CARBON IMPACT ANALYTICS

2020 REPORT ON THE FOOD & BEVERAGE SECTOR

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January 2022

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Executive summary

The food and beverage sector (including pre- and post-production activities) is one of the most emissive economic sectors, as it is responsible for about a third of total anthropogenic emissions, while agriculture alone produced more than 18% of global emissions in 2016. This report summarizes the results of the CIA (Carbon Impact Analytics) campaign, to identify the carbon performance and climate transition risk of 95 food and beverage companies. Together, these companies amount to about 2 000 billion euros in market capitalization, representing approximately half of the sector's total market capitalization.

This CIA campaign identified following key issues of the sector and its stakeholders:

- **Emissions from energy consumption play a minor role** in the sector's total emissions. Instead, emissions from agricultural practices including land use and deforestation are key.
- Few companies focus on the production and marketing of **high carbon food products**, including meat as well as coffee and cacao.
- In order to adapt to the agricultural transition, companies need to adapt their **food products**, as well as the **agricultural practices** applied to produce agricultural raw inputs. Only few companies focus on both aspects in the long-term strategy.
- Food and beverage companies do not report transparently and consistently on their **Scope 3 emissions**, even though they represent the main emission scope for these companies.
- Further **methodological developments** might be needed to **take into account the nutritional quality of food and beverage products** in the CIA rating method. An increased reporting transparency by analyzed companies regarding the quantities and types of sold products would be beneficiary for this.

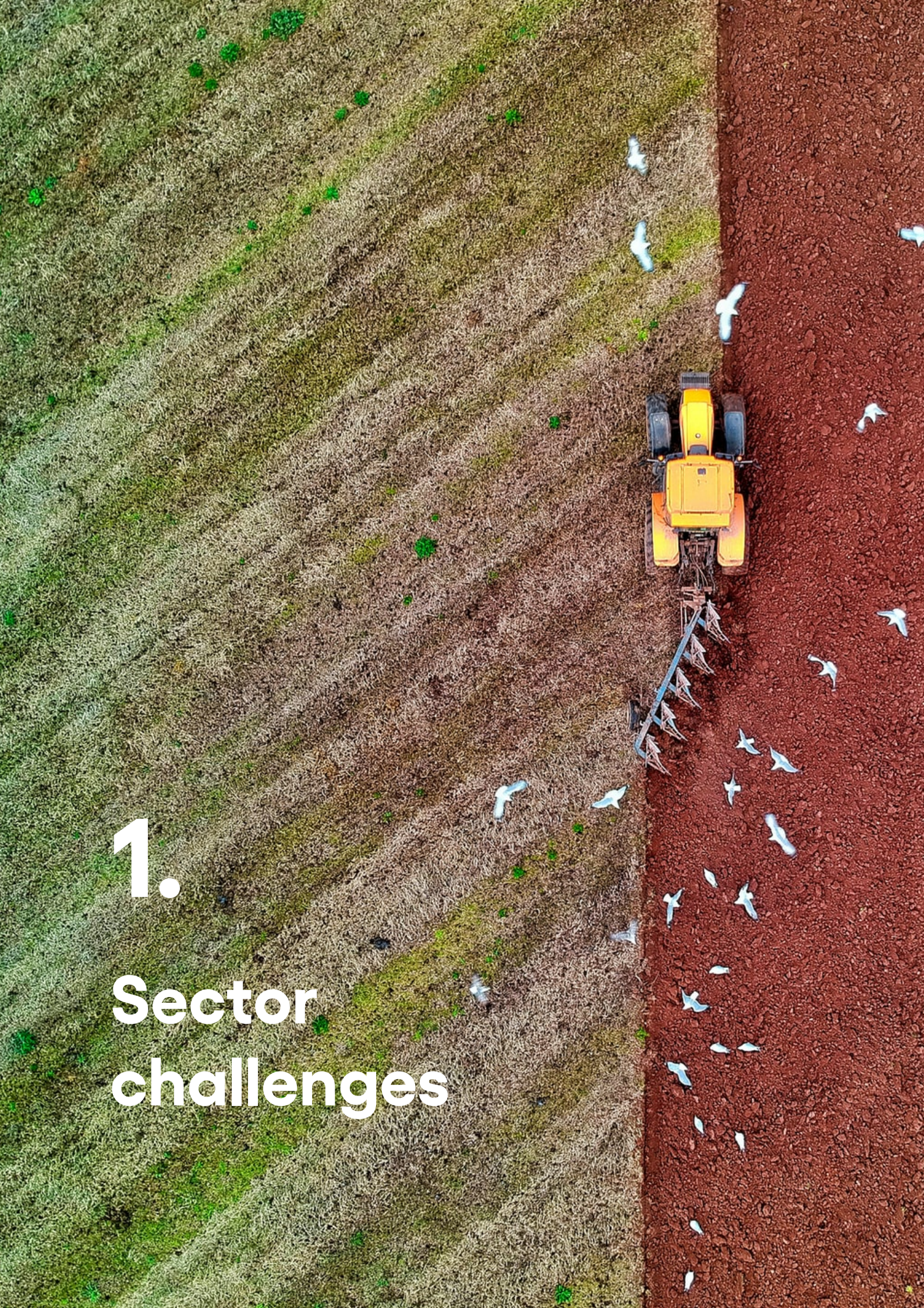
Introduction

As these lines are written, the world is preparing for the 26th United Nations Climate Change Conference in Glasgow. For the occasion, the international London-based think tank Chatham House has published a report drawn up for heads of state on the growing risk of food shortages due to climate change. In this report, the authors report that yields of staple crops could decline by 30% by 2050 unless action is taken to reduce emissions significantly in the last decade, while farmers should produce almost 50% more food to meet the global demand.

In 2021, a series of extreme weather events all over the globe gave a taste of what is possibly to come. Wheat prices have been exploding due to crop losses following a sustained record-breaking heat and drought in Canada and a brutal winter in Russia. In Madagascar, the worst drought in decades lead to the world first famine caused solely by climate change.

However, as well as being acutely vulnerable to changes in the climate, the food and beverage sector is also a significant driver of climate change. Besides that, agricultural system linked to the food and beverage sector is also a potential carbon sink. Thus, playing an important role in the climate transition regarding its own induced emissions, as well as sequestered emissions. Another particularity of the food and beverage sector is the role that consumers can play with regards to preferences and demand for certain products that are more or less resource demanding and vary largely concerning the associated environmental impact. Considering all these aspects makes this industry it a particularly interesting sector to study.

This report summarizes the results of the CIA (Carbon Impact Analytics) analysis campaign conducted in the second quarter of 2021 on a sample of 95 listed food and beverage companies. The CIA method seeks to measure a companies' 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 food and beverage 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.



1.

Sector challenges

1 Sector challenges

1.1 Presentation of the food sector

In this publication, the food sector is defined as the economic sector covering all activities related to the production, processing, trading, distribution, preparation and consumption of food and beverages. An overview of activities specifically covered by the Food CIA methodology is given in Section 1.1.3.

1.1.1 Relevance of the sector in the climate transition

Food and beverage production are closely linked to climate change. The food sector is one of the most emitting sectors - being responsible for 21% to 37% of overall anthropogenic emissions [1] -, while agriculture alone produced more than 18% of our global emissions in 2016. Overall, emissions from food systems increased by 17% over the past three decades, a trend that needs to be inversed, highlighting the urgence of climate action [2].

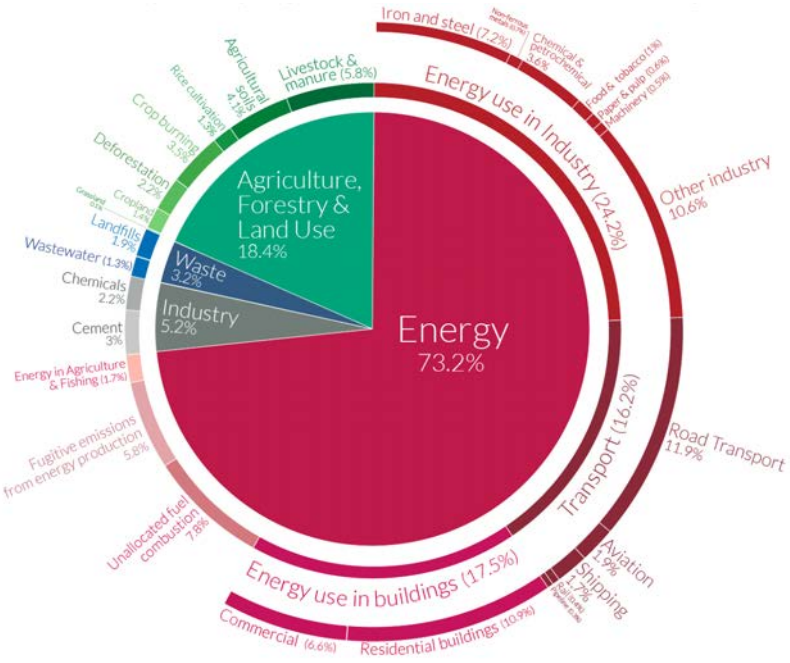


Figure 1: Global GHG emissions by sector. In this graph, agriculture is the only food-related activity to be reported separately and includes emissions from cropland[1] and agricultural soils[2]. Other emissions associated

[1] Depending on the management practices used on croplands, carbon can be lost or sequestered into soils and biomass. This affects the balance of carbon dioxide emissions: CO2 can be emitted when croplands are degraded; or sequestered when they are restored. The net change in carbon stocks is captured in emissions of carbon dioxide. This does not include grazing lands for livestock.
[2] Nitrous oxide – a strong greenhouse gas – is produced when synthetic nitrogen fertilizers are applied to soils. This includes emissions from agricultural soils for all agricultural products – including food for direct human consumption, animal feed, biofuels and other non-food crops (such as tobacco and cotton).

