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CARBON IMPACT ANALYTICS

2020 REPORT ON THE TRANSPORT SECTOR

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Executive summary

THE SECTOR'S KEY CHALLENGES

- The transport industry accounted for **24% of direct CO_2 emissions** (from fossil fuels) worldwide in 2019, or 8,258 million tonnes of CO_2 (*IEA*).

- Until the COVID-19 pandemic, the sector had been **constantly growing**: passenger transport activity increased by 74% between 2000 and 2015 (in passenger.kilometres), and the freight transport business by 68% over the same period (in tonnes.kilometres)[1]. The increase in demand for transport is correlated with an increase in population, and in GDP, so it is particularly strong in "developing countries", and considerable in "developed" countries.

- The transport sector is highly **dependent on oil products**: apart from rail-based transport, whose electrification is substantial and increasing, different means of transport (road, sea, air) rely 94% on oil derivatives. Alternative fuels and electric motorization are still underused in the sector.

- Equipment and investment related to transport is generally **significant** and has an impact over **multiple decades.** For example, the average life of an airplane is 30 years; for freight ships, 20 years and for locomotives, 30 years. The same is true for transport infrastructures such as roads, railways and ports, that may have a lifespan exceeding a century.
  Therefore, decarbonization targets must be planned in the long term.

- The **technological levers for decarbonization of transport will not on their own guarantee a reduction in sector emissions at a sufficient rate to limit global warming to a level well below 2°C**. Low-carbon alternatives are emerging in company strategies (electrification of vehicles, use of biofuels, energy efficiency). However, associated investment remains low, insufficient to meet the **targets** of reducing emissions compatible with a 2 degree scenario. So far, investment and low-carbon technologies have not been enough to cope with increased traffic.

- Setting credible targets for reducing emissions necessarily implies changes of vision on a large scale, and a multifactorial approach, such as the **Avoid - Shift - Improve** strategy: avoiding some travel (reducing volume of activity), shifting

[1]IEA, Energy Technology Perspectives 2016.

towards more fuel-efficient means of transport, improving the energy efficiency of transport.

COMPANY REPORTING AND CLIMATE AMBITIONS

- "Scope 3" emissions account for the majority of emissions (up to 96% of the total) for many companies in this sector: this is the case for logistics companies (who largely subcontract the transport themselves), operators and constructors of transport infrastructures (airports, railway stations, freeways, etc.), and vehicle manufacturers. Indeed, these "Scope 3" emissions **are not published extensively**, and are probably rarely monitored.

- **Only few companies have set Scope 3 reduction targets**, while **most of analyzed companies have set Scope 1 & 2 reduction targets, but those objectives remain marginal regarding their overall environmental impact.**

Introduction

This note summarizes the results of the CIA (Carbon Impact Analytics) analysis campaign conducted in the last quarter of 2020 on a sample of 140 listed transport industry companies. The CIA method seeks to measure a company's exposure to transition risk via an overall rating (from A+ to E-) and different sector indicators. Using our data, we ranked the analyzed companies in the transport sector according to their degree of exposure, but also observed the historical trends of their absolute emissions (Scope 1, 2 and 3), and assessed strategies pursued to align them – or not – with the world economy's decarbonization targets and reduce their exposure to transition risk. Note that the analyses were mostly conducted based on 2019 data, before the impact of the pandemic.

The transport sector stands out due to the wide range of stakeholders involved: equipment manufacturers, (e.g. car, truck, ship and airplane manufacturers), infrastructure operators, and transport operators. Analysing automotive equipment manufacturers provides a close-up view of the individual behaviour for use of cars (or LDV: Light Duty Vehicle). Contrastingly, analysing transport operators provides a general view of emissions from freight, and then from collective transport, (rail, urban, air).

1.

Transport sector presentation

1.1. The key challenges of the sector

1.1.1. Transport, a particularly polluting sector

Sustained growth in operating activities

Until the impact of the pandemic, whose long-term effects on physical flows are not yet known, the transport sector had been constantly growing since 1990, both in terms of passengers and goods transported. Between 2000 and 2015, passenger transport activity increased **74%**, in passenger.kilometres; and freight transport increased **68%** over the same period, in tonnes.kilometres[2].

In the last 10 years, the sectors operating activity increased by an average of **1.9% per year**, particularly significant in non-OECD economies, which have seen high demand for faster mobility.

High dependency on petroleum products

The transport sector relies on oil for **94%** of its energy needs, and is the sector with the least diversity in this respect. Indeed, oil-based fuels have two major advantages: in energy terms, they are very dense both per unit of volume and per unit of weight[3]. Accordingly, they are well suited for the transport industry, as vehicle size and performance limit weight and on-board energy. The sector is therefore not particularly resilient concerning its energy provisioning.

Continuously increasing emissions

Continuous dependency on fossil fuels implies that almost all of the increase in energy consumption in the sector resulted in an increase in greenhouse gas emissions.
Moreover, **gains in energy efficiency from new equipment have always been annihilated by increases in transported volumes**, which has prevented a reduction, or even stabilization, of emissions in the past. Indeed, decoupling greenhouse gas emissions from increasing transport volumes is limited, if not impossible.

[2] IEA, Energy Technology Perspectives 2016.
[3] Thus, one kilo of oil provides 12 kWh of energy, whereas one kg of high performance battery provides just 0.2. This explains how oil prevailed over electricity a century ago, whilst the two types of motorization were developed at more or less the same time.

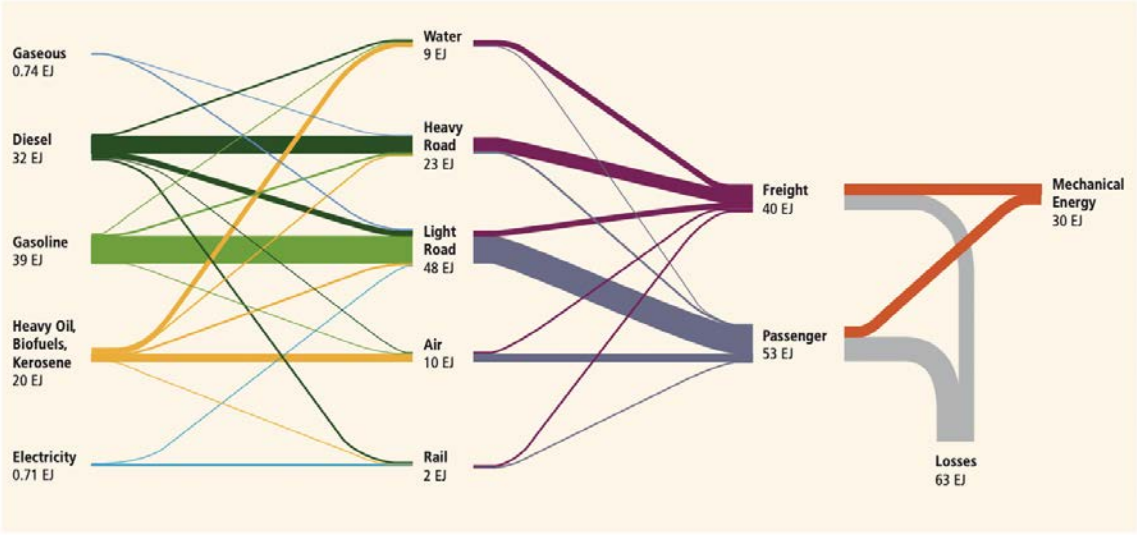
1.1.2. The sector's carbon footprint

Therefore, the transport sector is a sector with significant climate challenges. Emissions from transport of goods and passenger are estimated at **24%** of total CO_2 emissions caused by burning of fossil fuels (and so not considering vehicle manufacture or building of infrastructures), and **14%** of total emissions. In 2018, total emissions (burning of fossil fuels) in the transport sector reached **8,258 million tonnes of CO_2**[4].

Vehicles account for most transport emissions

Road vehicles alone (cars, trucks, buses) release about **75%** of transport-related emissions. Accounting for **45%** of emissions alone, private vehicles (or LDV, light duty vehicles) have the greatest impact[5]. The climate impact of personal cars is examined by analysing vehicle producers and equipment manufacturers. Emissions from vehicle users are part of Scope 3 emissions (downstream) for companies in the automotive sector: they account for 95% of total emissions calculated for the sector.

Trucks are the second most significant category for carbon emissions, releasing **21%** of transport-related greenhouse gas emissions. Their impact can be seen by analysing road freight forwarders. Air traffic (airlines) accounts for about **12%** of the sector's emissions, marked by significant growth: +5% per year since 2000, whereas the sector average is 1.9% over the same period. Sea transport (shipowners) accounts for **11%** of transport emissions. Finally, rail (railway companies) account for just **3%** of total transport-related greenhouse gas emissions, whilst it accounts for 9% of passenger flows and 7% of freight flows.



The graph shows final energy consumption of fuels by transport mean in 2009 for freight and passengers. Thermal energy losses account for about two thirds of total energy consumption, with a conversion rate from fuel to kinetic energy of about 32%.
N.B.: Line gage contributes towards total energy flows.
Chapter 8 - Transport of Climate Change 2014: Mitigation of Climate Change.

[4] Energy consumption in transport in IEA countries, 2018.
[5] IEA, Energy Technology Perspectives 2016.

1.1.3. A sector sensitive to numerous transition risks

Transition risks are defined as uncertain financial impacts (positive or negative) that result from a transition towards a low-carbon economy on different stakeholders.

Increasingly restrictive regulations

The major risk of transition for the transport sector is the sharp rise in regulatory or tax constraints applied to vehicles or fuels.

On January 1, 2020, the European Union introduced annual regulation of CO_2 emissions for light vehicles for the 2020-2024 period. For every vehicle manufacturer, emissions must now not exceed an average of 95 g of CO_2/km for all vehicles sold in the year. Penalties (of €95 per gCO_2/km per vehicle) will be applied if a manufacturer does not meet these limits. However, vehicles considered to pollute little (zero-emissions light duty vehicles; electric or hybrid) are considered favorably.

At European level, the "Emissions Trading System" (ETS), introduced in 2005, caps the emissions of a number of highly polluting industrial sites. Additional emissions from these sites must be bought, at a price set by supply and demand, by sites that have not used their full quota. In May 2021, the European Commission announced that the system would be extended to the transport sector, which will push companies to decarbonize their operations. In 2021, a tonne of CO_2 reached €49 and will probably continue to rise with the strengthening of climate policies (we estimate that the cost that would actually change behaviour in the transport sector exceeds €100 per tonne)[6].

A rise in the price of carbon for transporters implies a rise in costs for end users, and so a potential decline in activity for the most polluting means of transport.

Finally, other eco-contributions focusing on the most intensive means of transportation could also be set, on use of freeways or air transport. These could encourage consumers and companies to take measures to reduce their footprint.

A sector highly sensitive to the price of hydrocarbons, and now metals

The transport sector is extremely exposed to the volatility of oil prices, especially in importing countries. These variations may affect the stability of a company's business model.

Paradoxically, it may have negative consequences when barrel prices drop: thus, when oil prices fell in 2020, airlines that had hedged against rising prices by buying a share of

[6] Interview with Michel Colombier, Décryptage Mobilité Carbone 4, June 2021.

their fuel needs two or three years in advance at a price higher than current costs observed considerable losses[7].

The price evolution of **metals** (lithium, cobalt, nickel and copper) used to manufacture electric vehicles, as well as the electrification of the economy in general, is also worth exploring. Metal prices have been increasing constantly since climate policies have been strengthened. This trend should continue, even if there is an increase in supply in the medium term, meeting demand in the long term may be more difficult and lead to growing pressure on the prices of these metals. The IEA's sustainable development scenario (SDS) forecasts that between 2020 and 2040, world demand for lithium will rise more than fortyfold, whilst demand for cobalt and nickel will rise about twentyfold. This rise in demand will be largely due to electric vehicle batteries. In addition to an increase in demand, the availability of rare earth is not ensured on the long term, and companies that are highly dependent on these resources have low visibility on actual reserves and production volumes, since resources are concentrated in few countries, in which information might be difficult to obtain (for example, about 60% of extraction and about 90% of rare earth processing takes place in China).

New, disruptive technologies

According to the IEA, the share of electric vehicles (EVs), including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), in the global vehicle fleet rose from 1.0% in 2017 to 2.6% in 2019 and 4.6% in 2020[8]. This increase is the result of user demand for passenger transport alternatives considered as low-carbon, but also efforts from politicians through dedicated subsidies.

The rising demand for less carbon-intensive vehicles primarily benefits market stakeholders pursuing a strategy of electrification, and more widely, those producing more fuel-efficient vehicles. However, rising demand for SUVs (total market share of 40% in 2019 vs. 25% in 2014, according to the IEA), which are heavier and more powerful vehicles than average, and thus more fuel intensive, is one obstacle to the sector's decarbonization target.

Besides the emergence of less polluting vehicles, there is a second, more behavioral trend towards greenhouse gas emission reduction. This includes changing the way cars are used (car pooling applications and car sharing platforms), as well as switching to alternative means of transport (public transport, bicycles and other electric mobility).

[7] https://www.capital.fr/entreprises-marches/british-airways-iberia-perte-colossale-pour-le-groupe-iag-1395250
[8] IEA, Tracking Transport 2020.

Polluting stakeholders forced to reinvent themselves

Finally, there are also reputational risks, which tend to stigmatize the most polluting stakeholders.

For the automotive industry, *Dieselgate* has raised the issues of diesel-induced air pollution, and pushed manufacturers to transition towards electric vehicles - especially Volkswagen, where the scandal arose. A year after events began, VW announced its electric transition plan, "TRANSFORM 2025+". In addition to being costly (Volkswagen paid around 9.5 billion US dollars in compensation and legal fees in the US alone), the event led to a reduction in demand for thermal vehicles (particularly diesel ones).

The *Dieselgate* triggered the decline of diesel engines, which vehicle manufacturers had relied on until the scandal to reduce their greenhouse gas emissions. While diesel accounted for 57% of car sales in France in 2015, it represented no more than 31% in 2020, according to the *Comité des Constructeurs Français d'Automobiles* (French Car Manufacturers's committee) figures. Therefore, electric motorization is becoming essential for meeting the increasingly strict emissions targets set by regulations and maintaining trust among clients.

The air sector is also starting to become stigmatized, for instance with the *"Flyg skam"* (shame of traveling by air) in Sweden, which aims to adopt a more sober behaviour. However, it remains a marginal trend, as awareness of the collateral damage associated with air transport is not yet universal.

Towards adoption of new business models?

Since the early noughties, it has been noted that on average in the OECD, mileage covered per adult has stabilized, and has reached "peak travel" (Goodwin, 2012)[9]. In towns and cities, a fall in mileage covered by households, and a reduction in vehicle purchases can be observed. This is not the case in "developing countries", where transport flows are rising continuously.

In the OECD, "new mobility" is sustained by public policies, for example via promotion of public transport, subsidies for "soft mobility", and penalties for using cars (taxes on fuels, rising parking charges). Although increased urbanization may lead to increased use of private vehicles, due to urban sprawl, it is also an opportunity to change user behaviour. Metropolis densification could have a negative impact on the advantages of owning a vehicle (parking constraints and reduced effectiveness of travel - traffic jams). Therefore, the automotive sector economic model may change to a transport services model, in which the vehicle is no longer an item that is bought, but a service in its own right (hiring, sharing). Companies preparing for this transformation would then stand out from others relying on a sustainable "owner" model. This trend towards the vehicle as a service emerges on the frontier between the automotive sector and Big Tech companies:

[9] Peak Travel, Peak Car and the Future of Mobility, OECD, International Transport Forum, 2012.

stakeholders such as Tesla epitomize this market shift, and are beginning to challenge traditional stakeholders in the sector.

