MODUL UNIVERSITY
PRIVATE UNIVERSITY VIENNA

Assessing the Feasibility of Corporate Net Zero Targets : An Exploratory Inquiry

---

Master Thesis submitted in fulfillment of the Degree

Master of Business Administration

Submitted to Dr. Sabine Sedlacek

Alina Maria Moldovan

1602005

Vienna, Austria, 24.9.2022

Affidavit

I hereby affirm that this Master's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

The thesis was not submitted in the same or in a substantially similar version, not even partially, to another examination board and was not published elsewhere.

24.9.22	Moldovan Alina Maria
Date	Signature

ABSTRACT

Since the 2015 Paris Accords, pledging to achieve Net Zero emissions by mid-century has become the new norm for setting corporate climate action strategies. However, little work has been done to assess the extent to which Net Zero targets can be feasibly implemented by their issuers, given their track record in setting and meeting decarbonization targets. This thesis explores the following research question: *How can insights from a company's decarbonization track record help to assess the feasibility of its Net Zero targets?* Building on the work of Sitkin et al. (2011) on the Paradox of Stretch Targets, and MSCI's Climate Target Scorecard (Watanabe and Panagiotopoulos, 2021) this thesis develops and tests a 10-step model for estimating a company's unabated emissions post-2030. Three elements are central to the analysis: a company's track record, a target's level of ambition and a company's strategy in tackling its goals.

For the Food and Beverage industry, the model has revealed that companies are likely to significantly overshoot on their long-term Scope 3 targets, and slightly under-perform compared to Scope 1 and 2 targets. By extrapolating a decarbonization trajectory until 2050, the analysis has estimated that Danone and General Mills would need to spend the equivalent of 43% and 22% of their FY 2021 Net Income to achieve Net Zero in 2050, assuming a carbon removal cost of 50 EUR / ton. The two in-depth case studies from the Food and Beverage Processing sector have shown that a company's track record can indeed be used to identify feasibility gaps in decarbonization targets if it is complemented by an in-depth understanding of strategic mitigation options in a given sector. The model can be further developed by improving forward-looking analysis and by encompassing the full CDP target dataset.

Table of Contents

List of Abbreviations

AFOLU= Agriculture, Forestry and Other Land Uses
AUM = Assets under Management
BAU = Business as Usual
BHAG = Big Hairy Audacious Goals
CDP = Carbon Disclosure Project
CFI = Cocoa & Forests Initiative
COP = Conference of Parties
CGF = Consumer Goods Forum
DCF = Deforestation and Conversion Free
ESG = Environment, Social and Governance
FLAG = Forest, Land and Agriculture
FLW = Food Loss and Waste
FY = Fiscal Year
GHG= Greenhouse Gas Emissions
IPCC = International Panel on Climate Change
LUC = Land-Use Change
RSPO = Roundtable for Sustainable Palm Oil
SBTi = Science-Based Targets Initiative
WBA = World Benchmarking Alliance

1 INTRODUCTION

Context

The 2013 IPCC Fifth Assessment Report established that cumulative CO_2 emissions in the atmosphere are responsible for climate change. To stop global warming, net anthropogenic additions of CO_2 must reach zero by the second half of the 21st century - the groundbreaking outcome of the 2015 Paris Agreement that underpins the Net Zero framework (Black et al., 2021). Keeping global warming to well below 2 °C while aiming to limit it to 1.5 °C, with a 50% probability, implies that CO_2 emissions need to peak before 2030 and fall to Net Zero around mid-century. The momentum created by COP 26 led Black et al. (2021, p.10) to conclude that Net Zero has "very clearly evolved from a technical formulation into a central organizing principle for climate action".

With several countries enshrining this ambition into national law, the concept of Net Zero has gained momentum as the common denominator for decarbonization efforts across all sectors of economic activity. In the words of (Fankhauser et al., 2021, p.15) "Climate policy has a new focus: net-zero emissions". They refer to Net Zero as "a frame of reference through which global action against climate change can be (and is increasingly) structured and understood" (Fankhauser et al., 2021, p.15). The success of Initiatives such as the UNFCCC's Race to Zero Campaign, the Science-Based Targets' new Net Zero Standard, and governments' drive to set Net Zero targets enshrined in law, signal that Net Zero has emerged as a best practice in terms of climate action (Day et al., 2022).

A March 2021 report published in the run-up of COP 26 by the Energy & Climate Intelligence Unit (Black et al., 2021) assesses that Net Zero pledges covered at least 61% of global greenhouse gas emissions, 68% of global GDP and 56% of the world's population. The world's three largest carbon emitters, China, the United States and the EU have set carbon neutrality targets for 2060, 2050 and 2050 respectively, further enhancing the Net Zero momentum around COP 26. By March 2021, 120 nations, 100 regional governments, 800 cities and 1,500 companies had pledged to reach net zero around mid-century (Black et al., 2021).

In parallel to the establishment of the Net Zero framework, the ESG (Environmental, Social and Governance) investment industry has shown remarkable growth over the past decade. A 2021 analysis by the Impact Taskforce states that out of 250 TN EUR of global investable assets, 35.3 TN EUR were invested in ESG funds (Impact Taskforce, 2021). Between 2016 and 2021, investors and shareholders have moved from place 8 to place 3 (below #2 employees and #1 customers and consumers) as the stakeholder group with the most impact on companies' sustainability strategy in the next 5 years, according to 1232 CEOs across 113 countries (Accenture and United Nations Global Compact, 2021).

As Net Zero becomes established as the new carbon norm for corporate climate action, stakeholders such as investors are increasingly assessing companies' sustainability strategies based on the transparency and robustness of their net zero pledges. Nine out of ten investors surveyed by Standard Chartered Bank in 2020 (Standard Chartered Bank, 2020) claim that companies' Net Zero strategies, when endorsed by their CEOs, are critical factors in investment decisions. Two thirds of respondents stated that a company’s Net Zero transition plans and leadership are better predictors for future success than the company’s past financial performance.

According to another survey, over half of investors (56%) who regularly engage with CDP data stated that they performed detailed analysis of all the transition plans of all companies they invest in. 98% of respondents planned to conduct significantly more in-depth analysis within two years, paying most attention to the level of ambition and Scopes covered by targets (Oliver Wyman, 2021). Standardization and comparability of Net Zero targets are crucial for investors who factor companies’ climate related risks and opportunities in their asset allocation decisions.

Investors are not the only stakeholder group pushing for more accountability in corporate Net Zero target setting. In parallel, several initiatives promoting standardization in terms of formulating science-based Net Zero targets and disclosure transparency have set new benchmarks for best practices among companies with Net Zero pledges. COP26 and the associated campaigns pushing for Net Zero have had a strong effect on companies’ public statements of carbon ambition. Between 2020 and 2021, the number of companies pursuing science-based targets has increased 2.8 times (Lichtenau et al., 2022). The COP 26 call to action represented an opportunity for many companies to simultaneously acknowledge that their previous efforts have been inadequate, all the while projecting a commitment to future climate leadership via new and more stringent pledges.

The black box of feasibility

Empirical evidence points to the fact that ambitious targets do not necessarily translate into decarbonization outcomes. A May 2022 report from Bain & Company shows that worldwide, 31% of businesses with a decarbonization target for 2020 failed to reach their Scope 1 and 2 goals. More than a quarter (26%) performed 80% below their 2020 target (Bain, 2022). The finding is all the more compelling given that companies typically have full control over Scope 1 and 2 emissions and have access to cost-effective abatement levers to address them (Lichtenau et al., 2022) - in contrast to Scope 3 emissions, which represent a far bigger mitigation challenge for most companies.

This finding is in line with earlier research (Davis-Peccoud, Stone and Tovey, 2016) which shows that performance on sustainability programs is more difficult than other change efforts. Out of 300 companies surveyed, only 2% had achieved their sustainability programs, and 81% had settled for dilution of value and mediocre performance. This is in contrast to 12% and 50% respectively, for all other change efforts. (Davis-Peccoud, Stone and Tovey, 2016).

Examples from several industries support these findings. In 2021, fashion majors such as Burberry and H&M pledged to halve their CO2 emissions by 2030, overriding the 2018 target of cutting emissions by one third. Fashion label Levy Strauss’ Scope 3 emissions increased by 13% between 2016 and 2019, despite a Scope 3 target set in 2018 (Speed, 2021). Similarly, Cargill failed to meet its “Zero Deforestation by 2020” goal, and in response extended the goal to 2030 (Eavis and Krauss, 2021). A report (Beevor and Alexander, 2022) analyzing decarbonization targets set by airline companies between 2000 and 2020 shows that only 1 out of the 21 targets was achieved, and 16 targets were either missed, changed, replaced or abandoned during the two decades. A further 4 targets were set but not reported on.

On a more macro level, an analysis of CDP submissions by European companies (CDP and Oliver Wymann, 2022) highlights the disconnect between the growing number of companies with science-based targets, and evidence of on-par emissions reductions. Based on CDP data, Scope 1 and 2 emissions by European companies had declined at an annual average rate of 1.5% in the period 2017 - 2019 (normalized for the effect of the COVID 19 pandemic) which is insufficient compared to the 4.2-6% reduction range required by SBTi scenarios which are 1.5°C aligned (CDP and Oliver Wymann, 2022).

These findings come against the backdrop of a quadrupled number of companies setting science-based targets since 2020 (Bain, 2022), which require drastic emissions reductions on all three Scopes. This is in contrast to the evidence suggesting that companies are lagging behind relatively easy decarbonization targets and points to a potentially significant feasibility gap between what companies pledge, and what they are capable of delivering. Despite the establishment of SBTi's Net Zero standard in 2021, the UN Secretary-General António Guterres launched an Expert Group to develop more robust standards for businesses, investors, cities and regions setting Net Zero targets (Un.org, 2022). The creation of the committee in spring 2022 suggests that current efforts to create accountability among non-state actors are seen as insufficient at a global scale

Indeed, the emergence of Net Zero has increased the level of complexity in corporate climate action. For carbon-intensive companies, reducing Scope 1 and 2 emissions to nearly zero often involves wide-reaching changes to business strategy and processes. For companies with a smaller own carbon footprint, deep decarbonization across Scope 3 emissions is an unprecedented challenge. Added to these factors, the lack of scalable carbon removal measures, combined with the very limited time frame available to substantially curb greenhouse gas emissions, creates an unprecedented level of pressure on companies committed to combating climate change. It follows that the feasibility of Net Zero targets is dependent on the successful realization of internal organizational change projects which can both overrun the processes that led to past failure to achieve carbon targets, and also enhance future decarbonization performance.

Conversely, targets put forward by organizations that can nimbly adapt to large scale change, can trigger virtuous feedback loops whereby success on past commitments leads to setting ambitious and substantiated decarbonization targets. Commenting on Nestlé's new stretch target for 2020, set after surpassing its water objective in 2015, the former head of public affairs at Nestlé highlights the the process by which ambitious, yet achievable targets can support meaningful change: "The feedback loop of committing, acting, reporting and then getting positive feedback from ratings agencies became a real driver for positive change" (Davis-Peccoud, Stone and Tovey, 2016).

Research objectives

In order for corporate Net Zero standards to evolve as best practices in corporate climate action, two important credibility gaps need to be bridged. Firstly, the quality gap: practitioner-led research has identified numerous instances of misleading or incomplete Net Zero targets and has focused on assessing transparency around target coverage, evaluating the degree of alignment with science-based decarbonization pathways and the use of emission offsetting mechanisms. The SBTi's 2021 Net Zero standard, and its ongoing work in developing industry-specific reduction pathways is likely to contribute significantly to closing the credibility gap. Its Net Zero standard provides Paris-aligned quantifiable and time-bound pathways for both internal decarbonization efforts and external carbon removal mechanisms. Currently underway, the SBTI's development of sector-specific pathways is likely to further level the playing field and narrow companies' margin of maneuver in reaping reputational benefits from releasing perfunctory Net Zero goals.

The second credibility gap, which this thesis attempts to address, concerns target feasibility. Rigorous science-based targets imply deep and steep internal decarbonization pathways across all sectors, coupled with investments in carbon removal measures. Scientists, academics and practitioners alike agree that reaching Net Zero will require levels of industry transformation unprecedented in complexity, scale, speed and costs. However, many companies who embark on ambitious Net Zero journeys do so in spite of having underdelivered on previous decarbonization pledges, and despite not having clear roadmaps for achieving their goals. A situation in which companies set robust, but unachievable Net Zero targets represents a risk not only for the organizations themselves, but also for collective efforts to limit global warming to 1.5 degrees. Basing decarbonization scenarios on climate reduction pledges which are science-aligned but may be unachievable is likely to further shorten the limited window of action for stabilizing climate change to Paris-aligned levels.

The current Net Zero target setting environment appears to be in contradiction to the theoretical rules of corporate goal-setting. As presented by Michael Cyert and March (2020), and Graham Brown, (2020) organizations typically set goals based on intrinsic capabilities and the performance of other relevant market players. In contrast, the "Race to Zero" movement suggests the adoption of external goals, which establish common end points and achievement trajectories for all firms in a given sector. This phenomenon raises the question of whether firms which adopt Net Zero pledges do so after having considered their internal capabilities and past performance.

The question of whether Net Zero targets are in fact feasible given companies' track record emerges as a relevant area of research. How does a company's past carbon performance affect its future targets? How is past performance taken into account in future target setting? What information does a company's track record provide about the feasibility of its Net Zero targets? In an attempt to answer these questions, this paper turns to academic, scientific and practitioner-oriented literature. The leading research question guiding this research is formulated as follows:

> *How can insights from a company's decarbonization track record help to assess the feasibility of its Net Zero targets?*

More transparency into these questions could result in fresh ways of distinguishing between substantive and symbolic Net Zero targets, better tools for assessing the feasibility of pledges, and potentially improved climate performance disclosure frameworks.

The exploratory formulation of the research question is not accidental. To answer the question, this thesis will aim to prototype an analytical methodology which bridges academic literature and practitioner-centric analytical models, borrowing elements from both. Two in-depth case studies will serve as the first prototypes of implementing the methodology to assess the feasibility of Net Zero targets.

This thesis is structured along eight chapters and starts with an introduction. Chapter 2 provides an overview of the current state of play of corporate Net Zero pledges. It defines key concepts, provides a summary of key areas of criticism and presents emerging standards of best practice. The literature review in Chapter 3 reviews academic and practitioner-oriented sources relating to past performance and target setting. Chapter 4 provides a detailed explanation of the 10-step methodology and its theoretical and empirical background. Chapter 5 introduces the Food and Beverage Processing sector, which has been chosen for testing the methodology. The chapter offers insights into the sector's decarbonization pathway and establishes a methodology for computing a strategy score for Scopes 1,2 and 3. Chapters 6 and 7 apply the full methodology described in chapters 4 and 5 to Danone and General Mills, the two in-depth case studies presented in this research. In closing, Chapter 8 provides a discussion of the key findings.

2 NET ZERO IN THE CORPORATE REALM

Net Zero as the dominant norm for corporate climate action

The Net Zero movement is part of the broader practice of responding to the challenges of global warming by setting temperature targets. According to McLaren (2020), temperature targets represent the fifth, and current framework in the history of climate action. Past target setting frameworks formulated emissions reductions targets in terms of carbon budgets (Durban 2011, Doha 2012), atmospheric concentrations (Copenhagen 2009), percentage emissions cuts (Kyoto 1997) and stabilization targets (Rio 1992). The Net Zero framework departs from what was considered good practice in the aftermath of the Kyoto protocol: once common decarbonization measures such as addressing Scope 1 and 2 emissions only, or compensating own emissions by reducing emissions elsewhere are now deemed insufficient for keeping global emissions on a 1.5°C pathway (Day et al., 2022).

The 2015 Paris Agreement called on all countries to work together on bringing greenhouse gas emissions down to zero within the second half of the 21st century, with the aim to limit the global temperature increase relative to pre-industrial levels to 1.5°C or "well below 2°C". With its roots in COP 21, the framework of "Net Zero" has become one of the most important approaches to decarbonization. Governments, regions, cities, companies and investors are expressing their decarbonization ambitions and plans via "Net Zero Strategies", which outline 1) measures taken to reduce their own GHG footprint and 2) actions that compensate for remaining emissions which cannot be abated. These two elements combined put emitters on a path towards zero net Greenhouse Gas (GHG) emissions, meaning each entity takes out as much GHG from the atmosphere as it produces.

Murray (2021) sees the Net Zero movement as the "one of the fastest and most consequential corporate trends since the inception of the first Industrial Revolution. It is, in many regards, one of the most successful environmental campaigns in history". In 2020, 15% of all new decarbonization targets issued by companies in the MSCI universe were formulated as Net Zero . The 1500 companies which had set Net Zero targets represented approximately 33% of sales across the top 2000 public companies (Watanabe and Panagiotopoulos, 2021).

Defining Net Zero

Although the Net Zero framework has emerged from the climate science underpinning the Paris Agreement, its definition and use varies depending on the context in which it is used. (Race to Zero, n.d.). At a global scale, "*Net zero emissions are achieved when anthropogenic emissions of greenhouse gasses to the atmosphere are balanced by anthropogenic removals over a specified* period" (IPCC, 2018). Simply put, Net Zero refers to a state where greenhouse gas emissions are counterbalanced by greenhouse gas removals, bringing the total to zero over a given period of time. An individual entity pursuing Net Zero "*Reduces its emissions following science-based pathways, with any remaining GHG emissions attributable to that actor being fully neutralized by like for-like removals (e.g. permanent removals for fossil carbon emissions) exclusively claimed by that actor, either within the value chain or through purchase of valid offset credits*" (Race to Zero, n.d.).

Applied to corporate climate action, the concept of Net Zero refers to setting strategies consistent with achieving Net Zero emissions in line with the 1.5 °C pathway by no later than 2050 (Frankhauser et al. 2021). According to the Science-Based Targets Initiative, companies reach a state of Net Zero once they have reduced full value chain emissions as much as feasibly possible and permanently removed unavoidable emissions. Two criteria define what it means to reach Net Zero at the corporate level (Carillo Pineda, Chang and Faria, 2020, p 7):

1) *"To achieve a scale of value-chain emission reductions consistent with the depth of abatement achieved in pathways that limit warming to 1.5°C with no or limited overshoot"*;
2) *"To neutralize the impact of any source of residual emissions that remains unfeasible to be eliminated by permanently removing an equivalent amount of atmospheric carbon dioxide*"

The term "like for like removals" is key to understanding the difference between the concept of Net Zero and the concept of Carbon Neutrality, which are often used synonymously. Like for like removals refer to a state "when a source of emissions and an emissions sink correspond in terms of their warming impact, and in terms of the timescale and durability of carbon storage"(Race to Zero, n.d.). In contrast, Carbon and GHG neutrality refer to a state where actors compensate their value chain emissions in terms of quantity, but without taking into consideration the durability and relative magnitude of the removals (Race to Zero, n.d.). As opposed to carbon neutrality claims, Net Zero pledges prioritize the permanent removal of carbon, only for those emissions which remain after it is no longer technologically possible to reduce carbon emissions across the value chain.

Cumulative emissions, rather than emissions at a given point in time, determine global temperature change. The speed at which emissions are reduced is therefore critical. This implies that the lower the level of near-term emissions abatement, the higher the need to remove carbon from the atmosphere at a faster rate at a later point in time (Pineda, Chang and Faria, 2020). Scientists have linked one year of delay in emissions reductions measures with a two year decrease of the remaining time available to stay within the 1.5 °C warming threshold. In practice, front-loading emissions reductions measures means prioritizing early emissions reductions versus postponing action, with the aim of reducing cumulative emissions and allowing a buffer for potentially tightening the carbon budget as a result of new scientific findings or natural phenomena not currently accounted for. This context mandates for a short term and a long term component of Net Zero targets. Long-term Net Zero targets "set the direction of travel", while short term targets operationalize action over "decision-relevant time horizons" (Fankhauser et al. 2021, p 17).

Critiques of Net Zero

While the move towards aligning voluntary and previously uncoordinated climate ambitions to a global temperature goal is seen as a positive development by many, scientists, civil society representatives, professionals and academics draw attention to the conceptual flaws, the potential misuse and unintended nefarious effects of the corporate Net Zero movement.

Conceptual critiques

Despite the wide acceptance of Net Zero as a framework for climate action at a global level, a number of critics question its conceptual integrity when applied to corporate actors. The transposability of climate neutrality from a global to a company level is the main element of contention: how should the global carbon budget be allocated among sectors and companies? Should companies' indirect emissions be considered in their carbon budget? How should carbon sinks be allocated to actors who cannot compensate for their emissions within their own value chain? (Deloitte and Earth on Board, 2021).

The way in which this budget is allocated to public and private entities, and the targets which subsequently emerge from this allocation, are currently not governed by a unified and binding approach. In the absence of rigid definitions and compliance-based target-setting norms, defining Net Zero pathways is left at the discretion of corporate leaders, who currently have a significant decision margin on Scope, timing, ambition, operationalization and accountability (Frankhauser et al. 2021).

Critics of Net Zero argue that the self-centered nature of Net Zero targets does not support their embeddedness into climate neutrality at global level. In theory, once all sectors have been decarbonized, a limited amount of carbon sinks will be available to absorb all remaining emissions. Certain critics argue that In a Net Zero world, the allocation of carbon sinks should be a political choice based on the economic and social value provided by companies, and not on their current carbon footprint and their mitigation capabilities (Deloitte and Earth on Board, 2021).

Critiques of transparency

Alongside its quick adoption as the new dominant carbon norm (Pinkse and Busch, 2013) for private actors, practitioner-driven literature has highlighted the need to distinguish between substantive and symbolic attempts (Dahlmann, Branicki and Brammer 2019) at decarbonization.

Companies are often accused of using headline Net Zero targets as a cover for continued emissions. ExxonMobil and Chevron mention carbon capture and storage as a solution for compensating their emissions - however, a closer inspection of their pledges reveals that carbon capture and storage are only planned to cover 8% and 1% of their carbon emissions for one year, respectively (Carrington, 2021).

Despite the conceptual simplicity and apparent consistency of Net Zero, its operationalization into climate targets by companies has resulted in a wide spectrum of Scopes, time horizons and pathways (Deloitte and Earth on Board, 2021), rendering the comparative assessment of Net Zero pledges very difficult.

What is more, setting ambitious Net Zero targets despite a poor track record can be beneficial for companies aiming to improve their image. For example, the non-profit group Global Fashion Agenda considers that Net Zero targets in the fashion industry bring hopes of renewed ambitions and an expectation to “unlock” new resources for the Net Zero transition (Speed, 2021). This suggests that there is a high likelihood that companies set more ambitious climate targets despite having overwhelmingly failed to achieve previous decarbonization targets.

Ambitious pledges issued in the absence of a track record proving the organization’s capacity to deliver on them can be understood as a strategy with a dual demonstrative purpose: externally, it serves placate stakeholders by showing awareness and willingness to act; and as a strategic anchor to mobilize resources internally and overcome resistance to change (Davis-Peccoud, Stone and Tovey, 2016).

European electricity utilities’ 2009 carbon neutrality by 2050 pledge is cited (Pinkse and Busch, 2013) as an example of a carbon norm that aims to appease stakeholders without representing substantive organizational change. The fact that it promises significant carbon reductions far in the future, based on unproven technologies, represents evidence that electricity producers are masking a lack of action in the short run by creating a positive future image (Pinkse and Busch, 2013). Carbon offsets, as well as short term efficiency targets represent carbon norms that aim to improve a company’s image related to it’s current practices, by focusing on the “here and now” (Pinkse and Busch, 2013).

Trade-offs between long term and short term action

Pinkse and Busch (2013) warn that greenhouse gas targets spanning several decades could be a signal of lack of commitment to realize internal carbon reductions. In one of the most oft-cited critiques of the Net Zero concept, three environmental scientists write that “ the idea of net zero has licensed a recklessly cavalier “burn now, pay later” approach” (Dyke, Watson and Knorr, 2021), which simultaneously condones ever-increasing CO2 emissions and accelerates the destruction of the natural world. Carbon dependent companies such as Shell have used Net Zero to push the deadline for achieving Net Zero as far as possible in the future, avoiding significant emissions reductions in the short term, all the while publicly communicating Net Zero commitments which seem compatible with 1.5C (Watts, 2021). In contrast, ambitious climate strategies go beyond compensating emissions and demonstrate a strategic understanding of the activities which should be expanded, phased out or transformed in compliance with a Net Zero world (Deloitte and Earth on Board, 2021).

A 2020 study surveying senior executives from 250 multinationals and large domestic corporations around the globe evaluated their progress towards Net Zero targets (Standard Chartered Bank, 2020). The study revealed that 71% of surveyed companies plan to achieve most progress towards Net Zero between 2030 and 2050. Only 21% of companies aim for early action between 2020 -2030, which is in stark contradiction with the front loaded nature of Paris-aligned mitigation pathways.

From a business leader perspective, key barriers delaying the transition are a lack of capital, available affordable alternative technology and the non-consensus about Net Zero definition and targets (Standard Chartered Bank, 2020). The survey also highlights the complexity of the Net Zero transition: 52% of corporates claim that organizational change is a prerequisite for tackling Net Zero, with 52% of them expecting the Net Zero transition to be the most expensive project they have ever tackled. For

64% of them, the Net Zero transition is not commercially viable, as they find it difficult to justify sacrificing revenues from proven business models for the uncertain future gains of pivoting towards Net Zero. The challenge is all the more daunting for organizations in high-emitting sectors, which are facing restricted access to capital as a result of the ESG movement (Standard Chartered Bank, 2020).