On the other hand, the food sector is particularly vulnerable to the effects of climate change. Farmers are the first to suffer from the increased pressure on land and water. These last few years, extreme temperatures, droughts and floods have affected yield growth, making it more and more difficult for populations in certain area to sustain themselves.

Nevertheless, the food industry is a high-stake sector in the fight against climate change. The food sector has a significant role to play in the transition to a low carbon future as its contribution centers on two strong axes: the **reduction of its GHG emissions** and the development of agricultural systems that serve **as carbon sinks, sequestering emissions** (*see this article from Carbone 4* [4] for sector challenges specific to France).

Deforestation is an enlightening example of the two-fold potential of the food sector. In Figure 1, deforestation is responsible for about 2% of global GHG emissions worldwide. However, this figure represents net emissions from changes in forestry cover, meaning it includes "negative" emissions resulting from reforestation. Gross emissions from deforestation are estimated to be around 8 to 10% according to the World Resource Institute[5]. Three quarters of all deforestation is driven by agriculture[6]. When forests are cut down, it does not only release greenhouse gases into the atmosphere, but it also destroys carbon sinks that are vital for absorbing GHG emissions and mitigating global warming. By stopping deforestation and protecting ecosystems, the food sector would therefore greatly reduce its impact on climate change.

1.1.2 Emission sources & types

As previously stated, most of GHG emissions produced by the food sector comes from agriculture. In a recent study published in Nature Food, M. Crippa *et al.* has estimated GHG emissions related with the food sector for the years 1990-2015. The detailed repartition by sources can be found in Figure 2.

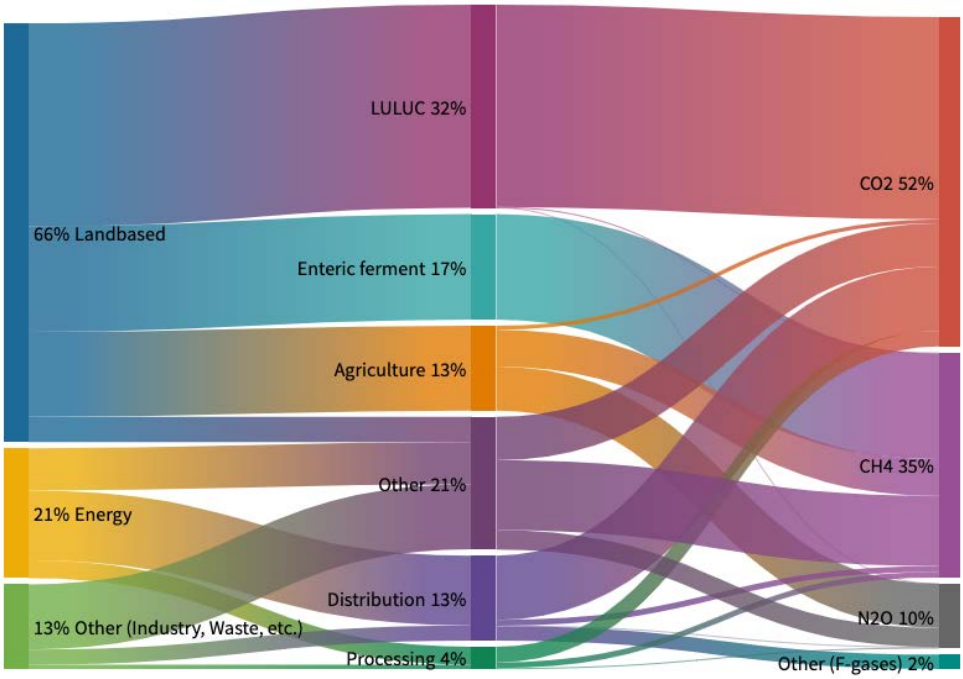


Figure 2: Emissions breakdown of the food sector by subsector, category and greenhouse gases. Adapted from M.Crippa et al., 2021.

In this study, it is estimated that only about **21% of all GHG emissions result from energy usage** (mainly due to transport, packaging and processing)**,** and about **66% of emissions are linked to land use and agricultural processes**. On the other hand, emissions from processing only amount to 4% of emissions[7]. Consequently, relevant emissions for food processing companies are **mainly Scope 3 emissions** from upstream activities such as the production of raw ingredients, packaging, and freight. The food sector (with the exception of the agricultural subsector) is therefore a perfect example of why looking at scope 3 emissions is essential to assess transition risks[3].

In addition to CO_2, the climate change impact of the agriculture sector is primarily driven by two non-CO_2 greenhouse gases: methane (CH_4) and nitrous oxide (N_2O)[4]. These gases play a significant role in warming the planet: methane is estimated to have a global warming potential (GWP) of about 28 times that of CO_2. As for nitrous oxide, its GWP is around 265 times that of CO_2. Non-CO_2 greenhouse gases are included in our CIA methodology and the results are provided in CO_2 equivalent.

[3] For more information about why scope 3 emissions are important to consider: http://www.carbon4finance.com/article-scope-3/

[4] According to M.Crippa *et al.*, the food sector total emissions consist of 52% of CO2; 35% of CH4; 10% of N2O; 2% of F-gases

1.1.3 CIA coverage

The CIA methodology covers each step along the value chain of the agri-food sector: agriculture (including biofuel production), soft-commodity trading, **food & beverage production**, and food retail. Nevertheless, please note that the results presented in Section 0 of this publication only focus on food and beverage production companies (including alcohols producers).

95 food and beverages production companies have been analyzed using the CIA bottom-up methodology, amounting to more than 1 892 billion euros in market capitalization or approximately 50% of the total market capitalization of food and beverages companies.

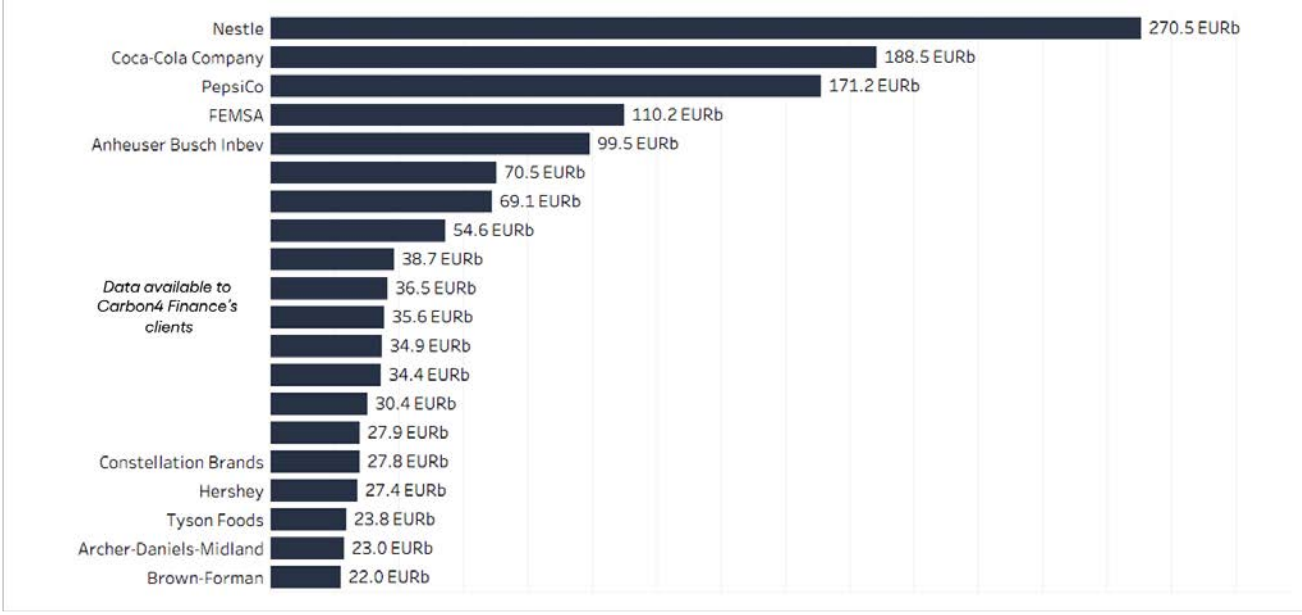


Figure 3: Market capitalization in the reporting year of the 20 largest companies analyzed.