1.1.4. What levers are needed for the transition to succeed?

To achieve a reduction in greenhouse gas emissions and meet the Paris Agreement, the sector needs to act according to the "Avoid/Shift/Improve" concept:

- ➔ **Avoid**: focus on reducing transport activities, both in terms of quantities (passengers or goods) and distances covered.
- ➔ **Shift**: use less intensive transport means; this is possible mainly by prioritizing less polluting transport.
- ➔ **Improve**: make efforts focusing on the intensity of transport, increasing the load for each journey (occupancy rate) and reducing energy consumed per unit of volume and distance (more recent vehicles and fleet electrification).

The main constraint to implementing these levers is the inertia of financing vehicles and transportation systems. In fact, infrastructures and certain vehicles such as trains and airplanes have a very long lifetime (several tens of years), which implies a poor dynamic of technical improvement. Hence, investments in low-carbon transport systems need to be extensive and maintained long-term.

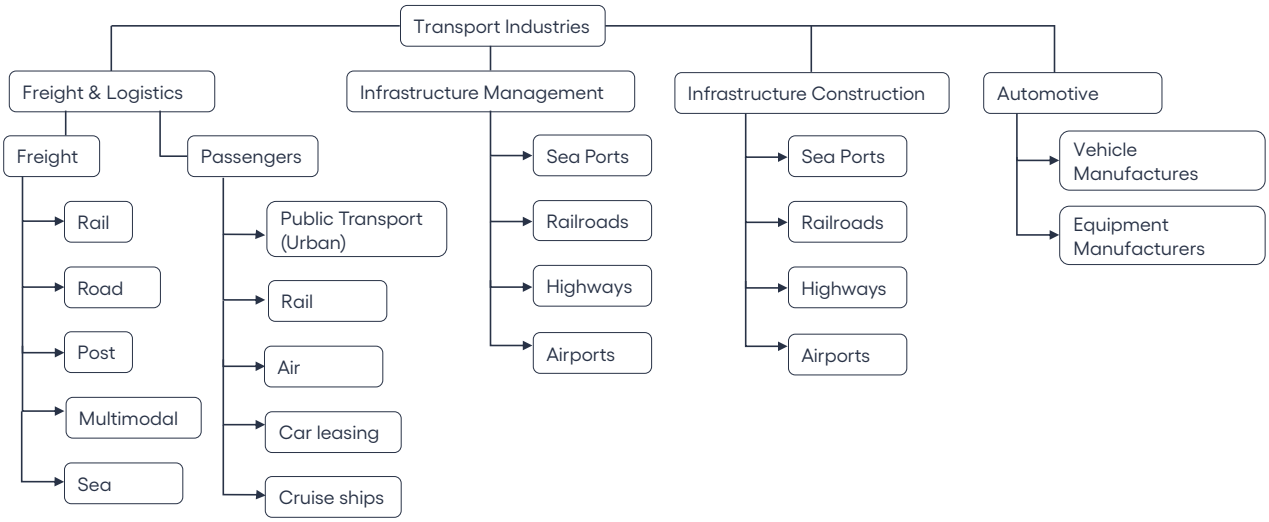
1.2. Classification and presentation of stakeholders

The analyses are conducted based on the latest data available, and depend on the reporting schedule of each company. For each campaign carried out in the fourth quarter of 2020, most analyses were conducted based on 2019 data.

Each transport activity is analyzed with specific methods, however, underlying emissions factors are common for the whole transport sector. Indeed, the methods are essentially based on the emissions induced by a vehicle's fuel consumption, both for operators and transport facilitated by an infrastructure, and vehicle manufacturers.

The transport sector is divided into four main types of stakeholders:

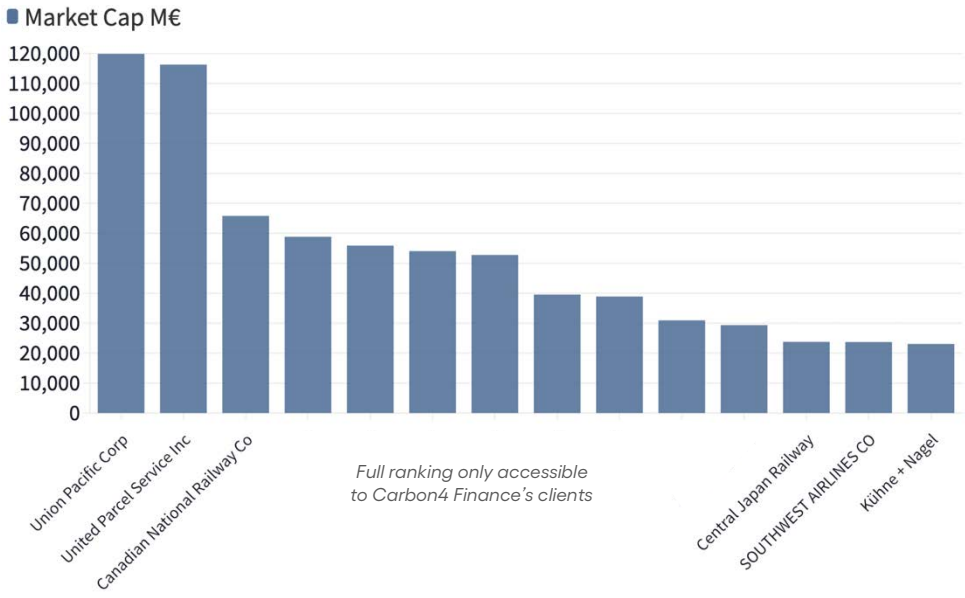
- ➔ **Transport operators** (passengers and/or freight): airlines, shipping companies, rail and road operators.
- ➔ Transport **infrastructure operators** (air/rail/road/sea)
- ➔ Transport **infrastructure constructors** (air/rail/road/sea)
- ➔ **Vehicle producers and equipment manufacturers**



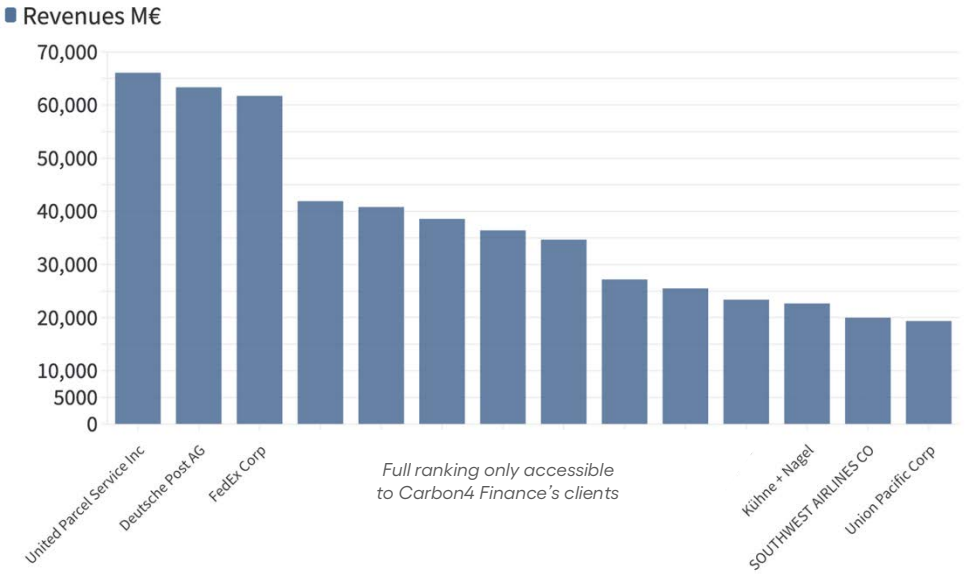
The first three categories consist of 110 companies analyzed (including around 75 listed companies). These 75 companies account for 55% of market capitalization in the transport sector (or €1,079 billion). They offer a comprehensive view of emissions from public transport stakeholders (primarily air, rail, urban multimodal) and the freight sector (road, rail, sea, and to a lesser extent, air).

Financially speaking, major **transport operators** stand out in two ways:

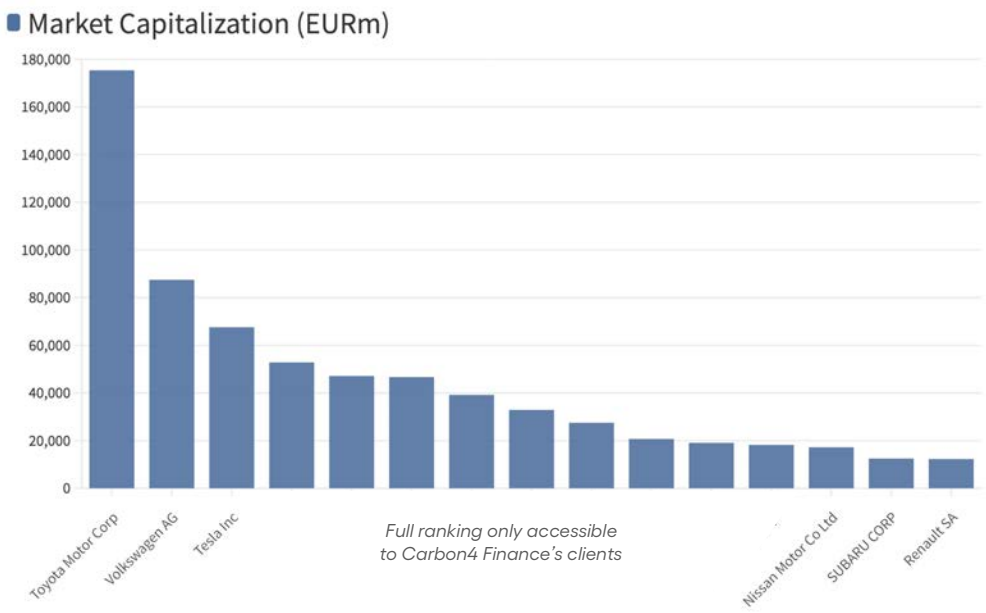
By using the market capitalization, we notice that rail companies are dominating the top of the ranking. Indeed, these companies have large rail networks, so the extent of their assets can be seen in the capitalization of these companies. Therefore, a company's market capitalization is not necessarily a good indicator of the flows actually transported.



Revenues are a better indicator of the extent of physical flows. Unsurprisingly, we find that postal companies and airlines are the most greenhouse gas-intensive activities:



The most emissive category is **automotive manufacturers**, of which 30 companies (21 vehicle producers and 9 equipment manufacturers) have been analyzed. These companies have a capitalization of €733 billion, accounting for 31% of market capitalization in the automotive sector. For this sector, the 15 largest companies account for over 90% of the total market capitalization for the companies analyzed. They are all vehicle manufacturers. The largest equipment manufacturer is Valeo SA, which is 16th in total market capitalization. The five largest companies (Toyota, VW, Tesla, Daimler and BMW) alone account for 60% of the industry total market capitalization. As the analyses were conducted in 2019, the recent dominance of Tesla, which became the sector's number one stakeholder in the second half of 2020, is not reflected in the graph below.



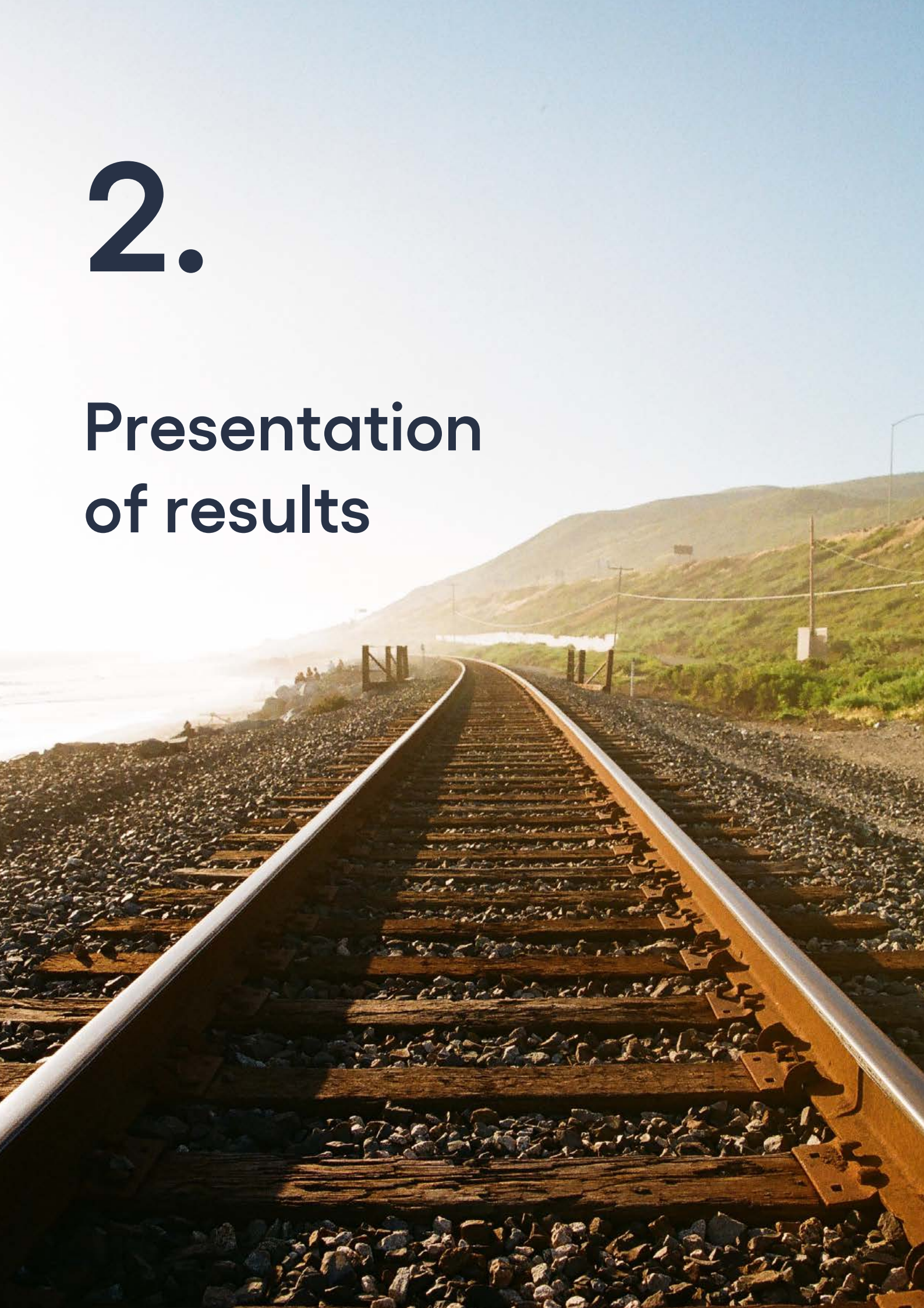
The specificity of the automotive sector is that it mostly represents private transport: the majority of light vehicles are intended for private travel, unlike transport companies, which structure collective travel.

The automotive sector accounts for about 45% of total travel-induced emissions[10]: it holds a special place in the transport sector.

[10] IEA, Energy Technology Perspectives 2016. Towards Sustainable Urban Energy Systems.

2.

Presentation of results



2.0. Review of the CIA Method

2.0.1. Score composition

Companies are assessed using a score divided into three subcriteria:

- **Past** performance: reduction in the company's carbon intensity over the last five years (change in the greenhouse gas emissions/volume of activity ratio)
- **Current** performance: the company's current carbon intensity (see inset below)
- **Forward-looking** performance: assessment of the stakeholder's climate strategy (reduction targets, low-carbon investments, etc.)

To assess the carbon intensity of stakeholders in the transport industry, we compare the company's greenhouse gas emissions (tonnes of CO_2) to the quantity of passengers or goods transported multiplied by the total distance covered: **tCO_2/p.km** or **tCO_2/t.km**. For passenger transport activity, we use the **p.km** indicator (total number of passengers × total distance covered in km); for freight activity, we use the **t.km** indicator (total quantity of goods transported in tonnes × total distance covered in km). For the automotive sector, the **gCO_2/km** indicator is used.