The pitfalls of “Net”

Scientist and popular climate activist Johan Rockström is among many voices warning that Net Zero allows for a large potential of misuse by companies. He cautions that by committing to reaching Net Zero carbon, companies may seek to improve their image without reducing their own emissions first: “If we could get rid of the “net” in net zero, I’d be the first to throw it away. There are huge risks of misuse. The only reason why I, the IPCC and most other scientists accept net is there is no choice” (Watts, 2021).

One element of concern is that Net Zero could perpetuate business as usual by legitimizing investments in carbon removal instead of deep decarbonization. Day et al. (2022) perform an analysis of Net Zero pledges made by 25 major multinational companies with combined FY 2020 revenues of USD 3.18 trillion and highlight the over-reliance of companies on offsets with limited credibility. Out of a sample of 25 multinational companies with Net Zero pledges, only 1 explicitly aimed to achieve its target without neutralization claims (Day et al., 2022). They find that on average, the reduction pledges of companies in the analysis sample with long term Net Zero commitments only amount to reduce their emissions footprint by 20% by their stated target years. The authors conclude that for approximately half of the companies in the sample, targets expressed as Net Zero do not represent a commitment to deep decarbonization, but rather conceal a downgrading of ambition or a continuation of business as usual compared to previous emissions reduction targets (Day et al., 2022).

Assuming that companies do indeed only use carbon removal to compensate for emissions which are impossible to abate, difficulties still remain in ensuring the “Like for like” principle in neutralizing emissions. On a conceptual level, critics argue that words such as “neutrality” and “compensation” introduce a semantic bias which implies that purchasing carbon credits is equivalent to reducing emissions at their source (Deloitte and Earth on Board, 2021). In reality, however, the deployment of carbon removal strategies is likely to be constrained by economic, political and natural limitations (Frankhauser et al. 2021). For instance, nature based solutions such as planting trees are often cited as carbon offset or removal measures, although they face the risk of reversal in case of illegal logging, disease or natural disasters, or climate-induced damage (Race to Zero, n.d.).

Furthermore, nature-based solutions have a scalability problem. For instance Nestlé’s commitment to neutralize 13m tonnes of carbon emissions per year would require a surface similar to the size of Denmark (Watts, 2021). Even under a theoretical scenario in which the principle of additionality is fully respected by all nature-based carbon offsetting actions, the capacity of natural carbon sinks is projected to be outstripped by the demand of realizing all nature-based commitments. (Deloitte and Earth on Board, 2021). Remaining emissions, which cannot be absorbed by nature-based solutions, will need to be neutralized using technological solutions which capture carbon and permanently store it.

The technological requirement of permanent carbon removal is, however, also problematic. Many carbon emissions removal technologies are at the moment unproven. McLaren (2020) refers to the delays in mitigation caused by the promises of future technology as “technologies of prevarication” - successive climate models factoring negative emissions from emerging technologies favoring cheaper, future technological solutions over costlier near-term interventions. Energy-switching from coal to gas in the 90s, coal-fired power plants equipped with carbon capture and storage technology in the 2000s, Bioenergy Carbon Capture and Storage (BECCS) in the 2010s, direct air capture and geoengineering in the latest decade represented pipe dreams at their time, but remained largely undeployed because of prohibitively high costs or unfeasible scaling requirements (Dyke, Watson and Knorr,2021). In principle, carbon dioxide removal mechanisms can serve a beneficial role in removing hard to abate emissions, but the assumption that they can be deployed at scale remains at best overly optimistic (Dyke, Watson and Knorr, 2021).

On a societal level, misleading Net Zero claims which are over-reliant on compensating emissions could delay profound change by abating stakeholder pressure for deep decarbonization. By creating the false impression that climate change is being meaningfully addressed, the Net Zero movement may reduce the pressure of stakeholders for transformational change. Without pressure from the general public, companies will be incentivized to choose cost-effective emissions neutralization options over deep decarbonization (Deloitte and Earth on Board, 2021).

The SBTi Net Zero Standard

The SBTi has rapidly established itself as the leading standard for decarbonization target setting. In the reporting year 2021, 24% of companies disclosing to the CDP had approved science-based targets, which represents an 85% increase compared to the previous year (CDP and Oliver Wymann , 2022).

Launched in 2021, the Science-Based Targets initiative developed the first standard for setting and certifying Net Zero targets for companies. SBTi’s Net Zero Standard tackles inconsistencies in setting corporate Net Zero targets, in order to render targets comparable and to better assess their contribution to global climate goals.

The standard is based on scientifically derived sectorial and general decarbonization pathways which are in line with keeping global warming to a limit of 1.5 degrees, which imply a reduction of all GHG emissions by 90% by midcentury (Pineda, Chang and Faria, 2020). Companies committed to the SBTi Net Zero standard must adopt widely accepted industry best practices such as setting intermediary targets consistent with net-zero tarejectories in 2030, setting long-term targets aiming for Net Zero no later than in 2050, and relying on carbon offsets or removals only to the extent to which they compensate for unavoidable emissions.

3 LITERATURE REVIEW

The literature review aims to uncover existing thought leadership on the relationships between a company's track record and the feasibility of meeting future decarbonization targets. This chapter distinguishes between two types of sources: 1) theoretical literature and 2) empirical literature. The first category includes works relating past performance to target feasibility, without providing quantitative evidence in support of the key findings. Although the theoretical literature covered in this chapter was often not developed specifically for concepts relating to decarbonization, it was selected due to its potential applicability in the field.

In contrast, the empirical works reviewed in this chapter cover quantitative evidence of target-setting practices, and refer most often specifically to decarbonization pledges. Empirical academic literature uses corporate climate disclosures to explore the drivers of target ambition and decarbonization outcomes. The widespread disclosure via the CDP platform provides a large, standardized dataset documenting companies' emissions, targets, risk management and sustainability strategies.A summary of the literature review findings is available in Annex 1.

In a third subsection, the chapter also covers two of the most widely analytical models used in the ESG industry.

Theoretical literature

The Behavioral Theory of the Firm

The behavioral theory of the firm (Michael Cyert and March, 2020) conceptualizes organizational goals as functions of own and competitor past performance. In any time period, organizational goals reflect "1) organizational goals of the previous time period, 2) organizational experience with respect to that goal in the previous period; 3) experience of comparable organizations with respect to the goal dimension in the previous time period"(Michael Cyert and March, 2020, 6.2 Four Major Relational Concepts section)

Organizations have memories in the form of precedents, which become institutionalized as semi-permanent arrangements. Precedents limit present-day decision making processed by preventing conscious consideration of past bargains which become embedded into the organization (Michael Cyert and March, 2020). From a behavioral goal-setting perspective, a current aspiration is "an extrapolation of past achievement and past aspiration"(Michael Cyert and March, 2020, 3.2 The Goal Formation Process section)

Graham Brown (2020) cautions against developing goals only based on past performance, but maintains a strong focus on a firm's intrinsic capabilities, both past and present. According to Graham Brown, goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.

Organizational aspirations

Bromiley and Harris (2014) empirically compare the ability of three models of organizational aspirations to describe responses to attainment discrepancy. Their work concludes that the separate social and self model, and the switching model (both described below) display most robustness in describing organizational responses to its performance relative to internal and external benchmarks.

The first model maintains that self-referential aspirations (based on a firm's own prior performance) and social-referent aspirations (based on average performance in the firm's industry) should be conceptualized as distinct phenomena. For example, if a company underperforms on both aspiration types, one cannot theoretically demonstrate whether the resulting behavior would focus more on improving performance versus an internal or an external benchmark (Bromiley and Harris, 2014).

The second aspiration - formation model proven to be empirically sound by Bromiley and Harris, (2014) is the switching model, which posits that a firm sets one aspiration at a time, constantly switching between self (own past performance) and social (competitor's performance) reference points. This approach suggests that companies which are underperforming relative to an industry benchmark will follow an aspiration to reach industry performance, while a company performing better than the industry average will aspire to perform slightly better than its own prior performance.

Hu, Song and Liang (2019) study the relationships between organizational performance, organizational aspiration and company performance when unforeseen, negative exogenous shocks occur at industry-level (here referred to as an 'environmental jolts'). Employing a quantitative study of 183 US firms, the authors find that both past performance and organizational aspiration positively impact organizational performance.

However, environmental jolts modulate these relationships differently depending on the shock's intensity. At high degrees of environmental jolts, past performance will increase organizational performance, while organizational aspiration will have no effect on organizational performance. When a shock occurs, companies benefitting from organizational slack due to good past performance will focus resources on dealing with the unexpected situation, diminishing the need for organizational aspirations to guide performance. Higher levels of environmental jolt lead to more uncertainty about future market conditions, which leads firms to rely more on past performance to guide future strategy. The converse is shown to be true for low levels of environmental jolt: past performance has no effect on organizational performance, while organizational aspirations positively contribute to performance (Hu, Song and Liang, 2019).

Big Hairy Audacious Goals (BHAG)

The concepts of BHAG and stretch goals are particularly useful in understanding the determinants and feasibility of long-term and extremely challenging corporate targets. The case of Boeing's entering the commercial airline market with their jet engine innovation in 1952 is the hallmark example of a "Big Hairy Audacious Target", a term coined by Collins and Porras (2011). Boeing was a first mover in bringing the jet engine innovation into commercial use - and essentially created the market for it - despite very challenging circumstances: no presence on the commercial market for airplanes, previous failures to enter it, recent layoffs and a reputation as a maker of military aircraft. The authors write:

> "*What should you do? If you're Boeing's management, you defy the odds and commit to the audacious goal of establishing yourself as a major player in the commercial aircraft industry. You build the jet. You call it the 707. And you bring the commercial world into the jet age [....] Perhaps you are thinking: But might Boeing just have been lucky? [...]we would be inclined to agree, except for one thing: Boeing has a long and consistent history of committing itself to big, audacious challenges*" (Collins and Porras, 2011, Chapter 5: Big Hairy Audacious Goals section)

Collins and Porras (2011) refer to the Boing example to show how visionary companies can rely on bold missions as a mechanism to carry out radical transformation. A BHAG is a clear and compelling focal point with a clear finish line - "it is tangible, energizing, highly focused. People 'get it' right away; it takes little or no explanation" Collins and Porras (2011, Chapter 5: Big Hairy Audacious Goals section) , BHAGs are characterized by a relentless commitment to goals which seem unreasonable and with a high level of risk. Achieving BHAGs does not depend on outstanding leadership - the goal itself represents a motivating mechanism, by becoming an institutionalized habit in the organization.

Attempts to link the concept of BHAG to setting Net Zero goals are few. Panwar (2021) argues that the net-zero emission targets put forth by companies can be conceptualized as BHAGs. Microsoft and Google's targets to not only become carbon neutral in the short term, but to also compensate for all their historic emissions are two examples of corporate net zero targets which have been described as BHAGs (Polman and Winston , 2021).

Based on Unilever's Sustainable Living Plan spanning the 2010 -2020 decade, a best practice example of long term comprehensive sustainability planning at the time, Polman and Winston (2021) conceptualize a goal-setting methodology that leads organizations towards net positive based on the BHAG framework. Their "SMART 2.0" goal setting paradigm revisits the Specific, Measurable, Achievable, Realistic and Time-bound paradigm and uses "Results-oriented" for the "R", and "Aspirational, Ambitious, Audacious, Absolute and Accountability" for the "A". Results-oriented goals are dictated by an outside-in perspective ("The climate doesn't care if it's realistic to eliminate carbon emissions by 2040 or 2050"), while Ambitious, Audacious and Absolute goals follow the logic of "aiming for the starts and landing on the moon" (Polman and Winston , 2021)

Stretch Goals

A related, and theoretically more elaborated concept, is that of Stretch Goals. Seemingly impossible goals, commonly referred to as "stretch goals" can serve as disruptive events that lead to a "substantial elevation in collective aspirations" and shift an organization's attention and resources towards possible new futures. Thompson, Hochwarter and Mathys (1997) wrote about stretch targets in the context of emerging globalization characterized by companies' battle to remain competitive in the new, global marketplace. They defined stretch targets as strategies to maximize group effectiveness, by "forcing organizations to significantly alter their processes in a way that often involves a whole new parading of operations"(Thompson, Hochwarter and Mathys , 1997, p.48).

> " *This means more than just applying harder goals. The whole notion is to force revolutionary change. With hard goals, the focus is on how things were done in the past and how to do them faster and smarter in the future. With stretch targets, the emphasis is on reinventing how to do the work, since the old methods will not lead the organization to reach the stretched goals*" (Thompson, Hochwarter and Mathys, 1997, p.50).

Several authors have linked the pursuance of stretch goals with high performance by stimulating exploratory learning within an organization by cultivating a culture of openness, energy, enthusiasm, playfulness and optimism (Sitkin et al.,2011). Stretch goals serve as methods for promoting exploration and creating energy and enthusiasm for major change projects (Sitkin et al.,2011). They support organizations to avoid the pitfall of perpetually postponing the development of long-term strategies because of preferring to prioritize pressing problems instead (Sitkin et al.,2011).

Sitkin et al. (2011, p. 547) define a stretch goal as "an organizational goal with an objective probability of attainment that may be unknown but is seemingly impossible given current capabilities (i.e., current practices, skills and knowledge)". Stretch goals are outcome-oriented (as opposed to process-oriented) performance goals, which differ from ordinary goals, and from challenging goals in two important ways (Sitkin et al.,2011):

1. Extreme difficulty: an extremely high expected performance level that is not achievable given the organization's current capabilities.
2. Extreme novelty: the organization must look outside of its skills, knowledge, or known practices to achieve the goal. The organization does not have any guiding templates to reach the target.

Associations between the concept of stretch goals and Net Zero pledges have been only anecdotally explored in academic literature. Nonetheless, conceptualizing Net Zero targets as stretch goals seems appropriate given the considerable and unprecedented challenge that the Net Zero transformation implies for businesses (Heskett (2008) refers to the informal commitment of European electric utilities to reduce their carbon emissions by 50% by 2040 as a stretch goal that might compromise the credibility of international commitments to decarbonization because of its pushing action too far into the future. Two years later, 61 European power groups committed to achieving carbon-neutral electricity by 2050 (Gow, 2009). Today, most electrical utility companies are pledging to reach Net Zero by mid-century. What can past performance teach us about the likelihood of history potentially repeating itself, once, again? The Paradox of Stretch Goals, presented below, can be potentially used as a framework for better understanding the intrinsic factors which influence the feasibility of corporate Net Zero strategies.

The Paradox of Stretch Goals

Sitkin et al. (2011) have also addressed the behavioral processes that can render stretch goals detrimental to organizations. They have conceptualized "the Paradox of Stretch Goals", which posits that companies which are best positioned to reap the benefits of adopting stretch goals (recent performance and slack resources), are least likely to do so (Sitkin et al. 2011). The theory describes two contingency factors that influence whether an organization benefits or suffers from adopting stretch goals: 1) recent performance and 2) slack resources.

Recent performance. Organizations who have experienced recent success are likely to benefit from stretch goals. Recently successful organizations are less likely to perceive seemingly impossible goals as threats and can deploy internal routines that have previously driven strong performance to creatively solve a difficult problem. Conversely, weaker recent performers are more likely to resort to hypervigilant, disorganized and defensive responses to seemingly impossible goals. (Sitkin et al., 2011).

Slack resources. Unabsorbed slack is understood as “the presence of financial or other resources that have not been committed or deployed in the system and are available for the discretionary use of management” (Sitkin et al., 2011, p.554). The presence of slack resources allows an organization to take on new challenges without diverting resources away from areas that already work well. Excess resources allow organizations to see stretch goals as opportunities, to deploy sufficient internal resources for exploring potential attainment paths and to constructively tackle failures (Sitkin, Miller and See, 2017).

The level of organizational slack in an organization impacts the way in which it responds to major shifts in its external environment (Michael Cyert and March, 2020), acting as a buffer which absorbs the impact of external shocks on the company. In boom periods, when a firm’s aspiration-level adjustments are less than the upwards trend in the external environment, an organization with slack resources will be able to access excess resources in order to adjust to the new market environment. When the external environment takes an unfavorable turn, slack represents a cushion which allows the organization to survive in adverse conditions (Michael Cyert and March, 2020).

Sitkin et al. (2011) and Sitkin, Miller and See, (2017) have conceptualized “the Paradox of Stretch Goals”, which posits that companies which are best positioned to reap the benefits of adopting stretch goals (recent performance and slack resources), are least likely to do so.

> *“This pattern suggests that it is really only under quite limited conditions that organizations will be safely positioned to experience positive learning and performance outcomes from pursuing stretch goals - namely, organizations with both hgh slack resources and high recent performance. Yet few organizations can realistically be expected to fall into this category. In fact, we speculate that most organizations carry levels of unabsorbed slack, which by our analysis would suggest that stretch goals usually will have disruptive or at best neutral effects*” (Sitkin et al.,2011, p.559)

Sitkin et al. (2011) developed four combinations that make up the Paradox of Stretch Goals, reproduced in the chart below. According to this framework, organizations which are most likely to adopt stretch goals are also those which are most likely to suffer adverse effects (cell 3), while those which could most benefit from stretch goals are the least likely to adopt them (cell 2).

The Paradox of Stretch Goals	**Slack resources**

The Paradox of Stretch Targets		Low	High
Recent performance	High	1. Effect of use: Neutral to Disruptive Likelihood of use: Low	2. Effect of use: Most facilitative Likelihood of use: Lowest
	Low	3 Effect of use: Most disruptive Likelihood of use: Highest	4. Effect of use: Neutral to facilitative Likelihood of use: High

Figure 4.1: The Paradox of Stretch Targets. Source: Sitkin et al. (2011)

The paradox is built on the proposition that stronger recent performance leads organizations into a "competency trap", whereby companies seek to capitalize on the skills and practices that led to success instead of exploring new capabilities. Similarly, the presence of slack resources can act as a buffer reducing the pressure of successful organizations to innovate, and is most likely to lead to incremental change (Sitkin et al., 2011).

Conversely, weak performers will see more benefit in adopting risky, radical new approaches that might reinstate them in a favorable position. Seemingly impossible problems that are not well understood could surpass the organization's capacity to deal with complexity, potentially leading the organization to search for quick fixes outside the organization, without a systematic internal and external benchmarking process. For instance, broadly shared employee perceptions that an organizational goal should not be pursued can dampen collective commitment to the goal, and negatively affect performance via low morale and resilience (Sitkin et al., 2011).

Sitkin et al., (2011) therefore conceptualize the Paradox of Stretch Goals as a situation whereby weak organizations inadvertently inflict harm upon the business by committing to stretch goals "out of desperation"(Sitkin et al.,2011, p.559), whereas those organizations who could use stretch goals to their benefit avoid to do so in order to preserve their preferential positioning (Sitkin et al.,2011).

Empirical literature

Past performance and target ambition

Freiberg, Grewal and Serafeim (2021) examine the relationship between setting science-based targets, target difficulty and investments in carbon reduction projects. The authors demonstrate that companies which have a positive track record in setting and achieving targets, and which operate within carbon-intensive sectors are more likely to set science-based targets. The perceived imminency, magnitude and financial impact of climate change risks also increase the likelihood of adopting science-based targets. Conversely, higher revenues from low-carbon products are not linked to a higher probability of setting science-based targets, confirming prior research stating that firms in low carbon intensity sectors are less likely than high polluters to set ambitious targets (Ioannou, Li and Serafeim, 2016).

Bolton and Kacperczyk (2021)'s extensive study examines firms' drivers in making decarbonization pledges by committing to CDP and/or SBTi standard. Taken together, their results empirically demonstrate that companies setting and acting on targets are those which are already best in class within their sectors, which implies that they have a positive track record in decarbonization. The combined data set from SBTi, CDP and Trucost covers 17385 unique companies which have either committed or stated a target with the SBTi or declared a commitment to CDP, in the period 2011-2019, covering approximately 80% of total market capitalization of firms included in Factset.

They find that companies most willing to commit to external standards are those whose Scope 1 carbon emissions are lower, thus finding empirical support for the argument that companies' decision to make decarbonization pledges is driven by a cost-benefit analysis. The analysis suggests that companies are most likely to commit if the cost of decarbonization is lower, which is more likely to be the case for companies with a lower emission profile. The finding that companies making decarbonization commitments strategically choose base years when emissions are largest adds further credibility to the cost-benefit driver hypothesis (Bolton and Kacperczyk, 2021).

While the authors find that Scope 2 emissions have no statistical effect on firms' commitment decisions, the level of Scope 3 upstream emissions is shown to significantly reduce a company's willingness to commit. Bolton and Kacperczyk (2021) also reveal a strong positive relationship between the percentage of firms committing to SBTi or CDP within a given industry, and a company's decision to make a decarbonization commitment, highlighting the important role of peers' adoption of carbon norms and coalitions on the individual company's decision to make commitments.

Carbon dependency

Pinkse and Busch (2013) argue that the adoption of carbon norms by companies differs based on their carbon dependency. From a theoretical point of view, firms with low carbon dependency can be expected to commit to short-term-oriented carbon norms, given their relative ease of further reducing their carbon intensity. Companies with high carbon dependency, on the other hand, need to reorient their business activities in order to meet carbon norms, and therefore are expected to set longer-term decarbonization goals. The long time frame also allows firms which are severely carbon dependent to continue making expected returns on existing investments (Pinkse and Busch, 2013). Bolton and Kacperczyk (2021) also find that the level of carbon dependency also influences the speed of abatement: companies with higher emissions tend to extend their target horizon more into the future, therefore commit to slower rates of abatement.

Dahlmann et al. (2019) hypothesize that the degree of carbon dependency shapes the effectiveness of substantive climate change targets. The authors hypothesize that in polluting industries carbon emissions targets are more likely to amount to symbolic attempts to create legitimacy. Conversely, in sectors that are less carbon dependent, substantive decarbonization targets may spur innovation and positively impact competitive advantage. Nevertheless, the study invalidates this general hypothesis, and instead shows that specific characteristics of substantive climate targets are distinctly correlated with carbon dependency. For firms with low carbon dependency, the study finds that absolute targets and broad Scope coverage are significantly correlated with environmental improvements. In the case of companies with higher carbon dependency, a higher level of ambition and a longer time frame are linked to better decarbonization outcomes.

Target ambition and decarbonization outcomes

Ioannou, Li and Serafeim (2016) assess the effects of target difficulty (defined as the targeted percentage reduction in carbon emissions from the base year) and monetary incentives on target completion. Their research reveals a non-linear correlation between target difficulty and completion : up to a certain threshold of difficulty (ranging between 57 - 66% aimed reduction), companies that set more difficult targets are able to achieve a higher degree of target completion. After this threshold, increased target difficulty negatively impacts target completion.

The authors also find that target difficulty is much more strongly correlated with target completion for heavy polluting industries than in low polluting industries. This is consistent with their hypothesis that relatively more polluting firms have a higher economic materiality of carbon reduction projects, which require substantial changes across operations, products and business models. Within the research sample, firms in heavy polluting industries have an average target difficulty of 15.4%, compared to 20.3% in low polluting industries. The average target horizons are inversely proportional to target difficulty: 7.8 years versus 6.7 years, respectively (Ioannou, Li and Serafeim, 2016).

The study (Ioannou, Li and Serafeim, 2016) also shows that adopting science-based targets corresponds to increased target difficulty, higher investment in carbon reduction projects and higher expected monetary savings from implementing these projects. Targets that become aligned with the science-based standard increase their ambition by 21% - 25%, compared to non-science-based pledges made by the same firm. Compared to non science-based climate initiatives, science-based projects result in approximately 60% - 64% more investment, between 17% and 19% additional CO_2 savings and additional monetary savings ranging from 22% - 33%. CDP confirms this finding by revealing that companies with science-based targets are 30% more likely to significantly invest in low-carbon R&D (CDP and Oliver Wymann, 2022).

An analysis of the Transition Pathways Initiative data (Dietz et al., 2018), covering companies in high emitting sectors which together account for 21% of emissions from all listed companies globally finds a strong correlation between carbon abatement practices. In practice, high-emitting companies seem to fit within two clusters: a class that implements all possible measures, and one which implements none. This implies that carbon management for high emitters is reliant on a considerable strategic commitment to decarbonization. The study also shows that companies with a larger market capitalization and which are headquartered in Western Europe implement more carbon management practices. Furthermore, the study indicated that there is a positive link between setting long-term decarbonization targets and the adoption of carbon management practices today (Dietz et al., 2018).

Analytical models in the ESG industry

Sustainalytics - feasibility through the lens of risk

Leading ESG analytics provider Sustainalytics’ corporate assessment methodology is centered around the concept of unmanaged risk. Sustainalytics ESG Risk Ratings assess companies’ exposure to financially material ESG risks and their management of these risks. By juxtaposing these two elements, Sustainalytics computes an overall company score which represents the level of risk which is left unmanaged (Sustainalytics, 2022b). Company risk profiles are based on analytical models which incorporate the potential impact of 20 material ESG issues across 138 sub-industry classifications as well as company-specific adjustments (Sustainalytics, 2022b).