1.2 Transition risks of the food & beverage sector

Due to its large contribution to climate change, the food and beverage sector is exposed to various transition risks. Transition risks arise when transitioning to a low-carbon economy. A fast and unprepared transition will result in higher transition risks. The CIA methodology helps identify transition risks and integrate them into investment or credit decision-making.

This section focuses on the main transition risks faced by the food and beverage sector.

1.2.1 Regulatory risks

Regulatory risks are an example of transition risk, relating to regulations that can emerge to accelerate the environmental transition and constrain some economic activities to take part in this transition.

For example, the European Green Deal had an influence on the Common Agricultural Policy (CAP) reform that was voted on 25 June 2021. The CAP supplies income support for European farmers and promotes rural development. The reform includes an increased ambition regarding environmental and climate related objectives as financial aids are conditionally granted based on compliance with standards meeting the Green Deal targets.

Moreover, the EU intends to introduce a "carbon border adjustment mechanism" by 2026, targeting mainly industrial products, which also includes fertilizers, potentially affecting food prices[8].

Europe is not the only one taking regulatory measures in order to comply with the Paris Agreement. Similar plans regarding a carbon-border-tax, potentially targeting products related to the food industry, are being discussed in the US by *Democrat* lawmakers[9].

Such measures will have a direct impact on the companies. The CIA methodology allows to identify companies that are more or less exposed to transition risks. For example, a top-rated food company (based on the CIA methodology) produce low-carbon products and considers climate change in its strategy. It is therefore less likely to be significantly impacted by, say, a carbon tax.

1.2.2 Market risks

The food and beverage sector is also subject to market risks, mainly due to changes in consumer behavior. As awareness grows for a more sustained food system, consumers are encouraged to favor vegetarian or vegan alternatives and local and seasonally produced food products. In France, the food company Bonduelle recently changed its mission to "We inspire the transition toward a plant-based diet to contribute to people's well-being and planet health." and enshrined it in the company's bylaws, explicitly showing investors and customers its intent to be part of the transition to a low carbon economy.

Moreover, supply risks are to be considered. Limited land is available globally to grow crops for food. Agricultural lands will potentially compete with increased land use due to urbanization[10].

1.2.3 Technology risks

Like in most sectors, food and beverage companies' performance depend on technology. Following the above-mentioned raising awareness (see Section 1.2.2) and shifting consumer behavior to vegetarian and vegan diets, the development of plant-based meat alternatives is a high-stake topic.

According to a research report published in 2020 [11], the plant-based food market is expected to grow at a CAGR of 11.9% from 2020 to 2027 to reach $74.2 billion by 2027. Therefore, for some food companies, investments in new technologies able to produce plant-based alternatives might be needed to remain competitive on the market.

In 2019, the Swiss multinational food company Nestlé sold a 60% share of Herta. However, the sale only included Herta meat business and Herta dough business. Nestlé retained its existing Herta vegetarian business and has developed it since then in line with its increased focus on plant-based offerings[12].

1.2.4 Reputational risks

Food companies may also suffer from reputation damage. Regarding climate reputational risks, they can stem from the use of palm oil, soy and other commodities associated with deforestation risks. For example, in the early 2010s, the Nutella maker Ferrero was widely criticized for using palm oil in products thus damaging its positive brand image. Consumers became aware of the issues associated with palm oil and boycotted Ferrero's products. At last, the company overcame the scandals by increasing the transparency on the traceability of its palm oil supply chain and certifying its palm oil with the RSPO (Roundtable on Sustainable Palm Oil) label. Reputational risks are increasingly relevant for companies as consumers are becoming more and more aware of climate change-related issues.

Deforestation does not only contribute to climate change but is also a threat to ecosystems. While the CIA methodology does not consider biodiversity, the BIA (Biodiversity Impact Analytics) tool, developed by Carbon4 Finance and launched in June 2021 is measuring the biodiversity impact of portfolios[5].

1.3 Physical risks

Because of its vulnerability to climate and meteorological conditions, the food and beverage sector is and will be particularly affected by physical risks. The CIA methodology only focuses on greenhouse gas emissions and does not cover physical risks[6].

[5] For more information, visit www.carbon4finance.com

[6] Physical risks can be estimated using the CRIS methodology developed by Carbon4 Finance or the OCARA methodology developed by Carbone 4. For more information, visit www.carbone4.com and www.carbon4finance.com

2.
CIA methodology

2 CIA methodology

In this chapter, it is described how the CIA methodology is applied to the food and beverage sectors. For more information on the CIA methodology in general, please refer to our CIA methodology guide.

2.1 Calculation of emissions

Induced emissions for scope 1, 2 and 3 are calculated based on physical flows and corresponding emission factors:

Induced emissions	=	**Physical indicator** (tonnes of sold food & beverage products)	×	**Emission factor** (tCO_2e/tonnes)

We use emission factors specific to about 60 types of food & beverage products and categorize sold products corresponding to these categories.

We calculate **induced emissions** for following Scope 3 emission categories:

- ***Agricultural raw materials***, from the farming of inputs
- ***Packaging materials***, from packaging production
- ***Transport & distribution***, up- and downstream
- ***Use of sold products***, e.g. refrigeration in supermarkets
- ***End-of-Life, e.g.*** treatment of packaging materials and food waste

In the CIA methodology, **emissions savings** are generally composed of **reduced and avoided** emissions.

Emission savings	=	**Reduced emissions** (tCO_2e)	+	**Avoided emissions** (tCO_2e)

Due to the lack of transparency of reported Scope 3 emissions, **reduced emissions** are only calculated for Scope 1&2 emissions for the food and beverage sectors calculated (see also section 4.1). Avoided emissions are not calculated due to a lack of a relevant, sector-specific benchmark. Reduced emissions are calculated based on the carbon intensity evolution over the past five years.

Reduced emissions	=	Δ **Scope 1+2 intensity** (%)	×	**Emissions in current year** (tCO_2e)

2.2 Sectoral Rating and performance indicators

The sectoral rating for food, as well as beverage production activities correspond to the weighted sum of 3 indicators, ranging from 1 (best performance) to 15 (worst performance):

- **Past performance – 10%** of the sectoral rating
- **Current performance – 50%** of the sectoral rating
- **Forward-looking performance – 40%** of the sectoral rating

2.2.1 Past performance

The assessment of the past performance aims to provide a historical view on a company's business activity. In general, the evolution of a company's performance over the past five years is analysed in the CIA methodology. In the context of Food and Beverage companies, the **Carbon Impact Ratio (CIR)** of reduced Scope 1&2 emissions (calculated in case of a Scope 1&2 intensity improvement over the past 5 years) per induced Scope 1&2 emissions is used, also referred to as **reduced CIR**:

$$\text{Reduced Carbon Impact Ratio (CIR)} = \frac{\text{Reduced emissions } \textit{Scope 1\&2} \ (tCO_2e)}{\text{Induced emissions } \textit{Scope 1\&2} \ (tCO_2e)}$$

The reduced CIR is an easy-to-read indicator of the carbon impact of a company and enables comparison between a part of the carbon impact of a company and its sectoral peers. In particular, the reduced CIR enables the identification of companies which have significantly improved the carbon-efficiency of their own operations over the past five years. By taking into account location-based Scope 2 emissions, rather than market-based Scope 2 emissions, it is focussed on efforts to reduce the electricity consumption rather than relying on different green electricity purchase schemes.

For the food & beverage sector, only Scope 1&2 emissions are taken into account to assess the past performance, although Scope 1&2 emissions are not the significant emissions of this sector (which are primarily upstream Scope 3 emissions linked to the consumption of agricultural products). However, no reliable information is reported by companies on their Scope 3 emissions, and even much less for the evolution of Scope 3 emissions over the past 5 years. Therefore, only Scope 1&2 emissions are used to assess the past performance and a relatively low weight (10%) is applied to this rating criteria.