The method is detailed in full in the ***Appendix***, at the end of the document.

2.0.2. A few notes on Scope 3

As a reminder, Scope 3 corresponds to the company's indirect emissions. **Upstream Scope 3** covers company suppliers' emissions (including associated freight) and **Downstream Scope 3** covers company clients' emissions (including associated freight). Scope 3 often accounts for a preponderant share of company emissions:

- For transport infrastructures, Downstream Scope 3 emissions from use of transporting vehicles predominate.
- Similarly, most of a vehicle manufacturer's emissions cover use of vehicles during their lifecycle.
- Finally, logistics companies often massively use subcontracting for their activities. Subcontractors' emissions are Upstream Scope 3 emissions (services purchased).

In most countries, and for companies listed on financial markets, there are transparency obligations for Scopes 1&2 only, and Scope 3 is therefore reported very little. Accordingly, Carbon4 Finance always recalculates key Scope 3 emissions based on company activity. This ensures:

- That the company is analyzed according to its role in the greenhouse gas emissions chain. For example, for a vehicle manufacturer, plant energy efficiency is a minor lever for decarbonization: greenhouse gases emitted by vehicles during their use phase represent the essential impact of carbon on the activity.
- Applying the same Scope 3 emissions calculation method to all stakeholders enables a fair comparison.

2.0.2.1. Subcontracting for logisticians

The consideration of **subcontracting** is a major addition of the 2020 update on transport sector operators. Multimodal freight transport companies such as DSV Panalpina, C.H. Robinson Worldwide or Kühne + Nagel see some of the highest sales in the transport sector, but CO_2 emissions that are very low compared with the volumes transported, as they only report on Scope 1 & 2. In reality, most emissions in their value chain come from subcontractors' vehicles (transporters chartered by logisticians), of which use is particularly important within the logistics sector, especially for multimodal transport providers.

As an example, GEFCO, a leading European logistics company, which specializes in the automotive sector, and one of few companies to report their subcontractors' emissions, Scope 3 emissions account for over 95% of total emissions. To score companies, Carbon4 Finance considers Scope 3 from subcontracted transport, not just Scope 1&2. Intensity in tCO_2/t.km used to compare stakeholders with one another indeed includes emissions from outsourced transport. Similarly, reduction targets are considered from the point of view of the most significant emissions (choice: Scope 1&2 direct emissions, Scope 3 subcontracted or both).

2.0.2.2. Automotive manufacturers

Scope 3 emissions from vehicle producers, caused by use of the vehicle during its lifetime, are calculated according to three criteria:

- the carbon intensity of vehicles produced (gCO_2/km) (directly correlated with fuel consumption, l/100 km)
- the vehicle's total mileage in the course of its life cycle
- the fraction of Value Added by the manufacturer in the vehicle's final price.

The share of value added is used to avoid double-counting of the car's downstream emissions when multiple stakeholders are involved in its production chain. Each stakeholder will "inherit" the fraction of emissions from manufacturing and using the vehicles *pro rata* to the share of their value added in the total final price of the vehicle.

Note that for the vehicle carbon intensity, we calculate **real emissions,** from actual consumers in the use phase, which are higher than the emissions declared by

manufacturers, which are obtained during specific testing cycles, that does not accurately reflect real driving conditions.

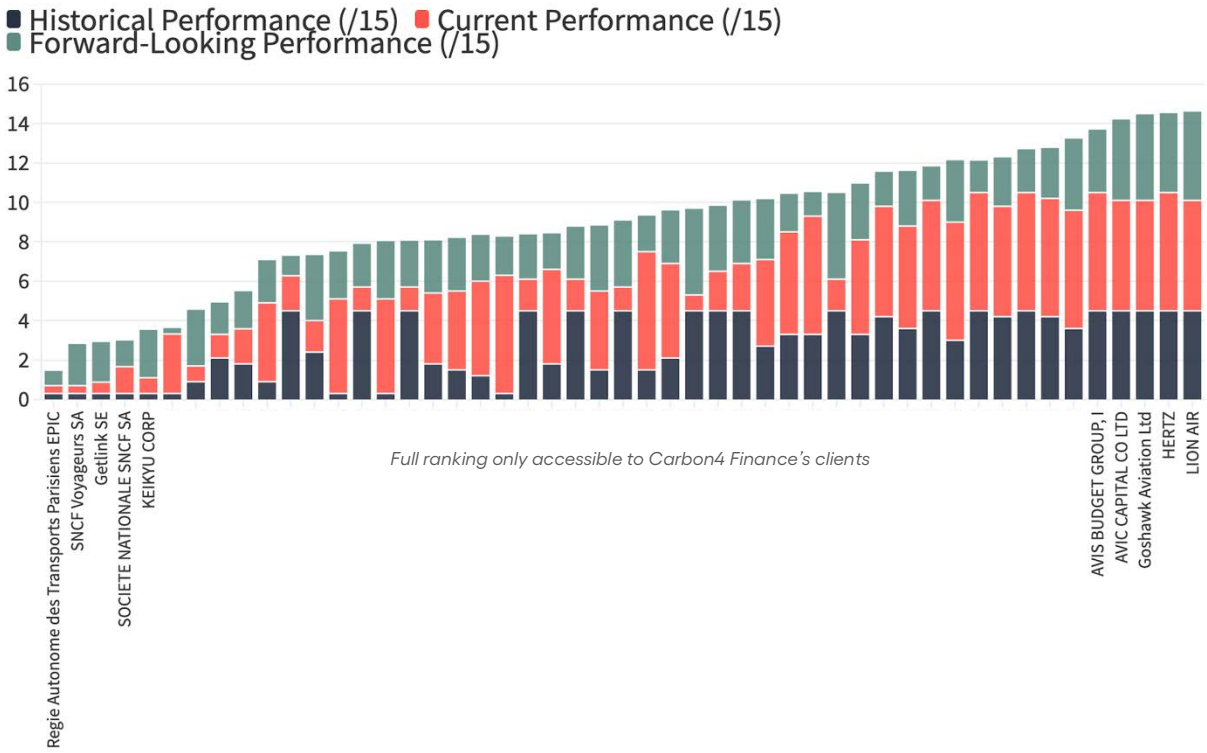
2.1. Transport operators: overall analysis

Generally, classification of companies in the transport operators' sector is largely indexed on the carbon intensity of the transportation mean used. Accordingly, as a whole, the results of this analysis campaign are quite intuitive: the more a stakeholder uses a carbon-hungry means of transport, the worse is its score. However, looking at the distribution of scores in comparable groups of stakeholders is more interesting.

2.2. Passenger transport

2.2.1. Results in the sector as a whole

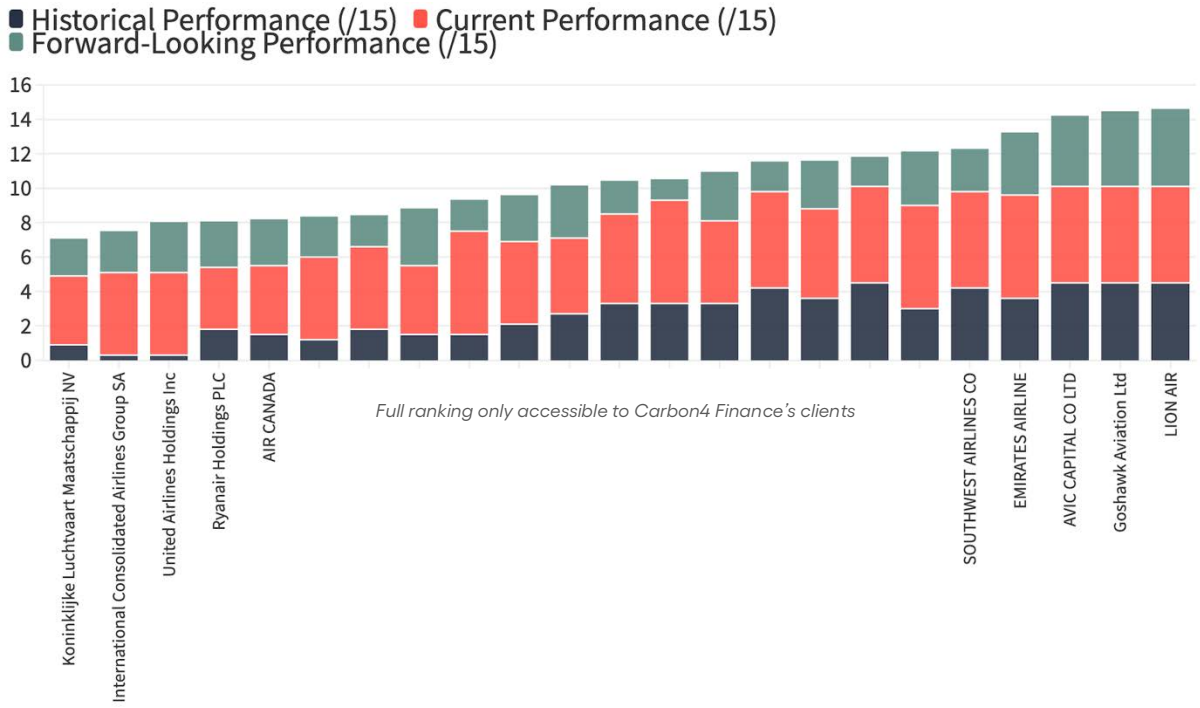
With the CIA methodology, a low score corresponds to a stakeholder resilient to the carbon constraint, whilst a high score indicates a significant risk of transition for the stakeholder.



There are 3 major company profiles:

- ➔ On the left of the graph, we see the most performant companies (low score). This is mostly due to the use of an energy-efficient mean of transport, and mostly concerns rail companies. Furthermore, the companies with the best scores demonstrate that they have considerably reduced their emissions, in terms of reduction in carbon intensity in the last 5 years and they implement convincing climate strategies. Finally, climate-related reports are generally of a good quality.
- ➔ Most companies receive a score between 8 and 12. They are more diversified, their average score coming from a good performance regarding at least one element in the score: reduction in their carbon intensity in the last 5 years, low-intensity means of transport or pursuit of an ambitious decarbonization strategy.
- ➔ Finally, across other companies (on the right of the graph), poor scores are based on the use of intensive transport means (airplanes/cars), often coupled with not particularly transparent climate reporting.

2.2.2. Airlines



Air transport accounts for the largest sample of companies analyzed.

For airlines, the primary levers for reducing emissions per p.km are the accelerated renewal of their fleet (adoption of more fuel-efficient models), that is largely used by the most ambitious companies, and the constant quest for a higher fill rate. Note, and this is

one of the limits of our method, that this does not guarantee reduction in emissions at absolute value. A number of companies evoke shifting towards agro-fuels to completely decarbonize their activity, but in practice, their use is very marginal to date. In addition, and given the low level of current use, companies are often unable to prove that consumed biofuels do not cause deforestation (this limit will be even more difficult to observe if volumes increase). Replacing kerosene with biofuels is beneficial to the climate provided that cultures do not encroach upon food production. Rather, this induces, directly or as a result of a domino effect, deforestation, and the corresponding emissions do not compensate for those avoided through reduction in oil product use.

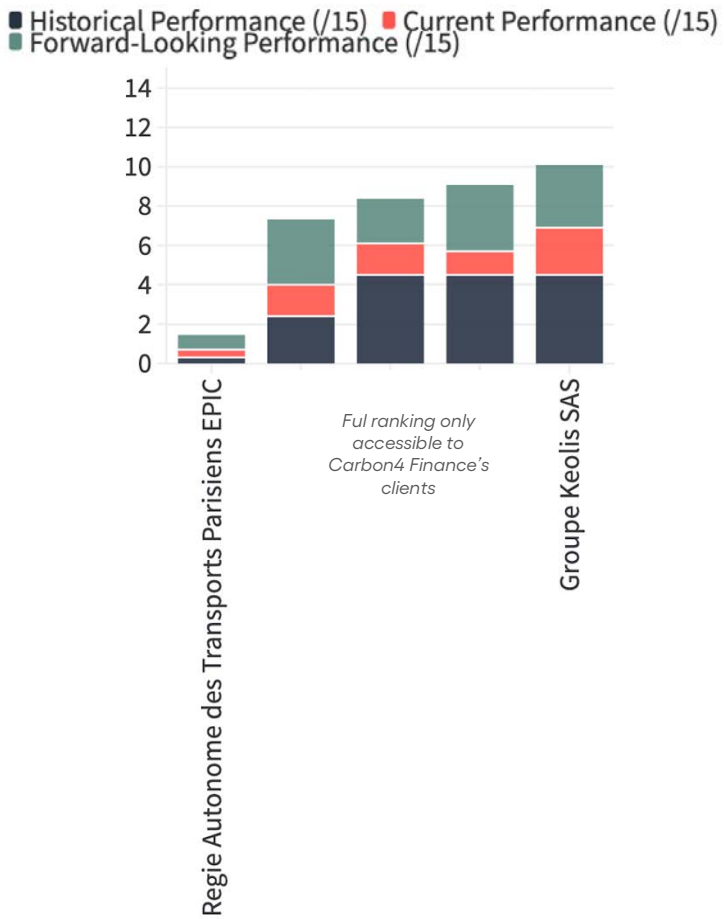
For an airline company to get a good score, several conditions must be met:

- ➔ It must be able to prove that it has **significantly reduced its carbon intensity** over the last five years, which requires renewing the fleet with more recent, more efficient airplanes. In practice, this condition is very rarely met.

- ➔ It must also be able to obtain a carbon intensity (in tCO_2e per number of passengers + tonne of freight per km) as low as possible. This requires a modern fleet, but especially **high fill rates**: this is the argument used by low-cost companies such as Ryanair when demonstrating a degree of environmental efficiency.

- ➔ Finally, it must set **ambitious and realistic reduction targets**, and invest in less energy-intensive airplanes continuously. Here, we see major companies that seek to decarbonize considerably. However, US companies (which obtain the best forward-looking scores) may have declared unattainable reduction targets. For now, scores are based on companies' declarations, rather than our own appreciation of what is realistic, which sometimes provides surprising results.

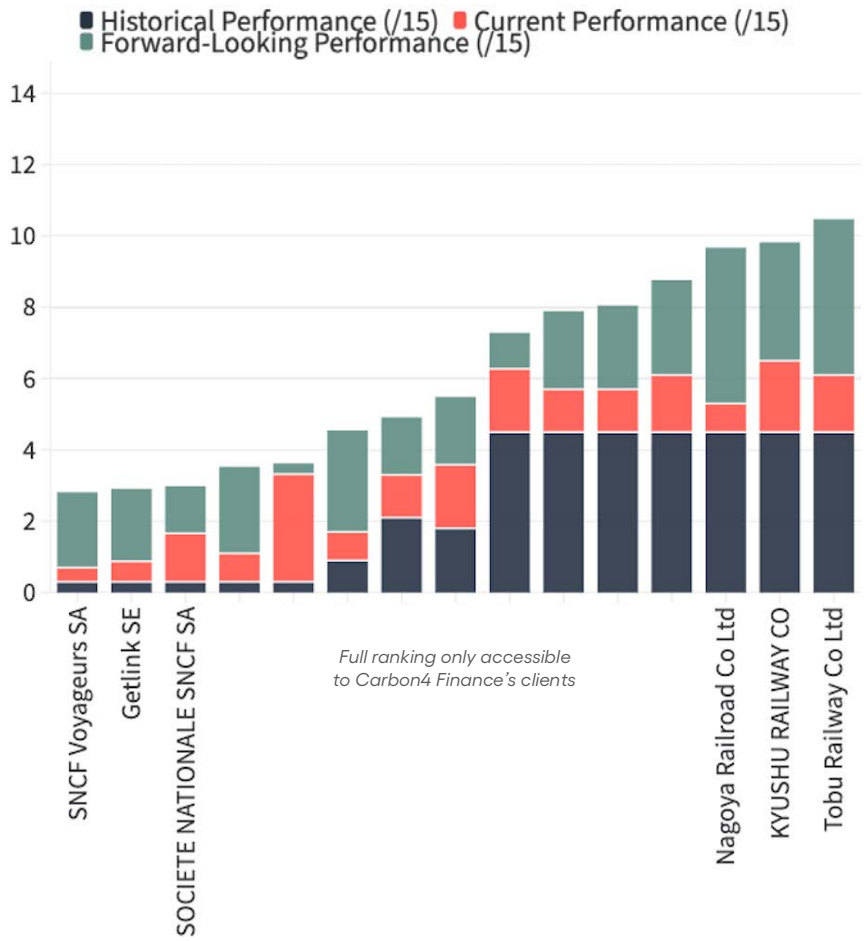
2.2.3. Public transport companies



Companies in this sector use urban transport networks: metro, bus or taxis. They are often smaller companies, some of them being listed, and some being private, owned either by private stakeholders or the State.