The concept of Manageable Risk is at the core of Sustainalytics' methodology, and represents the proportion of a company's risk exposure that can theoretically be managed by the company. Manageable risk is determined by four dimensions: 1) employee engagement; 2) the company's vulnerability to external threats; 3) the complexity of the issues that constitute risks and 4) physical limitations relating to technology and innovation (Sustainalytics, 2021).

To assess a company's management score, Sustainalytics assesses the degree to which a company is able to manage its relevant issues by evaluating the robustness of its ESG practices, programs and policies. Sustainalytics distinguishes between two components that make up the management score: 1) preparedness and 2) track record (Sustainalytics, 2021). While the first element considers the programmes, structures and policies in place to manage risks, the second element combines quantitative outcomes (eg. actual emissions reductions) with qualitative elements such as the involvement in controversies and other negative events. Combined, the risk exposure and the management risk result in what Sustainalytics calls the "Management Gap", which represents the difference between the risk that could theoretically be managed by a company, and the risk that is actually managed (Sustainalytics, 2021).

While Sustainalytics' assessment model provides a balanced analysis between a company's carbon risk profile, the strength of its carbon management measures and its track record in decarbonization, it does not appear to provide specific analysis pertaining to the feasibility of Net Zero decarbonization targets. Furthermore, its publicly available methodology papers do not show evidence that it tracks the impact of individual decarbonization commitments on the company's performance, focusing instead on the overall outcome of the company's decarbonization measures taken all together.

MSCI - Feasibility through the lens of track record and strategy

Since June 2021, MSCI proposes a framework specifically designed to assess corporate Net Zero targets, allowing institutional investors to compare decarbonization pledges between different issuers and to assess which targets are realistic (MSCI, 2021) It is formulated as a cross-sector framework of analysis consisting of three key dimensions: 1) Target comprehensiveness: the extent to which a target covers a company's emissions; 2) Target ambition: the amount of carbon that is being reduced and the speed of decarbonization and 3) Feasibility: the extent to which a target is feasible and the likelihood that it will be achieved (Watanabe and Panagiotopoulos, 2021).

The second and third elements are most relevant for the present research. MSCI measures the ambition level of a corporate Net Zero target by comparing the targeted reduction and pathway within a company's decarbonization claim against a net-zero trajectory to 2050 Watanabe and Panagiotopoulos, 2021).

MSCI's Implied Temperature Rise Methodology starts by allocating a 2 degree emissions budget to each company under scrutiny. Next, it projects companies' future emissions trajectories on each Scope considering their current emissions and reported emission reduction. Finally, it calculates a company’s overshoot/undershoot in 2070 and its equivalent implied temperature rise by comparing the company’s projected emissions to its allocated emissions budget (MSCI, 2021a). A target’s ambition level is therefore evaluated in absolute terms against a scientific benchmark, and not relative to the ambition level of past decarbonization targets set by the company.

With institutional investors in mind, MSCI sets the premises for understanding the feasibility of Net Zero targets with the following question: “How much confidence can one have that a target will be met, given the target’s key characteristics and what we know about the company’s track record and strategy for meeting climate targets?” (Watanabe and Panagiotopoulos, 2021, p.3). MSCI (Watanabe and Panagiotopoulos, 2021, p.6) proposes track record and strategy as two overarching indicators of feasibility, broken down into the following analytical components: “track record of meeting previous targets; progress on active targets; the intention to use carbon offsets ; revenue from climate-change solutions; decarbonization strategy by Scope and category”.

MSCI assesses the company’s track record in meeting its own decarbonization targets by comparing emissions in the expired target’s end year, with actual emissions reported for the same year. If reported emissions are below targeted emissions, the past target is considered as met. The company’s progress on its current target is obtained by comparing reported emissions in the current year with the current target’s projected linear (same amount of reductions delivered each year, between the baseline and the end year) trajectory (Sitkin et al. 2011). From these two elements, MSCI derives a level of confidence that a company will be able to meet its target (Watanabe and Panagiotopoulos, 2021).

MSCI finds evidence to support using a company’s track record in meeting carbon targets as an indicator of its likelihood to meet future targets. A 2022 analysis of the 1038 constituents of the MSCI ACWI index shows that 63% had set at least one previous target. Close to 60% of companies which set targets met at least some of them, with 13.5% having met all their now-expired targets (Watanabe and Panagiotopoulos, 2021). Among the MSCI ACWI sample, the likelihood of being on track to meet current targets was highest for companies which had set and achieved previous decarbonization targets. In contrast, companies which had never set decarbonization targets were the least on track with respect to their current targets (Watanabe and Panagiotopoulos, 2021).

Literature review conclusions

The literature review revealed that the gap between past performance and the practice of setting ambitious Net Zero targets has not been systematically addressed by academic or practitioner-driven research. The behavioral theory of the firm (Michael Cyert and March, 2020), as well as more recent frameworks based on it (Bromiley and Harris, 2014), (Graham Brown, 2020), (Hu, Song and Liang ,2019) strongly suggest that past performance is an important factor in developing organizational goals, alongside a company's relative performance against a competitor benchmark (Graham Brown ,2020)

Theoretical literature provides rich insights into the relationship between past carbon performance and organizational goals. The concepts of Stretch Goals (Sitkin, Miller and See, 2017), (Sitkin et al., 2011) and BHAG (Collins and Porras ,2011) seem particularly appropriate to describe the aspirational nature of Net Zero goals, and their unprecedented level of complexity and difficulty. The reviewed theoretical literature on goal setting points strongly towards the fact that robust organizational goals should be grounded in the organization's internal capabilities, indicated among others by its performance on past targets.

Extrapolating these findings to climate targets, one may conclude that robust decarbonization goals should take into consideration the company's track record in setting and meeting carbon targets. However, according to the sample on works researched through this literature review, theoretical concepts on organizational goal setting have not been directly applied to Net Zero pledges.

The literature review has documented only two empirical studies establishing a correlation between meeting past decarbonization targets and future target setting behavior. Watanabe and Panagiotopoulos (2021) show a positive relationship between the completion of past targets and the likelihood of meeting current, ongoing targets, however without referring specifically to Net Zero targets. Freiberg, Grewal and Serafeim (2019) show that companies which have completed previous targets are more likely to adopt the Science-Based standard in target setting. The quantitative analyses based on the CDP dataset offer several insights which are foundational for this paper's research methodology and hypotheses : 1) target difficulty (Ioannou, Li and Serafeim, 2016), robustness (Dahlmann, Branicki and Brammer,2019) and adoption of external standards (Freiberg, Grewal and Serafeim 2019) are generally associated with better decarbonization outcomes and 2) firm size positively influences target ambition and decarbonization outcomes (Ioannou, Li and Serafeim ,2016), (Accenture and United Nations Global Compact, 2021).

However, the quantitative studies reviewed here are not designed to provide deeper insights into the processes that happen at company level. For instance, Freiberg, Grewal and Serafeim (2019)'s study uses a dummy variable to describe whether a company has achieved a decarbonisation target in the past. The variable takes the value of one if the company has met at least one target, and the value of zero otherwise. While this method provides a first insight into the link between past performance and target ambition, it does not allow a deeper understanding of how past target type and ambition impacts future target setting, nor does it indicate the degree of continuity between targets across time.

In contrast to empirical studies, models used in the ESG industry provide analytical methodologies which are simultaneously built to assess the performance of individual companies and to create benchmarks across peer groups and industries. The model developed by Watanabe and Panagiotopoulos (2021) to assess the degree of robustness of decarbonization targets comes closest to the aims of this research.

4 METHODOLOGY

Objectives and overall approach

As presented in the previous chapters, Net Zero pledges have become the new norm for corporate climate action, despite the lack of established best practices, benchmarks, and standardized pathways in setting Net Zero corporate goals. As a result, corporate Net Zero targets set since 2015 display differ widely in terms of transparency, ambition, scientific grounding and feasibility.

Academic literature on corporate decarbonization performance and target setting emphasized the role of past performance in predicting future success. It therefore suggests that analyzing from a company's past track record in setting and working towards decarbonization goals could result in relevant insight for assessing the likelihood that companies will set robust and feasible Net Zero targets. The same finding is also emphasized by empirical quantitative studies which highlight a positive relation between a target's track record in setting and achieving ambitious decarbonization targets with future performance on decarbonization (Freiberg, Grewal and Serafeim, 2019).

However, this backward-looking perspective has not been systematically explored as a potential source of insights for evaluation target robustness and feasibility in practitioner-led research, standards and assessment methodologies. While Net Zero pledges have proliferated, models to assess their feasibility have only partially caught up. Although ESG ratings providers have long provided carbon analytics solutions, MSCI's Target Scorecard is the only tool which combines target comprehensiveness, ambition and feasibility in one assessment methodology, according to the review conducted for this research. Most other practitioner-driven studies assessing decarbonization efforts at company level have focused principally on dimensions of transparency and comprehensiveness.

In response to these challenges, this methodology proposes a framework to assess the feasibility of corporate Net Zero targets by combining insight from academic literature and practitioner-driven models. The concept of Stretch Goals (reference) will provide the theoretical underpinning for the proposed methodology. Firstly, it provides a framework for comparing targets with their past iterations. A stretch target is defined as a goal with an extreme level of novelty and difficulty - which involves an intrinsic comparison to a company's track record in setting and delivering on targets. By extending this approach to decarbonization targets, one can assess their level of "stretch" by contrasting them to similar targets set in the past, and to the corresponding decarbonization strategies put in place by the company as a response. A decarbonization target which has no precedent in the company, and which requires the company to innovate in order to meet it, can be conceptualized as a stretch target.

Secondly, academic sources around stretch targets provide a theoretical frame of reference for assessing the conditions under which stretch targets can lead to positive outcomes for companies. According to the "Paradox of Stretch" targets, the companies which are most likely to benefit from setting stretch targets are the least likely to set them. According to Sitkin et al. (2011) a company should only set stretch goals if it does so on the foundation of positive past performance and if it has slack resources to deploy in order to adapt to the goal's exigencies.

As Sitkin et al. (2011) posit, stretch goals are paradoxically most often used as recovery mechanisms by companies that aim to rebound from a negative past performance. Extending this logic to decarbonization targets, a central assumption of this thesis is the fact that a company's past performance on decarbonization is positively related to a company's likelihood of meeting future decarbonisation targets. Another assumption derived from the work done by Sitkin et al. (2011) is that companies with a negative track record in terms of decarbonization are more likely to achieve less ambitious goals, which they refer to as "small wins" and "small losses". Therefore, a central assumption in this work is that past performance and the difficulty of a target relate inversely to the likelihood of a company to meet its decarbonization targets.

The focus on a company's track record as a factor in assessing the feasibility of Net Zero targets has also been conceptualized in MSCI's Target Scorecard (Watanabe and Panagiotopoulos, 2021), which will inform several methodological aspects in the framework presented below. Namely, the calculation methodologies for calculating a company's track record against its past and current targets are inspired by the scorecard, along with the process of identifying and structuring decarbonization targets around the three emission Scopes.

The methodology presented below aims to enrich both the Stretch Target framework and MSCI's Target Scorecard by combining the two approaches in order to add richness to existing models for assessing the feasibility of decarbonization targets. The Paradox of Stretch Goals provides a theoretical guideline of how a company's track record, combined with an assessment of the difficulty level of a target, can shed light into the likelihood that that target will be reached. MSCI's Target Scorecard provides the starting point for the numerical analysis underpinning the model. Finally, the methodology developed in this thesis goes beyond both frameworks by proposing a method to better understand the financial implications of reaching Net Zero under different company decarbonization scenarios.

The methodology proposes a 10-step process to obtain a set of scenarios which quantify a company's cost of reaching Net Zero under different decarbonization trajectories and carbon price scenarios. They are summarized in the table below, and described in more detail in the following sections of this chapter.

Analytical Methodology Overview		
Analytical steps	**Overview**	**Data sources**
Steps 1-2 are performed at company level		
Step 1: Describing the Net Zero pledge	Detailing a company's Net Zero pledge and breaking it down into sub-targets whenever possible	Company publications (sustainability reports, annual reports, press releases, website, etc.)
	Step 2.1: Gathering information from the companies CDP Climate disclosure for the past	

Step 2: Identifying past target iterations	10 years on decarbonization targets and GHG emissions	Companies' CDP Climate disclosures
	Step 2.2 clustering the data obtained in step 2 into past iterations of the targets and sub-targets identified in step 1.	
	Step 2.3 Visually depicting the resulting target iteration trajectories alongside the company's historic GHG emissions	
Steps 3-8 are performed for each target identified in step 1		
Step 3: Past performance score	Step 3.1: Assess past performance score relative to previous target iterations and convert it into a numerical value (P1 Score)	Analysis based on data collected in step 2
	Step 3.2 : Assess past performance relative to the current target and convert it into a numerical value (P2 Score)	
	Step 3.3 : Obtain the final Performance score (P score) by adding the P1 and P2 scores	
Step 4: Target commitment score	Step 4.1: Assess target ambition relative to previous target iterations and convert it into a numerical value	Analysis based on data collected in step 2
	Step 4.2 Assess target ambition compared to a business as usual trajectory and convert it into a numerical value	
	Step 4.3 Obtain the final Commitment score (C score) by adding the C1 and C2 scores	
Step 5: Strategy score	Step 5.1: Identify the factors driving emissions for each target	CDP disclosures and company publications
	Step 5.2: Select an appropriate measurement scale for the factors identified in step 5.1	
	Step 5.3: Convert the indicators identified in Step 5.2 into the strategy score system	
Step 7: Target stretch score	Compute a target stretch score by subtracting the strategy score from the target commitment score	Analysis based on data computed in step 5
Step 8: Target completion likelihood score	Compute a completion likelihood score by subtracting the target stretch score from the past performance score	Analysis based on data computed in step 6

Steps 9-10 are performed at company level		
Step 9: Unabated emissions scenarios	Build three unabated emissions scenarios s follows: 1) A best case scenario where all targets are met fully and on time; 2) A most likely scenario, based on the completion likelihood scores computed for each target; 3) A business as usual scenario assuming that emissions follow the company's historical emissions trend in the absence of any abatement measures;	Analysis based on data collected in step 2 Analysis based on data computed in step 5
Step 10: Cost of Net Zero scenarios	Estimate the cost of removing the unabated carbon emissions resulting from step 9 as a % of the company's FY 2021 financial metrics and under different carbon price scenarios	Analysis based on data collected in step 2 Analysis based on data computed in step 5

Table 4.1: Analytical Methodology Overview. Source: own concept.

Step 1: Describing the Net Zero pledge

The first step in the analysis is simply a description of the headline Net Zero pledge and the different sub-targets that fall under it. Often, a Net Zero goal is in fact a collection of goals ascribing differentiated levels of decarbonization to Scopes 1,2 and 3, complemented by a pledge to net out all remaining emissions by a certain date. Targets within a Net Zero pledge can be formulated as intensity, absolute targets or operational goals, and can be set either for the sort, medium or long term.

Each target will be identified, described and separately labeled. Following the methodology described by MSCI (Watanabe and Panagiotopoulos, 2021), sub-targets which fall under the Net Zero umbrella will be distinguished by Scope, whenever possible. A further rule derived from MSCI's methodology is that whenever a company sets both an intensity and an absolute decarbonization target for the same Scope, the absolute target will be prioritized in this and the following analytical steps.

According to the methodology set out by Watanabe and Panagiotopoulos (2021), the following data points will be collected and described for each target falling under the company's Net Zero headline pledge: target type (absolute/intensity), unit of measure, target Scope, target baseline, target end year and total emissions reductions required between the baseline and the target end year.

Step 2: Identifying past target iterations

The second step consists of 1) gathering data on the company's track record in setting decarbonization targets and on its historical carbon emissions and 2) organizing the data into target iterations.

Step 2.1: Gathering information on track record

Each year, companies are invited by investors to submit information about their climate-related risks, opportunities and mitigation to the CDP. Information drawn from these disclosures represents the basis for the calculations performed in the next steps.

The CDP (formerly known as the Climate Disclosure Project) is a non-profit organization offering a climate reporting platform to companies, governments and cities on climate change, water security and deforestation. CDP represents "the world's largest, most comprehensive dataset on environmental action", with more than 13000 companies disclosing comprehensive data on their environmental impact and management on the platform (reference). The CDP dataset has been chosen for this analysis due to the comparability of data across reporting years, companies and industries. The reports contain data imputed by the companies themselves, and are available for free to any registered user on the CDP platform.

For the present research, the following data points have been collected for each company in the sample, for the past 10 reporting years.

Data Collection from Corporate CDP Climate Disclosures	
Data point	**Definition for the current research Scope**
GHG emissions for Scopes 1,2 and 3	GHG emissions disclosed by companies each year, for all Scopes and sub-categories, absolute and intensity
Target baseline (Year A)	A target's baseline is the value starting from which the company sets emissions reduction targets. It is represented by a baseline year, and the emissions value reported in that year. The target baseline year can be either the same as the target year, or it can represent a value reported before the target start year.
Target start (Year B)	A target's start year represents the reporting year when a certain target was set, together with the reported value in that year.
Last year in target reporting (Year C)	The last year in which the target was considered as active according to the company's CDP disclosures. For instance, if 2019 is the last year when a company stops reporting progress on its 2025 target, then 2019 will be considered as the last year in the target reporting, following the assumption that the target has been abandoned.
Last reported value (Year D)	The last available reported value of a target's metric. This is applicable both to expired and active targets, and equals the last available reported value of the target's metric. For instance, if the current year is 2021, the last reported value of an Absolute Scope 3 target that reached its deadline in 2019 will be the Absolute Scope 3 value reported by the company in 2021.
Target year end (Year E)	The target's deadline, or the latest year by which the targeted reduction should be achieved.

Targeted reduction	The target's goal, expressed as a % reduction compared to the target baseline, to be achieved by the target year end.
Target perimeter	Refers to the calculation method used to define the target's baseline. For instance, Scope 3 targets set following SBTI guidelines do not include all sub-categories reported under the GHG protocol. In case where the difference between the two perimeters is large, the target will be recalculated using both perimeters, and indicated in the target iteration coding

Table 4.2: Data Collection from Corporate CDP Climate Disclosures. Source: own concept.

Designed to serve paying customers such as institutional investors, the CDP platform does however have certain drawbacks for the present research. Firstly, each user with a free account can only access 20 submissions. Secondly, the reports are not downloadable in Excel format. As a consequence, the present analysis uses data which was collected manually from PDF documents, and is therefore limited in Scope and prone to potential errors.

Step 2.2: Defining past target iterations

Over time, a target can be restated by changing one or several characteristics, such as the baseline value or the target end. This step of the methodology attempts to investigate whether a company has previously set targets similar to those included in a company's Net Zero pledge. The present analysis seeks to identify and systematize historic decarbonization targets, in order to 1) compare them to the company's current decarbonization targets and 2) to assess whether the targets have been met, missed, dropped or restated.

For the purpose of this research, a target iteration is understood as a previous version of a target that is currently active. Two targets are considered as iterations of each other if they cover the same type of indicator (intensity or absolute) and if they refer to the same Scopes. Similarly, a target which is a continuation of an expired target is also considered an interaction for the purposes of this research. For instance, a target which was achieved in 2020, and is re-introduced in 2021 with a new target year, baseline and reduction ambition will be considered as the 2021 iteration of the same broader target.

Standardized naming is used to distinguish between different target iterations as follows: Start year | Absolute/intensity | Scope | Targeted reduction | Base year - End year | Baseline (if several baseline iterations apply to the same year). For example, the notation "2015 Iteration | Abs S1 | -28% | 2010-25 | Base 339437" should be interpreted as follows: A target set in 2015, requiring a 28% decrease in absolute Scope 1 emissions between 2010 and 2025, with a baseline of 339437.

In some cases, highly different time horizons can also be a separating factor between two targets. For instance, year-on-year intensity targets will be assessed separately from long-term intensity targets, and minor changes between targets will not be considered as separate iterations. When this occurs, an explanation will be provided.

Step 2.3: Defining past target iterations

Steps 2.1 and 2.2 described above are visualized using a chat as the one below. A thicker blue line represents the actual emissions disclosed by a company for each reporting year.The continuous line highlights targets that are currently active, while the dotted lines represent expired iterations of the target. Years A, B, C, D are plotted using the actual emissions reported by the company in the corresponding years.

Year E corresponds to the value expected at the end of each target iterations. For each iteration, the expected value in the target end year (Year E) is calculated as a percentage reduction compared to the baseline. For instance, if the baseline is 430 in year 2010, and the target stipulates a reduction of 50% by 2030, the value in the end year will be calculated as 430 - 430*50%. In this example, the expected value 2030 is 215. The targeted reduction rate is not depicted in the chart, but can be conceptualized as the slope of the imaginary line linking points A and E.

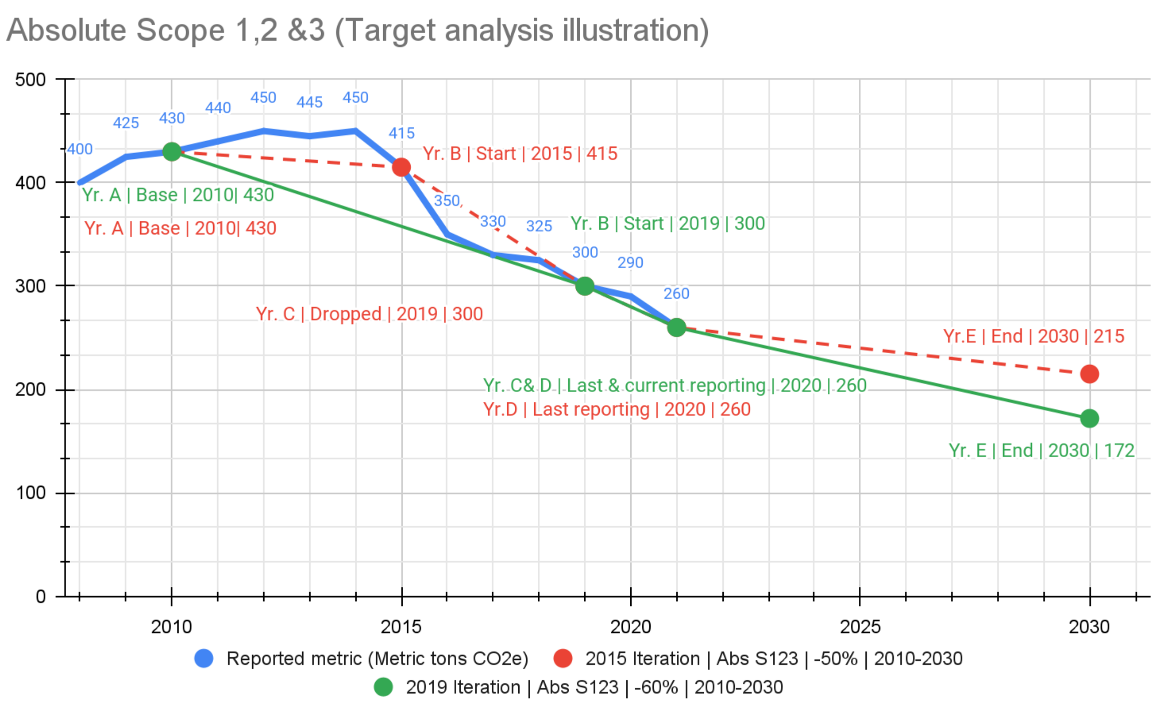


Chart 4.1. Absolute Scope 1,2 & 3 (Target Analysis Illustration). Source: own concept and numbers

In the example presented above, the Absolute target for Scopes 1,2 and 3 had a total of two iterations. The green line represents the currently active target iteration (2019 Iteration | Abs S123 | -60% | 2010 -2030), which was set in 2019, and mandates a reduction of 60% between 2010 and 2030. In this case, points C&D overlap, as the target is still active in the last available reporting year. The dotted red line depicts a previous iteration (2015 iteration | Abs S123 | -50% | 2010 -2030), which was set in 2015 with an aimed reduction of 50% between 2010 and 2030. It was abandoned in 2019 (point C), and superseded by the current target iteration.

Step 3: Performance score

The analytical framework prototyped through this thesis interprets "past performance" as a company's track record in setting and working climate-related performance objectives. (reference) describe "recent past performance" as one of the two factors influencing a company's likelihood to succeed in achieving a stretch goal. However, the authors do not clearly define the concept of past performance, and do not apply to the realm of decarbonization ambitions. Watanabe and Panagiotopoulos (2021), on the other hand, include a company's track record in meeting past and current targets as two indicators used in assessing the feasibility of a company's Net Zero target.

In this step of the methodology, the two approaches are combined under the central assumption that a company's performance against its past and current decarbonization targets can be understood as the "recent performance" element described in (reference)'s work.

Step 3.1 : Performance compared to past target iterations (P1 Score)

The first step in comparing a target's performance is to plot the expected emissions reductions trajectory should the target be on track, starting from the year in which the target was set. In the example below, the yellow line between Points B and E represents a linear reduction trajectory that would bring total emissions to a value of 215 by 2030.

Comparing the emissions values reported by the company with the projected values on the target's trajectory is used as a proxy to define whether the target was met. In the chart below, for example, the target trajectory line is above the reported emissions line, which indicates that the company is actually performing better than the minimum requirement for being on track with its target.

