO_2e data.

In one of the world's most used indexes, the all world MSCI, the car sector represents about 3% of the total. This means that any portfolio that tracks the index will, as of next year, see its CO_2e content increase by, roughly roughly 3%. If you're an asset manager that is trying to reduce its Scope 3 emissions by an average of 3% in the next 30 years to meet your Paris goal, the change in disclosure will set you back a year or more.

It isn't just the absolute Scope 3 levels, that make car stocks and bonds particularly undesirable and incredibly close to oil securities, but rather the ratio between Scope 1 and 3 emissions. At even levels of direct emissions, for example, a furniture stock will determine modest increase in accounts emissions when shifting to Scope 3.

In a world that shifts its narrative from direct emissions to Life Cycle Analysis and Scope 3 emissions it is reasonable to expect a clear tendency to shift the asset allocation from high to low

Scope3/Scope1 ratio's securities. Relative value ESG traders will probably be shorting the ratio/spread.

4. The new kid on the block: the EU taxonomy

The Taxonomy Regulation[8] establishes the list of environmentally sustainable activities, and it mandates financial and non financial entities (funds and corporations) in the EU to disclose to what extent funds marketed as 'sustainable' are aligned with such definition. Such alignment, in the case of an investment fund for example, is represented by a Green Asset Ratio (GAR), literally a % of 'EU greenness determined by the weighted sum of all assets' greenness. The greenness of each individual asset is determined as a % of the corporation's revenue that are taxonomy aligned.
For example: if Volkswagen is 7% taxonomy aligned and it represents 1% of the overall portfolio, the portfolio will add 0,07% to its overall greenness.
The criteria for sustainability in the car sector were published on 9 December 2021 with the Climate Delegated Act applying as of 1 January 2022. The criteria are rather strict as they consider as 'sustainable' cars that emit 50gr CO2e/km (basically BEVs and PHEVs) until December 2025 and then, as of January 2026 only EVs or 'zero tailpipe emissions' vehicles (BEV and FCEV).
Corporations will have to disclose their alignment as of 2024 and at the moment the situation is estimated to look like as Table 1.3 indicates.

Table 1.3: Global 2021 sales and EV sales fraction.

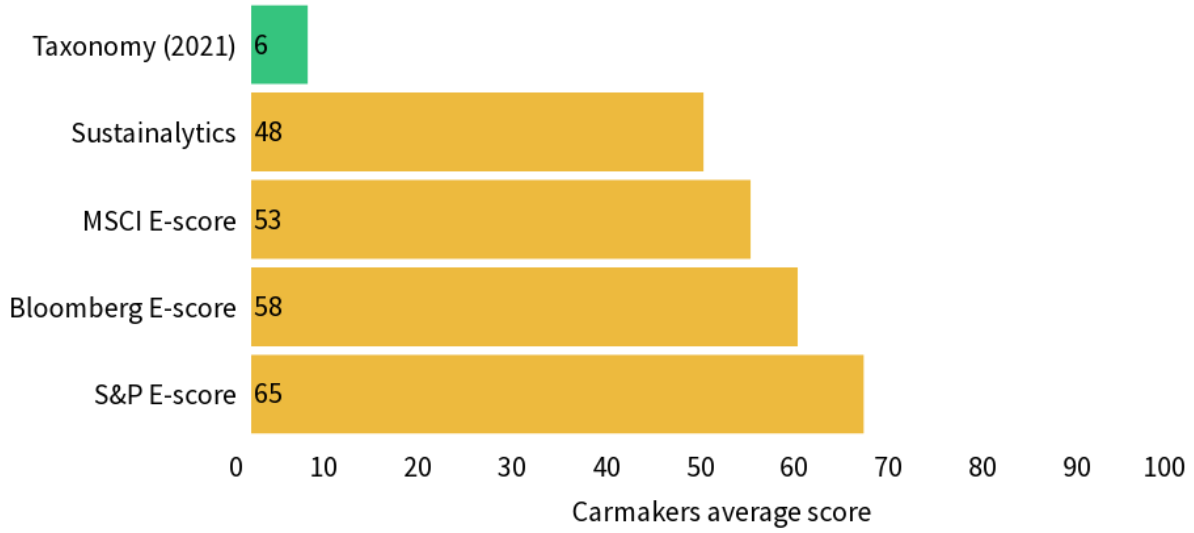
	Total vehicles sold (2021)	PHEV & BEV sold*	Taxonomy alignment*
BMW AG	2,521,514	328,314	13.0%
Hyundai-Kia	3,890,726	422,000	10.8%
Volkswagen Group	8,576,000	762,850	8.9%
Mercedes	2,751,366	227,458	8.3%
General Motors	6,291,000	516,634	8.2%
Stellantis	6,579,300	388,000	5.9%
Ford	4,200,000	117,497	2.8%
Renault–Nissan–Mitsubishi	7,509,150	433,455	2.5%
Toyota	10,495,548	112,000	1.1%
Honda	4,546,000	14,324	0.3%

Source: Global sales from 2021 annual reports. * Amount and percentage of PHEV and BEV sold in 2021.