These companies generally have a carbon intensity far below average. This comes from the high fill rates that public transport enables.

2.2.4. Rail companies

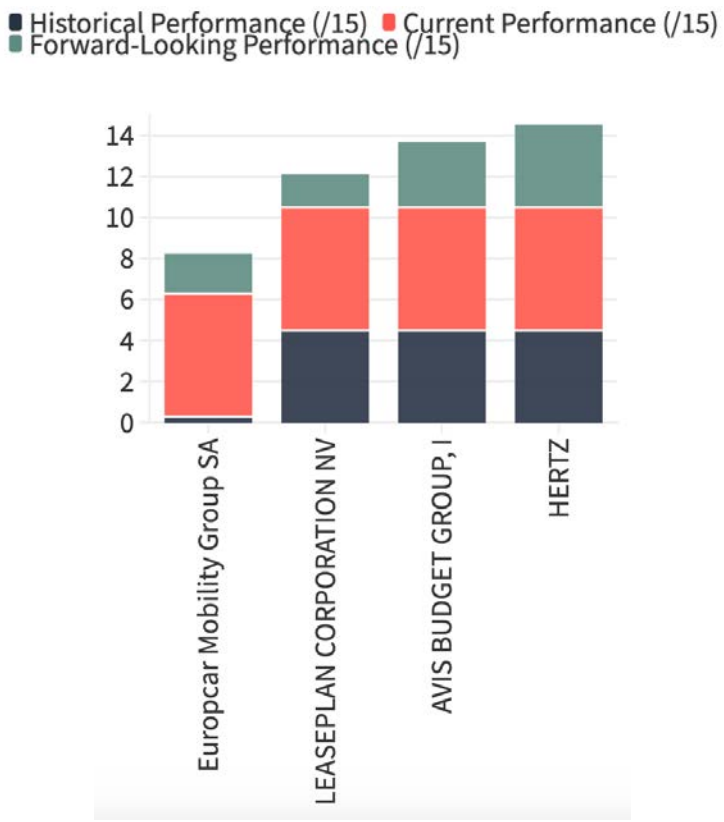


Rail transport remains the least energy-intensive means of land transport, which does not prevent stakeholders in the group from being ambitious in their decarbonization strategy, often with electrification of locomotives being the key to the reduction of their carbon intensity.

These companies are often public, and may be partially held and financed by States.

Some of the Japanese companies score less than other stakeholders, this difference due to lack of transparency of data reported (p.km and emissions) that prevents calculation of the past score.

2.2.5. Car leasing companies



These are vehicle hire or long-term leasing companies (mainly LDV or light duty vehicles).

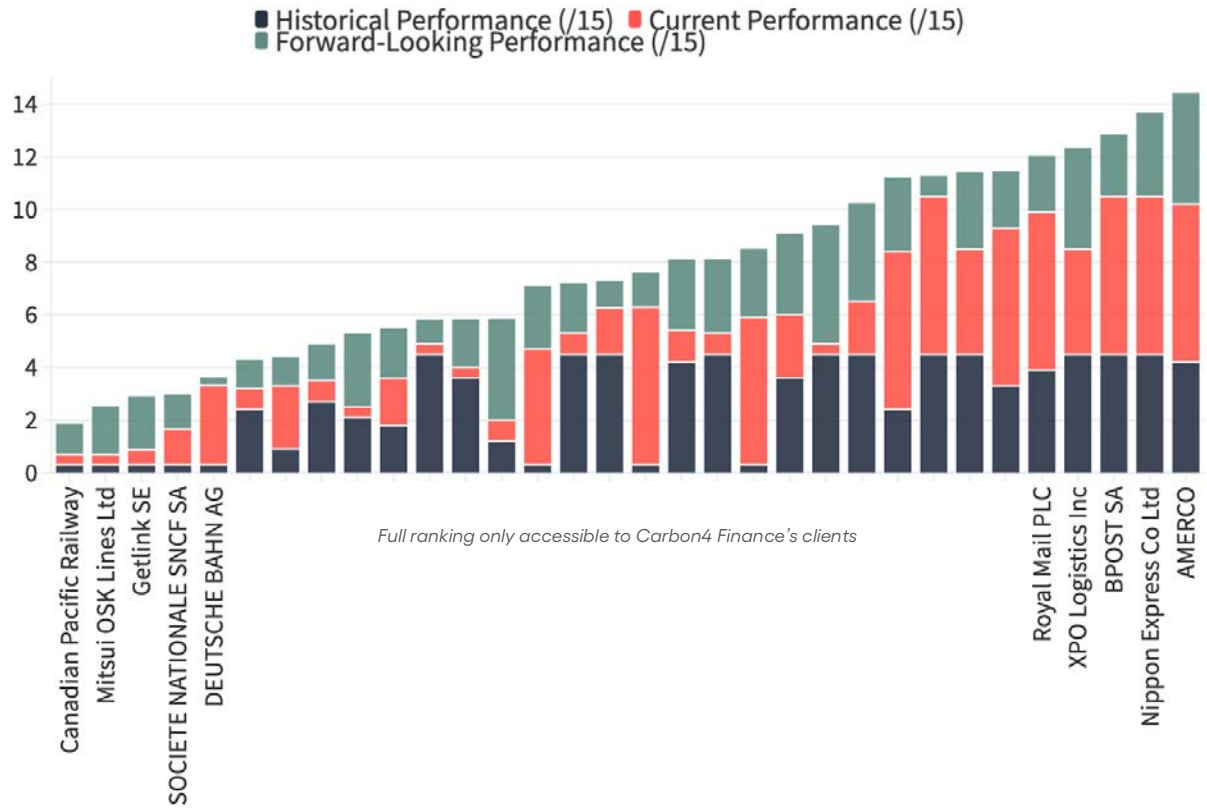
Depending on these companies' method of reporting, emissions associated with vehicle use (consumption of gasoline and diesel) are categorised as Scope 1 or Scope 3 emissions.

Historically, most of these operators have never wanted to report on hired vehicle user emissions. Recently, some stakeholders have started to do this in Scope 1 (previously, they were sometimes reported in Scope 3, or not at all).

- ➔ The past score reflects the vehicle fleet's reduction in carbon intensity in the last 5 years. Europcar only reports on the subject: other stakeholders do not provide information on the historical carbon intensity of their fleet.
- ➔ Present score is particularly poor because of a very low fill rate (1.1 person per vehicle on average).
- ➔ Companies such as Europcar and Leaseplan have planned to reduce their emissions and electrify their fleet, which gives them a better forward-looking score.

2.3. Freight and logistics

2.3.1. Results in the sector as a whole



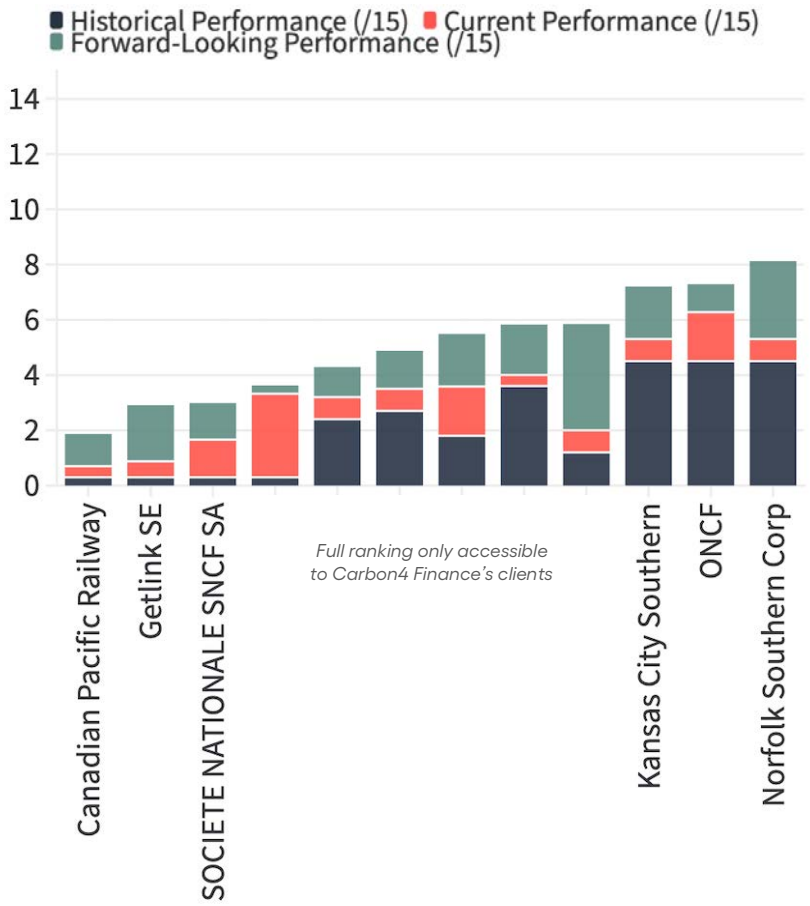
There are three main company profiles regarding climate performance:

- Companies with a score below 6 are the best positioned in terms of the climate, and exclusively comprise rail companies.

- Then come more diversified companies with good performance in at least one element of the score (past, present or forward-looking).

- Finally, companies with a score above 10 are highly intensive and do not have particularly convincing decarbonization targets. Moreover, if the past score is very high, this is due to increased carbon intensity or lack of transparency in terms of emissions and volumes transported in the last 5 years.

2.3.2. Rail companies

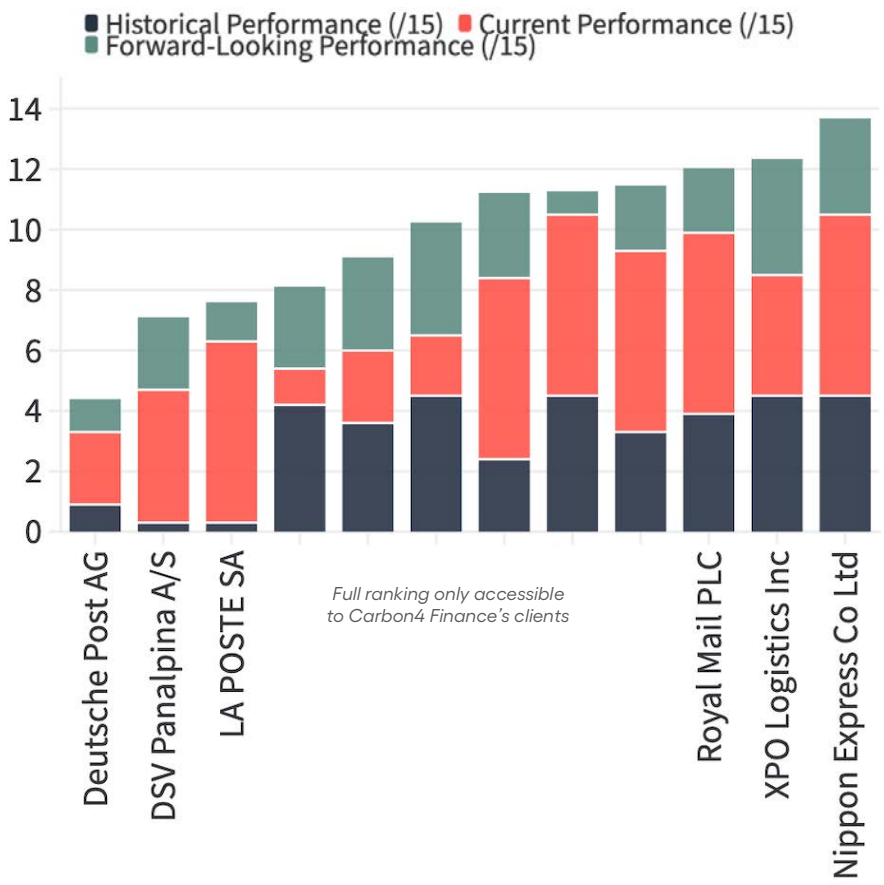


Rail companies offer an energy-efficient mean of transport, which is a distinguishing factor in a world emphasizing carbon constraints. Aware of this development opportunity, they stand out for their environmental performance.

Therefore, rail companies report their emissions very well and track their carbon intensity closely. They distinguish themselves for their extremely low energy consumption, and their environmental reports are more transparent than those of the rest of the sector. Finally, most have reduced their carbon intensity in the last 5 years.

Therefore, these companies are (almost) all in the top 20 for best scores in the panel of stakeholders examined. This is not only due to low carbon intensity, but especially notable reduction in their energy consumption and their consideration of the climate as an opportunity for major development. Collectively, rail companies manage to obtain particularly good past, present and forward-looking performances, making them stand out from other stakeholder types.

2.3.3. Rail Freight and Multimodal companies



Freight companies are the most diversified in terms of transport means. Firstly, we see **postal companies** which manage complex parcel delivery systems. They often use air and road transport. For them, there is also the challenge of delivery to the "last mile", which is not particularly profitable and highly intensive (little volume transported but high emissions). Major stakeholders in the sector include FedEx, UPS and Deutsche Post.

Logistics companies are another type of multimodal stakeholder. They only handle a relatively small fraction of volumes managed, and subcontract the rest. Therefore, these companies have a very high Scope 3 related to use of subcontracting, and a smaller Scope 1&2 (in some cases negligible). These stakeholders' added value especially comes from organization of transport rather than its operation.

These companies generally lack transparency regarding their subcontractor emissions and have no interest in climate-related challenges (they hardly ever have targets for reducing emissions from outsourced transport). However, they have the capacity to influence the environmental management decisions of the thousands of subcontractors

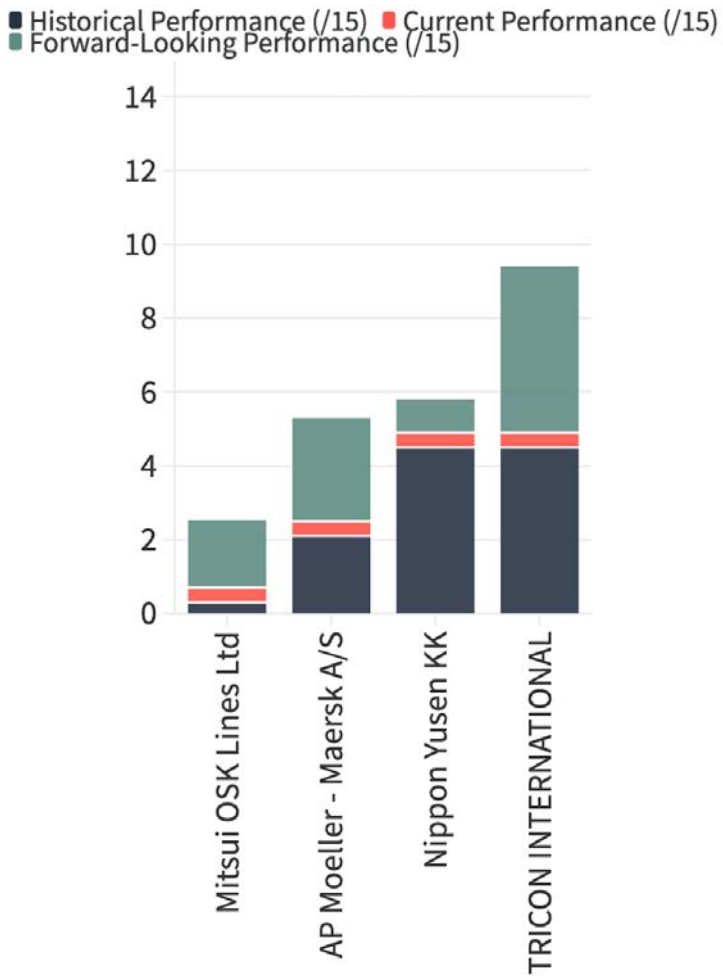
they employ. Companies that best represent this type of stakeholder include Kühne und Nagel and DSV Panalpina A/S.