The ***past performance rating*** is directly related to the reduced CIR. Companies with a higher reduced CIR receive a better past performance rating than companies with a lower reduced CIR. When the reduced CIR is zero, it indicates that a company could either not reduce its carbon emission intensity over the past five years (resulting in a past performance rating of 14), or that the company does not report sufficient data to calculate reduced emissions (resulting in a past performance rating of 15).

NB: While for other sectors the past performance rating is based on **benchmarking company's emission reduction rates with sector-specific IEA ETP scenarios**, this approach is not used for the food & beverage sector. This is due to no reliable information being available on the evolution of Scope 3 emissions (i.e., the sector's significant emissions) over the past years. Such an approach will be implemented in the CIA methodology in following years, when historic information is available in our database (or when companies improve their reporting).

2.2.2 Current performance

For the food and beverage sectors, the current performance is assessed via the **carbon intensity of sold products**, which allows to measure the current positioning of a company relative to its peers. The Carbon intensity of sold food and beverage products includes all relevant emission scopes from upstream (deforestation, transport…) to downstream (refrigeration, end-of-life…) and is expressed per tonnes of sold products. It is calculated as follows:

$$\text{Carbon intensity} = \frac{\text{Induced emissions}\ \textit{Scope 1\&2 + Scope 3 upstream (agricultural inputs, deforestation, packaging, transport) + Scope 3 downstream (use of sold products, end-of-life treatment)}\ (tCO_2e)}{\text{Tonnes of sold products}\ (\text{tonnes})}$$

The carbon intensity determines the **current performance rating**. A lower carbon intensity results in a better current performance rating. For example, a carbon intensity of 2 tCO_2e/tonne of product (approximate carbon intensity of vegetables) results in a current performance rating of 1/15; a carbon intensity of 29 tCO_2e/tonne of product (approximate carbon intensity of beef) results in a current performance rating of 15/15.

It should be noted that using the carbon intensity per tonnes results might favour relatively heavy products with a high water content and does not take into account the nutritional function of the sold product. Using an energy or nutritional reference unit rather than a mass-based approach might help to refine results in future campaigns (more on this limitation in section 4.2).

2.2.3 Forward-looking performance

As for other sectors, the **forward-looking performance rating** is based on different criteria:

- **Strategy:** This criterion analyses to which degree the company intends to adapt and contribute to a decarbonized economy. For food and beverage companies, we analyze aspects such as agricultural practices (e.g. crop rotation, deforestation), shift towards low-carbon products (e.g. vegan products), shift towards low-carbon transport modes or reduction of transport and packaging.

- **Low-carbon Capex:** For food and beverage companies low-carbon capital expenditures include among others energy efficiency improvements of production processes, shift to non-animal-based products (e.g. acquisition of companies specialized in plant-based products).

- **Emission reduction targets:** Reduction targets are compared to emission and climate change scenarios from the FAO (for agricultural practices, i.e. Scope 3 emissions for the food & beverage sector) and from the SBTi and the IPCC (for Scope 1&2 emissions). As the selected scenarios describe the evolution of absolute emissions, absolute emission reduction targets were taken into account if available. In case of intensity reduction targets, we estimated absolute reduction targets based on the past evolution of total production volumes.

- **Governance:** To assess the governance related to a company's climate change performance, we analyze the organizational level at which climate-related decisions are made, employee trainings on climate issues, and incentives (financial and non-financial) linked to the company's carbon performance.

2.3 Rating method

Past, current and forward-looking performance ratings and the corresponding weights *(see chapter 2.2)* are used to calculate the **sectoral rating** of a company's activity, ranging from 1(best score) to 15 (worst score). To aggregate multiple sectoral ratings for a single company, an **overall rating** is calculated as the average of the sectoral ratings for each of a company's activity, weighted by the corresponding revenue share.

Besides the individual performance indicators (past, current and forward-looking), the sectoral ratings are also determined by our **cap and floor system**, which defines the applicable ratings for a sector.

For food and beverage companies, different ratings are applicable:

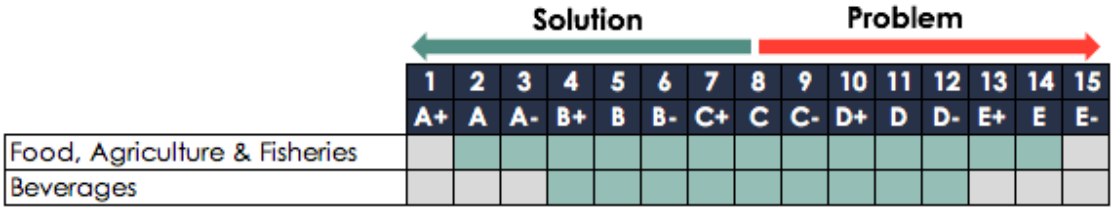
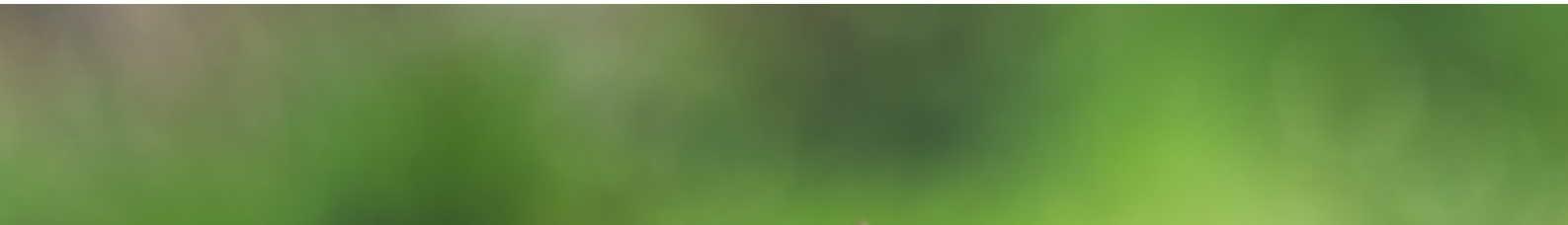


Figure 4: Cap and floor of applicable food and beverage sector ratings.

For food activities, a wider range of sectoral ratings is applicable (2 to 14) compared to beverage production activities (4 to 12). This is mainly due to one reason: there is a larger variety of food products in terms of carbon performance than for beverages. While carbon intensities for beverages range between about 0.5 tCO2/tonne for water and almost 5 tCO2/tonne of liquor, most non-alcoholic beverages have a carbon intensity only slightly higher than the one of water. For food products, a much larger range regarding the carbon intensity exists, ranging from legumes (about 1 tCO2e/tonne) to beef (about 30 tCO2e/tonne).

Both applicable ranges for the food and the beverage sector are symmetrically centred around an average rating (8/15), since the food and beverage sectors as we have not taken a position on the future role of this sector, regarding whether it needs to reduce, or increase its role in the global economy. Instead, the food and beverage sectors need to refocus their activities and improve their carbon performance (the food sector more than beverages).



3.
Results

3 Results

In this section, the results of the food and beverage campaign carried out in the first half of 2021 are presented.

3.1 Overview of Sectoral ratings

3.1.1 Food companies

The following figure shows the distribution of the **food sectoral ratings** by indicator for the 53 analysed companies that have a significant food production activity. Companies with a better sectoral rating (left side of the graph) are facing a lower transition risk due to a higher contribution to the food sector's low-carbon transition compared to companies on the right side of the graph.