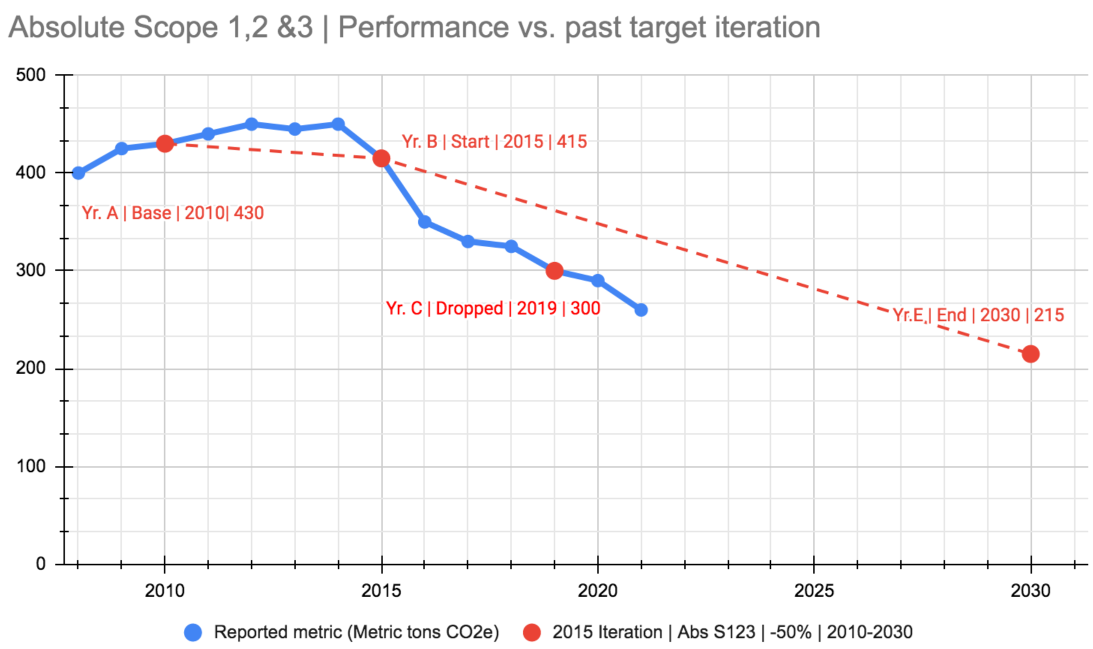


Chart 4.2. Absolute Scope 1,2 & 3 | Performance vs. past target Iteration. Source: own concept and numbers

Next, the projected yearly reduction rate between the start and end years is calculated as a percentage change relative to the start year, using the following formula:

$$Line\ slope:\ ((Value\ in\ Year\ E\ -\ Value\ in\ year\ B)\ \div\ Value\ in\ year\ B)\ \div\ (Year\ E\ -\ Year\ B))$$

The projected yearly values along the line B-E are then calculated as liniar reductions starting from point B, where year n = 0 is equivalent to year B. Year B+1 is equivalent to n+1, and so on.

$$Projected\ value\ in\ year\ n\ =\ Value\ in\ year\ B\ -\ Value\ in\ year\ B\ *\ Line\ slope\ *\ n$$

Point C, which corresponds to the last year in which the company reported its progress on the target, will be taken as the reference point for assessing the company's performance against its target. In case the target is still active the last year in the company's reporting (point D) will be used instead.

The company's performance compared to its past target iteration (P1) will be calculated as the difference between the reported and the projected values in year C:

$$Performance\ in\ year\ target\ last\ reported\ on:$$
$$=\ (Reported\ value\ in\ year\ C\ -\ Projected\ value\ in\ year\ C)\ \div\ Projected\ value\ in\ year\ C$$

Expressing this figure as a percentage of the projected value in year C will result in a figure which indicates whether the company is over performing (<0), on target (=0), or underperforming (>0). A positive figure represents an overshoot, while the value itself represents how much the company is overshooting its target in point C, as a % of the projected value in year C. Conversely, a negative value represents overperformance as a % of the projected value. Scores for past performance will be attributed in the following way:

P1: Performance compared to past target iteration		
(Reported value in year C - Projected value in year C) Projected value in year C	**Interpretation**	**P1 score**
< 0	Overperformance	2
= 0	On target	1
> 0	Underperformance	-1
N/A	No past iteration	0

Table 4.3: P1: Performance compared to past target iteration. Source: own concept.

Overperformance compared to a past target iteration will receive a maximum P1 score of 2. Performance on target is scored with a P1 of 1, and underperformance corresponds to a P1 score of -1. A target without a past iteration receives a past performance score of zero.

The analysis described above will be repeated for each past iteration of the target which is being currently analyzed, as presented in the table below. In case a target has more than one past iterations, the final P1 score will be calculated by averaging the P1 scores for each target iteration.

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
2015 Iteration | Abs DDR | 0% | 2015-20	-26.7%	Exceeding projections	**2**

Step 3.2 : Performance compared to current target iteration

The second step in calculating the past performance score for a target is to assess the company's performance relative to the target that is currently active. In the figure below, the 2019 target iteration is currently active. To assess the company's performance against this target, we compare actual emissions in the current reporting year (Year D) to the emissions projected by the target's trajectory. The resulting metric will inform the P2 score, which represents a company's performance compared to an active target. This is in line with the methodology laid out by Watanabe and Panagiotopoulos (2021), who used the same reasoning to assess a company's track record compared to its current target.

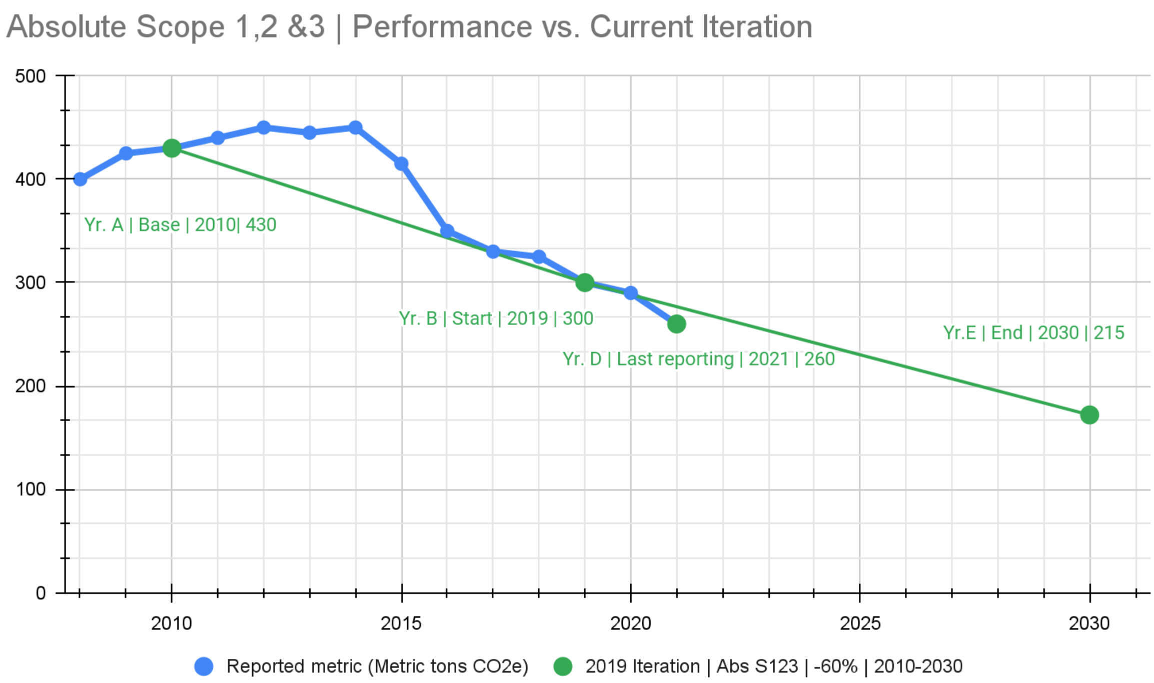


Chart 4.3. Absolute Scope 1,2 & 3 | Performance vs.current target Iteration. Source: own concept and numbers

The company's performance compared to its current iteration (P2) will be calculated as the difference between the reported and the projected values in year D:

$$Performance\ in\ last\ reporting\ year\ (P2) = (Reported\ value\ in\ year\ D\ -\ Projected\ value\ in\ year\ D)\ \div\ Projected\ value\ in\ year\ D$$

As in the previous step, a metric lower than 0 represents an overperformance, a metric equal to zero represents performance in line with the target, while a metric higher than zero represents an underperformance compared to the current targets. The resulting P2 scores are presented in the table below:

P2. Emissions performance compared to current target iteration		
(Reported value in Yr. D - Projected value in Yr. D D)/ Projected value Yr. D	**Interpretation**	**P1 score**
< 0	Overperformance	2
= 0	On target	1
> 0	Underperformance	-1

Table 4.4: P1: P2. Emissions performance compared to current target iteration. Source: own concept.

Step 3.3 : Performance compared to current target iteration

The final step in assessing a company's performance compared to past and current targets consists of combining the P1 and P2 scores obtained above, by simply adding the two scores. The resulting score represents the company's performance compared to both its current and past targets on a particular Scope. Assuming, for example, that we have conducted the analysis on a target pertaining to Scope 3, the following possible combinations emerge:

<table>
<tr><th colspan="5">Performance score (P) = Performance vs. past target (P1) + Performance vs. current target (P2)</th></tr>
<tr><td colspan="2">Target</td><td colspan="3">Perf. vs. current target (P2)</td></tr>
<tr><td colspan="2">P 1 and P2 scores</td><td>1 (overperforming)</td><td>0 (on target)</td><td>-1 (underperforming)</td></tr>
<tr><td rowspan="4">Perf. vs. past target (P1)</td><td>2 (overperforming)</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>1 (on target)</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>0 (no past target)</td><td>1</td><td>0</td><td>-1</td></tr>
<tr><td>-1 (underperforming)</td><td>0</td><td>-1</td><td>-2</td></tr>
</table>

Table 4.5: P1: Performance score (P) = Performance vs. past target (P1) + Performance vs. current target (P2). Source: own concept.

A company that is over performing compared to both the current and past iterations of a certain target will receive a maximum P score of 3. Conversely, a P score of -2 will be given to a company which is underperforming compared to both the current and past target iterations. A company which is exceeding expectations compared to its current target, but has not set any similar targets in the past will be scored with a 1. Similarly, an underperformance compared with a current target which has no past iteration will receive a P score of -1.

Step 4: Target commitment score

In a next step, each sub-target comprising a company's Net Zero goal will be attributed a "Commitment score". The commitment score will be calculated similarly to the Performance score, by adding two distinct components: the C1 score, which assesses the level of ambition of a current target compared to previous iterations of the same target, and the C2 score, which assesses the level of ambition of the currently active target relative to the company's future business as usual trendline.

The methodology presented in this section draws mainly from (reference)'s definition of Stretch Targets as goals which display extreme novelty and an extreme level of difficulty. By applying this framework to decarbonization targets, the target commitment score can be understood as a metric assessing the level of difficulty of a certain goal. For instance, a target which is more ambitious than comparable objectives set in the past, and which drives decarbonization significantly below the company's business as usual trajectory can be understood as displaying the high level of difficulty which is characteristic of stretch targets.

While the methodology developed in the MSCI Target Scorecard (Watanabe and Panagiotopoulos, 2021) includes an analysis of a target's ambition level, the method used in this section differs from that described by Watanabe and Panagiotopoulos (2021). Watanabe and Panagiotopoulos (2021) measure a target's ambition relative to a company's decarbonization trajectory needed to keep its emissions in line with a 2 degree warming scenario. In contrast, the methodology laid out below defines target ambition relative to a company's own past ambition, and likely future performance.

Several reasons justify this departure from Watanabe and Panagiotopoulos (2021). Firstly, the present methodology considers a target's ambition as a defining element of a target's level of stretch (explained in step 7). For this reason, it needs to represent the extent to which a company has achieved something similar in the past. The methodology proposed by Watanabe and Panagiotopoulos (2021) does not allow for this comparison: for instance, if a company has consistently set and met ambitious targets relative to its sectoral decarbonization pathway, the target would be considered ambitious but not a stretch goal, since the company already has experience in delivering on similar levels of ambition. Secondly, the method used by MSCI is less accessible. It requires converting a company's emissions into an equivalent "warming potential", which requires the use of sectoral decarbonization models as well as a separate methodology to attribute a certain carbon budget to an organization.

Step 4.1: Evaluating commitment vs. previous target iterations

Referring back to the chart presented in Step 2.3, the next step involves comparing the decarbonization ambition between the current target (2019 Iteration | Abs 123 | -60% | 2010 -2030) and its past iteration (2015 Iteration | Abs 123 | -50% | 2010 -2030).

In this analysis, the key metric illustrating a target's ambition is the yearly rate of change between the target's start year and its end year. In contrast to the rate of change between the base year and the target year, this metric represents the actual speed of reduction needed to meet the target, given a company's performance since the baseline year.

It is computed as the difference between the reported value in the start year (year B) and the projected value in the end year (year E), divided by the total number of years remaining between the target's start and its end year:

$$Yearly\ rate\ of\ change\ between\ the\ target\ start\ year\ (Year\ B)\ and\ the\ target\ end\ year\ (Year\ E) \\ = (Projected\ Value\ in\ Year\ E - Reported\ value\ in\ year\ B) \div (Year\ E - Year\ A)$$

The first step in comparing the ambition level of two iterations of the same target is to calculate the yearly rate of change between the target's start year and its end year for each target iteration. In the illustration provided, the metric for the 2015 Iteration is calculated as (215 - 415) / (2030 -2015) = -13.3. Repeating the same calculation for the 2019 iteration, we obtain - 11.6, which means that in order to reach the target on time, the company will need to reduce its emissions by 11.6 tons of CO2e every year, starting 2019 and until 2030.

To assess which target iteration is more ambitious, one simply needs to compare the two values. In the example provided, - 13.3 < - 11.6, which means that the target's 2015 iteration was more ambitious, because it required a higher annual absolute reduction from its start year value. To find out the difference in ambition in relative terms, one must only calculate the difference between the two reduction rates, as a % of the current reduction rate.

$$Past\ iteration\ rate\ of\ change\ as\ \%\ of\ current\ iteration\ rate\ of\ change$$
$$= (Yearly\ rate\ of\ \Delta\ in\ Iteration\ 1 - Yearly\ rate\ of\ \Delta\ in\ Iteration\ 2) / Yearly\ rate\ of\ \Delta\ in\ Iteration\ 2$$

Applying the formula above to the given example, we obtain 0.146, or 14.6% when expressed in percentage terms. This figure signifies that the yearly reduction rate required by the 2015 iteration is 14.6% higher than the reduction rate needed to reach the target goal in its current iteration. If the metric is above zero, we conclude that the current target is less ambitious than its previous iteration. Conversely, a metric below zero represents an increase in ambition from one iteration to the next. The corresponding target ambition scores are presented in the table below.

C1. Current target ambition compared to past target iteration		
Yearly rate of change of past iteration as % of rate of change of current target	**Interpretation**	**C1 score**
< 0	Increase in ambition	2
= 0	Same ambition	1
> 0	Decrease in ambition	-1
N/A	No past iteration	0

Table 4.6: C1. Current target ambition compared to past target iteration. Source: own concept.

The same procedure will be used to compare the current target iteration to its past iterations. In case a target has more than one target iteration, the C1 scores will be averaged in order to obtain a final score. The score will be presented as in the example below:

C1. Current target ambition compared to past target iteration			
Target iteration	**Yearly rate of change of past iteration as % of rate of change of current target**	**Interpretation**	**C1. Ambition score relative to past iteration**
2015 Iteration | Abs 123 | -50% | 2010 -2030 vs. 2019 Iteration | Abs 123 | -60% | 2010 -2030	14.6%	Decrease in ambition	**-1**

Step 4.2: Evaluating commitment vs. a business as usual scenario

The second component (C2) of the target commitment score is obtained by comparing the current target's ambition to the company's business as usual emissions trajectory. The resulting score indicates whether the target is likely to push the company to decarbonize more aggressively than the company's emissions trend in the absence of the target.

To calculate C2, we compare the expected emissions in the end year of the current target, with the likely emissions in the same year, following a business as usual scenario. In the chart below, the Business as Usual (BAU) scenario is illustrated using a dotted blue line.

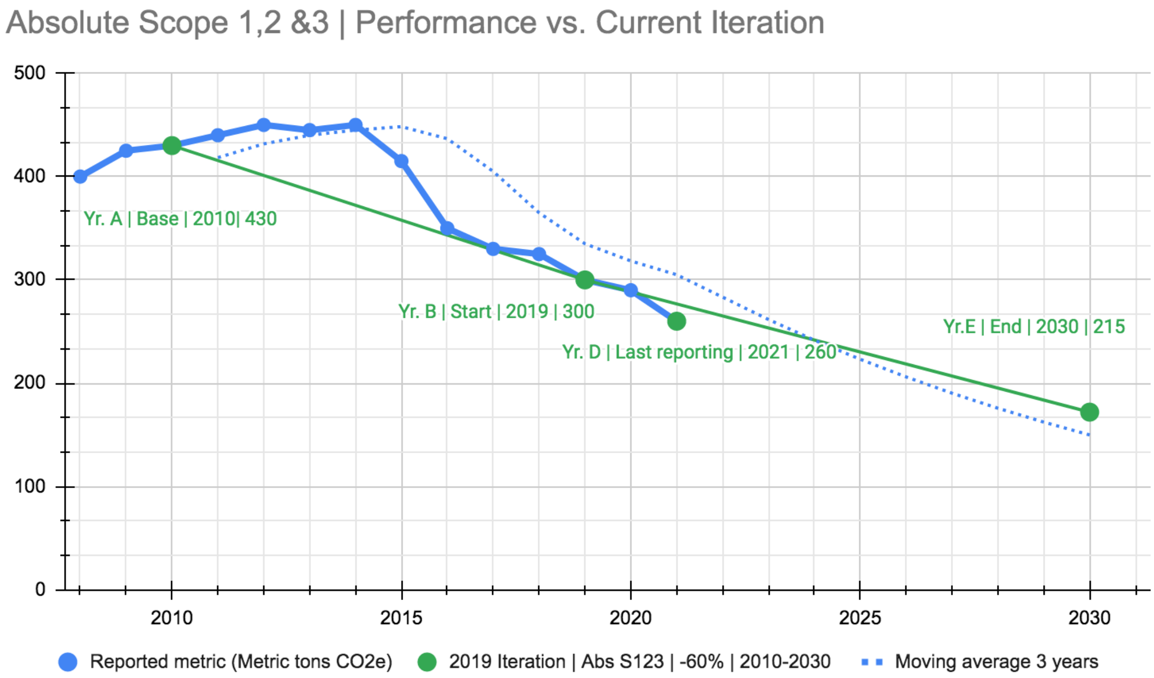


Chart 4.4. Absolute Scope 1,2 & 3 | Performance vs.current target Iteration. Source: own concept and numbers

The Business as Usual Scenario considers that none of the current targets will be achieved and estimates an emissions trajectory in the absence of any decarbonization targets. It is computed by calculating the average yearly rate of change for the last 3 years of reporting to obtain a year-on-year rate of change. The rate of change thus calculated is then applied iteratively to compute emissions until the last target year set by the targets which are active in the last year of reporting. The following formula is used to project business as usual emissions, with n representing the last year of reporting.

$$BAU\ emissions\ trajectory:$$

$$Step\ 1:\ Calculate\ 3\ year\ average\ values$$
$$3\ year\ average\ in\ year\ n\ =\ (total\ CO2\ in\ year\ n-3+ total\ CO2\ in\ year\ n-2\ +\ total\ CO2\ in\ year\ n-1)/\ 3$$

$$Step\ 2:\ Calculating\ the\ rate\ of\ \Delta\ between\ the\ 3\ yr.\ average\ in\ yr.\ n\ and\ 3\ yr\ average\ in\ yr.\ n-1$$

$$= (3\ yr.\ average\ in\ yr\ year\ n - 3\ yr.\ average\ in\ yr\ year\ n - 1) \div 3\ yr.\ average\ in\ yr\ year\ n$$

$$Step\ 43{:}\ Apply\ rate\ from\ Step\ 2\ to\ estimate\ future\ values$$
$$CO2e\ in\ year\ n + 1 =$$
$$CO2e\ in = 3\ yr\ average\ in\ year\ n\ + 3\ yr\ average\ in\ year\ n\ * Rate\ of\ \Delta\ btw.\ yr\ n - 1\ and\ yr.\ n$$

To calculate the C2 score, we compare the end value expected in the last year of the target to the end value computed using the formula described above. The metric is calculated as the difference between the end value in the target trajectory and the end value in the BAU trajectory, expressed as a percentage of the expected value given the target's trajectory.

$$Difference\ bet.\ targeted\ value\ in\ yr\ E\ and\ BAU\ value\ in\ yr\ E\ as\ \%\ of\ targeted\ value\ in\ yr\ E$$
$$= (BAU\ GHG\ in\ Yr.\ E - Targeted\ GHg\ in\ Yr\ E) / Targeted\ GHg\ in\ Yr\ E$$

In the example provided, the value expected in 2030 if 2019 Iteration | Abs 123 | -60% | 2010 -2030 is to be fully met is 215. According to the BAU trajectory, the company's emissions in 2030 would amount to 150 if no mitigation action is taken. The target is, therefore, less ambitious than the BAU scenario. In percentage terms, the expected value in the BAU scenario represents -14% of the projected value according to the target trajectory.

C2. Current target ambition compared to business as usual trajectory			
Target iteration	**(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E**	**Interpretation**	**C2. Ambition score relative to business as usual trajectory**
2019 Iteration | Abs 123 | -60% | 2010 -2030 Vs. BAU	-14%	Target is less ambitious that the business as usual trajectory	**- 1**

The range of possible scores obtained through this method is described below:

C2. Current target ambition compared to past target iteration		
(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E	**Interpretation**	**C1 score**
< 0	Increase in ambition	1
= 0	Same ambition	0
> 0	Decrease in ambition	-1

Table 4.7: C1. C2. Current target ambition compared to past target iteration. Source: own concept.

Step 4.3: Computing the final Commitment Score

The final commitment score is obtained by adding the two scores obtained in steps 4.2 and 4.1, as shown in the table below:

Commitment score (C) = Ambition vs. past iteration (C1) + Ambition vs. BAU trajectory (C2)				
Target		**Ambition vs. BAU trajectory (C2)**		
C 1 and C2 scores		**1 (more ambitions)**	**0 (same ambition)**	**-1 (less ambitious)**
Ambition vs. past iteration (C1)	**2 (more ambitions)**	3	2	1
	1 (same ambition)	2	1	0
	0 (no past target)	1	0	-1
	-1 (less ambitious)	0	-1	-2

Table 4.8: Commitment score (C) = Ambition vs. past iteration (C1) + Ambition vs. BAU trajectory (C2). Source: own concept.

The resulting matrix contains commitment scores ranging from 3 to -2. A target with the maximum commitment score of 3 is more ambitious than both its past iterations and the company's BAU trajectory. Conversely, the score of -2 is attributed to targets that have a lower ambition compared to both past targets and BAU emissions.

Step 5: Strategy score

Comparing a target's past performance and level of ambition in comparison to past iterations represent the first two steps needed to estimate a target's feasibility. A third step assessing a company's strategy for reaching its decarbonization goals adds further depth to the analysis. According to the "Paradox of Stretch Targets" framework (Sitkin et al, 2011), the second factor which determines the likely success of a stretch target is a company's slack resources. For the purpose of this analysis, slack resources will be conceptualized as the company's ability to deliver on its targets. In other words, this analysis assumes that the company's strategy and resources dedicated to meeting a certain goal indicate the availability of resources within the company in order to work towards the target. Watanabe and Panagiotopoulos (2021) also include strategy as a criterion for assessing the feasibility of a target, disaggregated by Scope and by target category.

As with the first two elements, the analysis of a company's strategy will take a comparative approach, in order to highlight whether a company's changes in a way that is supportive of its evolving goals. For instance, one can imagine that a company sets a Net Zero target which is extremely ambitious (which in this analysis is equivalent to a high ambition score), but set against the backdrop of missed past targets (quantified here as a low past performance score). In this case, the target's credibility would depend on whether the company can demonstrate improvements in its decarbonization strategy which could be conducive to its goal.

Step 5.1 : Identify emission drivers

Many factors contribute to a company's carbon footprint, and the strategies adopted in response can be manyfold. In order to simplify the assessment process, the strategy analysis will only be conducted for the factors which are most material for the company.

The first step consists of calculating the percentage of total emissions represented by Scopes 1, 2 and 3, in the year in which the target was set. The Scope which represents the highest percentage of the total will be considered as the main category driving emissions, and will be analyzed more in-depth.

In a second step, whenever possible, the Scope which emerges as the most prominent will be broken down into sub-drivers, expressed as a percentage of emissions within the broader Scope. This method is particularly well suited for the packaged consumer goods sector, where Scope 3 generally represents more than 90% of a company's total GHG footprint. For this sector, therefore, it is important to focus on the emission sub-categories that make up Scope 3.