Multimodal logistics companies are the most interesting in terms of transition. They are highly dependent on air transport due to strong competition on delivery times. Although very much constrained by their clients, freight operators have many powerful options to reduce greenhouse gases, and among them modal shift is a strong lever for action (favoring low-carbon solutions such as sea or rail transport over intensive solutions such as road and air transport). This subject is also still rarely evoked in extra-financial reports, yet a major challenge of this industry is to raise client awareness of the carbon impact of fast delivery.

Another effective lever for action is the incentives and constraints that these stakeholders may have on their network of subcontractors: favoring subcontractors whose fleet meets certain environmental standards, acting on vehicle fill rate, etc.

Apart from Deutsche Post and DSV Panalpina, which very much use rail transport and sea transport, these companies obtain low scores. This is due to a high carbon intensity score, lack of ambition in terms of their climate impact and finally, poor reporting practices. These three aspects reveal a feeling of still very little responsibility when it comes to climate challenges in a highly competitive industry in which delivery times are still the primary constraint.

2.3.4. Sea freight companies



Those companies operate container ships and/or bulk carriers. The core business of these companies is shipping, but in some cases, they also focus on multimodal freight and handling at ports.

The Danish company AP Moeller - Maersk A/S, the world number one shipowner, is the largest company in the sector. The activity is characterized by very low carbon intensity, that positions it towards the top of the classification.

2.3.5. Forward-looking performance of goods transport

Applying the qualitative criteria outlined in the Method section, the three best scores are obtained by the following companies:

Company	Strategy	Horizon	Low-carbon investment	Targets
DB	-The company's sustainability strategy clearly states that it is encouraging a modal shift towards rail use over other forms of passenger and merchandise transportation. The company continues to promote and develop rail transportation.	2018 - 2050	76%	The company has planned to be carbon neutral by 2050 and has set short and middle term targets.
RATP	- The company plans to shift 100% of its service to low carbon mobility (e.g. by operating 100% of busses that run either on electricity or on renewable gas, the share was about 27% in 2019). -In addition, the Company demonstrates expertise and implements projects in key areas for a sustainable development of this industry (such as operating electric busses, offering sufficient bike parking close to its public transport stations and implementing 100% of LED lightning at its stations).	2015 - 2025	33%	RATP has planned to decrease by 50% its energy consumption per p.km. A strong target for a company already mostly electrified.
postnl	- The Company aims to achieve emission-free delivery of all parcels and mailon the last mile in the Benelux by 2030 - The Company intends to increase the share of its delivery fleet running on electricity or renewable fuels from currently 45% to 60% in 2030. -The company is also involved in a low-carbon transport pilot project, using hydrogen.	2017 - 2030	65%	The company declares an ambitious reduction intensity target per transport distance (gCO2/km) of 80%

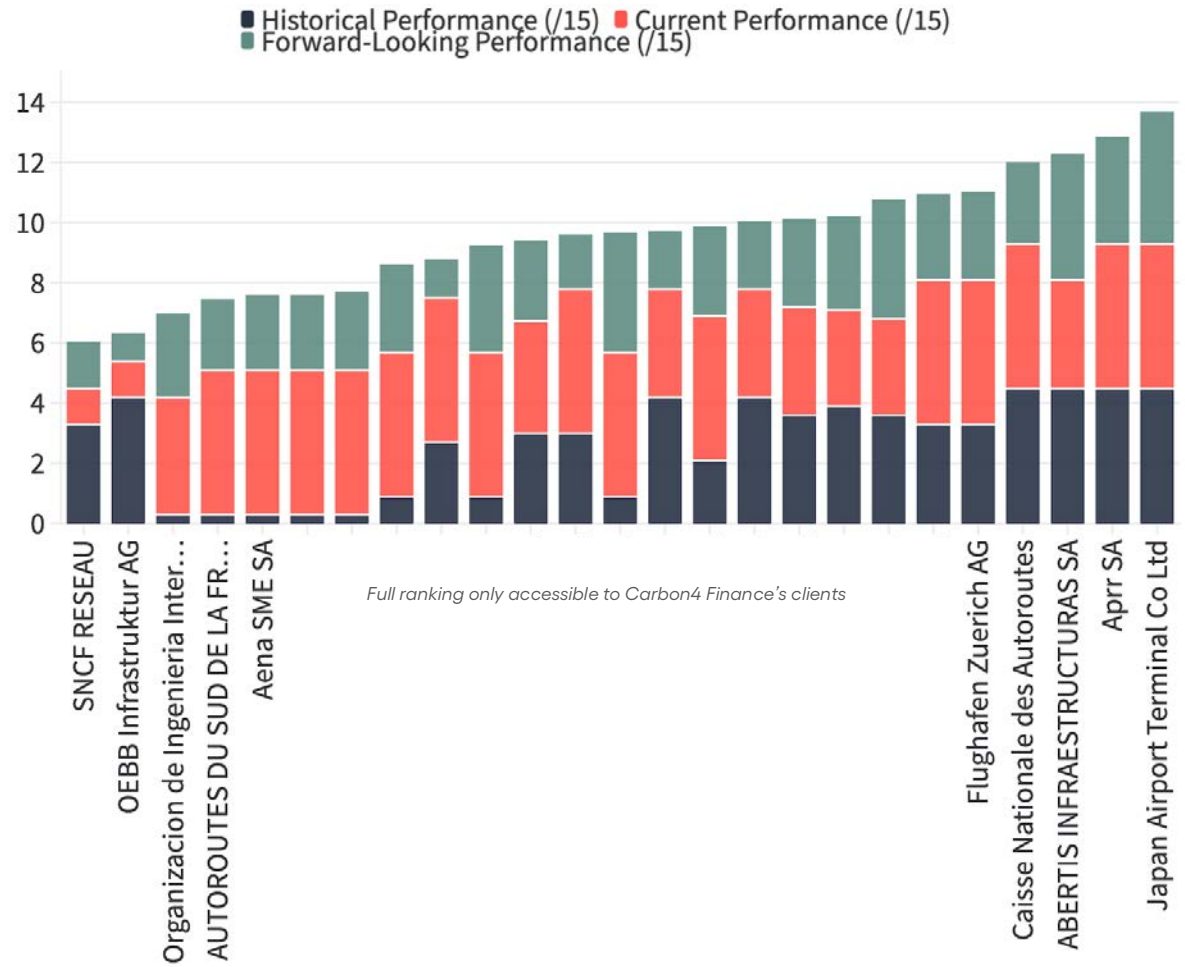
Deutsche Bahn is the most ambitious company in terms of climate strategy. Even though it is already performing well, it intends a considerable decarbonization in the next few years; it also very much promotes train use, and is developing a rail freight service. The company intends to expand its business as the carbon constraint increases.

RATP is almost as ambitious, foreseeing no longer using fossil fuels; the company is also a major stakeholder in soft and alternative mobility (bicycle, etc.).

Finally, PostNL, the Dutch post system, is the most ambitious freight company: it plans to reduce its impact by using light electric vehicles, and would like to have very little impact on the last mile (by using electric bicycles, for example).

2.4. Transport infrastructure operators

2.4.1. Results in the sector as a whole



The challenges in this sector are twofold: the company must be capable of both decarbonizing its operations (Scope 1, 2, and part of Scope 3 upstream), but especially help its users to decarbonize their activities: it is in fact Scope 3 emissions downstream that account for most of their emissions.

Two types of stakeholder are analyzed:

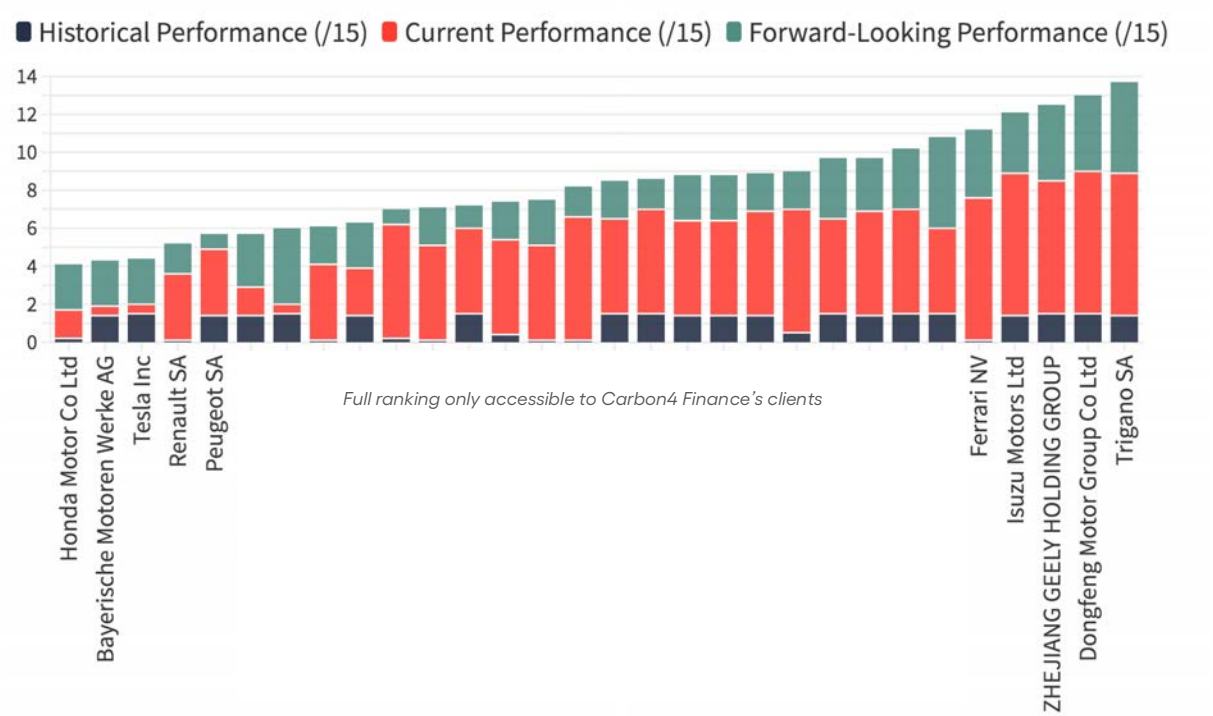
- Specialized operators: they operate a single type of infrastructure, and often handle large portfolios. This is especially the case with freeways and airports.
- Operators whose infrastructures are a necessity more than an independent activity. This is, for example, the case for rail or shipping companies, whose main activity is to sell transport services, and for which the infrastructure (railway, port) is an asset that enables them to do this.

2.5. The automotive sector

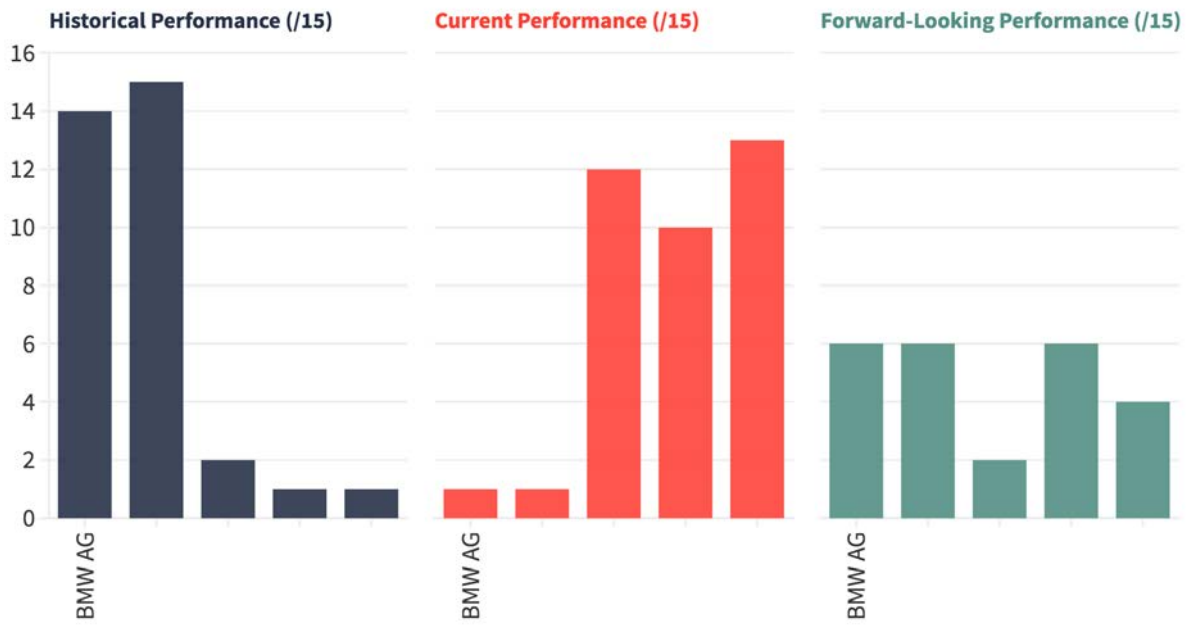
2.5.1. Overall Score

CIA's company analysis provides an insight into the climate performance and risks of transition of stakeholders in a sector, but also identifies the companies that release the most greenhouse gases in an industry. The 30 companies analyzed have a total carbon footprint of 1,259 billion tCO_2e, including 901 million for vehicle manufacturers (other emissions are attributable to non-automotive sector equipment manufacturers). Induced emissions are 95% downstream Scope 3 emissions (emissions from vehicle use). For vehicle producers/equipment manufacturers, the 5 companies that release the most emissions (Volkswagen, Toyota, General Motors, Ford and Fiat Chrysler) account for 55% of total emissions produced by the 30 companies analyzed. Volkswagen accounts for about 22% of emissions produced by the automotive sector.

Of the 10 maximum polluters, 5 are companies that received a particularly low total score (Volkswagen, Honda, Nissan, Peugeot and Renault).



Of the 5 companies with the highest market values, Tesla and BMW receive the best overall scores. The good performance of the two companies comes from a solid present performance (low carbon intensity of vehicles sold). However, it is Volkswagen that receives the best forward-looking score, owing to its ambitious electrification strategy. Finally, Daimler obtains the lowest score, particularly due to poor carbon intensity of 233 gCO_2e/km (real emissions).