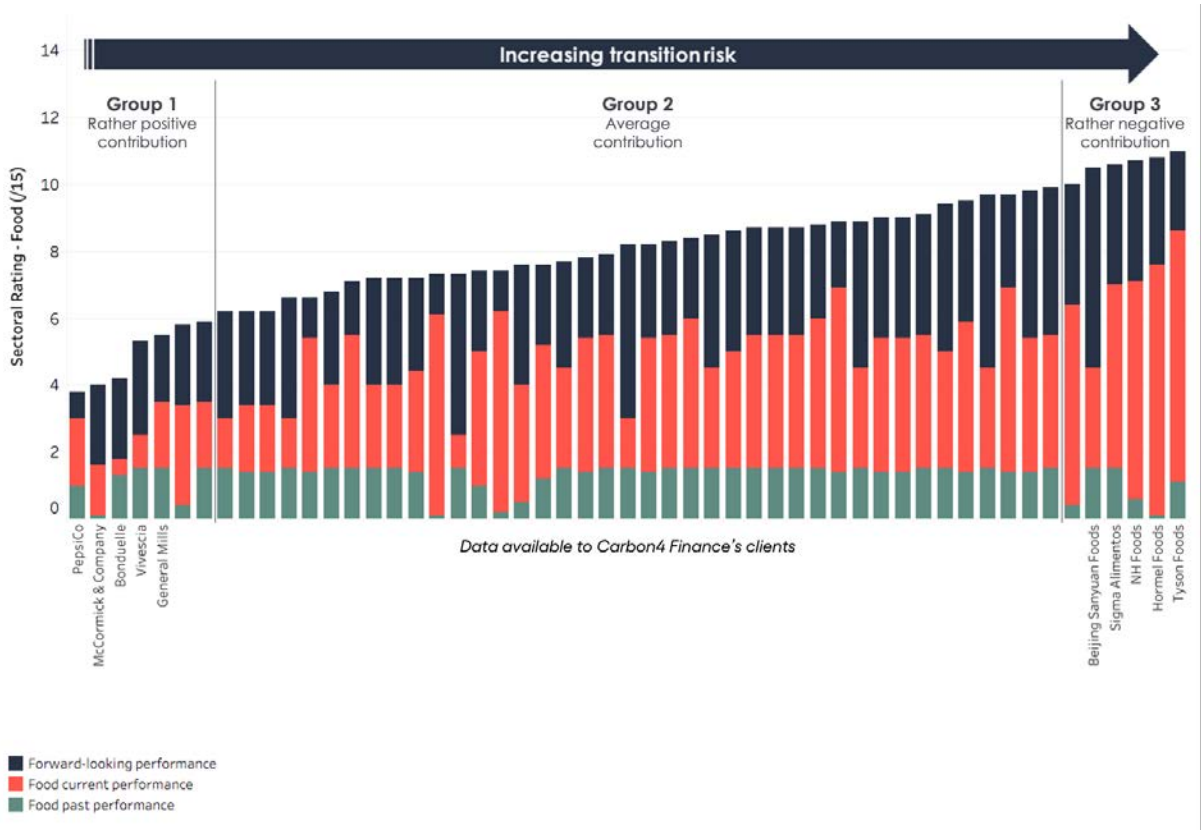


Figure 5: Sectoral rating of companies' food activities by indicator (past, current, forward-looking). Companies with a better rating face a lower transition risk and are listed further on the left of the graph.

Group 1 – Companies with a rather positive contribution
Only seven companies with a food sector rating better than 6 (i.e. a score better than B-). While this group includes companies with a top as well as with a worst-possible past performance, these companies have generally two things in common:

- No carbon intensive products such as meat or coffee / cocoa
- A relatively ambitious forward-looking performance

Group 2 – Companies with an average contribution
Most companies receive a rather average sectoral rating between 7 and 10 (i.e. between C+ and D+). This heterogenous group includes a wide variety of companies with different climate change related strengths and weaknesses. What these companies have in common is that none of them focus neither on the sales of vegetarian products or meat-based products.

Group 3 – Companies with a negative contribution
This group includes six companies with a rating worse than 10 (i.e. a D rating or worse). These companies principally focus on products with a high climate change impact such as meat and do not compensate this lack in current performance with a good forward-looking rating.

It should be stressed, that the production of meat products does not necessarily result in a bad overall rating, since companies could receive a positive past, or forward-looking performance without completely shifting away from a meat-based business. However, while levers to improve the carbon performance of meat products do exist, these are not addressed by the companies in this group. These levers include the choice of meat products (e.g. chicken vs beef), as well as shifting to low-carbon agricultural practices, also referred to as agroecological practices. Agroecological practices for livestock production include the exclusion of feed that is associated with high deforestation risk (e.g. soybeans from unspecified origins), waste management (e.g. to use animal waste as fertilizer or for biogas production), and replacing synthetic inputs with organic alternatives[13].

3.1.2 Beverage companies

The following figure shows the ranking by **beverage sectoral rating** for the analysed companies with a significant beverage production activity. **A low rating represents a positive contribution to the sector's low-carbon transition and consequently a low exposure to transition risk.**

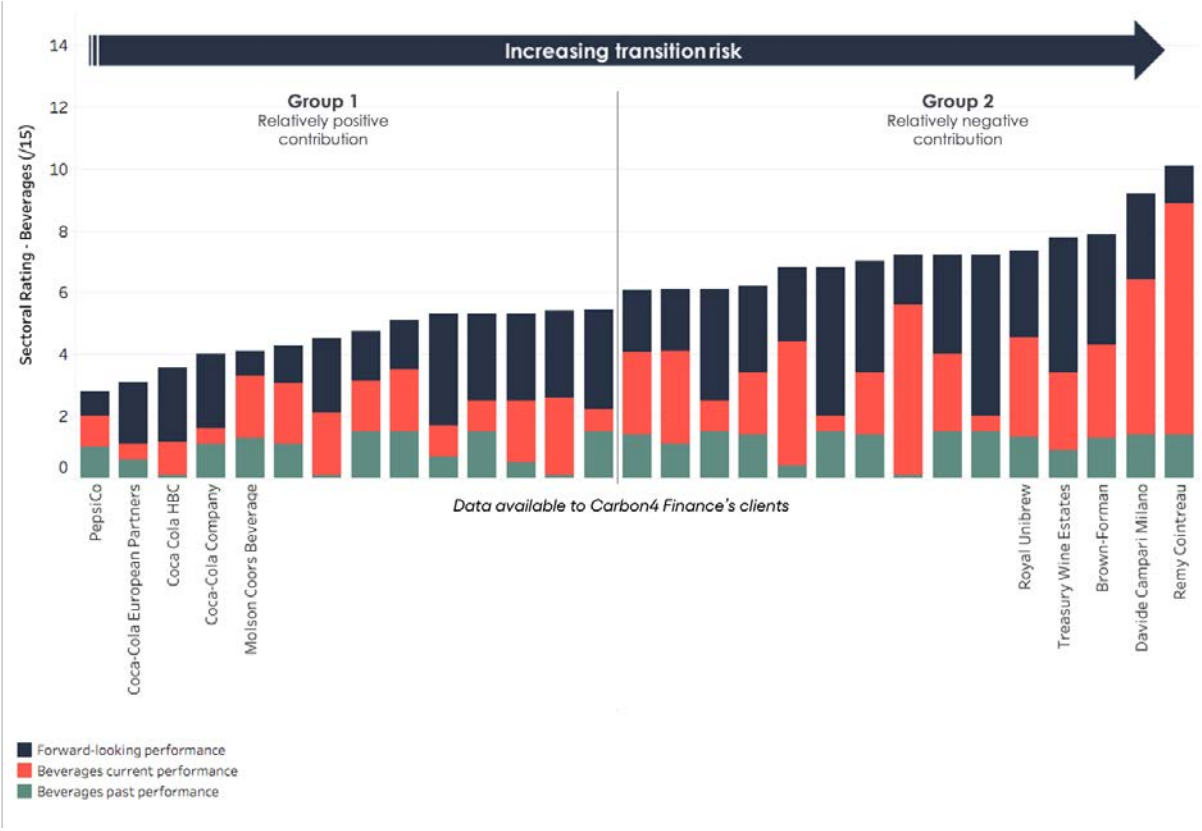


Figure 6: Sectoral rating of companies' beverage activities by indicator (past, current, forward-looking). Companies with a better rating face a lower transition risk and are listed further on the left of the graph.

Group 1 – Companies with a comparatively low contribution

While 14 of 30 companies receive a sector rating better than 6 (i.e. better than B-), only six companies receive an overall rating (including secondary activities and the cap and floor system) better than 6. Among these six companies are only two companies that are involved in the production of alcoholic beverages (Molson Coors Beverages and Carlsberg). Both of these companies compensate their relatively high carbon intensity of their sold products (primarily beers) with ambitious strategies and emission reduction targets that result in positive forward-looking ratings.

Group 2 – Companies with a comparatively high contribution

None of the beverage companies obtained a sectoral rating higher than 11. Nevertheless, this is a heterogenous group of companies and includes companies with a rather negative impact on the climate.

Two companies stand-out from this group: Davide Campari Milano and Remy Cointreau, which are mainly involved in the production of spirits with a high alcohol content and thus sell a product portfolio with the highest carbon intensities of all analysed beverage companies.

There are two main reasons why producers of alcoholic beverages perform worse regarding the carbon intensity (and thus the present performance) than producers of non-alcoholic beverages: the production process of alcoholic beverages and the type of used packaging. The production process of alcoholic beverages is generally more emissive due to energy intense processes such as brewing, fermentation, or distillation. Especially the production of beverages with higher alcohol content requires a significant amount of energy for distilling processes[14]. Regarding the use of packaging, alcoholic beverages are primarily sold in glass bottles (as well as aluminium cans in case of beers), while non-alcoholic beverages are mainly sold in plastic bottles. Although plastic pollution has significant environmental implications, glass requires more resources and energy to produce.