Step 5.2 : Select an appropriate measurement scale

Unlike the past performance and the target ambition scores, a company's strategy score is not as easily quantifiable in a standardized manner. What constitutes a strong strategic response in order to tackle a certain goal depends on several factors such as the industry, the type of emissions, where in the value chain they occur, mitigation options available, etc.

Therefore, it is important to identify an appropriate benchmark against which to measure a company's efforts in working towards its targets. Ideally, the measurement framework chosen is constructed by reviewing best practices, as well as desired progress pathways, at industry level, in order to allow for comparability between companies that operate in the same industry. Different benchmarks and methodologies may apply depending on the Scopes addressed by the target.

For the purposes of this prototype, the chosen benchmark for assessing the strategy of companies in the food and beverage sector is the World Benchmarking Alliance's 2021 Food and Agriculture Benchmark. More details about the reasoning behind this choice, its constituent elements, as well its mapping to strategy scoring framework presented below, will be described in the next chapter.

Step 5.3 : The strategy scoring scale

The third step consists of attributing a strategy score for each active target. The strategy score represents the company's preparedness in carrying out the necessary measures in order to achieve its desired decarbonization goals.

Despite the tailored assessment approach described in the previous step, the methodology requires a common strategy measurement scale for all targets in order to obtain a quantifiable overview of Net Zero targets. Therefore, the chosen benchmarks from the previous step need to be translated into the common strategy scoring scheme represented below. The way in which this conversion is done is left at the latitude of the analyst and should be explained in a methodological note. An example of how the World Benchmarking Alliance's 2021 Food and Agriculture Benchmark is converted to the scoring scale presented below will be elaborated in the following chapter.

The following scale will be used to assess the company's strategy to reach a certain target. The elements provided in the description column are for orientation purposes only, and should be adjusted to fit the chosen assessment scale.

Strategy score		
Strategy score	**Interpretation**	**Description**
3	**Strong strategy**	● Technological innovation - changing the focus of the strategy completely, for instance by adopting technological innovations that were not previously available. A typical example in the Packaged Consumer Goods industry would be adopting regenerative agricultural practices. ● Business strategy innovation - changing the business' product and service portfolio towards a less carbon intensive offering. This can range from adopting circular business models to developing new products and services with a reduced carbon footprint. ● Adding new areas of focus in decarbonization - introducing actions and programs to tackle significant emissions factors which were previously not addressed. In the case of Scope 3 emissions in the Packaged Consumer Goods Sector, this could mean focusing on a new Scope 3 sub-category
2	**Moderate strategy**	● Adding or increasing operational targets for a pre-existing objective - for example, adding a target for renewable energy consumption as part of a broader Scope 1 goal, or adding a year-on-year intensity target to support an Absolute target ● Incremental changes in investments and spending towards a pre-existing target
1	**Weak strategy**	● Same operational metrics and targets between two target iterations despite an increase in ambition on the broader Scope
0	**No strategy**	● A lack of operational metrics and targets to support broader decarbonization goals

Table 4.9: Strategy score. Source: own concept.

Step 7: Target stretch score

In this step, each active decarbonization target will then be attributed a "Stretch score" , which is computed by subtracting the strategy score from the commitment score. In theoretical terms, this translates as the following: the more ambitious the target, and the less prepared a company is to work towards it, the more a target can be considered as "Stretch". This is in line with Sitkin et al. (2011) definition of Stretch Targets, which need to be simultaneously extremely difficult (represented here by a higher target ambition score) and extremely novel (represented here by a lower strategy score).

By subtracting the possible strategy scores from the possible commitment score for each target, the following range of combinations is obtained.

Target stretch score						
S and C scores	Commitment = 3	Commitment score = 2	Commitment score = 1	Commitment score = 0	Commitment score = -1	Commitment score = -2
Strategy score = 3	0	-1	-2	-3	-4	-5
Strategy score = 2	**1**	0	-1	-2	-3	-4
Strategy score = 1	2	1	0	-1	-2	-3
Strategy score = 0	3	2	1	0	-1	-2

Table 4.10: Target stretch score. Source: own concept.

The resulting scores range from -5, which is equivalent to the lowest level of stretch, to 3, which represents the highest level of stretch. A target with a score of -5 would need to be less ambitious than its past iteration and BAU scenario and simultaneously benefit from a very strong strategy to achieve the goal. A target with a stretch score of 3 would be more ambitious than previous iterations and the BAU trajectory, but would not benefit from any strategic support.

Step 8: Target completion likelihood score

Finally, the past performance and the stretch scores will be combined to indicate the likelihood of achieving a target.The two scores are subtracted from each other to show opposing dynamics: a good past performance can make up for the high difficulty level of a very ambitious target by tapping into a motivated and experienced employee base.

The scores are computed by subtracting the stretch score from the past performance score. This is in line with Sitkin et al.'s (2011) thinking that a positive past performance can support a company in achieving a stretch target. Conversely, the "Paradox of Stretch Goals" (Sitkin et al.,2011) framework maintains that companies that set ambitious goals in order to catch up on a bad track record are unlikely to meet their stretch goals. This relationship is also validated by Freiberg, Grewal and Serafeim (2019) who find that companies who have set and performed well on decarbonization targets are likely to set more ambitious targets in the future, and to perform better against them.

The resulting likelihood scores are presented in the table below:

Likelihood of meeting target	**Past Performance score**					
	Past Perf. = 3	**Past Perf. = 2**	**Past Perf. =**	**Past Perf. = 0**	**Past Perf. = -1**	**Past Perf. = -**

			1			**2**
Stretch score: 3	0	-1	-2	-3	-4	-5
Stretch score: 2	1	0	-1	-2	-3	-4
Stretch score: 1	2	1	0	-1	-2	**-3**
Stretch score: 0	3	2	1	0	-1	-2
Stretch score: -1	**4**	3	2	1	0	-1
Stretch score: -2	**5**	4	3	2	1	0
Stretch score: -3	**6**	5	4	3	2	1
Stretch score: -4	7	6	5	4	3	2
Stretch score: -5	8	7	6	5	4	3

Table 4.11: Target likelihood score. Source: own concept.

Looking at the extremes, if a company that has exceeded its targets in the past (past performance score of 3) sets a comparatively less ambitious target (stretch score of -5, which implies a strategy score of 3 and a commitment score of -2), it is highly likely to achieve its target. Conversely, a company that sets an extremely ambitious (Stretch score of 3, which is equivalent to a commitment score of 3 and a strategy goal of 0) target to improve its reputation after underperforming on its past commitments (Past performance score = 0), it is least likely to be able to achieve its target (Likelihood score -5).

A limitation of the proposed methodology is that it does not include an assessment of whether past iterations were ambitious to start with. For instance, the fact that a company's past performance exceeded the goals set by a past iteration could also indicate that a company has set easily achievable goals as a means of virtue signaling. A missed past target could similarly mask potentially significant efforts made by a company to accomplish goals which were not designed to be met. The deeper analysis needed to investigate these scenarios is beyond the Scope of this research, and would include assessing the company's targets against an industry benchmark of available decarbonization paths at the moment in time when the target was set. These limitations notwithstanding, comparing the decarbonization ambition of current targets with that of previous targets does provide a first indication of how a company's decarbonization efforts are evolving over time, and does provide indicative data points on the company's future decarbonization trajectory.

Step 9: Unabated emissions scenarios

In many cases, companies do not provide concrete figures on the amount of emissions that will be "netted out". With time horizons spanning decades until net zero goals, companies are often unable to predict neither the amount of emissions that will need to be neutralized, nor the means for doing so. Often, the deadlines set for Scope 1, 2 and 3 decarbonisation targets are several decades earlier than the final Net Zero goal. It is therefore not possible to predict the pathways and costs needed to reach Net Zero, with several factors at play : whether or not current decarbonization targets will be achieved, whether the company will set new targets, available decarbonization technologies, regulations and carbon pricing, a company's strategy and financial standing, and so on.

In full awareness of these limitations, the last step of the analysis seeks to provide a sense of proportion about the costs of reaching Net Zero, as a function of the likelihood of meeting current decarbonization goals. The process can be broken down in two steps: 1) estimating the amount of emissions left to neutralize once all active targets have expired and 2) calculating a cost of neutralization using a company's internal price of carbon and expressing it as a percentage of key financial metrics.

Three scenarios will be considered when estimating remaining emissions, described in the table below:

Unabated emissions scenarios		
Scenario #	**Scenario name**	**Explanation**
Scenario 1	Best Case Scenario	All targets are 100% met
Scenario 2	Differentiated likelihood	Targets with a likelihood scores of 7 or 8 are considered achieved at 100%
		Targets with likelihood scores of 6, 5 or 4 are considered achieved at 75 %
		Targets with likelihood scores of 3, 2, 1 or 0 or are considered achieved at 50 %
		Targets with likelihood scores of -1, -2 or -3 are considered achieved at 25%
		Targets with a likelihood score of - 4 or -5 are considered 0% achieved
Scenario 3	Business as usual	Emissions follow the same trend as in the last reporting year available, using a moving average formula

Table 4.12: Unabated Emissions Scenarios. Source: own concept.

The emissions value remaining in each scenario represent the leftover emissions which need to be netted out in order to reach Net Zero, should the company target carbon neutrality in the end year for each scenario. To project the emissions trajectory to a point farther away than the current target end date, we assume that the same rate of change achieved in each scenario by the expiration date of each target will be maintained in the future, following a linear trajectory.

In the **Best Case Scenario**, we assume that all Scope 1,2 and 3 targets are met fully and on time regardless of their score. It is calculated individually for each target and then aggregated to form the total unabated emissions in this scenario.

$$Scenario\ 1\ Leftover\ emissions:$$
$$Value\ in\ Year\ A\ +\ Value\ in\ Year\ A\ *\ targeted\ reduction\ rate$$

The **Differentiated Likelihood Scenario** ascribes different target completion rates according to a target’s likelihood score, compiled using the steps above. It is calculated individually for each target and then aggregated to form the total unabated emissions in this scenario. The formula for calculating leftover emissions is expressed as follows:

$$Scenario\ 2\ Leftover\ emissions:$$
$$Value\ in\ Year\ A\ +\ Value\ in\ Year\ A\ *\ targeted\ reduction\ rate\ *\ achievement\ rate$$

The **Business as Usual Scenario** is calculated using the same formula described in Step 4.2, for every individual target. The resulting trajectories are then added up to calculate the total emissions remaining under the Business as Usual scenario.

Step 10: Cost of Net Zero scenarios

For each scenario, the resulting emissions represent the remaining emissions to be neutralized, should the company aim to reach Net Zero in the year when its last Scope 1,2 or 3 target expires. The same analysis can be performed for years further in the future, by extending the decarbonization pathways obtained in Step 9 according to a linear trajectory.

It is important to note that in reality organizations often have a significant buffer between the end date of current targets and the dates by which they aim to reach Net Zero. For instance, most organizations in the Packaged Consumer Goods industry set their Scope 1,2 and 3 targets for 2030, while their Net Zero targets are due only in 2050. In this hypothetical case, the costs of neutralizing emissions in 2030 are likely to be significantly higher than the costs of neutralization in 2050. However, the estimations calculated using the method described below do give an indication of the scale of the remaining challenge on companies’ journey to Net Zero.

In the absence of sufficient foresight to estimate the price of carbon removal in the distant future, the internal price of carbon set by companies will be used as a proxy. If a company does not disclose an internal price of carbon, an average of the internal carbon prices set by comparable organizations will be used. The analysis can also be enriched by adding additional carbon price scenarios which reflect the costs of carbon removal options available to a specific industry.

For each scenario, the cost of reaching Net Zero will be calculated by multiplying the resulting remaining emissions with relevant carbon price scenarios. To put the resulting figure into perspective, it will be calculated as a % of the organization's Gross Revenue, EBITDA, and profit margin in the last year of reporting.

Piloting the methodology

In the following chapters, the methodology will be tested on companies within the Food and Beverage Processing sector in three steps. The reasons for choosing this sector in order to pilot this methodology are explained in detail in the introduction of the following chapter.

The first step consists of testing whether Steps 1 through 4 of the methodology are applicable to this sector and whether the performance and commitment metrics can be operationalized. This will be done through four mini case studies that focus on describing companies' Net Zero targets, on identifying past target iterations and on the comparative visual depiction of performance and ambition. The mini case studies serve as a first validation that the two core elements of the methodology, the performance and the commitment scores can indeed be analyzed with the information available. They are presented in chapter 5 below.

The second step consists of designing an assessment methodology for decarbonization strategies in the Food and Beverage sector. In order to do this, the rest of chapter 5 will provide a summary of strategic risks and opportunities in this sector, recognized decarbonization pathways as well as existing assessment methodology. Finally, chapter 5 will integrate these elements into a methodology for scoring the strength of companies' decarbonization strategies in the Food and Beverage sectors.

In a third step, the full methodology integrating the performance, commitment and strategy scores will be tested on two in-depth case studies, presented in chapters 6 and 7. The in-depth case studies will be focused on testing the degree to which the three scores can be combined in order to obtain a quantifiable estimation of the cost of reaching net Zero.

Danone and General Mills have been selected as the two in-depth case studies for the following reasons : 1) they both have long-term Net Zero targets ; 2) they are both recognized sustainability leaders in their sectors, 3) they publish extensive climate-related information through publicly available reports, 4) CDP climate disclosures are available for at least a decade and 5) they allow to test working with absolute and intensity targets.

5 DECARBONIZATION PATHWAYS IN THE FOOD AND BEVERAGE SECTOR

Introduction

This chapter will provide an introduction to the elements that need to be taken into consideration in order to assess a company's strategy in the Food and Beverage sector. This chapter serves as an introduction to the two case studies that follow, making the link between the methodology presented in the previous chapter, and the framework used to assess the strategy of companies in the Food and Beverage industry.

The Food and Beverage sector has been chosen to prototype the methodology presented in the previous chapter for several reasons. Firstly, as will be explained in more detail within this chapter, companies in the AFOLU (Agriculture, Forestry and Other Land Uses)[1] sector represent simultaneously an important source of emissions and a valuable carbon sink. In the case of companies within this sector, Net Zero pathways do not only include internal decarbonization measures, but also opportunities to sequester carbon while conducting business. Therefore, assessing the target-setting behavior of companies within these industries can give interesting insights into how businesses are attempting to switch towards carbon-positive operating models.

Secondly, carbon removal solutions enabled within the AFOLU sector are the only decarbonization solutions implemented at scale currently (Katz, 2021). Often bundled under the generic term of "Nature-Based Solutions", carbon removal mechanisms that capture and store carbon within biomass or soils are currently the most cost-effective and technologically feasible means of offsetting carbon (Katz, 2021) . With raw material supply chains playing a critical role in halting deforestation, changing agricultural practices and restoring natural ecosystems, companies active in this sector have considerable leverage in protecting natural carbon sinks.

Thirdly, despite the sector's strategic role in maintaining global warming under the Paris-mandated threshold, the AFOLU sector appears to be off track in delivering on its potential. On a macro level, the World Resource Institute's 2021 report on "The State of Climate Action" (Boehm et al., 2021), finds that out of the 7 country-level indicators tracking progress towards goals related to forests, peatlands, coastal wetlands, and grasslands for limiting global warming to 1.5 degrees, four are off track and three cannot be assessed because of insufficient data. Furthermore, they find that encouraging signs of progress on crop yield growth, ruminant meat productivity and ruminant meat consumption rates are countered by increasingly rising emissions from agricultural production (Boehm et al., 2021).

Furthermore, the Food and Beverage sub-sector has been chosen specifically in order to explore the complexities of reducing Scope 3 emissions, which represent upward of 90% of total emissions for Food and Beverage processing companies. Reducing Scope 3 emissions by engaging with complex supply chains is among the top challenges of companies that attempt to reach Net Zero, but which is only starting to receive a paramount level of scrutiny (World Economic Forum, 2021).

[1] FLAG (Forests, Land, and Agriculture) is also used as an alternative denomination for this sector

Finally, as the table below indicates, the Food and Beverage processing sub-sector has the highest number of companies committed to setting SBTi - certified Net Zero targets compared to all other sectors that fall under the AFOLU cluster (Science-Based Targets Initiative, 2022). Companies in the Food and Beverage processing industry are also at the forefront of setting Science-Based Targets. 7.2% of all companies having set at least one Science-Based short term target were in the Food and Beverage Processing industry. This figure is second only to the Professional Services sector, which represents 13.6% of the total (Science-Based Targets Initiative, 2022).

Sectors according to SBTi's definition	Committed to Net Zero		SBTI near-term targets	
	As % of total committed in SBTI sample	As % of companies in sector	As % of total committed in SBTI sample	As % of companies in sector
Food and Beverage Processing	4.44%	40.00%	7.20%	26.23%
Food and Staples Retailing	0.63%	37.50%	1.84%	30.30%
Food Production - Agricultural Production	1.06%	40.00%	1.36%	5.56%
Food Production - Animal Source Food Production	0.42%	36.36%	0.64%	11.11%
Forest and Paper Products - Forestry, Timber, Pulp and Paper, Rubber	1.27%	42.86%	1.92%	17.24%
Hotels, Restaurants and Leisure, and Tourism Services	2.75%	59.09%	1.68%	30.00%
Total	**10.58%**	N/A	**14.64%**	N/A

Table 5.1: AFOLU sector and SBTi targets. Source: (Science-Based Targets Initiative, 2022)

Preliminary observations on past performance and ambition

The SBTi data provided above shows that companies in the Food and Beverage Processing sector have been among the most enthusiastic adopters of the SBTI standard for short-term target setting. This section will broaden the perspective by conducting a first assessment of how companies' Net Zero targets compare to past iterations and to their business as usual future scenarios.

Nestlé[2]

Nestlé is a global food and beverage manufacturer with a diversified product portfolio including powdered and liquid beverages, coffee, pet care, nutritional health science, milk products, ice cream and confectionery. Nestlé launched its SBTi- aligned roadmap in 2020, pledging to reach Net Zero GHG by 2050. Nestlé's Net Zero Roadmap translates into targets differentiated by Scopes , all with a baseline year of 2018 (Nestlé S.A., 2021b):

- **Target 1**: reduce absolute Scope 1 and 2 emissions by 20% until 2025 and by 50% until 2030

[2] All figures in this subsection were sourced from the company's CDP reports for 2010- 2021

- **Target 2:** reduce absolute Scope 3 emissions by 20%, 50% and 100% until 2025, 2030 and 2050 respectively
- **Target 3**: reach Net Zero by 2050

Target 1: reduce absolute Scope 1 and 2 emissions by 20% until 2025 and by 50% until 2030

The chart below depicts Nestlé's current targets, together with an expired target aiming to reduce Scope 1 and 2 emissions by 12% between 2014 and 2020. The dotted line represents the emissions trajectory in a business as usual scenario. Visually, the chart indicates that Nestlé has performed significantly better on its Scope 1 and 2 emissions compared to the target it set in 2014. However, Nestlé's short term target has a similar slope incline compared to its past iteration, which suggests that Nestlé has not significantly increased its ambition despite its over-performance compared to past targets.

The same trend is observed for its 2030 target, which, despite being more aggressive than the other two targets depicted here, still has an endpoint that is higher than the company's business as usual scenario. This indicates that Nestlé has a high likelihood of achieving its targets for Scopes 1 and 2.

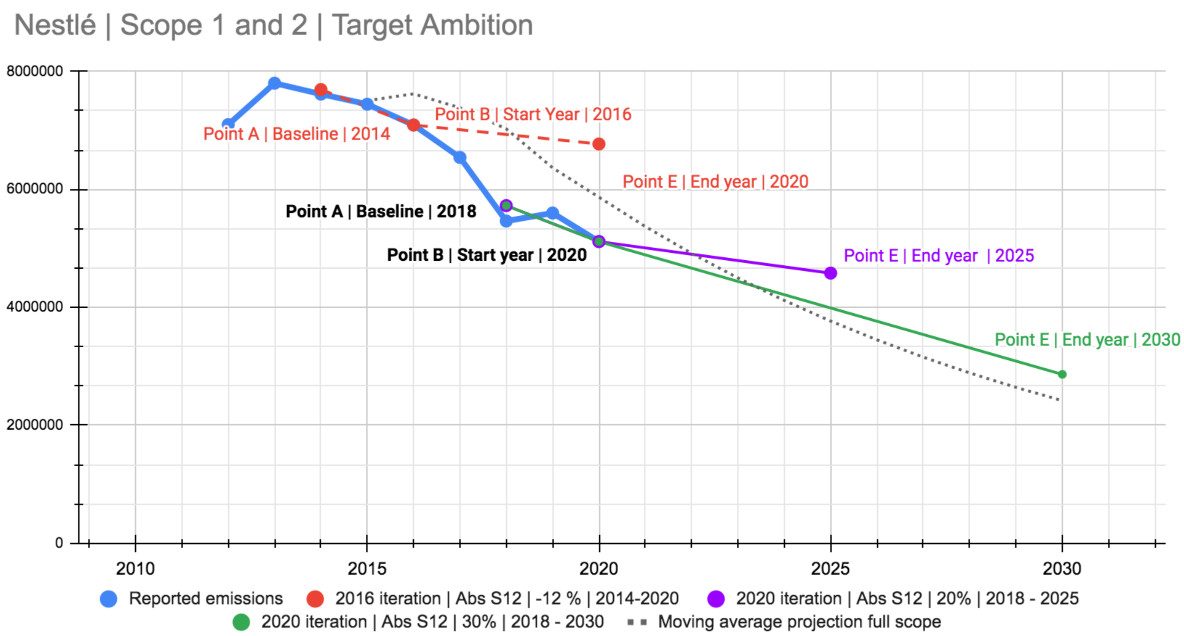


Figure 5.1:Nestle Scope 1 and 2 target ambition. Source: own calculations based on company CDP disclosures

Target 2: reduce absolute Scope 3 emissions by 20%, 50% and 100% until 2025, 2030 and 2050 respectively

Nestlé's 2020 target iterations for Scope 3 were set on a different baseline compared to their predecessor. In line with SBTi guidelines, the new baseline represents 81% of the full Scope 3 emissions reported according to the Greenhouse Gas Protocol. For comparability purposes, reported emissions are recalculated using the SBTI-approved baseline and plotted in the chart below.

The chart below compares Nestlé's current Scope 3 targets with a past iteration set in 2016 and mandating a reduction of 8% between 2014 and 2020. In 2019, when the target was dropped, Nestlé's Scope 3 emissions were 3.43% lower than in 2014. Compared to the trajectory implied by the target, Nestlé's performance in 2019 represents a 4 % overshoot. If the target were to still be active in 2020, when the company experienced a significant increase in Scope 3 emissions, then Nestlé would have underperformed its target by 14.3%.

As the target trajectory slopes indicate, Nestlé's 2020 Scope 3 targets are more ambitious than their 2016 iteration. This holds true even when taking into account the lower baseline used in the 2020 iteration. Furthermore, if achieved, the company's Scope 3 targets would significantly shift the company's currently upward trending emissions trajectory.

In conclusion, the 2020 Scope 3 iterations represent an increase in ambition compared to the previous target and in comparison to the company's future emissions trajectory. This finding, together with the negative track record in tackling Scope 3 emissions, puts the company at risk of not being able to meet its target.

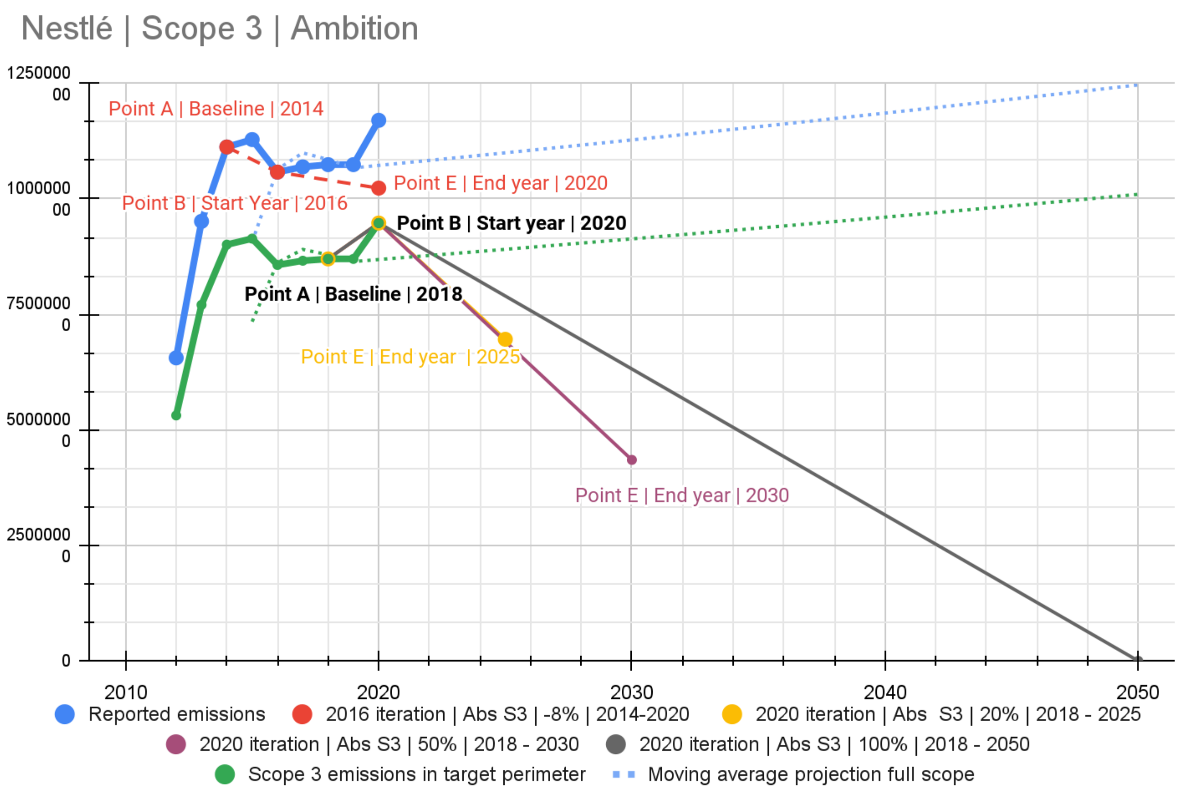


Figure 5.2: Nestle Scope 3 target ambition. Source: own calculations based on company CDP disclosures

Target 3: reach Net Zero by 2050

Nestlé's Net Zero roadmap includes plans to remove 13 million tons of CO2 from the atmosphere by 2030 by improving agricultural practices, planting trees, restoring ecosystems and implementing agroforestry measures. For the decades between 2030 and 2050, Nestlé aims to achieve regenerative food system at scale, supported by advanced agricultural techniques, and zero emissions logistics and operations. The company forbids carbon removal via offsets, stating that all carbon removal needs to take place through “insetting” within its own value chain (Nestlé S.A., 2021b)

Unilever[3]

British-Duch Unilever PLC is one of the largest players in the consumer goods industry globally, selling products in beauty and personal care, food and refreshment, and home care products. It is often included in the Food and Beverage sector because of its significance in the dairy and palm oil supply chains.