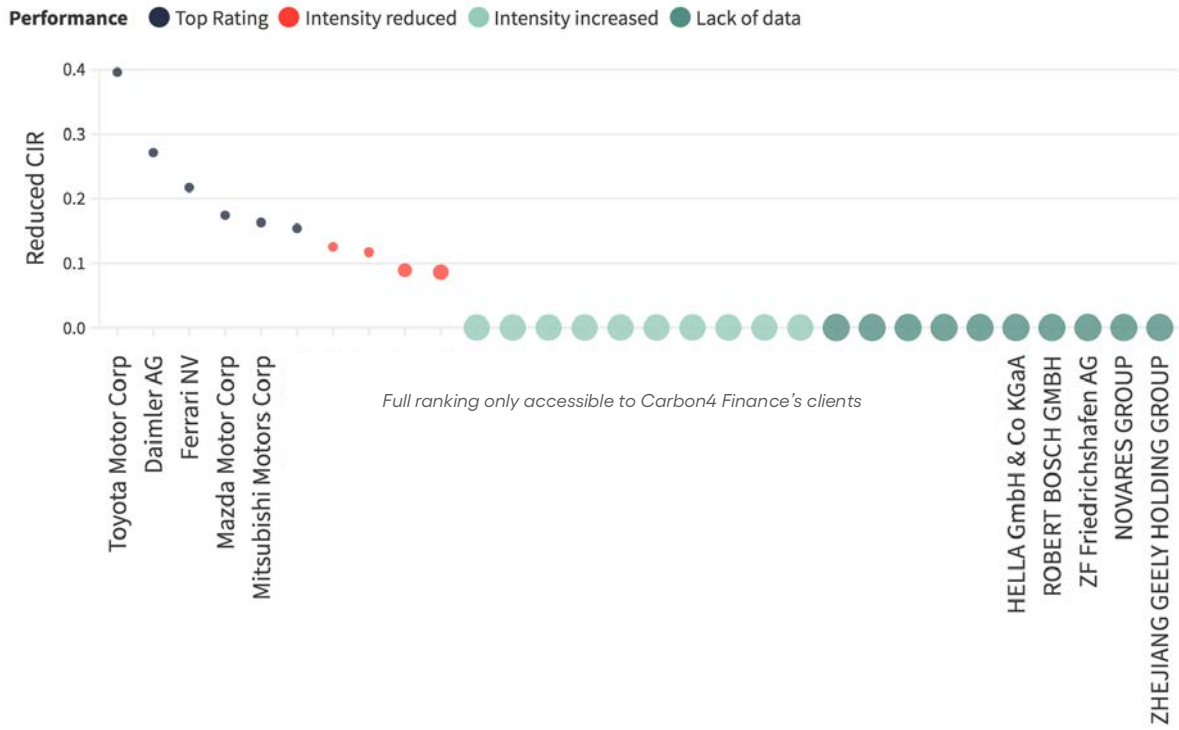


Results by indicator are analyzed in greater depth in the coming sections.

2.5.2. Past performance

Past performance is indexed on the increase in the company's carbon efficiency over the last 5 years across all company operations.

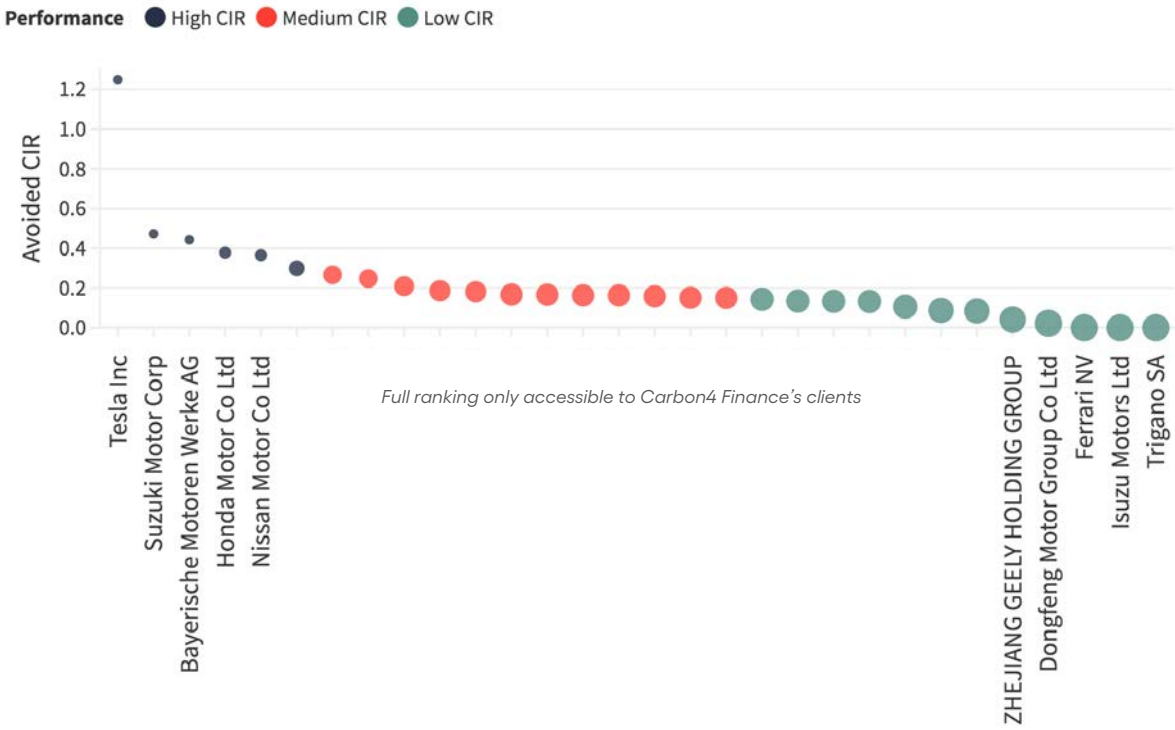
Of the 30 companies analyzed, 6 obtain the highest score possible in this category, owing to their reduction in intensity in equipment manufacture. Scope 1&2 intensity fell for 10 companies in the sample. For 10 other companies, Scope 1&2 intensity rose: these companies receive a score of 14/15. Finally, for the remaining 10 companies, it was not possible to calculate change in Scope 1&2 intensity (lack of data): in this case, the companies receive the lowest score, 15/15.



The 6 companies that received the best past score reduced their Scope 1&2 intensity by over 13%. Toyota scored the greatest reduction in its Scope 1&2 intensity, 28% based on our calculations. In fact, the company has invested in several energy efficiency projects (with the introduction of hydrogen burners -based on renewable energy- which replace fossil fuel burners, and the renewal of very energy-intensive equipment).

2.5.3. Present performance

Present performance is based on avoided emissions that are very much correlated to carbon intensity and the geographical coverage of vehicles sold (see Appendix to get more information on the methodology). The 5 companies that received the highest score are: Tesla, Suzuki, BMW, Nissan and Honda.



As vehicles sold by Tesla are electric, there are no exhaust gases when they are used. However, one must also consider battery production, and production of the electricity used to recharge the battery. Considering these elements, on average, Tesla vehicles produce 117 gCO_2e/km, a value not very different from the other 4 highest scoring companies that stand between 150 and 183 gCO_2e/km.

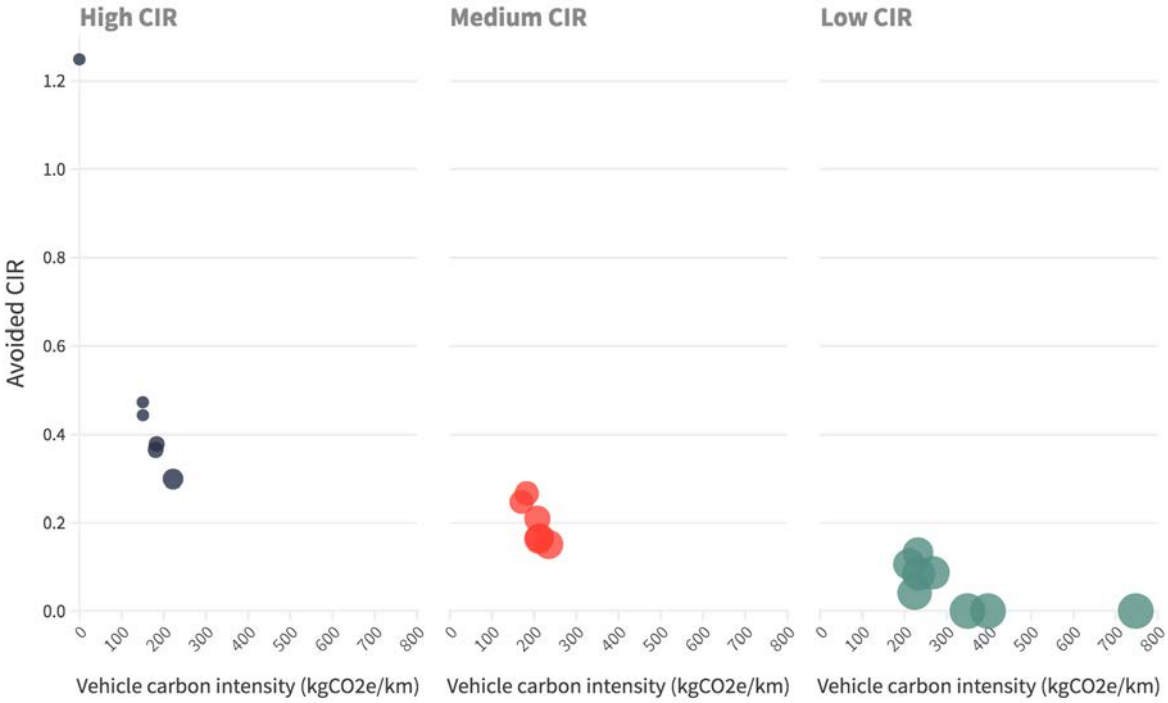
BMW low vehicle carbon intensity (151 gCO_2e/km) is caused not only by better performance for new thermal vehicles, but also a higher share of electric vehicles sold (5.1%, or more than twice the average for companies analyzed, with 2.4%).

Furthermore, BMW benefits from the transparency of its emissions test method (WLTP procedure), i.e. the procedure closest to real conditions of use. The other 3 companies in the top 5 have used the NEDC procedure, or have simply not published the test method used (in this case, it is considered that the NEDC was used). As the NEDC procedure is the one that minimizes emissions most in relation to driving under real conditions, companies that do not demonstrate transparency when calculating emissions are penalized, and a heavier weighting is applied to their emissions published.

With average emissions of 150 gCO_2e/km for its vehicles sold, Suzuki also scores above average for present performance. Moreover, the sale of relatively simple and efficient vehicles in regions where the carbon intensity of the existing vehicle fleet is high means that many emissions may be avoided. However, these are also markets whose vehicle fleet renewal rate is rather low (expanding markets), that limits, to a greater or lesser extent, the gains from avoided emissions.

For certain countries (such as India), the average carbon intensity of the vehicle fleet and the vehicle renewal rate are not detailed in the method; in this case, we use average values.

The graph below shows that the ratio of avoided emissions over induced emissions is only partially correlated to the carbon intensity of vehicles sold: the intensity of the vehicle fleet and the replacement rate on a regional scale are also considered when calculating this indicator.



The average emissions of vehicles sold by Honda (183 gCO_2/km), Nissan (181 gCO_2/km) and Renault (182 gCO_2/km) are close, but the avoided emissions/ induced emissions ratio is higher for Honda (0.39) and Nissan (0.37) than Renault (0.27). This is explained by the geographical presence of these stakeholders: for these three companies, this indicator is higher for vehicles sold in North America, as it is essentially about renewing the fleet, and emissions from outgoing vehicles are much higher than those of models of the manufacturers concerned. However, the share of vehicles sold in North America differs for the three companies: 38% for Honda, 33% for Nissan and just 11% for Renault.

In practice, average avoided emissions from vehicles replaced are higher in North America (309 gCO_2/km) than in Europe (219 gCO_2/km). Therefore, we believe that manufacturers whose sales are mainly located in North America are less exposed to the risk of transition, since small models should continue to replace large ones if there is a constraint on emissions.

2.5.4. Forward-looking performance

Applying the qualitative criteria explained in the Method section, the following three companies obtain the best scores in the automotive sector:

Company	Strategy	Horizon	Low-carbon investment	Targets
	- The company intends to shift its business to focus on electric vehicles, with quantified EV sales targets for 2030: 70% in Europe (recently doubled from 35%), 50% in USA and China. - Investments in public EV charging infrastructure (development of 35,000 chargin points by 2025, linked to an investment of 250 EURm).	2018 - 2030	38%	The whole VW group intends to achieve a 30 percent reduction of CO2 emissions (including Scope 1, 2 and 3 emissions. Beyond that, it intends to become carbon neutral in 2050.
	- Clear focus on Evs (BEVs and PHEVs). PSA targets 50% of offered vehicles available as EV by 2021 and 100% by 2025. - PSA offers 5EV-based) car sharing option (e.g. Free2Move).	2018 - 2034	31%	Peugeot has set a 37% CO2 intensity reduction for the use of its sold vehicles.
	- Valeo intends to focus on electric vehicle equipment, such as thermal battery management systems. - Valeo focusses generates more than 50% of its revenue from on equipment that aims to improve the carbon performance of vehicles (e.g. EV equipment, start-stop systems for ICEVs).	2015 - 2020	54%	Valeo has set a rather ambitious Scope 1&2 reduction target of 2% per year. (NB: as equipment manufacturers can not be hold responsible of the emission intensity of the car itself, Scope 3 targets are not included in the assessment of equipment manufacturers).

As well as Volkswagen and Peugeot, Renault and Daimler are in the top 5 in the sector.
These four manufacturers have a powerful strategy for transition to electric, and consequently invest a significant share of their capital in low-carbon technologies. Furthermore, the companies have set targets to reduce Scope 1&2 emissions, and most importantly targets to reduce the carbon intensity of their fleet (Scope 3).
Tesla, which only produces electric vehicles, receives a good forward-looking score, but is penalized for its lack of targets to reduce Scope 1&2 emissions: it therefore does not get the highest score possible. Volkswagen, which receives the best forward-looking score, is the company with the most comprehensive strategy for transition towards electric mobility. Not only does it invest in electric vehicles (including developing battery production capacities), but it also develops infrastructures for electric vehicles (recharging stations).

Among equipment manufacturers, Valeo receives the best forward-looking score. The company is investing in developing low-carbon mobility solutions such as electric motorization systems. Valeo is also transparent about amounts of capital expenditure dedicated to low-carbon mobility equipment.

2.5.5. Key messages from CIA's analysis of the automotive sector

The main conclusions of the analysis of the sector are:

- Scope 1&2 emissions constitute only 5% of total emissions.
- Scope 3 emissions are ones vital to understanding the risk of transition for vehicle manufacturers. However, several manufacturers still do not publish the carbon intensity of vehicles sold.
- The sector's traditional stakeholders are threatened with new stakeholders with disruptive business models, such as Tesla,
- Vehicle manufacturers might need to adapt to new means of mobility (car sharing, change in the sector to services), but there are few stakeholders that integrate these changes in behaviour in their strategy.

2.6. Limits

CIA's analyses are highly dependent upon calculating carbon intensity. Indeed, carbon intensity has an impact on two of the three total score indicators:

- ➔ Past performance (calculated on emissions in Scope 1&2) → it will receive the poorest score if it lacks historical data to calculate it
- ➔ Present performance → if calculation is not feasible (lack of data), we will take the low average per means of transport (or the average per region for vehicles sold for vehicle manufacturing companies)

Limits specific to the transport operators:

Even though CSR (corporate sustainability responsibility) ratios are increasingly comprehensive and accurate, many companies do not publish enough information on their volume of activity and their emissions, preventing recalculation of carbon intensity. This is especially the case for logisticians using large scale subcontracting, with, for example, package transporting companies (postal type) that do not really track volumes subcontracted. For passengers, data is generally detailed and publicly available, but multimodal public transport companies such as Keolis and Transurban Group have no reliable reporting.