3.2 Results by indicator – Food companies

In the following subsections the results of **food companies by performance indicators** (past, current and forward-looking) are presented.

3.2.1 Past performance

For only 14 of the 52 analysed food companies a Scope 1&2 intensity reduction was calculated. Consequently, reduced emissions – and a reduced CIR larger than 0 – have only been calculated for these 14 companies (for all others, CIR = 0; see following graph). For another 10 food companies an increased Scope 1&2 intensity has been calculated (resulting in a score of 14/15). For the remaining 28 food companies, no Scope 1&2 intensity evolution was calculated due to a lack of reporting transparency (resulting in in the lowest score possible: 15/15). It was not possible to calculate the Scope 1&2 intensity evolution for more than 50% of the analysed food companies, indicating a clear lack of transparency in the companies' reporting (more on this issue see chapter 4. *Limits*).

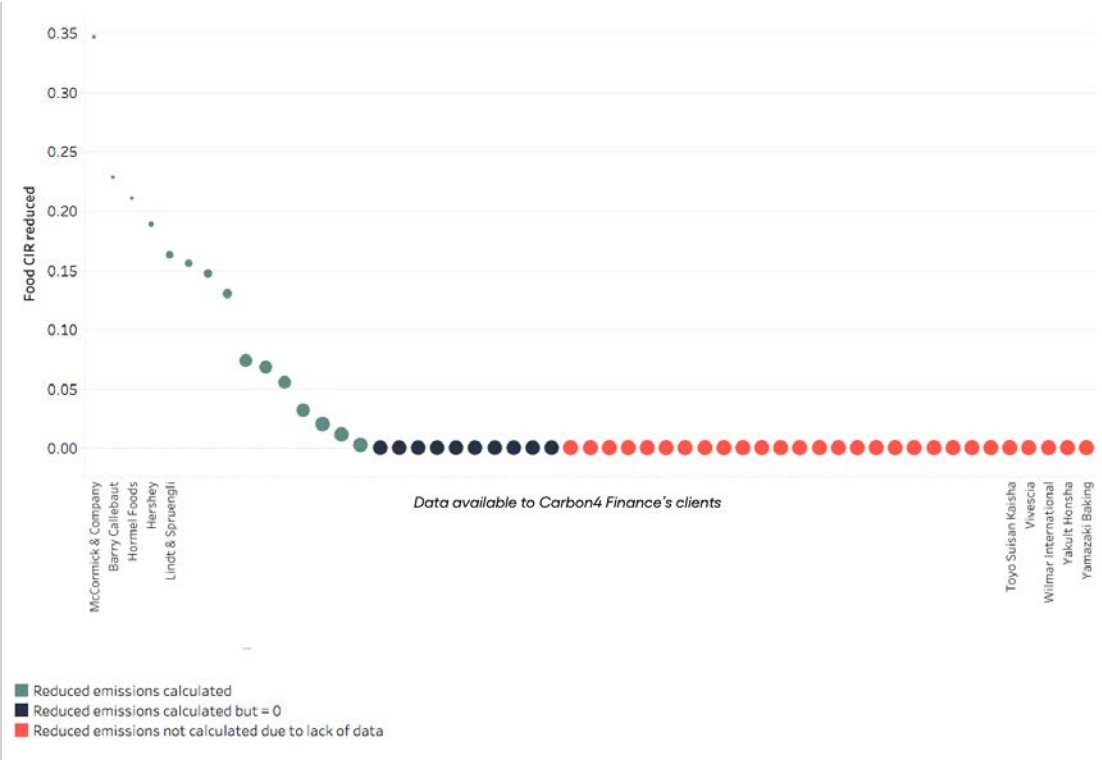


Figure 7: Companies ranked by the past performance indicator (reduced CIR) of their food activity. Companies with a higher reduced CIR) receive a better score and are listed further on the left side of the graph.

All of the 14 companies that reduced their Scope 1&2 intensities achieved this reduction by the implementation of energy efficiency measures, or the production of on-site renewable energy. The **top 5 companies** regarding the past performance are presented below.

Rank	*Company*	*Main activity*	*Past performance description*
1	McCormick & Company	Manufacturer of spices	McCormick reduced its Scope 1&2 intensity by **26%** over the past 5 years. The company claims to have made significant improvements in energy efficiency by implementing new technologies and production systems.
2	Barry Callebaut	Chocolate and cocoa product manufacturer	Barry Callebaut reduced its Scope 1&2 intensity by **19%** over the past 5 years. This is mainly due to the implementation of renewable energy generation on-site for its processing plants. Berry Carbeau claims that of 2019, 23 of its 61 processing plants are fully powered by renewables (without distinguishing between on-site renewable electricity generation and different schemes to buy green electricity).
3	Hormel Foods	Production and processing of meat and other food products	Hormel reduced its Scope 1&2 intensity by **17%** over the past 5 years, mainly due to energy efficiency improvements and on-site implementation of renewables.
4	Hershey	Producer of chocolates & other sweets	Hershey reduced its Scope 1&2 intensity by **16%** over the past 5 years. This was achieved through energy, packaging and water consumption reduction, indicating a more efficient production (waste however increased).
5	Lindt & Spruengli	Chocolate and cocoa product manufacturer	Lindt & Spruengli reduced its Scope 1&2 intensity by **14%** over the past 4 years[7], mainly due to energy efficiency improvements.

3.2.2 Current performance

As the current performance is based on the carbon intensity, companies that focus on vegetables and exclude meat or animal-based products receive a better score than others.

[7] Due to lack of data, we calculated the evolution over 4 years instead of 5.

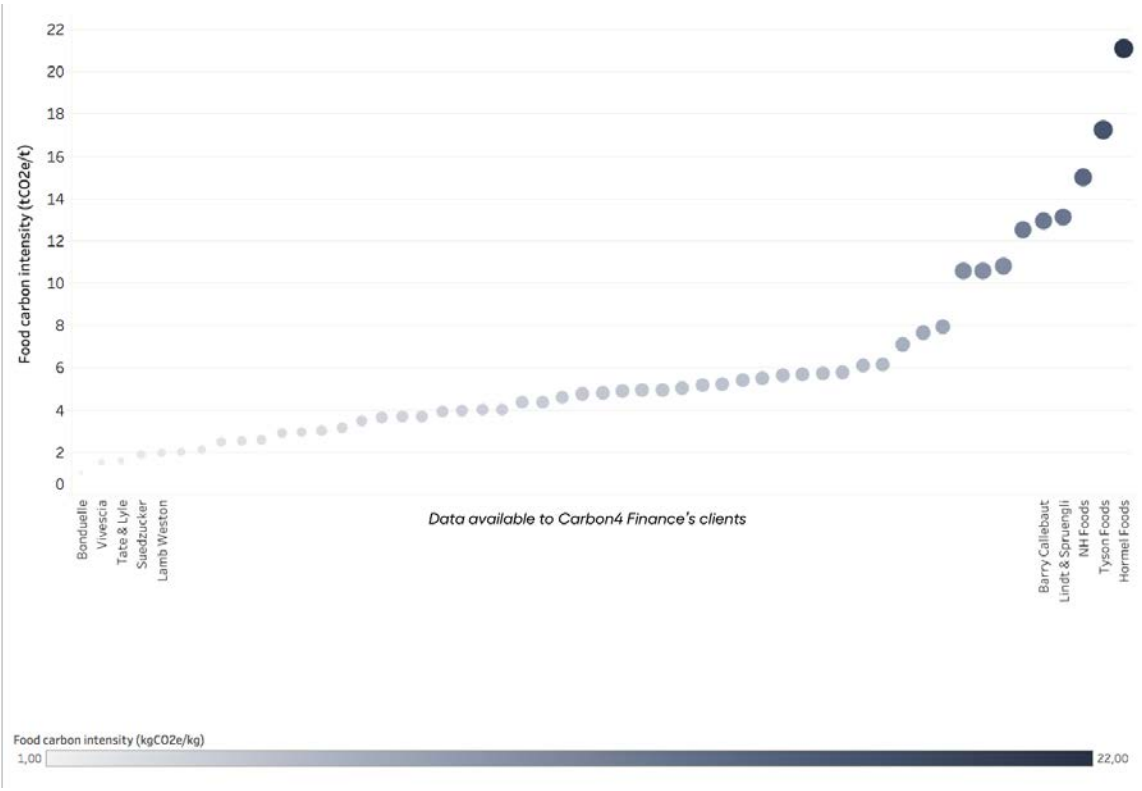


Figure 8: Companies ranked by the carbon intensity of sold food products. Companies with a lower carbon intensity receive a better score and are listed further on the left side of the graph.