In 2020, Unilever committed to achieve Net Zero emissions from all products by 2039 (Macmillan, 2020). Its Net Zero strategy consists of three interrelated targets (Unilever plc, 2022a):

- **Target 1 :** reduce Scope 1 and 2 emissions by 75% until 2025 and by 100% until 2030 against a 2015 baseline.
- **Target 2:** Halve the full value chain emissions products by 2030 against a 2010 baseline.
- **Target 3:** Achieve net zero emissions covering Scope 1, 2 and 3 emissions by 2039.

Target 1 : reduce Scope 1 and 2 emissions by 75% until 2025 and by 100% until 2030 against a 2015 baseline

Since 2010, Unilever has had four iterations of this target. The current version was set in 2016, as part of the company’s commitment realignment in the aftermath of the Paris accord. It represents a continuation of a target set in 2015 which aimed for a reduction of 100% between 2008 and 2030. In the period between 2016 and 2019, the target was active alongside a long term goal of maintaining emissions at zero in the decade 2030 - 2040, which was no longer reported on starting 2020. Based on the chart, one can see that Unilever was over-performing compared to past iterations, and that the company’s new target does not represent an increase in ambition compared to previous targets.

[3] All figures in this subsection were sourced from the company’s CDP reports for 2010- 2021

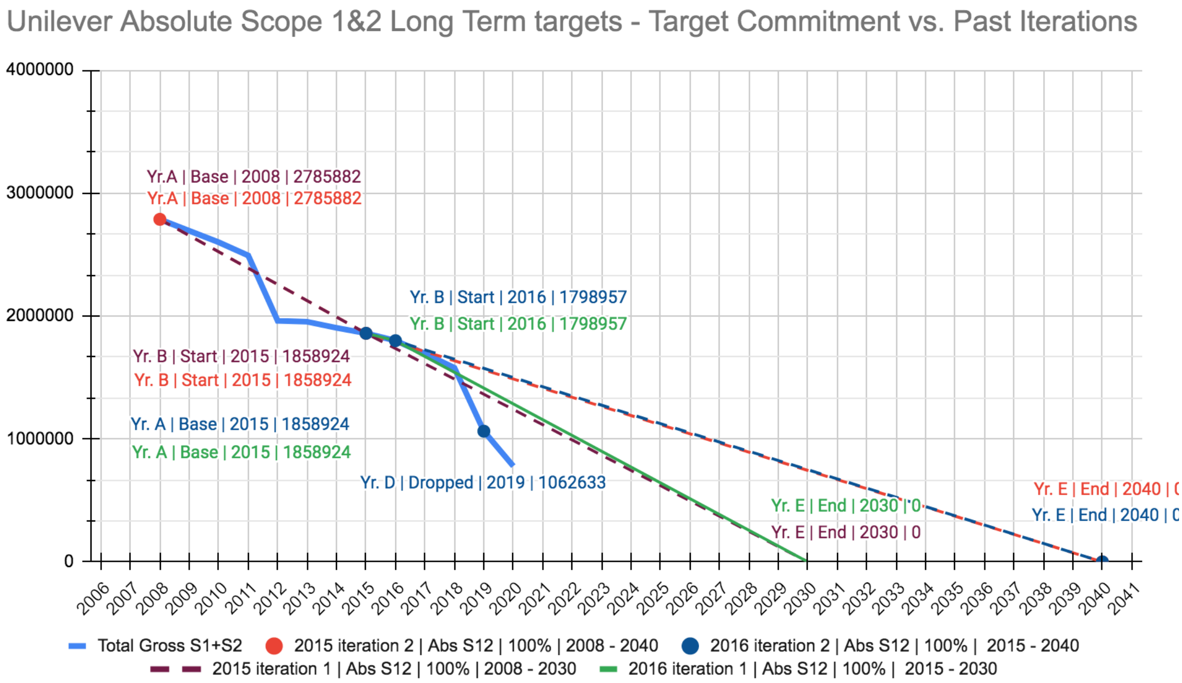


Figure 5.3: Unilever Scope 1 and 2 target ambition. Source: own calculations based on company CDP disclosures

Compared to a Business as Usual Scenario (depicted with a dotted line in the chart below), Unilever's 2030 Scope 1 and 2 target would not significantly depart from the company's trajectory.

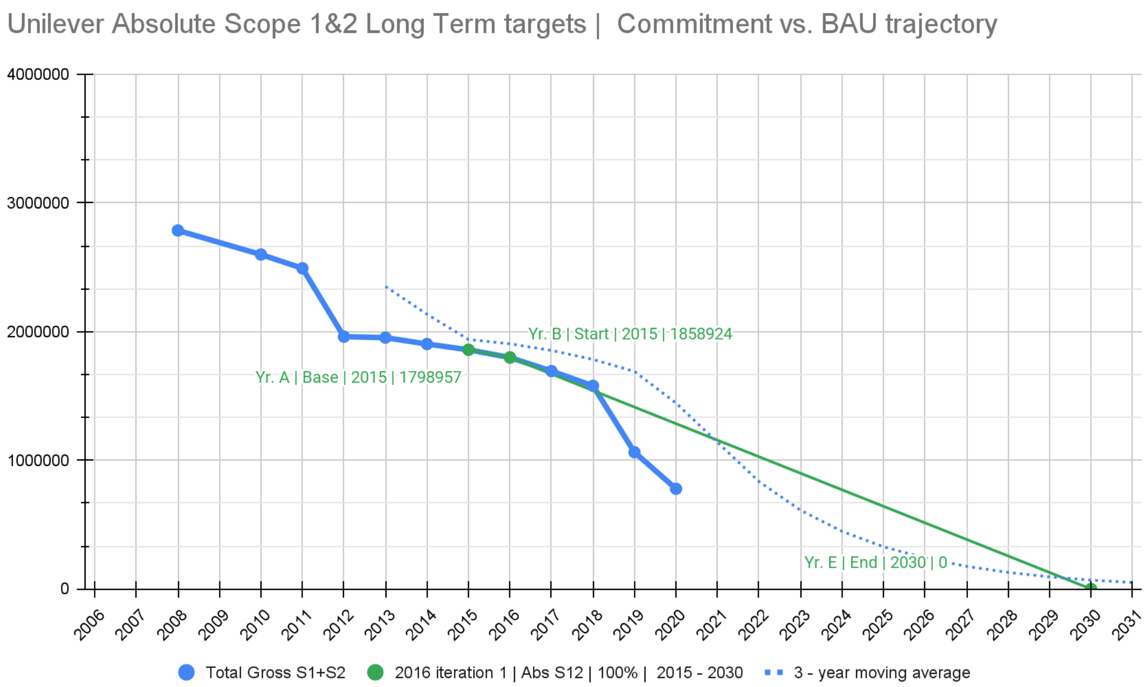


Figure 5.4: Unilever Scope 1 and 2 target vs. BAU. Source: own calculations based on company CDP disclosures

GIven the company's low level of ambition, and its track record of over-achieving on its targets, it is very likely to deliver on its Scope 1 and 2 ambition.

Target 2: Halve the full value chain emissions products by 2030 against a 2010 baseline

Unilever's medium-term target is approved by the SBTI under the 2 degrees scenario and is the only active target that directly links CO2 emissions to activities that fall under Scope 3, which represents more than 98% of Unilever's absolute carbon footprint. The chart below shows Unilever's current target and two previous target iterations, one set in 2010 and one in 2015.

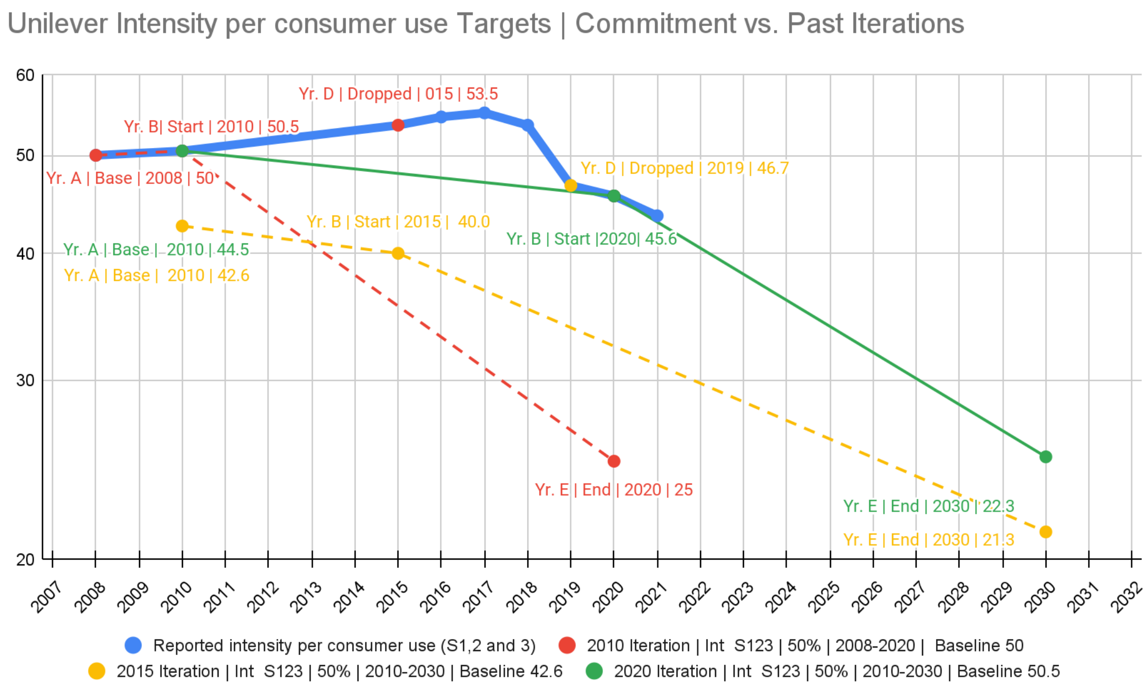


Figure 5.4: Unilever intensity target. . Source: own calculations based on company CDP disclosures

Between 2008 and 2021, Unilever has reduced its emissions intensity by 8.8% compared to the 2008 baseline used in the 2010 iteration. If the 2010 target had still been active in 2021, this would have meant that Unilever had made progress towards its target amounting to only 17.6%. Its current target displays a similar reduction rhythm compared to its 2010 iteration, but delays the decarbonization timeline by 10 years. Although it is steeper than the 2015 iteration, its end result in 2030 is a markedly higher quantity of emissions left unabated.

The chart below plots the current target against the company's business as usual trajectory. It shows that the current target aims for a reduction which does not push the company to aim for significantly lower emissions compared to its business as usual trajectory.

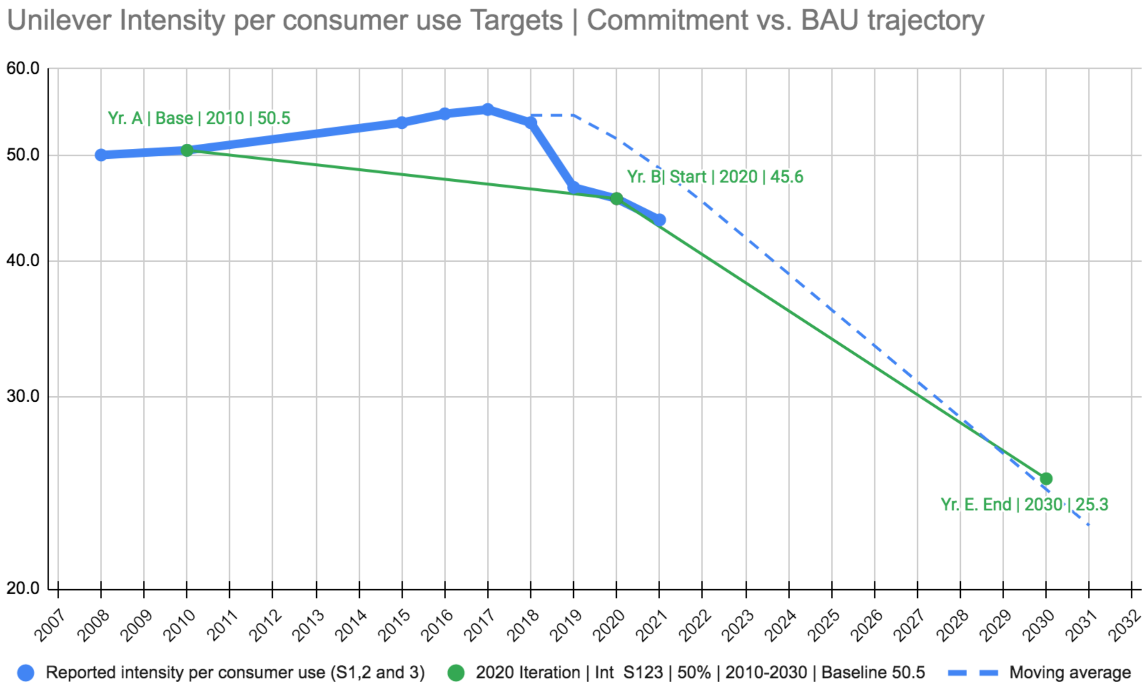


Figure 5.5: Unilever intensity target vs. BAU. Source: own calculations based on company CDP disclosures

The company's low level of past performance, coupled with a relatively unambitious target, would result in a medium likelihood that the company will deliver on its intensity target, assuming that it has the appropriate strategy in place.

Target 3: Achieve net zero emissions covering Scope 1, 2 and 3 emissions by 2039

Unilever's Neet Zero policy mentions that it will not use carbon offsetting in the 2020 -2030 decade, when it will focus on reducing emissions from its own value chain in alignment with the 1.5 ambition of the Paris Agreement. Between 2030 and 2039, and thereafter, Unilever plans to achieve Net Zero through carbon removals. Although it has not committed to a defined compensation pathway, it has launched a €1bn Climate & Nature Fund which invests in natural climate solutions such as forest protection and regeneration, as a service supporting Unliever's brands to reach their individual climate goals (Unilever plc, 2022a).

PepsiCo[4]

PepsiCo is a global food and beverage manufacturer, known for brands such as Lay's, Doritos, Cheetos, Gatorade, Pepsi-Cola, Mountain Dew, Quaker, and SodaStream.

In 2020, PepsiCo pledged to reach Net Zero by 2040. Its Net Zero pledge includes the following targets (PepsiCo Inc., 2021b):

- **Target 1**: Reduce absolute Scope 1&2 emissions by 75% until 2030, on a 2015 baseline
- **Target 2**: reduce absolute Scope 3 emissions by 40% until 2030, compared to a 2015 baseline

[4] All figures in this subsection were sourced from the company's CDP reports for 2010- 2021

- **Target 3**: Achieve Net Zero by 2040

Target 1: Reduce absolute Scope 1&2 emissions by 75% until 2030, on a 2015 baseline

PepsiCo has set two previous target iterations for its Scope 1 and 2 emissions, as shown in the chart below. For both iterations, it has either achieved its goals (for the 2012 iteration) or performed better than the target trajectory (for the 2016 iteration). The new target is significantly more ambitious than the 2016 iteration, and is likely to have a positive effect on decarbonization compared to the business as usual trajectory. Given its positive past performance, and assuming it has the right strategy in place, PepsiCo is would have a medium to positive likelihood to reach its goals on Scopes 1 and 2.

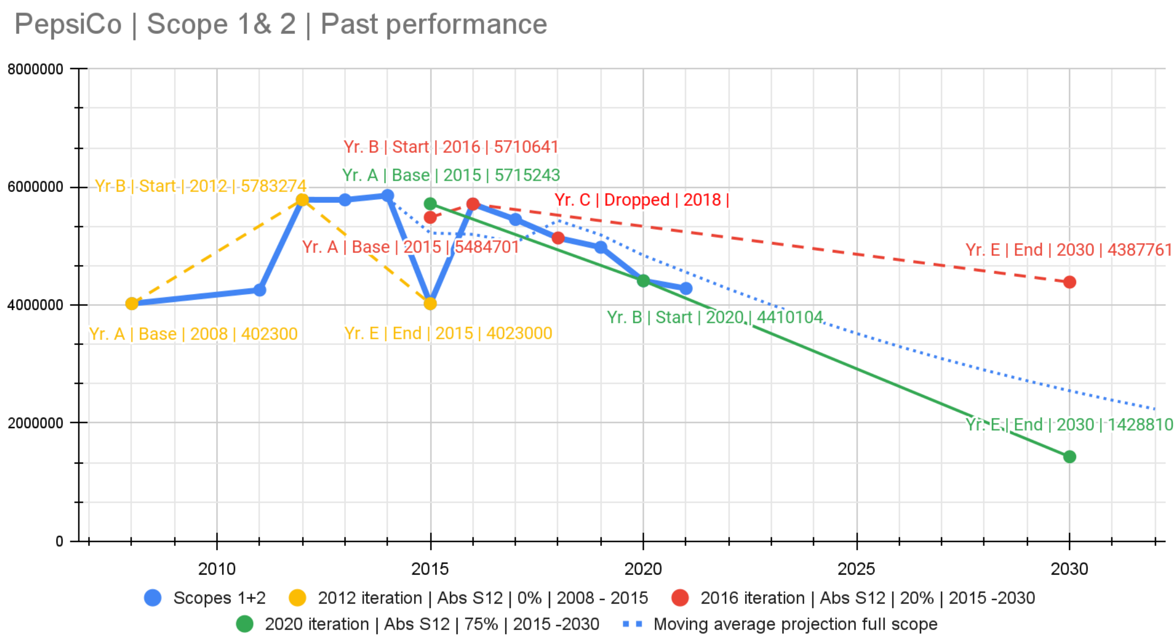


Figure 5.5 PepsiCo Scope 1 and 2 targets. Source: own calculations based on company CDP disclosures

Target 2: reduce absolute Scope 3 emissions by 40% until 2030, compared to a 2015 baseline

The company's current targets for Scope 3 represents a re-iteration of its 2015 target. Compared to the 2015 version, the 2020 target has a lower baseline and a reduction rate twice as steep. Compared to the company's business as usual trajectory, the target is also likely to bring the company's emissions down by more than what would have happened in the absence of the target. Assuming that it has the right strategy in place, PepsiCo would be well positioned to deliver on its Scope 3 target based on its past performance and target commitment.

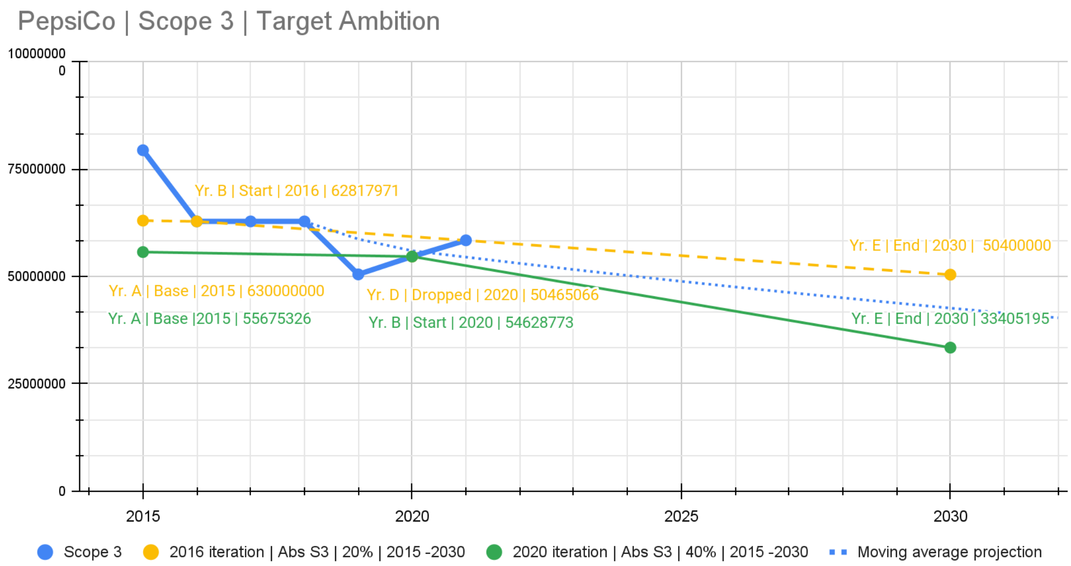


Figure 5.6: PepsiCo Scope 3 target. Source: own calculations based on company CDP disclosures

Target 3: Achieve Net Zero by 2040

PepsiCo declares that it is not planning to use carbon offsets before 2030 in order to reach its Net Zero goal (PepsiCo Inc., 2021b). It plans to achieve its Net Zero goal by sequestering carbon in soil as well as through reforestation and peatland regeneration. Switching to 100% renewable energy and scaling up circular business models are also part of the plan (PepsiCo Inc., 2021b) However, its pathway does not estimate the amount of emissions that it intends to offset by 2040.

Conclusions

The mini case-studies presented above reveal several patterns. 1) Net Zero pledges consist of several inter-relate targets referring to Scopes 1,2 and 3. 2) Net Zero targets are not quantified and do not have baselines, as opposed to targets on the three emissions Scopes. 3) Scope 1,2 and 3 targets have had several past iterations, while Net Zero targets appear to have no precedent. 4) Net Zero pledges bring renewed ambition on Scope 3 targets, but do not show an increase in ambition on Scopes 1 and 2. 5) Historically companies have performed better on Scopes 1 and 2 than on Scope 3.

Strategic risks in the Food and Beverage Processing sector

From a risk perspective, companies in the Food and Beverage sector are strongly exposed to climate-related disruptions along their raw material supply chains. Increasing temperatures combined with water stress may drive up sourcing costs by reducing the productivity of crops and livestock operations. For instance, the 2012 droughts in the American Midwest increased prices for corn and soybeans, while the 2018 droughts in Germany reduced cereal yields by 16% compared to the previous three years (PwC, 2020). PwC (2020) estimates that under the IEA's 2 degrees scenario, food and beverage companies which do not adapt to their changing environment will see a decrease in EBITDA of 44% by 2050 (compared to 2019), even if they are able to transfer their increasing costs down to consumers (PwC, 2020). In the 2 degrees scenario, global average costs of raw materials may increase by 10% until 2030, which, combined with an increased price of electricity, could lead to increases of production costs by almost 30% by 2030 (PwC, 2020).

However, evidence from the field highlights the insufficient progress made by the major land-based powerbrokers up to date. A June 2022 study from UN Climate Change High-Level Climate Champions provides preliminary evidence that 90% of major forest, land and agriculture companies which have committed to Neet Zero targets are likely to miss them because of insufficient efforts to tackle deforestation. The study shows that only 9 out of 149 companies have made significant progress on deforestation, based on Forest 500 data (Global Canopy et al., 2022).

These findings are reflected in a 2019 study assessing the 2019 CDP disclosures of Food Value Chain companies. Out of the 479 companies included in the sample, only 16% had targets specifically focused on reducing value chain emissions (Schrempf, Herrera and Schmidt, 2020). Across companies which are exposed to deforestation critical commodities, disclosure and target setting on palm oil was more prevalent than for soy and cattle. Nonetheless, target setting on all three commodities was built upon sustainable procurement and third party certification schemes. Traceability, which is vital to halting deforestation, was only rarely prioritized through target setting. Furthermore, less than 1% of companies in the sample had set a target for land use change, and only one company had a methane target (Schrempf, Herrera and Schmidt, 2020).