Limits specific to the Automotive sector:

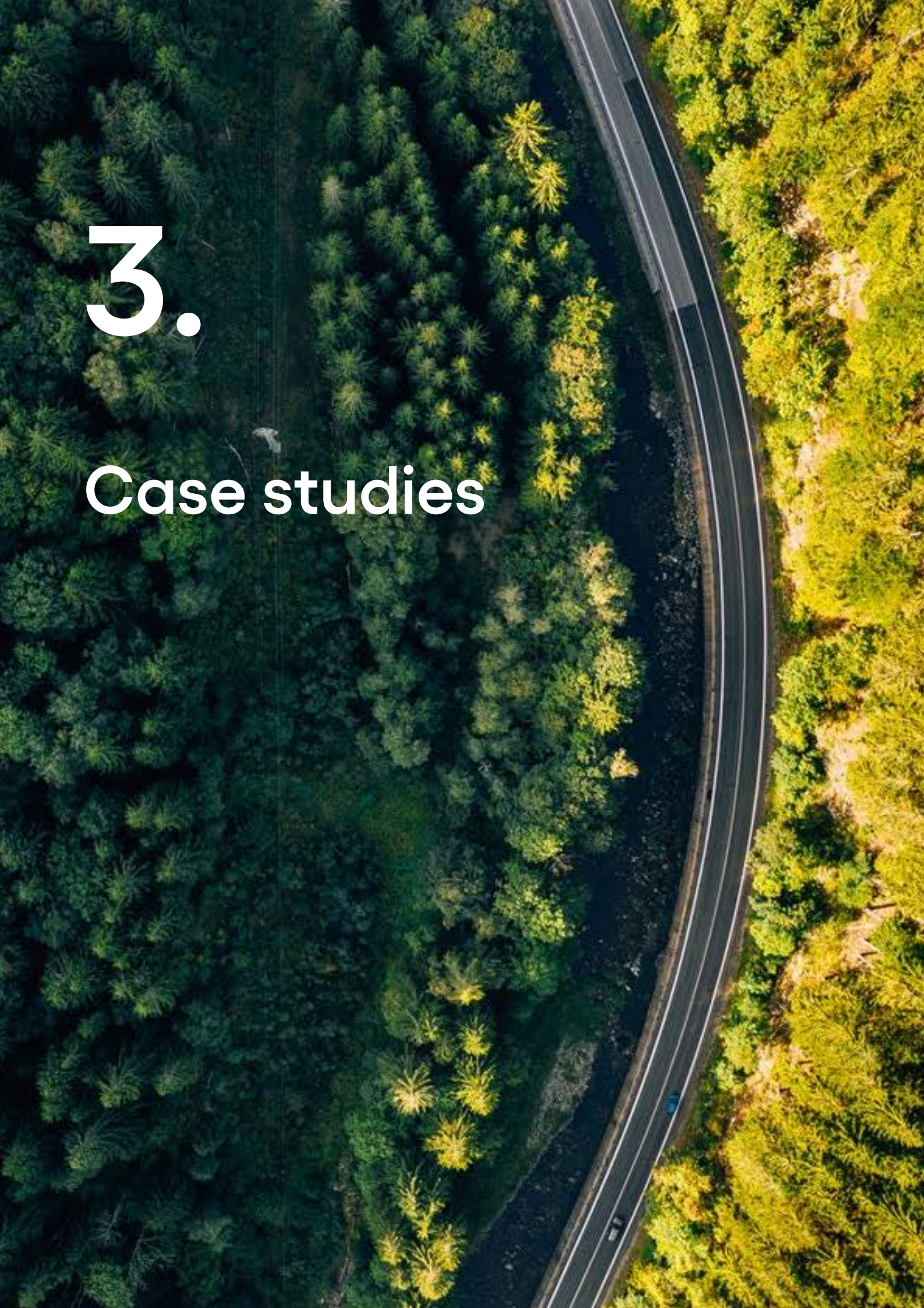
Calculation of past performance is based only on Scope 1&2 emissions, and excludes Scope 3.

This is primarily due to lack of reliability and consistency of emissions per vehicle sold published by manufacturers, especially since testing conditions could change from one year to another, making it impossible to assess the variation of these changes. Furthermore, as testing procedure is not always disclosed by companies, testing conditions can change from one year to another without manufacturers disclosing those changes.

The change in Scope 3 intensity will be made when CIA next updates its method.

Because sales of electric vehicles account for a relatively low share of total sales (2.4% for the sample examined), CIA's method focuses more on the performance of thermal vehicles.

However, because of the exponential rise in sales of electric vehicles, it will become important to be able to judge the relative performance of different models on the market to better assess the relative climate impact of electric vehicles, for example, amongst heavy and so relatively inefficient vehicles such as the GMC Hummer EV (over 1000 HP and 5 tonnes), and lighter and more efficient vehicles such as the Zoe model from Renault.



3.

Case studies

3.1. FedEx: ambitious announcements, mixed performance

In March 2021, FedEx declared that it wanted to be carbon neutral by 2040[11]. This is a very ambitious announcement, and a good reason to take a closer look at the analysis of this company.

The analysis is based on 2020 carbon data (the most recent available at the time of the analysis).

CO_2 emissions (about 19 million tonnes) are broken down as follows:

- 65% come from air freight
- 20% come from road freight (HDV + LDV)
- 15% come from subcontracting: FedEx does not disclose the means of transport actually used

This leads to particularly high carbon intensity calculated for the whole group, very close to that of airplanes, and five times the average intensity of a road-only operator. This particularly high intensity is due to massive use of air freight. However, this figure is a rough estimate, as the company is not transparent about transported volumes.

To achieve carbon neutrality, the company foresees several levers:

1. **"Vehicle Electrification":** electrification of its whole land vehicle fleet. This would enable the company to reduce its carbon impact by 20%.
2. ***"Sustainable Fuels":*** *FedEx will continue to invest in alternative fuels to reduce airplane and vehicle emissions"*. Here, FedEx addresses the problem of its high dependency on air transport. The French national low carbon strategy is setting a long-term target of 50% biofuels (with no deforestation) by 2050. Even though the feasibility of this target is very much subject to debate, air transport emissions could be reduced by up to 50%.

[11] Statements made from the following declaration: https://investors.fedex.com/news-and-events/investor-news/investor-news-details/2021/FedEx-Commits-to-Carbon-Neutral-Operations-by-2040/default.aspx

3. ***"Fuel Conservation and Aircraft Modernization"*:** We have calculated that in the last five years, the company has reduced its fuel consumption per tkm by 4%. This represents a potential further reduction of 16% by 2040 continuing at the same pace.

4. If we add to the top of the target range propositions 2 and 3 (highly optimistic), this means **a nearly 58% reduction** in its emissions from **air freight**.

5. Around 5 million tCO_2eq would then remain to be sequestrated for air transport.

6. *"FedEx will continue efforts to make its more than 5,000 facilities worldwide more sustainable through continued investments in efficient facilities, renewable energy, and other energy management programs."* This statement concerns its Scope 2 only (electricity consumption), so at most, 5% of its total energy consumption.

In its Neutrality 2040 plan, FedEx does not, at any time, mention either modal shift on air transport, or emissions from transport subcontracting. The company also plans to sequestrate nearly 5 million tonnes of CO2 every year. While this might seem very ambitious, it does not avoid the company's dependence on fossil fuels, and thus does not "cancel out" its induced emissions (see NZI referencing[12] for further details).

In total, the company obtains a rather low score of 11/15, or D.

- Firstly, this comes from its average score of 8/15 for its past performance. It is linked to its renewal of its air and land fleets, which have led to increased energy efficiency.

- On its "current" performance, the score is the lowest possible (15), due to the very high carbon intensity of air freight, itself at the heart of the company's activity.

- Finally, the company's forward-looking performance is mixed as even though the company is ambitious in terms of decarbonization targets, it cannot guarantee that it will achieve its targets. As seen above, the company is highly focused on carbon sequestration, not even mentioning modal shift, that would be a more realistic way of actually reducing its emissions. However, its investment in more efficient means of transport gives it a score of 9.5/15, or just below average.

3.2. Toyota: automotive giant, average climate performance

Toyota is the world's largest vehicle manufacturer. The Japanese manufacturer presented its "Toyota Environmental Challenge 2050"[12] strategy in October 2015, which describes its ambition to achieve zero CO_2 emissions from new vehicles and production sites by 2050. In its seventh "Environmental Action Plan", announced with the publication of its 2020 environmental report, Toyota underlines the aforementioned targets and defines specific milestones for 2030 (30% emissions reduction for new vehicles relative to 2010, and 30% reduction of emissions from production sites compared to 2013).

To achieve this target, Toyota intends to increase its electric vehicle sales (including 100% battery electric vehicles, plugin and non-plugin hybrids, as well as fuel cell vehicles). Toyota is an industry benchmark for new motorization, in particular with a consequent hybrid range (mainly non-rechargeable vehicles).
Toyota is a hybrid technology pioneer: the Prius is the first vehicle of its kind to have been mass produced, firstly in Japan in 1997, then internationally in 2000. However, as of early 2021, the Japanese manufacturer is still not selling 100% electric vehicles,
and is concentrating on hybrid technology and fuel cell (hydrogen) cars. Toyota did present its first 100% electric model, the "C+pod", an ultra-compact two-seater vehicle, in December 2020; the vehicle should be in mass production by 2022. Its fuel cell vehicles do face major challenges: high costs reflected in the price and so low sales, a general lack of hydrogen infrastructures, as well as uncertain effects of hydrogen use on the environment. Energy is needed to produce hydrogen: indeed, most of the time, this energy comes from fossil fuels rather than low-carbon sources.

Toyota's ambition is to sell 5.5 million electric vehicles by 2030. In 2019/20, the manufacturer sold 9 million vehicles, accounting for about 60% of total sales (supposing sales remain constant). However, most of these vehicles would be hybrid vehicles (probably largely non-rechargeable), which means that most cars sold by Toyota, after 2030, will still depend on fossil fuels.

Toyota's overall rating is 7.6/15, which represents an average performance and results in a ranking in the middle among the companies analyzed (classification 15 out of 30). The company has the best past performance score (1/15) as a result of a 30% Scope 1&2 reduction in the last five years (see section 3.6.2).

Toyota's present performance is below average (10/15). This is due to a relatively high estimated carbon intensity of sold vehicles (213 gCO_2/km under real conditions) despite the relatively high proportion of electric vehicles sold (5.9%, largely above average

[12] https://www.toyota-europe.com/world-of-toyota/feel/environment/environmental-challenge-2050

amongst the companies analyzed at 2.4%). However, all electric vehicles sold over the analyzed period are rechargeable hybrid vehicles (note that we do not distinguish non-rechargeable hybrid vehicles from thermal vehicles in our analyses, as their actual emissions under real conditions are very close). No all-electric electric vehicle was sold in Toyota's 2020 reporting year (that ended on March 31).

It is possible that the lack of the company's transparency about the carbon intensity of sold vehicles is having an impact on Toyota's present performance: when the company was analyzed, the most recent data were from 2018 and focused only on sales made in Europe. Therefore, the average sector intensity of thermal vehicles sold was used for the analysis.

Although Toyota is not one of the top 5 companies that received the best forward-looking score, it was just above average, with 6/15. It gets a positive score for its decarbonization strategy, but not the maximum as most vehicles sold after 2030 will still depend on fossil fuel energy. Moreover, Toyota is not totally transparent concerning its low-carbon investments. However, specific projects such as R&D investments in alternative motorization systems (fuel cells) show that the company does allocate some of its capital expenditure to potential low-carbon projects. Furthermore, Toyota has published ambitious targets for reducing Scope 3 emissions (use of vehicles sold), and Scope 1&2 emissions. Toyota's governance has a positive impact on its forward-looking performance, with financial incentives linked to the company's carbon performance, and consideration of climate-related challenges by its Board of Directors.

In conclusion, although Toyota has reduced its Scope 1&2 intensity, the change in Scope 3 emissions cannot be analyzed correctly without data. The CIA method does not yet consider Scope 3 emissions in past performance, and the case of Toyota shows that it would not necessarily be possible to do this due to the lack of transparency of the analyzed companies. For Toyota, lack of transparency is already a significant limitation regarding present performance. To assess the change in Scope 3 carbon intensity over the years, companies need to publish these emissions transparently, in detail and consistently.

Glossary

Scope 1 corresponds to direct emissions resulting from burning of fossil fuel energy, such as gas, oil, coal, etc.

Scope 2 corresponds to indirect emissions from consumption of electricity, heat and steam necessary for product manufacturing.

Scope 3: these are other indirect emissions connected to other stages of the product and/or service life cycle (provisioning, transport, use, end of life, etc.). Therefore, we distinguish Scope 3 which covers emissions from company suppliers and **downstream** Scope 3 which covers emissions of company clients.

GES: greenhouse gases.

Induced emissions: emissions generated by company activities.

Reduced emissions: calculated based on company performance: has the company improved the greenhouse gas/volume of activity ratio in the last five years?

Avoided emissions: is the company more efficient than others in its sector? Is its 5-year alignment strategy better than the reference sector alignment scenario used?

Emission Factor (EF): this is a factor used to convert activity data into greenhouse gas emissions. It is the average emission rate of a given source in relation to business units or processes.

Key Sources

AR5 Synthesis Report: Climate Change 2014, IPCC

Tracking Transport 2020, IEA

Energy Technology Perspectives 2016, IEA

Appendix

Presentation of the sectoral approach

In the first section, we detail the composition of the sectoral rating used to assess the company's carbon performance. Some criteria are based on the company's emissions, which are calculated during the analyses. These calculations are presented in more detail in the second section of this appendix.

First Part - Calculation of Sectoral Rating

A company's sectoral rating for transport activities is the weighted sum of 3 indicators and may range from 1 (best performance possible) to 15 (worst performance possible), except for automotive manufacturers. For these we cap the range of potential ratings from 2 to 14.

Absolute past performance: improvement in the company's carbon performance over the last five years, in other words, the evolution of greenhouse gas emission intensity per volume of activity ratio.

Relative current performance: the company's performance vis-à-vis its peers.

Forward-looking performance: analysis of companies' transition strategy (reduction targets, climate roadmap, low-carbon investments).

Past performance:

To analyze the company's past performance, we use its reduced emissions.

Reduced emissions are calculated from the change in the ratio of CO_2 emissions per physical indicator (t.km or p.km) ratio, at constant scope, and over a constant period of five years.

For all stakeholders to be comparable, we use the "Carbon Impact Ratio" (CIR) indicator: it corresponds to the ratio of reduced emissions over induced emissions (see the emissions calculation section), and is used to assess the company's ability to reduce its emissions for a given volume of activity.

$$\text{Reduced CIR } (\%) = \frac{\text{Reduced Emissions } tCO_2}{\text{Induced Emissions } tCO_2}$$

Reduced CIR performance is scored from 1 (highest score, reduction greater than 10%) to 14/15 (14: energy efficiency has fallen and 15: no data).

Limits:

To calculate reduced emissions, it is necessary to have access to a carbon reporting for the company's reporting year, and for the reference year (five years before, i.e. 2014 if the company is analyzed for the fiscal year 2019) that corresponds to the scope of the company's carbon assessment in year N. Otherwise, it is not possible to make a meaningful comparison of the carbon intensity over the period, and the company receives the worst CIR score (No Data = 15).

If the stakeholder uses subcontracting, companies which are transparent about subcontracted Scope 3, have been able to reduce carbon intensity of subcontracted freight over the last five years, will have a greater emissions reduction and thus will have an advantage over their peers.

Finally, in the case of construction companies of transport infrastructures, lack of data means that we cannot use a past performance indicator: the sector score in this category of stakeholders relies on current and forward-looking indicators only.

Present performance:

For transport operators, we use the **Carbon intensity** to assess carbon performance using a constant physical indicator: tonne.kilometers (t.km) for freight forwarders, and passenger.kilometers (p.km) for passenger transport. The scores are benchmarked according to the range of performances observed in the sector.

For vehicle manufacturers, we use the **avoided Carbon Impact Ratio** which represents the company's contribution to reducing the impact of the vehicle fleet in terms of the carbon intensity of its sold vehicles and the vehicle replacement rate in a given region. This indicator is always calculated, but may be equal to 0 when the carbon intensity of cars produced exceeds the benchmark (as is the case with Ferrari, for example).