The **top 5 companies** regarding the current performance all focus on different plant-based products.

Rank	*Company*	*Main activity*	*Current performance description*
1	Bonduelle	Processor and distributor of vegetables	Bonduelle is principally involved in supplying low-carbon food products including a variety of (frozen) fruits, vegetables and pulses, leading to a low carbon intensity of **1.0 tCO2e/tonne**, resulting in a **current score of 1/15**.
2	Vivescia	Agro-industrial cereal cooperative	Vivescia is involved in the growing and processing of cereals and cereal-based products, resulting in a carbon intensity of 1.5 tCO2e/tonne and a **current score of 2/15**.
3	Tate & Lyle	Ingredient provider for the food & beverage industries	Tate & Lyle's products are mainly corn-based sweeteners (e.g. corn syrup), starches and other food additives. For its product mix we estimated a carbon intensity of **1.6 tCO2e/tonne**, resulting in a **current score of 2/15**.
4	Suedzucker	Processor of agricultural raw materials (primarily sugar)	Suedzucker sells beetroot-based sugar and sugary products, but also other types of processed foods. For its product mix we estimated a carbon intensity of **1.9 tCO2e/tonne**, resulting in a **current score of 2/15**.
5	Lamb Weston	Manufacturer of mainly potato-based food products	Lamb Weston principally sells potato-based products, for which we estimated a carbon intensity of **2.0 tCO2e/tonne**, resulting in a **current score of 2/15**.

3.2.3 Forward-looking performance

On average, food companies receive a forward-looking rating of 8/15, and only five companies receive a rating of 4/15 or better. Nine companies receive a rating of 10/15 or worse. These are companies that barely include climate change-related aspects in their long-term strategy and have generally no (ambitious) emission reduction targets.

Currently, food companies are not yet facing significant constraints by policy makers in terms of the climate performance of their sold products. Instead, the push to include climate change mitigation aspects in the companies' forward-looking strategies seems largely to be derived from the side of consumers that increasingly demand low-carbon food products.

The following figure shows the forward-looking score ranging from 1 (best score) to 5 (worst score).

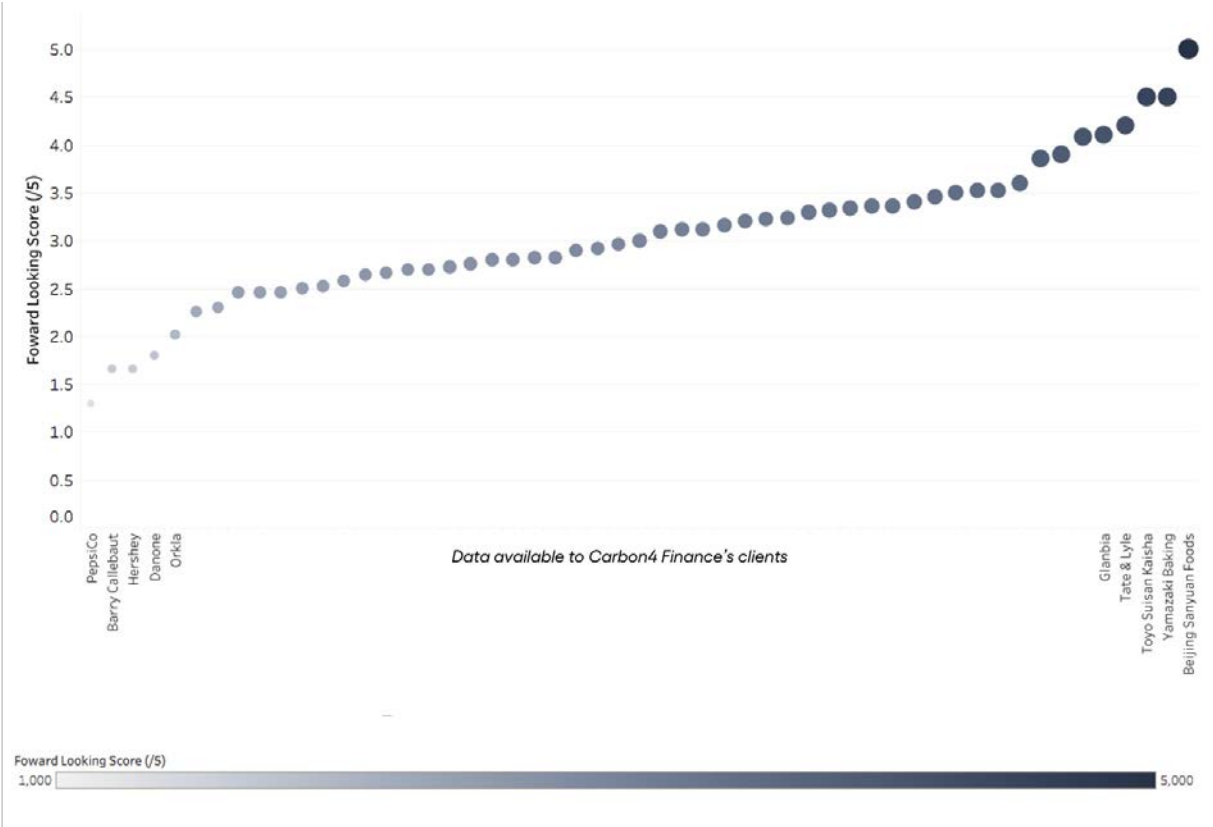


Figure 9: Companies ranked by the forward-looking performance of their food activity. from 1/5 (worst score) to 5/5 (worst score).

All food companies ranked in the **top 5** regarding the forward-looking performance have set relatively ambitious targets to reduce their Scope 1&2 and Scope 3 emissions. This is also reflected in all of them being classified as 1.5 °C or 2 °C bye the Science Based Targets initiative (SBTi). Moreover, they have in common that they integrate key climate change mitigation aspects in their long-term strategy, and that climate change-related governance aspects are integrated in their company structure.

Rank	***Company***	***Main activity***	***Past performance description***
1	Pepsi Co	Manufacturer and distributer of food and beverage products	PepsiCo has defined a wholistic strategy that includes all climate change key challenges for the food and beverage industry: agricultural raw materials, transport (including vending and cooling equipment) and packaging. Additionally, Pepsi has set ambitious Scope 1&2 and Scope 3 reduction targets that are classified as 1.5 °C by the SBTi.
2	Barry Callebaut	Chocolate and cocoa product manufacturer	Barry Callebaut has defined a wholistic strategy that includes targets regarding the sourcing of agricultural raw materials. Barry Callebaut communicates also ambitious, quantified commitments to shift its activities towards decarbonized agricultural practices, e.g. by offering support and training in agroecology to its supplying farmers, exclusion of products contributing to deforestation with unspecified origins) and it has set an internal carbon price. Additionally, the company has set ambitious Scope 1&2 and Scope 3 reduction targets that are classified as 1.5 °C by the SBTi.
3	Danone	Food & beverage company	Danone is well aware of key climate challenges for its sector and integrates aspects such as regenerative agriculture, deforestation and sustainable packaging in its long-term strategy. Additionally, Danone has set a quantified target to increase its plant-based sales and has set rather ambitious Scope 1&2 and Scope 3 emission targets (2 °C classified by the SBTi).
4	Hershey	Producer of chocolates & other sweets	Hershey has made commitments to increase its share of “responsible” agricultural raw material sourcing (e.g. through agroforestry and shade-grown cocoa) and reduce its use of packaging. However, its commitments are more vague and less ambitious compared to afore mentioned companies. Nevertheless, Hershey hast set ambitious reduction targets for its Scope 1&2 and Scope 3 emissions, that are classified 1.5 °C by the SBTi.
5	Orkla	Supplier of different (food) consumer products	Orkla has set goals to increase recycled material content in its packaging and to purchase sustainable raw materials. Additionally, Orkla hast set ambitious reduction targets for its Scope 1&2 and Scope 3 emissions, that are classified 1.5 °C by the SBTi.

3.3 Case studies

Danone and Nestlé are two multinational food and beverage producing companies with similar activities and of comparable size (even though Nestlé's Market Cap is almost 8 times higher in the respective reporting years[8], not many food companies come close to the size of Nestlé, see figure 3). Both companies' revenues are mainly retrieved from food products, with the production of beverages playing a secondary role. Consequently, the companies' overall performances are primarily based on their food activity.