Strategic opportunities in the Food and Beverage Processing sector

A high degree of market concentration across the value chain, especially in segments such as meat processing, ready-to-eat cereal and retail groceries, means that engagement with the few high-leverage companies in this sector could lead to large-scale transitions in key global supply chains (Kobayashi and Richards, 2021). In theory, companies in the food value chain can leverage their purchasing power to prompt disclosure and improved practices across their supplier base (Schrempf, Herrera and Schmidt, 2020). Aware of this significant leverage, investors are increasingly driving decarbonization efforts across the food value chain. For instance, FAIRR, a global investor initiative totalling US$25 trillion assets under management in 2020 has called for a moratorium on soy-related deforestation in the Amazon, targeting the 60 most impactful animal protein companies (Schrempf, Herrera and Schmidt, 2020).

On the upside, food companies are well positioned to benefit from feeding a rising population, which is expected to increase by 24% by 2050 compared to 2020 (PwC, 2020). In addition, shifting consumer preferences towards healthier and more sustainable lifestyles have led to an increase in demand for products that combine health benefits and lower carbon footprints (PwC, 2020). Consumers are now demanding more transformative products that call into question the liniar, high carbon impact and low-cost business model of today’s food production systems (Clarke et al., 2019). Firms which respond to this trend by investing in innovation around alternative proteins, for instance, can capitalize on the plant-based meat segment, which has grown twice as fast as processed meat since

2010. In addition to shifting food consumption preference towards vegan diets, millennial consumers also prefer products that use less packaging (Clarke et al., 2019).

Increasing pressures to innovate

On the other hand, with consumers favoring small, innovative and conscious brands, traditional large consumer brands can no longer rely on their business size as a guarantee for reaching consumers (PwC, 2020). Although many food and beverage companies offer a multitude of products, their revenues derive from a small segment of flagship brands. This lack of diversification, combined with the high business value of intangible assets and the proximity to consumers, make brands vulnerable to shifting consumer trends, reputation risks and consumer activism.

Clarke et al., (2019) find that 60% of companies' top 10 brands in terms of revenue have failed to bring low market innovations in the period 2014-2019 (Clarke et al., 2019). Companies instead choose to roll out transformative innovations at a smaller, experimental scale. Across the Food & Beverage and Consumer Goods sectors, only 14% of transformative innovations were rolled out across the entire organization (Clarke et al., 2019). While little is changing at the level of core brands, companies compensate for limited investments in internal R&D with high level M&A activity Clarke et al., 2019). Companies in the food and beverage sector create "strategic optionality" by acquiring small - scale environmentally activist brands (Clarke et al., 2019). The figure is slightly better for Household & Personal Care companies, where the figure stands at 29% (Clarke et al., 2019).

Evolving decarbonization pathways

Several important developments in the sphere of GHG accounting, upcoming in the near future, are likely to significantly alter the reporting landscape in the private sector. In the course of 2022, the Science-Based Targets Initiative is expected to complete its science-based guidelines for FLAG (Forest, Land and Agriculture) targets. It covers emissions and removals resulting from FLAG-related operations, land use change and land management, up to "the farm gate" (Anderson et al., 2022).

The incoming target certification scheme prepared by SBTI implies that companies will not be able to use bigenic removals occurring in their value chain to meet non FLAG targets (Anderson et al., 2022). More generally, the IPCC states that "AFOLU mitigation measures cannot compensate for delayed emission reductions in other sectors" (IPCC, 2022, p.37). As several examples show, the Net Zero target setting framework is providing opportunities to escape these principles under the guise of carbon neutrality.

This means that in the future, companies will set SBTI-compliant FLAG emission targets only for those portions of their value chain which are related to the land sector. For emissions beyond this perimeter, such as those stemming from production-related energy use, a standard, non-FLAG target will apply. In parallel, the GHG protocol has also been preparing guidelines for reporting land use and change, CO2 removals and biogenic products. The standard is expected to bring significant changes to the process of decarbonisation target setting, which will take into account carbon removals and storage and would introduce specific targets for land sector activities (Greenhouse Gas Protocol, 2022).

The AFOLU sector as a source of emissions

According to the IPCC (2022) emissions from the AFOLU (Agriculture, Forestry and Other Land Uses) sector represented 13-21% of total global man-made GHG emissions between 2010 and 2019. Although there is some variation in emissions accounting in food chains, studies show consensus on the fact that the majority of emissions in the food and beverage sector stem from agricultural production and land use changes (Kobayashi and Richards, 2021).

Tallying up the AFOLU sector's emissions produced and removed between 2010 and 2019, the IPCC finds that the sector is a net source of carbon emissions, having added +5.9 ± 4.1 GtCO2 per year during this period, with deforestation responsible for about 45% of total AFOLU emissions (IPCC, 2022). Land-use change emissions result from commodity-driven land conversion, including forests and other ecosystems such as grasslands and peatlands (Kobayashi and Richards, 2021). Between 2001 and 2015, Cattle consistently topped the list of commodities responsible for replacing forest areas for commodity production, followed from afar by palm oil, soy and cocoa (Boehm et al., 2021).

Emissions from agriculture production also include the nitrous oxide emissions from fertilizer use and tillage practices, as well as methane emissions from beef, dairy and rice production. Non CO2 emissions from methane (beef, dairy and rice production), nitrous oxide (using livestock manure and synthetic fertilizer in agricultural production) and fluorinated gasses (used as refrigerants) represent 47% of all GHG emissions for this sector (Kobayashi and Richards, 2021). Agriculture accounts for 50% of human-produced methane, while the use of nitrogen-based fertilizers in the cultivation process represent 75% of global nitrous oxide emissions (Schrempf, Herrera and Schmidt, 2020)

The AFOLU sector as a carbon sink

At the same time, the land and agriculture sector can also contribute to decarbonization by generating nature-based carbon sinks. Although experts concur on the importance of the land sector in achieving Paris agreement emission levels, their estimation of its decarbonization potential varies. Boehm et al. (2021), for example, estimate that a 40% decrease in emissions from agricultural production complemented by large-scale reforestation could achieve net-zero emissions for the land sector by 2050, population growth included. Kobayashi and Richards, (2021), assess that land-based interventions can offset up to 25% of global emissions and estimate that to align with a 1.5-degree scenario, land-based emissions should be reduced at a rate of 7.4 Gt CO2e per year between 2020 and 2050, driven by decarbonization in land use change, agriculture, diet shifts and reduced food waste. According to the IPCC (IPCC, 2022) the AFOLU sector can supply 20-30% of the mitigation needed to keep global warming below 1.5 - 2 degrees by mid-century (Smith et al., 2014).

Roe et al., (2019) find that transforming the land sector can feasibility and sustainably provide between 21% and 30% of the 15 GtCO2e which need to be eliminated per year in order to reach the

1.5 degrees climate target. The land use sector offers both mitigation and removal opportunities which Roe et al. (2019) clustered into eight priority measures which could maximize carbon reduction while respecting cost, political and demand-side constraints. Table 5.2 summarizes the mitigation levers available to the land sector, and table 5.3 shows findings for the sector's carbon removal opportunities.

Mitigation options

Reducing deforestation and ecosystem degradation stands out as the most promising mitigation option, capable of providing 31% of possible reduction in this sector. However, the required rate of change to meet this challenge is steep, reaching 25% in 2020, 70% in 2030, 90% in 2040 and 95% in 2050 (Roe et al., 2019). This is consistent with findings from the IPCC, which estimates that the conservation, restoration and improved management of forests (especially in tropical areas), coastal wetlands and peatlands have the highest mitigation potential of AFOLU solutions, constituting around 52.5% of its mitigation potential (Smith et al., 2014).

Reducing emissions from agriculture, especially CH4 and N2O from livestock and fertilizer use, represent a further 7% contribution to land-use mitigation. For this category, the emission trajectory is much milder, with emission reductions decreasing by 15% compared to a Business as Usual Scenario by 2040, and reaching 25% in 2050. On this category the IPCC (2022), is slightly more conservative, estimating that improved crop and livestock management and carbon sequestration in agriculture could account for approximately 17.5% of this AFOLU's total mitigation potential.

Lastly, a 50% adoption rate of plant-based diets by 2050, and a 50% reduction of food waste and food loss can contribute another 6% each (Roe et al., 2019). This is also in line with the IPCC's projections which attribute approximately 14% of the sector's mitigation potential to demand-side measures such as shifting to more sustainable diets, reducing food waste, using bio-materials (IPCC, 2022).

Carbon mitigation activities			**% reduction**			
Activity	**% of total land-based mitigation by 2050**	**Description**	**2020**	**2030**	**2040**	**2050**
Reduce emissions from deforestation and degradation, conversion of coastal wetlands, and peatland burning	31%	Conservation policies, establishment of protected areas, law enforcement, improved land tenure, REDD+, sustainable commodity production, improved supply chain transparency, procurement policies, commodity certification, cleaner cookstoves	5%	20%	35%	50%
Reduce emissions from agriculture	7%	Reduce CH4 and N2O emissions from enteric fermentation, nutrient management, synthetic fertilizer production, manure management	20%	30%	45%	50%

Shift to plant-based diet	6%	Reduce production of GHG-intensive foods	10%	30%	45%	50%

Table 5.2: Carbon mitigation activities in the AFOLU sector. Source: Roe et al., (2019)

Carbon removal options

Roe et al. (2019) further detail four key land-based carbon removal possibilities and their respective trajectories until 2050, as summarized in Table 5.3 below. Among these, restoring forests and other ecosystems provide the largest carbon sequestration benefits and represent 24% of the total carbon mitigation potential for land-based solutions. The implementation trajectory is heavily skewed towards the last two decades before the 2050 cut-off, with total removals from ecosystem restorations growing 5 times between 2030 and 2040, and 10 times between 2030 and 2050. A similar speed in removals is projected to stem from improved forest management, growing tenfold between 2030 and 2050.

Regenerative agriculture practices such as enhancing soil carbon sequestration account for 9% of total carbon removal and are projected to grow more than tenfold between 2020 and 2050 (Roe et al., 2019).

Carbon removal activities			**Cumulative GtCO2e of carbon removal**			
Activity	**% of total land-based removal by 2050**	**Description**	**2020**	**2030**	**2040**	**2050**
Restore forests, coastal wetlands and drained peatlands	24%	Invest in restoration, national and local policies, payment for ecosystem services	0	9	45	90
Improve forest management and agroforestry	11%	Optimizing rotation lengths and biomass stocks, reduced-impact logging, improved plantations, forest fire management, certification; integration of agroforestry into agricultural and grazing lands	0	4	20	40
Enhance soil carbon sequestration in agriculture and apply biochar	9%	Erosion control, use of larger root plants, reduced tillage, cover cropping, restoration of degraded soils, biochar amendments	0	3	16	32
Deploy BECCS	7%	BECCS R&D, investment and deployment	0	0	11	22

Table 5.3: Carbon removal activities in the AFOLU sector. Source: Roe et al., (2019)

The increase in production yields as a necessary precondition decarbonizing the food system is not addressed by Roe et al., (2019), but is strongly emphasized by the World Resource Institute (Searchinger et al., 2018 and Searchinger and Ranganathan, 2020) and other authors (Boehm et al., 2021). The key argument is that feeding a growing population while simultaneously increasing natural carbon sinks and significantly reducing deforestation will only be possible if the efficiency of land use will increase significantly (Boehm et al., 2021).

In order to close the “food gap” until 2050, Searchinger et al., (2018) estimate that the world will need to produce 56% more crop calories compared to 2010, requiring an additional area of farmland twice the size of India, if yield rates are projected to grow at past rates. Increasing agricultural production without expanding agricultural land involves improving the yields of livestock, pasture and crops, all the while improving soil and water management (Searchinger et al., 2018). These measures need to happen at the same time as efforts to reduce the carbon impact of farming practices and not at the expense of natural ecosystems.

Pitfalls of land-based carbon removal

However, the porous definitions of each of these categories, together with the lack of scientific consensus surrounding the impact of these mitigation levers, can lead to the propagation of little understood and ill-defined practices. The food industry’s focus on regenerative agriculture, a method which gained momentum after the 2015 COP in Paris, can be considered as an example. A hallmark initiative is “4 per 1000”, launched by France at COP21, which maintains that a theoretical annual 0.04% increase in carbon sequestered within the world surface of soils could “nealy compensate the annual CO2 increase of the atmosphere” (The international "4 per 1000" initiative, 2022). The initiative centers climate mitigation efforts within the AFOLU sector around soil health, with a medium-long term vision to create a certified carbon compensation scheme for agricultural lands and forests (The “4 per 1000” Initiative, 2020). A growing number of regenerative agriculture certification schemes, such as the Regenerative Organic Certification, claim to go “beyond organic” by focusing on soil health and carbon sequestration (Reguzzoni, 2018).

This is in contrast to the findings presented above, which credit soil carbon sequestration with only 9% of the sector’s total carbon mitigation potential. Searchinger and Ranganathan (2020) point to several scientific limitations associated with soil carbon sequestration practices. For example, they cite evidence that most soil carbon practices take crops out of production thus driving the expansion of agricultural land elsewhere. No till farming, another hallmark of regenerative agriculture, is also not without mixed scientific findings pointing to the complexity of soil carbon formation: gains in carbon sequestration in top layers of the soil can mask losses in the lower levels, while long-term no till practices have been found to increase emissions of nitrous oxide (Searchinger and Ranganathan, 2020). Added to the complexity of soil carbon formation science are variations in practices, land types and types of farming, which can cause significant variations in the potential of regenerative agriculture to create scalable emissions reductions.

In contrast to experts who consider soil carbon sequestration as the most promising carbon mitigation lever within regenerative agriculture, Searchinger and Ranganathan (2020) propose a “produce, protect, prosper” strategy. They caution against overly optimistic projections of the potential of working agricultural lands to sequester additional carbon, and identify the preservation of existing vegetation reservoirs as the most effective mitigation lever available to the sector. These practices, coupled with increasing productivity on existing agricultural land, for instance by increasing the efficiency of nitrogen and other chemicals, represent “the largest potential climate mitigation prize of regenerative and other agricultural practices” (Searchinger and Ranganathan, 2020).

A framework for assessing decarbonization strategies in Food and Beverage

As mentioned in the previous chapter, assessing a company’s decarbonization strategy requires a sector-specific methodology which takes into account the specific factors driving emissions as well as the options available for decarbonization.

The assessment methodology proposed in this section is based on the World Benchmarking Alliance’s Food and Agriculture Benchmark, released in February 2021. The World Benchmarking Alliance (WBA) emerged in 2018 as a partnership between Aviva, the UN Foundation and the Business and Sustainable Development Commission with the aim to develop SDG-centered corporate performance benchmarks (World Benchmarking Alliance, 2021b). The organization develops industry benchmarks following a rigorous process which involves dialogue and research, expert panel review, public consultation and stakeholder engagement (World Benchmarking Alliance, 2020). WBA’s Food and Agriculture Benchmark is the first of a series of three benchmarks dedicated to the food sector, such as the Access to Seeds Index and the Seafood Stewardship Index (World Benchmarking Alliance, 2022).

The benchmark was chosen for several reasons. Firstly, it combines a very broad sector coverage with in-depth and structured analysis. WBA’s Food and Agriculture Benchmark assesses the performance of the 350 multinational companies with most influence along the food and agriculture value chain, from agricultural inputs producers to food and beverage processing and food retail segments. It assesses and ranks companies based on a set of 45 indicators covering governance and strategy, environment, nutrition and social inclusion.

Secondly, and most importantly, it is well aligned with the work of Roe et al. (2019) and with the upcoming SBTI standard for science- based Net Zero target setting in the FLAG sector. The table below maps the environmental indicators used in the Benchmark along the mitigation and removal options included in the SBTI’s FLAG guidance document (Anderson et al., 2022), which is based on Roe et al. (2019). With regards to carbon mitigation activities, WBA’s framework covers most categories conceptualized by Roe et al. (2019) and included in the SBTI guideline. One notable item missing, however, is a criterion that evaluates policies addressing CH4 and N2O emissions from enteric fermentation, manure management, and rice fields, which are specifically mentioned in the framework of Roe et al. (2019).

Carbon mitigation activities			
Mitigation options (Roe et al. 2019) and SBTi (Anderson et al., 2022)		**WBA criteria (World Benchmarking Alliance, 2021c)**	**WBA criteria description (World Benchmarking Alliance, 2021c)**
1	Reduce emissions from deforestation,	B3. Protection of	The company demonstrates that it is achieving

	degradation, and land conversion	terrestrial natural ecosystems	conversion-free operations and supply chains for its high-risk commodities.
2	Reduce emissions from agriculture	B7. Fertilizer and pesticide use	The company demonstrates that it is optimizing the use of fertilizers and pesticides
3	Shift to plant-based diets	B5. Protein diversification	The company is transitioning to a diversified protein portfolio
4	Reduce Food Waste	B9. Food loss and waste	The company is reducing food loss and waste.

Table 5.4:Carbon mitigation activities. Source: adapted from Anderson et al.,(2022), Roe et al. (2019), and World Benchmarking Alliance, (2021a)

For carbon removal activities, however, WBA's methodology is notably weaker. It does not include criteria relating to restoring forests and improving forest management and agroforestry, which together account for 35% of the sector's carbon removal potential according to Roe et al. (2019). WBA's methodology does not include an indicator on BECCS, which is not considered a drawback given the fact that the activity is also excluded from SBTi's FLAG guidelines (Anderson et al., 2022).

Carbon removal activities			
Mitigation options (Roe et al. 2019) and SBTi (Anderson et al., 2022)		**WBA criteria (World Benchmarking Alliance, 2021c)**	**WBA criteria description (World Benchmarking Alliance, 2021c)**
1	Restore forests	N/A	N/A
2	Improve forest management and agroforestry	N/A	N/A
3	Enhance Agricultural Soil Carbon	B6.Soil health and agrobiodiversity	The company is transitioning to a diversified protein portfolio
4	Deploy BECCS	N/A	N/A

Table 5.5:Carbon removal activities. Source: adapted from Anderson et al.,(2022), Roe et al. (2019), and World Benchmarking Alliance, (2021a)

Despite these drawbacks, which will be addressed in the next sub-section, WBA's methodology offers a common evaluation scheme which can serve as a baseline for developing assessment criteria for the elements not directly covered by WBA. Its scoring guideline assigns scores ranging from 0 to 2, in increments of 0.5. The table below reproduces the general scoring framework upon which the individual scoring guidelines are built for each criteria (World Benchmarking Alliance, 2021a). In general, the lowest score is attributed to companies which show no evidence of action or awareness about a particular topic. In order to be scored in the middle of the range (a score of 1), a company needs to provide quantitative data or a target in relation to an indicator. The maximum score is attributed to companies who have achieved their targets and show engagement in further best practices.

Score	WBA Baseline Scoring Guideline
0	The company does not provide evidence of policies or activities relating to the indicator.
0.5	The company has a policy, statement or commitment, or for some indicators provides evidence of activities (not company-wide) that contribute to the indicator.
1	The company scores 0.5 and in addition provides either quantitative data or a target that relates to the outcome of the indicator.
1.5	The company scores 1 and in addition provides both a target and discloses performance against that target.
2	The company scores 1.5 and in addition has achieved the target and discloses performance against that target. For some indicators, it provides additional evidence of best practice, such as engaging across the value chain to achieve outcomes.

Table 5.6: WBA Baseline Scorecard . Source: World Benchmarking Alliance, (2021a)

The strategy scoring methodology for Scope 3

The resulting scoring methodology blends four considerations: 1) the availability and quality of data reported by companies; 2) reflecting as closely as possible the science-based categories and weights provided by (Roe et al. 2019) and SBTi; 3) integrating a common scoring framework following WTA's guidelines and 4) the ability to translate the resulting framework into the strategy strength scoring scale presented in the previous chapter.

The first two considerations have been tackled jointly within the first iteration stage in developing the methodology. To test the feasibility of directly using the criteria defined by (Roe et al. 2019) and SBTi in the scoring system, the agriculture and forestry management practices reported by companies as part of their CDP disclosures have been mapped against Roe et al. (2019)'s breakdown. This exercise has shown that companies often do not provide a clear distinction among different practices. For instance, many companies report on Regenerative Agriculture as one practice in which they incorporate elements ranging from improving the CO2 absorption capacity of soils (which falls under category # 3 of carbon removal activities) to optimizing the use of agricultural inputs (which is category #2 in the carbon mitigation section).

As a result of this exercise, the 7 decarbonization levers (excluding BECCS) presented by Roe et al. (2019) have been clustered into four categories which are clearly distinguishable in companies' reporting. Each of the four categories has been ascribed a weight, calculated as the average of the individual weights presented by Roe et al. (2019) and SBTI. The resulting segments and their weights are presented in the table below.

Strategy assessment clusters

Cluster	Cluster component	Weight in Roe et al. (2019)	Weight in SBTI (Anderson et al., 2022)	Final cluster weight
Land-use	Land-use Change	26%	31%	**58%**
	Restore Forests	27%	24%	
Regenerative Agriculture	Improve SFM and agriculture	12%	11%	**29%**
	Improve agriculture	5%	7%	
	Enhance Agricultural Soil Carbon	9%	9%	
Shift Diets	Shift Diets	8%	6%	**7%**
Reduce Food Loss and Waste	Reduce Food Loss and Waste	8%	6%	**7%**

Table 5.7: Strategy assessment clusters. Source: own calculations and concept adapted from Anderson et al.,(2022), Roe et al. (2019), and World Benchmarking Alliance, (2021a)

In a next step, the scoring methodology provided by the WBA has been applied to each of the clusters. In cases where the criteria scored by WBA matched well with the four clusters, the scoring criteria were used exactly as in WBA's methodology. The the table below, the scoring guidelines which were reproduced exactly from the WBA methodology are marked with an *. In instances where WBA's methodology did not exactly match, the scoring guideline was adapted to better fit the clusters described above.

Cluster	Strategy scores according to WBA (World Benchmarking Alliance, 2021a)				
	0	**0.5**	**1**	**1.5**	**2**
Land-use*	No evidence of achieving deforestation and conversion-free (DCF) supply chains for its high risk commodities.	Qualitative evidence towards achieving DCF supply chains for its relevant high-risk commodities.	DCF target for some, but not all, of its relevant high-risk commodities, and reports against the target OR Evidence that it has achieved DCF for some but not all of its relevant	The company has a DCF target for all its relevant high-risk commodities, and reports against the target by disclosing the proportion of commodities that are DCF.	The company provides evidence that it has achieved 100% DCF supply chains for all its relevant high-risk commodities.

			high risk commodities. OR DCF target for all of its relevant high-risk commodities, but no reporting		
Regenerative Agriculture	No evidence of transitioning to a regenerative agriculture in its supply chain	Qualitative evidence of regenerative agriculture activities or commitments	Time-bound target to increase regenerative agriculture and reports progress against it OR The proportion of its portfolio that is sourced from regenerative agriculture practices is disclosed	Sales-based, time-bound target to increase regenerative agriculture, but does not report against the target OR No sales-based target, but discloses an increase regenerative agriculture sourcing	The company has a sales-based time-bound target for regenerative agriculture sourcing as a % of its total sourcing and reports progress against the target
Shift Diets *	No evidence of transitioning to a diversified protein portfolio	Qualitative evidence of protein diversification activities or commitments	Timebound target to increase alternative proteins and reports progress against it OR The proportion of its portfolio that consist of alternative proteins is disclosed	Sales-based, time-bound target to increase alternative proteins, but does not report against the target OR No sales-based target, but discloses an increase in alternative proteins sales.	The company has a sales-based time-bound target for replacing animal proteins with alternative proteins as a percentage of its total portfolio, and reports progress against the target
Reduce Food Loss and Waste *	The company does not provide evidence of reducing food	Qualitative evidence of reducing FLW across its own Operations.	Time-bound target to reduce FLW across own operations, but no reporting	The company has a time-bound target to reduce FLW across its own operations,	The company meets score 1.5 AND provides evidence of activities to

	loss and waste (FLW).	OR The company is measuring FLW across its own operations.	OR Quantitative evidence of reducing FLW across its own operations	and reports progress against it.	collaborate with value chain partners to prevent FLW.

Table 5.8: Scope 3 strategy scores according to WBA methodology. Source: own concept and World Benchmarking Alliance, (2021a)

Finally, in order to convert the scoring scheme presented above into the strategy scores presented in the previous chapter, the scores for each category are multiplied by the respective weights for each pillar.

Weighted scores		**Scores**				
Clusters	**Weights**	**0**	**0.5**	**1**	**1.5**	**2**
S1. Land-use	**58%**	0	0.142	0.285	0.427	0.57
S2. Regenerative Agriculture	**29%**	0	0.287	0.575	0.862	1.15
S3. Shift Diets	**7%**	0	0.035	0.07	0.105	0.14
S4. Reduce Food Loss and Waste	**7%**	0	0.035	0.07	0.105	0.14

Table 5.9: Scope 3 strategy weighted scores. Source: own calculations and concept adapted from Anderson et al.,(2022), Roe et al. (2019), and World Benchmarking Alliance, (2021a)

To calculate a strategy score for a particular target, the weighted scores for each pillar are added and clustered into 4 ranges. The resulting score is then translated into strategy scores ranging from 0 to 3, as shown in the table below.