Taxonomy scores are far from flattering for most manufacturers. The score has been structured as a pure impact score on climate mitigation. If compared with the ESG scores it's as if the entire E pillar was computed simply by calculating the % of EVs over the total sold. Unsurprisingly the E score of most raters pale in comparison with the severity of the taxonomy scoring methodology. The figure below represents the average E and taxonomy score for all 9 OEMs examined.

[8] (Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088)

Figure 1.13: Normalised E-pillar (0-100) ESG ratings and Taxonomy averaged on 9 carmakers (2021 data)



Source: T&E calculations of the taxonomy alignment of 9 carmakers based on 2021 sales.

4.1 Recommendations

1. ESG ratings in the car industry are leading to the wrong capital allocation and need urgent re-basing with, at least, a fifty-fold increase of the weight assigned to Scope 3 emissions.
2. As a consequence, also ESG indexes and benchmarks should be rebased. ESG rating agencies and benchmark providers need to adjust fast or lose completely credibility.
3. The EU needs to accelerate the process to legislate ESG ratings to end the wild west of methodologies that is creating confusion and leading to greenwashing.
4. Whilst these changes are implemented, investors should use the EU taxonomy as an E score, instead of that provided by ESG assessments.
5. To limit the impact of the 'carbon bomb' asset managers seem to be left the only option of **drastically underweighting** the car sector, with **divestment as a likely option**.

Annex I - Supplementary material

Table I.1: The index shows the ratio between CO_2 emissions and millions invested: the difference between declared and estimated data highlights the 'Carbon Trap'.

	Declared Emissions vs EUR millions invested (tCO2/mlnEUR)	T&E estimated emissions vs EUR millions invested (tCO2/mlnEUR)
Toyota	1,917	3,234
Volkswagen	4,558	7,179
Renault/Nissan/Mitsubishi	9,908	15,919
Stellantis	3,743	9,313
Honda	7,062	7,302
Ford	5,687	5,638
Hyundai-Kia	3,394	7,323
Mercedes-Benz	2,359	3,810
BMW	1,809	3,268
Exxon Mobil	2,059	
Shell	6,938	
BP	7,210	
AVERAGE OIL (BP, Shell, Exxon)	5402	

Bibliography

1. European Union. (2018). *A Clean Planet for all*. Retrieved from 52018DC0773 - EN - EUR-Lex

2. Mathieu L. How clean are electric cars? Transport & Environment report April 2020, online: https://www.transportenvironment.org/wp-content/uploads/2020/04/TEs-EV-life-cycle-analysis-LCA.pdf

3. Dornoff J, Tietge U, Mock P, On the way to "Real-World" CO2 values: the European passenger car market in its first year after introducing WLTP. ICCT White paper, May 2020, online: https://theicct.org/sites/default/files/publications/On-the-way-to-real-world-WLTP_May2020.pdf

4. The Greenhouse Gas Protocol. A corporate accounting and reporting standard - Revised edition. World Resource Institute. Online: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

5. Laura Aguilar Esteva, Akshat Kasliwal, Michael Kinzler (2019, 17 April), "Scope 3 Emission Assessment and Circular Economy Protocol Development at Ford Motor Company", Report N. CSS19-12, Center for Sustainable System, University of Michigan, online: https://css.umich.edu/sites/default/files/publication/CSS19-12.pdf

6. The Carbon Disclosure Project, Introduction and methodological notes. https://www.cdp.net/en/info/about-us

7. https://www.acea.auto/figure/average-co2-emissions-from-new-passenger-cars-by-eu-country/

8. Uwe Tietge, Peter Mock, Sonsoles Daíz, Jan Dornoff, CO2 emissions from new passenger cars in Europe: Car manufacturers' performance in 2020, ICCT Briefing August 2021, online: https://theicct.org/sites/default/files/publications/eu-co2-pvs-performance-2020-aug21_0.pdf

9. Greenpeace report 2021: Countdown to zero. Comparison of major automakers' carbon emission levels and compliance in China, the EU and the USA. Online: https://www.greenpeace.org/static/planet4-eastasia-stateless/2021/09/66f9a849-countdown-to-zero_20210922.pdf

10. Federal Chamber of Automotive Industries 2021 report, online: https://www.fcai.com.au/library/publication/20211231_fcai_co2_standard_report_-_industry_and_brand_final.pdf

11. Jan Dornoff, Uwe Tietge, Peter Mock, On the way to "Real-World" CO_2 values: the european passenger car market in its first year after introducing the WLTP, ICCT White Paper May 2020, online: https://theicct.org/sites/default/files/publications/On-the-way-to-real-world-WLTP_May2020.pdf

12. https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-20

13. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013L1O.pdf

14. European Commission, Directorate-General for Climate Action, Hill, N., Amaral, S., Morgan-Price, S., et

al., *Determining the environmental impacts of conventional and alternatively fuelled vehicles through LCA : final report*, Publications Office, 2020, https://data.europa.eu/doi/10.2834/91418

15. Berg, Florian and Kölbel, Julian and Rigobon, Roberto, Aggregate Confusion: The Divergence of ESG Ratings (August 15, 2019). Available at SSRN: https://ssrn.com/abstract=3438533 or http://dx.doi.org/10.2139/ssrn.3438533