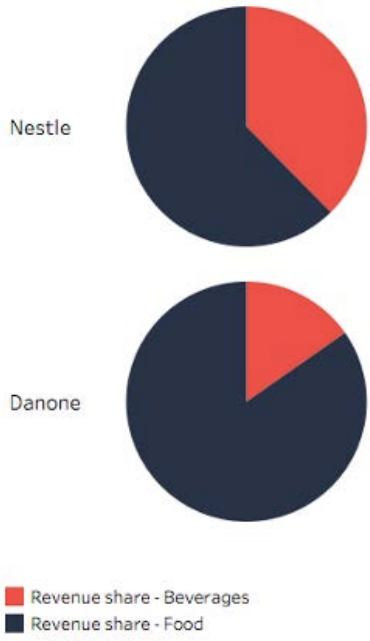


Figure 10: Revenue distribution of Danone and Nestlé.

Both companies receive the same CIA overall rating (taking into account sectoral ratings for food and beverage activities as well as the cap and floor system), a C+ (7/15). However, the companies obtain their ratings based on different strengths and weaknesses. While Danone could not reduce its Scope 1&2 intensity over the past 5 years (leading to a past score of 14/15 for its food and beverage activity), Nestlé achieved a reduction of about 13% (leading to a past score of 4/15 for both activities).

As for the past performance, Nestlé receives a better score for the current performance of its food activity, due to a slightly lower carbon intensity of sold food products (4 tCO2e/t compared to 5 tCO2e/t). Danone's higher carbon intensity is caused by the company's focus on dairy-based products, while Nestlé focusses on a wider range of mainly processed food products, including among others breakfast cereals and candies (food categories that might benefit from the mass-based approach regarding carbon intensity and the current performance). On the contrary, Danone receives a better current performance for the beverage activity, thanks to a significantly lower carbon intensity of sold beverages, as Danone primarily sells water. Nestlé on the other hand sells soft drinks as well as cacao and coffee-based drinks.

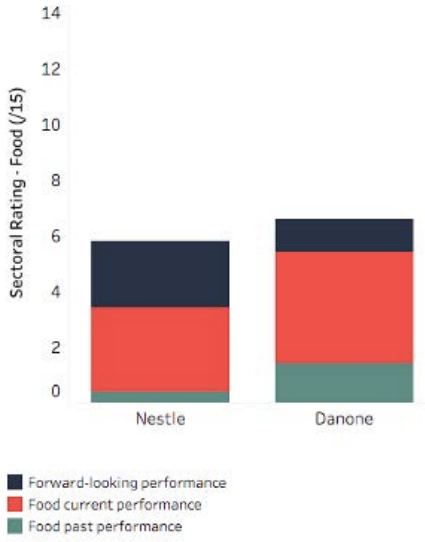


Figure 11: Food sectoral ratings of Nestlé and Danone by performance indicators.

[8] It should be noted that due to different reporting schedules of the companies, the analyses for Nestlé and Danone are based on different reporting years, 2019 and 2020 respectively.

While Danone's current carbon intensity of food products is higher compared to Nestlé's products, this might change in the coming years. Danone is quickly expanding into plant-based dairy alternatives (the company intends to increase its plant-based sales to 6 000 USDm by 2025, which would represent about 30% of its 2020 revenue) and is aware of the importance of agricultural practices needed for an agricultural transition. While Nestlé is also getting increasingly involved in plant-based dairy alternatives (namely by having introduced its own pea-based milk substitute in May 2021, or by having sold the meat business of its Herta subsidiary while having kept its vegetarian business), these products only represent a marginal share of the Swiss food company[15]. Since low-carbon food products seem to play a more important role in Danone's future product portfolio, as well as more ambitious emission reduction targets, lead to a better forward-looking score for Danone (3/15 compared to 6/15 for Nestlé). While both companies do transition to some degree towards low-carbon food alternatives, they are already feeling impacts by the food sector's shift towards more sustainable products. Organic soy prices reached a record high in the US in 2021, increasing the price pressure on soymilk manufacturers such as Danone[16].

Overall, Nestlé and Danone seem better positioned than most of their peers to face the climate transition. In case of Nestlé this is due to a diverse product portfolio, that includes food products with a relatively low climate impact. This results in an above average climate impact rating despites Nestlé being associated with several socio-environmental controversies that go beyond the CIA methodology (e.g. use of GMOs, promoting unhealthy food, child labour) Danone, while currently focussing on dairy products, is aware of its transition risk and will increase its offer of low-carbon food products.

4.

Limits

4 Limits

In general, there are two types of limitations of the food and beverages campaign: limits caused by **the lack of transparency** of analysed companies and **methodological limits** of the CIA approach applied to the food and beverage sectors. Often, these two aspects are linked in a way that the first drives limitations of the CIA methodology itself.

4.1 Companies' disclosure

Transparency on sold tonnes by product type
As presented in section 2.1, we calculate Scope 3 emissions based on the tonnage produced with different emission factors depending on the type of product. However, food companies often do not disclose their physical production volumes by product type, resulting in the need to estimate these based on available data (e.g. revenues by product types, average prices for different product types, total production volumes). To increase the reliability of calculated Scope 3 emissions and resulting performance indicators such as the carbon intensity, it is needed that companies increase their reporting transparency on this matter.

The past performance indicator
As presented in the methodology section (2.3), the past performance rating is only based on the evolution of Scope 1&2 emissions, which represent only about 4% of total induced emissions. Thus, the most relevant emissions (Scope 3) are not included. As reporting on Scope 3 emissions is often incoherent between different actors, and rarely available over the past five years, no reliable evolution of Scope 3 emissions is possible. To change this, companies either need to start reporting their dominant Scope 3 emissions (from purchased goods), or their evolution of the Scope 3 intensity.

Use of sold products
Currently we do not distinguish whether produced food products are used as nutrition for humans or animals in our Scope 3 downstream calculations. This limitation rather affects producers of raw/unfinished products. For example, if a company is involved in the processing of soybeans, its downstream impact should differ depending on whether for soy milk or animal fodder is produced. As companies are not always transparent (or aware) of the final use of their intermediate products, this distinction was not included in the analysed CIA campaign.

Sequestration of emissions
As mentioned in the introduction, the food sector is not only a source of induced emissions, but also a potential carbon sink, as emissions are potentially sequestered in the soil of sustainable agricultural systems. However, current agricultural systems

are far from becoming a net emission sink. In France, agricultural land is actually releasing carbon, instead of storing it. This is mainly due to the artificialisation of soils and land use change (such as deforestation). To understand to which degree companies are contributing to a shift to more sustainable soil management that helps to stock carbon rather than releasing it, companies need to start reporting more precisely on the agricultural practices employed to produce sources raw materials.

4.2 Methodological limits

End-of-Life emissions
While we generally use emission factors specific to 60 different food categories, we use a generic emission factor for all types of food products to calculate emissions from the End-of-Life treatment of sold products. This is due to currently no product-specific emission factors being available for this emissions category. End-of-Life emissions represent only 2.3% of total induced emissions.

Physical reference unit
As indicated by the present performance indicator (carbon intensity in tCO2e/tonne), we use a mass-based approach to determine the climate performance of food products. Using this approach, we neglect the nutritional composition which might lead to a preference of unhealthy food products, or products with a high water content. Alternatively, a calorific energy-based approach (GHG emissions per calories), or a nutritional quality-based approach (incorporating nutrient density scores) could be used. However, a purely calorific energy-based approach might lead to an increased preference for unhealthy food products, and a nutritional quality-based approach would require more data on the composition of sold food products, which are currently rarely reported by analyzed companies.

While it needs to be stressed that the CIA methodology purely focusses on the climate performance, and not on aspects such as nutritional health, it still needs to be questioned what the function of food is, and which sort of products are needed to nourish a growing population while natural boundaries are limited.

5 Conclusion

Companies of the food and beverage sector play a key role in the transition to a more climate friendly economy, with food companies playing a more important part, due to a higher climate impact of products, as well as a wider variety of products in terms of carbon footprint. Companies of the food and beverage sector are facing an agricultural transition, that is distinct from the energy transition that most other sectors are facing, since energy consumption represents a minor source of emissions compared to other sectors. Instead, emissions often result from agricultural practices as well as the use and transformation of land.

As land use (including deforestation) does not only impact the climate, but also the ecosystem of the occupied land, the food sector is having a significant impact on biodiversity. Consequently, the transformation of the food and beverage sector requires a shift towards low-carbon food products and agroecological practices, not only for the sake of climate change mitigation, but also to preserve biodiversity.

At this moment, only few companies seem to fully prioritize climate change mitigation in their short, mid and long-term strategy. Nevertheless, companies are aware of the transition and the corresponding risks. Consequently, some companies have set relevant targets to be part of this transformative process. Being key contributor to GHG emissions and potential carbon sink in the future, food systems, and consequently companies in the food and beverage sector need to change their business practices. In order to continue to improve our coverage of this sector, stakeholders need to improve their reporting transparency on Scope 3 emissions as well as physical production volumes.

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