For infrastructure constructors and operators, a **Direct Score** is awarded, directly correlated to the intensity of the transport mean associated with the infrastructure. Rail infrastructures, the most low-carbon transportation mean, receive a score of 3/15, ports

receive an intermediate score of 8/15, and more carbon-intensive infrastructures receive higher scores: 9/15 for freeways, 12/15 for airports.

Forward-looking performance

The company's capacity and determination to adapt to climate change is also captured during the analysis: this is the challenge of the company's qualitative analysis, used to assess the company's forward performance. Different criteria are considered:

- ➔ **Strategy**: this criterion considers the degree of importance that the company gives to climate change, from the measurement of emissions to willingness to reduce them through the adoption of structural decarbonization projects.

- ➔ **Low-carbon CapEx**, or low-carbon investments: this is the percentage of investment expenditure allocated to low-carbon solutions (vehicle fleet electrification and/or modernization, projects to increase fuel efficiency, alternative fuels, etc.).
  The highest score is allocated to companies where a significant share of CapEx is used to fuel projects compatible with a world with constrained greenhouse gas emissions; with no information available on its investments, the company receives the lowest score.

- ➔ **Emissions reduction targets** The company obtains the highest score if its reduction target is compatible with a "Beyond 2°" scenario as defined by the IEA (so compatible with global warming limited below 2°C); the lowest score is allocated if the company has no reduction target. This criterion considers the most significant emissions, by economic model:
- For operators: Scope 1&2 if the operator uses a vehicle fleet directly, and Scope 3 only if the operator mainly uses subcontractors.
- For Infrastructures (Constructors and Operators): Scope 1&2, and Scope 3 linked to use of infrastructures.
- For vehicle manufacturers: Scope 1&2 and Scope 3 linked to use of vehicles throughout their life cycle.

- ➔ **Governance**: employee involvement is considered in the qualitative score allocated to the company. Three subcriteria are considered: the organizational level at which climate-related decisions are made, the degree of employee training on climate issues, and incentives (financial and extra-financial) linked to the company's carbon performance.

Category/ Indicator	Transport Operators	Infrastructure Operators	Infrastructure Construction Companies	Automotive Manufacturers
Past	Reduction of vehicle fleet carbon intensity	Reduction of infrastructures operations carbon intensity	No past performance due to lack of data	Reduction of manufacturing operations carbon intensity
Present	Carbon intensity of transportation mean	Direct score depending of the intensity of the associated transportation mean	Direct score depending of the intensity of the associated transportation mean	Avoided emissions resulting from replacement of exixting vehicles with less emissive models
Forward-looking	Climate-Change Strategy	Climate-Change Strategy	Climate-Change Strategy	Climate-Change Strategy

Sectoral rating method by category - Summary

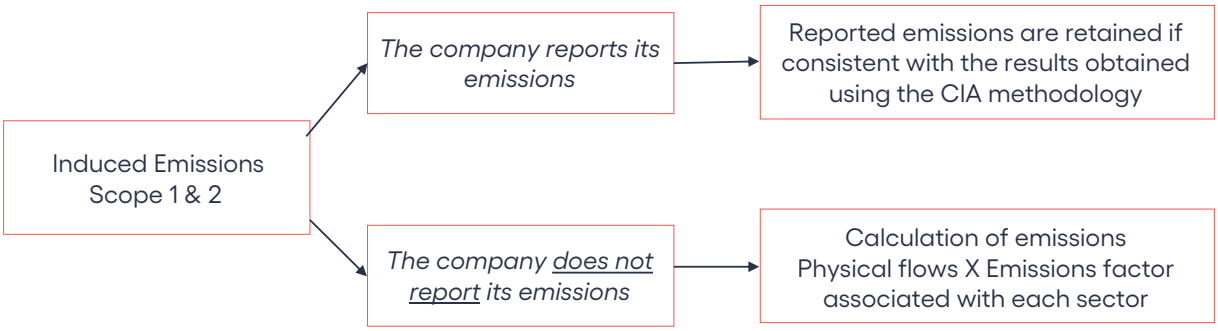
Second Part - Calculation of induced emissions

Scope 1&2

Induced Scope 1&2 emissions are emissions linked to the company's energy consumption: either directly (fuel & gas directly consumed by the company), or indirectly (this is the case for electricity, generated upstream, particularly via burning of fossil fuels).

For transport operators which use their own vehicle fleet, consumption of fuel by the vehicles used constitutes most induced Scope 1&2 emissions, which account for most of the stakeholder's carbon footprint.

For other stakeholders (constructors and operators of infrastructures, vehicle manufacturers), Scope 1&2 emissions induced are linked to energy used for construction works, operation of infrastructures, or operating vehicle production plants.

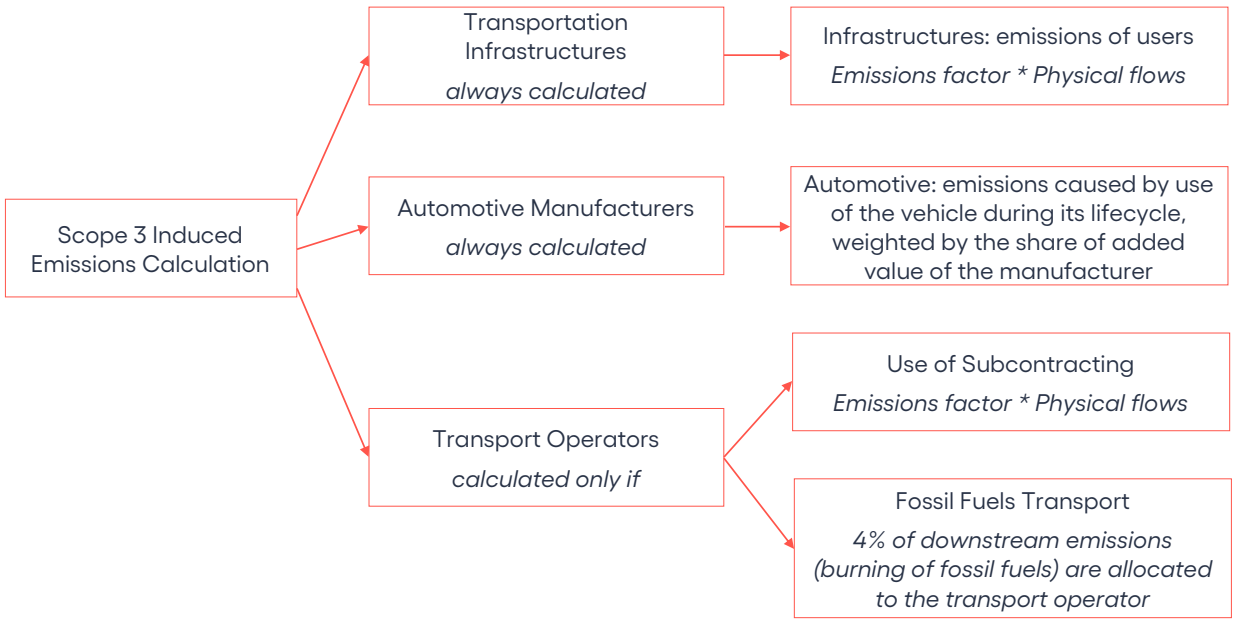


Scope 3

Scope 3 are emissions which are induced by the company's value chain, but are not directly attributable to the stakeholder. Companies disclose these unequally: therefore, Carbon4 Finance always calculates or recalculates these emissions.

For **Transportation Infrastructures Operators and Constructors,** and **Vehicle Producers/Equipment Manufacturers**, Scope 3 emissions induced are **always** calculated: these are emissions linked to use of infrastructures/vehicles.

For **Transport Operators**, they are calculated **only if** the company **subcontracts** some or all of its activities, and/or if it **carries fossil fuels**: in this case, 4% of emissions linked to burning of fossil fuels transported (coal, oil, gas) are attributable to the transporter.



SCOPE 3

Consideration of subcontracting is a crucial addition of this sector update. Emissions caused by subcontracting are included in the company's Scope 3 (Upstream): they are not concerned by extra-financial declaration obligations which only applies to Scope 1&2 for listed companies.

Accordingly, some multimodal freight forwarders such as DSV Panalpina, C.H. Robinson Worldwide and Kühne + Nagel handle considerable volumes of goods but CO_2 emissions that are very low in relation to volumes transported, since they only report on Scope 1&2, whilst most emissions from their value chain come from subcontractors' vehicles, of which use is particularly important in the logistics sector, especially for multimodal transport providers. As an example, GEFCO, a leading European logistics company that specializes in automotive logistics, and one of few companies in the sector to track its subcontractors' emissions, Scope 3 emissions account for over 95% of total emissions.

Carbon4 finance considers or calculates Scope 3 from subcontracted transport the same way as Scope 1&2: the different parameters used to score the company, such as intensity in tCO_2/t.km, do indeed include subcontractors' emissions. Similarly, reductions targets appreciation applies to the most significant emissions (choice: direct Scope 1&2, Scope 3 linked to subcontracting, or both).

SCOPE 3 – AUTOMOTIVE

*To calculate Scope 3 emissions from Vehicle manufacturers, we use carbon intensity of vehicles produced (gCO_2/km), and the vehicle's total mileage during its life cycle, which we multiply by a percentage of added value provided by the stakeholder in the final product price. The share of value added is used to avoid counting emissions several times when many stakeholders are involved along the value chain. Note that for vehicle carbon intensity, we use **real emissions** (arising from actual consumption during the use phase), higher than the emissions declared by manufacturers, which are themselves obtained during very optimistic driving cycles, far from real conditions of use. Vehicle emissions and/or fuel consumption are measured with different types of test: NEDC (New European Driving Cycle), WLTP (Worldwide Harmonized Light Vehicles Test Procedure), and RDE (Real Driving Emissions). With the CIA methodology, for all analyses to be comparable, all consumption and emissions data have been balanced to obtain real emissions. Therefore, NEDC and WLTP data have been considered via a balance factor to be comparable with RDE data.*

Category/ Induced Emissions	Scope 1 & 2	Scope 3 - Upstream	Scope 3 – Downstream
Operators	*Energy consumed by the vehicle fleet*	*Only if The company uses subcontracting*	*Only if The company transports fossil fuel*
Infrastructure Operators	*Energy consumed by infrastructure operation*	*N.A.*	*Emissions of infrastructure users*
Infrastructure Construction Companies	*Energy consumed by infrastructure construction*	*N.A.*	*Emissions of infrastructure users*
Automotive Manufacturers	*Energy consumed by automotive manufacturing*	*N.A.*	*Emissions from use of the vehicle during their lifecycle*

Summary Table - Emissions Induced

Third Part - Calculation of saved emissions

Reduced emissions

We assess the company's capacity to reduce its emissions by comparing change in the company's carbon intensity (Scope 1&2 greenhouse gas emissions/physical volume of activity ratio) over a five-year period. The physical volume on which we base our calculations corresponds either to transport activity for operators (p.km or t.km), or traffic for infrastructure activities (number of passengers for an airport, number of vehicles for a freeway, etc.), or the number of vehicles produced for vehicle manufacturers.

Notwithstanding particular cases, reduced emissions only concern Scope 1&2 emissions, due to lack of reliable data for Scope 3 emissions.

If a company outsources its transportation activities, adequate Scope 3 emissions can be compared. It is possible that the company has reduced Scope 3 emissions if it reports intensity of subcontracted transport over the last 5 years. Reliable data is not usually available.

$$\text{Intensity Change } (\%) = \frac{\text{Reporting Year Intensity } (gCO_2/t.km \text{ or } p.km) - \text{Reference Year Intensity } (gCO_2/t.km \text{ or } p.km)}{\text{Reference Year Intensity } (gCO_2/t.km \text{ or } p.km)}$$

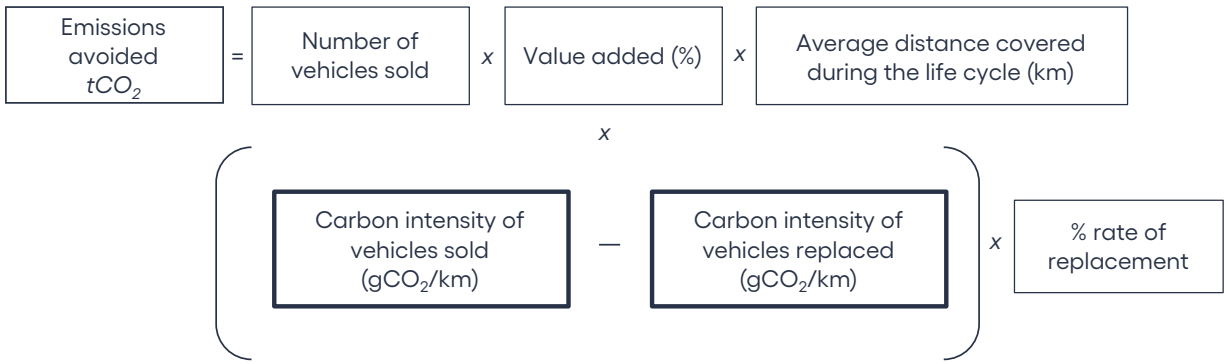
Avoided emissions

With the CIA methodology, avoided emissions are the difference between the stakeholder's significant emissions and a reference scenario. We believe that significant emissions are in fact emissions that concern final transport, thus avoided emissions are calculated on Scope 1&2 for transportation operators and Scope 3 for infrastructure operators.

For the transportation industry, the SBTI 2DS sector scenario (IAE Mobility Model) has been retained: it sets targets to reduce carbon intensity enough for limiting global warming to 2 degrees. If, for the reporting year, the stakeholder outperforms the scenario's objectives, in other words, if its emission factor calculated (in $kgCO_2/p.km$ or $kgCO_2/t.km$) is inferior to the carbon intensity anticipated by the scenario used, avoided emissions are calculated.

$$\text{Avoided Emissions } (tCO_2) = \text{Induced Emissions } (tCO_2) - \text{Physical Volumes } (p.km \text{ or } t.km) \times \text{Average Sectoral Carbon Intensity } (tCO2/\text{physical volume})$$

For the automotive sector, avoided emissions are calculated on Scope 3 only, and are based on the difference between the carbon intensity of new vehicles sold and the average carbon intensity of the stock of older vehicles replaced. Avoided emissions are only calculated for the share of new vehicles that replace the existing stock: the proportion of vehicle replacement for the analysis year is included in the calculation.



Category/ Saved Emissions	Reduced Emissions		Avoided Emissions
	Scope 1 & 2	Scope 3 – Upstream	Scope 3 – Downstream
Operators	If improved carbon efficiency regarding operations	Only if subcontracting carbon intensity has improved	If the stakeholder's carbon intensity is better than industry average
Infrastructure operators	If improved carbon efficiency regarding operations	N.A.	If the stakeholder's carbon intensity is better than industry average
Infrastructure Construction Companies	Not calculated, lack of data	N.A.	If the stakeholder's carbon intensity is better than industry average
Automotive Manufacturers	If improved carbon efficiency regarding operations	N.A.	If new vehicles sold replace more carbon-intensive vehicles

Summary Table - Emissions Saved

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Created in 2016 and based in Paris, Carbon4 Finance brings the Carbone 4 consultancy expertise to the financial sector, which since 2007 has been providing carbon accounting, scenario analysis and consultancy services in all economic sectors.

Carbon4 Finance offers a comprehensive set of climate data solutions covering both physical risk (the CRIS methodology: Climate Risk Impact Screening) and transition risk (the CIA methodology: Carbon Impact Analytics). These proven methodologies allow financial organisations to measure the carbon footprint of their portfolio, assess their alignment with a 2°C compatible scenario and measure the level of risk arising from climate change events.

Carbon4 Finance applies a rigorous bottom-up, research-based approach, which means that each asset is analyzed individually and in a rigorous manner.

For more information, please visit www.carbon4finance.com