Sum of weighted scores	**Corresponding strategy score**	**Explanation**
Range 1: 0 - 0.5	0	No strategy
Range 2: 0.51 - 1	1	Weak strategy
Range 3: 1.1 - 1.5	2	Moderate strategy
Range 4: 1.51 -2	3	Strong strategy

Table 5.10: Scope 3 strategy score conversion table. Source: own calculations and concept

In the example below, a company has scored 1.5 on S1, S2 and S3,and 2 on S4 (column B), the weights for each pillar (column C) and multiplied with the scores (column B) to obtain the weighted score for each strategy cluster. The weighted scores in column D are added in column E. The resulting metric of 1.825 is within Range 4, which is equivalent to a total strategy score of 3.

A:Strategy pillars	B: 2020 Metric	C: Weight	D: 2020 metric weighted	E: Final metric based on WBA (sum of all weighted scores)	F:Corresponding strategy score
S1. Land-based measures	1.5	58%	1.15	1.825	3 Strong strategy
S2. Regenerative agriculture	1.5	29%	0.4275		
S3. Shifting diets	1.5	7%	0.105		
S4. Reduce Food Waste	2	7%	0.14		

Table 5.11: Scope 3 strategy score conversion table. Source: own calculations and concept

The strategy scoring methodology for Scopes 1 and 2

A simplified version of the methodology detailed for Scope 3 will be applied to assessing a company's strategy on Scope 1 and 2. The WTA's Benchmark for Food and Agriculture also contains a criterion which evaluates a company's actions on Scopes 1 and 2 (World Benchmarking Alliance, 2021a), which is reproduced in the table below.

Indicator	Strategy scores according to WBA (World Benchmarking Alliance, 2021a)				
	0	0.5	1	1.5	2
Scope 1 and 2 GHG emissions	The company does not provide evidence of reducing its Scope 1 and 2 GHG emissions.	The company discloses quantitative reductions for segments of its Scope 1 or Scope 2 emissions.	The company has a target to reduce its Scope 1 and 2 emissions but does not report against the target OR The company does not have a target, but discloses quantitative reductions for its Scope 1 and 2 emissions.	The company has a target (not aligned with 1.5°C) to reduce Scope 1 AND 2 emissions and reports progress against the target	The company has a target (aligned with 1.5°C) to reduce Scope 1 AND 2 emissions and reports progress against the target

Table 5.12: Scope 12 strategy scores according to WBA methodology. Source: World Benchmarking Alliance, (2021a)

The framework used by the WBA reflects the fact that very often targets for Scopes 1 and 2 cover both Scopes simultaneously. However, the preliminary research conducted for this thesis has shown that Scope 1 and 2 emissions often show diverging trajectories within the same company, as well as different levels of ambition in tackling them. Therefore, the case studies presented in the next chapter will apply the scoring scale presented above to Scopes 1 and 2 individually.

To obtain the final strategy score for a target which considers Scopes 1 and 2 together, the WBA scores for each Scope are averaged and translated into the common strategy scoring grid as described above. In the example below, a company which has no policies to reduce its Scope 1 emissions is scored with 0. The same company has a Scope 2 reduction target which is aligned with a 2 degrees scenario, and therefore receives a score of 1.5. The average score of 0.75 sits within the second range defined above, which results in an overall strategy score of 2 for its Scope 1 and 2 target.

S score	**WBA Scores**	**WBA Average**	**Corresponding strategy score**
S1 Scope 1	**0**	**0.75**	2 Weak strategy
S.2 Scope 2	**1.5**		

Table 5.13: Scope 12 Strategy score conversion table. Source: own calculations and concept

6 Case Study 1: General Mills

Company overview

Headquartered in Minneapolis, Minnesota, USA, General Mills is a global manufacturer and marketer of consumer and pet foods, selling more than 100 brands in over 100 countries. The company employs around 32,500 people around the globe, with a net sales of $18,9 Billion in fiscal year 2022 (General Mills Inc., 2022a). Its largest global categories are: snacks, ready-to-eat cereal, natural pet food, refrigerated and frozen dough, baking mixes and ingredients, yogurt and super-premium ice cream (General Mills Inc., 2021c).

In fiscal year 2020, Cereal, Pet Food, Ice Cream, Snack Bars, and Mexican Food represented approximately 45 percent of the company's net sales, broken down as shown in Figure 6.1 (General Mills Inc., 2020b). In 2022, the business is aiming to reach mid single digit growth rates through a strategy of acquisitions and divestitures that is consolidating its position in North America and in the above mentioned core segments (General Mills Inc., 2022a).

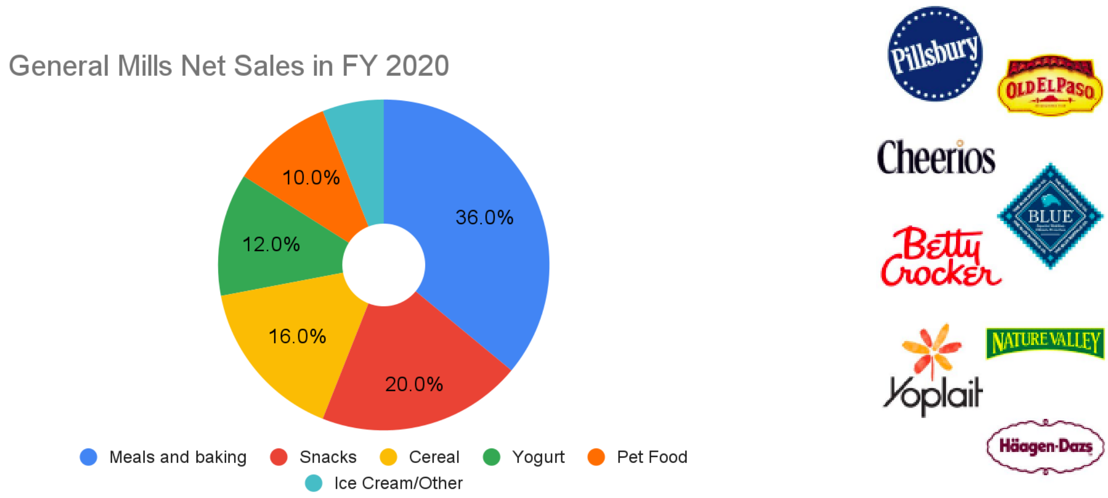


Figure 6.1: General Mills Net Sales in FY 2020 and main brands. Source: General Mills Inc., (2022a)

Carbon footprint

An analysis of General Mills' carbon profile provides a first set of insights into the Scope and depth of the company's decarbonization commitments. Like most companies operating in the Food and Beverage sector, General Mills' gross carbon footprint overbearingly originates from its indirect Scope of operation. According to the company's 2021 CDP disclosure (General Mills Inc., 2022c), 96.9% of the company's emissions are within its Scope 3 category, which means that they originate from entities that are not owned or controlled by the company. In the same reporting year, Scope 1 and 2 emissions, which are under the direct operational control of the company, represented only around

3% of the company's total carbon footprint. The breakdown of the company's total gross emissions per Scope is provided in Table 6.1 below[5].

General Mills 2021 CDP disclosure	Metric tons of CO2e	As % of total emissions
Gross Scope 1	364000	2.04%
Gross Scope 2	195000	1.09%
Gross Scope 3	17300000	96.87%

Table 6.1: General Mills gross emissions. Source: (General Mills Inc., 2022c)

As expected, General Mills' total GHG emissions are largely driven by its Scope 3 emissions, as shown by the close correlation between the Total and Scope 3 curves in the chart below (measured on the left axis)[6].

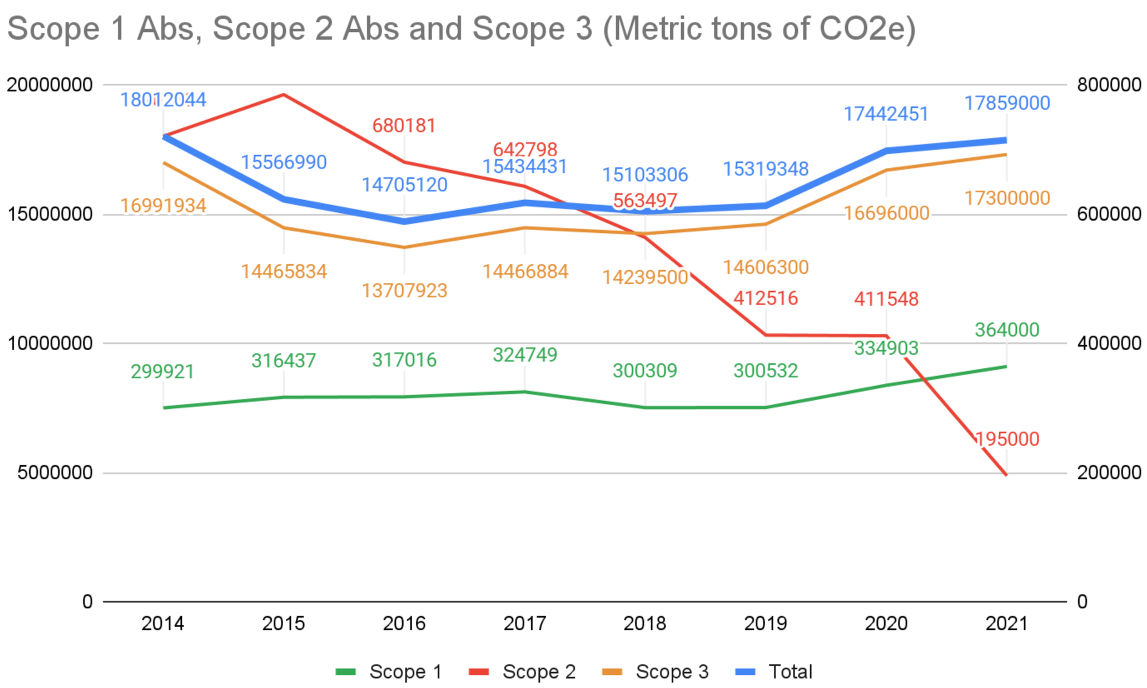


Figure 6.2: General Mills Scope 1,2 3 emissions time series. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021. Own calculations and concept.

Upstream of the value chain is where the company faces the most significant climate-related risks. Changing weather patterns induced by climate change can create raw material shortages and price volatility by negatively affecting crop yields, inducing water shortages and damaging ecosystems (General Mills Inc., 2022b). It is therefore unsurprising that General Mills' latest materiality assessment identifies climate change, ingredient sourcing, regenerative agriculture and packaging as four out of the six priorities which are core to General Mill's strategy and performance (General Mills

[5] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021

[6] Ibid.

Inc., 2022e). This is reflected in the company's decarbonization commitments, elaborated in the section below.

Net Zero commitment

General Mills' commitments on climate action gained public acclaim as early as 2015, when it was among the first companies across all sectors to set a science-based target (General Mills Inc., 2022b). The company's disclosure and actions on decarbonization are recognized by the CDP, which included General Mills on its "A list" of climate change leaders for three consecutive years (General Mills Inc., 2020c). Taking all dimensions of ESG into account, General Mills is seen as an industry leader by the major sustainability ratings providers. In 2021, MSCI upgraded the company's score to the highest possible level, "AAA", after having rated the company as "AA" since 2017 (MSCI, 2022). Sustainalytics' ranks General Mills as number 26 out of 575 companies (whereby #1 in the ranking is the industry leader) in its ESG Risk assessment within the food products industry, echoing the generally positive perception of the company's overall sustainability performance (Sustainalytics, 2022).

Building on its positively perceived track record, General Mills announced a new set of objectives in 2020, to "accelerate planetary health, healthy living ecosystems, and thriving farmers and communities over the next 10 years" (General Mills Inc., 2020c). The company pledged to reduce GHG emissions across the full value chain by 30% by 2030 and net zero emissions by 2050 in alignment with the new SBTi 1.5oC guidance.

A closer look into General Mills' sustainability reporting reveals that the first objective described above consists of three distinct targets, differentiated by Scope:

- **Target 1**: a 42% reduction in absolute Scope 1 and 2 emissions by 2030, from a 2020 baseline
- **Target 2**: A 30% reduction in absolute Scope 1,2 and 3 emissions by 2030, on a 2020 baseline
- **Target 3**: Achieve Net Zero GHG emissions by 2050

Target 1: 42% reduction in Scopes 1+2 by 2030 from a 2020 baseline

General Mills' first target aggregates Scopes 1 and 2 under the single goal of reducing absolute Scope 1 and 2 emissions by 42% within a decade. All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[7].

Target iterations

General Mills has been setting separate absolute reduction targets on Scopes 1 and 2 starting 2015. Considering all baseline changes which occurred over the past 10 years, General Mills has had a total of five target iterations for Scopes 1 and 2 combined.

[7] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

Before 2020, General Mills has set separate targets for Scopes 1 and 2. Both targets were set in 2015, targeting a reduction of 28% between the 2010 baseline and 2025. The targets were active for three years, before being replaced by year-on-year Scope 1 and 2 intensity goals between 2018 and 2019. The Scope 1 and 2 target which is currently active was set in 2020, for both Scopes combined.

The chart below illustrates the two targets for Scopes 1 and 2 with baselines which are closest to the GHG figures reported by General Mills in its CDP disclosure for the respective baseline years. The target trajectories are represented by dotted lines, while reported emissions are illustrated with continuous lines. The thicker blue line represents reported emissions for Scopes 1 and 2 combined.

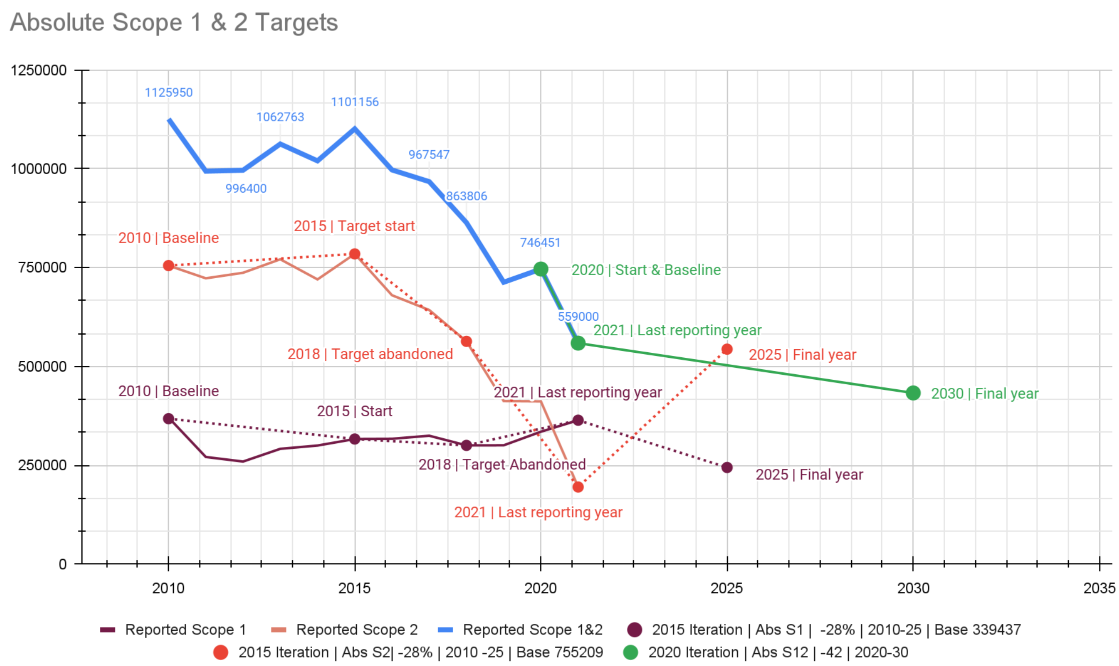


Figure 6.3: General Mills Absolute Scope 1 & 2 targets. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Past Performance Score

All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[8].

P1. Emissions performance compared to past target iterations

The chart below depicts the Scope 1 and 2 targets as projected linear trajectories between their respective start and end years.

[8] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

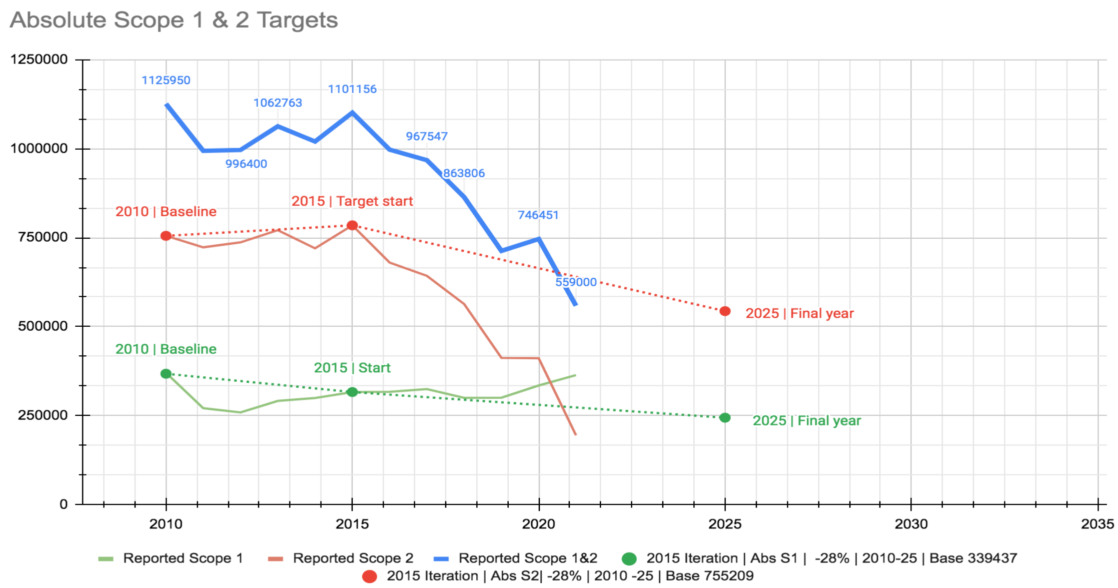


Figure 6.4: General Mills Absolute Scope 1 & 2 targets. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

In 2018, the last year of reporting for both targets, General Mills was strongly over-performing compared to its Scope 2 target, and was relatively on track with its Scope 1 target. As the chart shows, this dynamic has continued beyond 2018 as well, with Scope 2 emissions continuing to drop at a faster rate than required by the target, and Scope 1 emissions displaying an increasing trend.

In numerical terms, the 2015 Scope 2 iteration was over performing by 23.9% compared to the target's projected value in 2018, the last year of reporting. The target's overperformance also holds true for its second iteration which has a larger baseline.

In the same year, General Mills' reported Scope 1 emissions were 1.8% higher than the projected rate, thus slightly underperforming. However, reported emissions fall down to -0.22% of the projected value when considering the second Scope 1 iteration from 2015, which has a larger baseline of 367882.

In order to obtain an analysis that is comparable to the 2020 iteration, which considers both Scopes together, the separate targets set in 2015 are considered as a cumulative target on total emissions for Scopes 1 and 2. The resulting target is equivalent to a reduction of 29.8% over the same time period, and is represented by the dotted red line in the chart below:

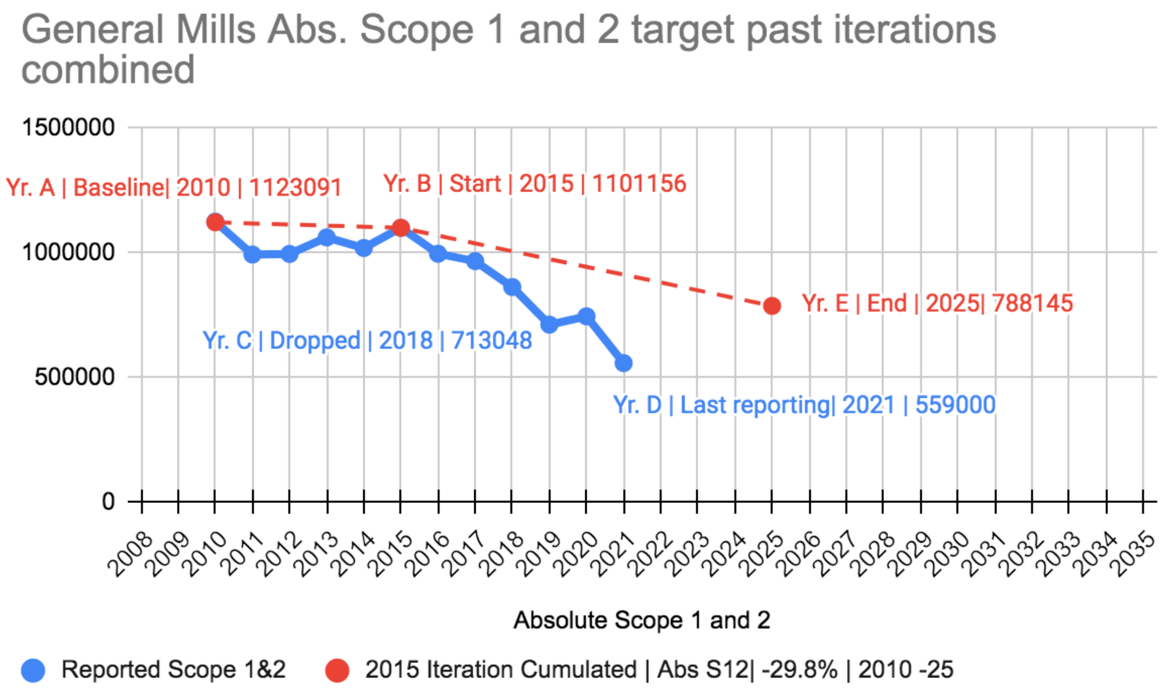


Figure 6.5: General Mills Absolute Scope 1 & 2 targets past iterations combined. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

In year C, when both targets were dropped, General Mills's Scope 1 and 2 emissions combined were 14.25% lower than expected emissions based on the target trendline. The resulting P1 score is therefore equal to 2.

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
2015 Iteration Cumulated | Abs S12 | -29.8% | 2010 -25	-14.25%	Exceeding projections	**2**

P2. Emissions performance compared to current target iteration

The second step in calculating the past performance score consists in assessing General Mills' Scope 1 and 2 performance relative to its current target, which is represented below as a linear trajectory.

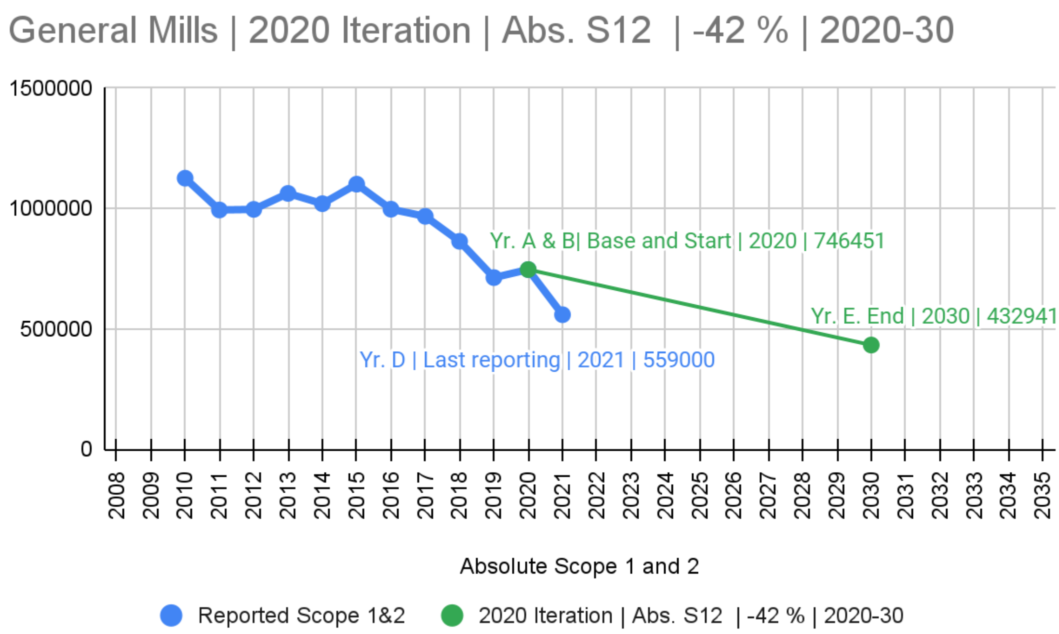


Figure 6.7: General Mills Absolute Scope 1 & 2 target. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

In year D, General Mills' emissions were 21.8% lower than the figure implied by the target's trajectory. Therefore, the company's performance score relative to its currently active target is equal to 1.

P2. Emissions performance compared to current target iteration			
Target iteration	**(Reported value in Yr. D - Projected value in Yr. D D)/ Projected value Yr. D**	**Interpretation**	**Performance score relative to currently active target**
2020 Iteration | Abs. S12 | -42 % | 2020-30	-21.8%	Company is overperforming relative to its current target	**1**

A total Past Performance score for Scopes 1 and 2 is obtained by adding the P1 and P2 scores.

P. Past Performance score			
Target iteration	**P1. Performance score relative to past target iterations**	**P2. Performance score relative to currently active target**	**P. Past Performance score = P1+P2**
Scopes 1 and 2	**2**	**1**	**3**

Target Commitment Score

To understand how the current target compares to its predecessors in terms of decarbonization ambition, the 2015 iterations of Scopes 1 and 2 are aggregated into one target, resulting in a 29.8% reduction on a 2010 baseline by 2025. The resulting trajectory is depicted in the chart below, alongside the decarbonization pathway implied by the currently active target. All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[9].

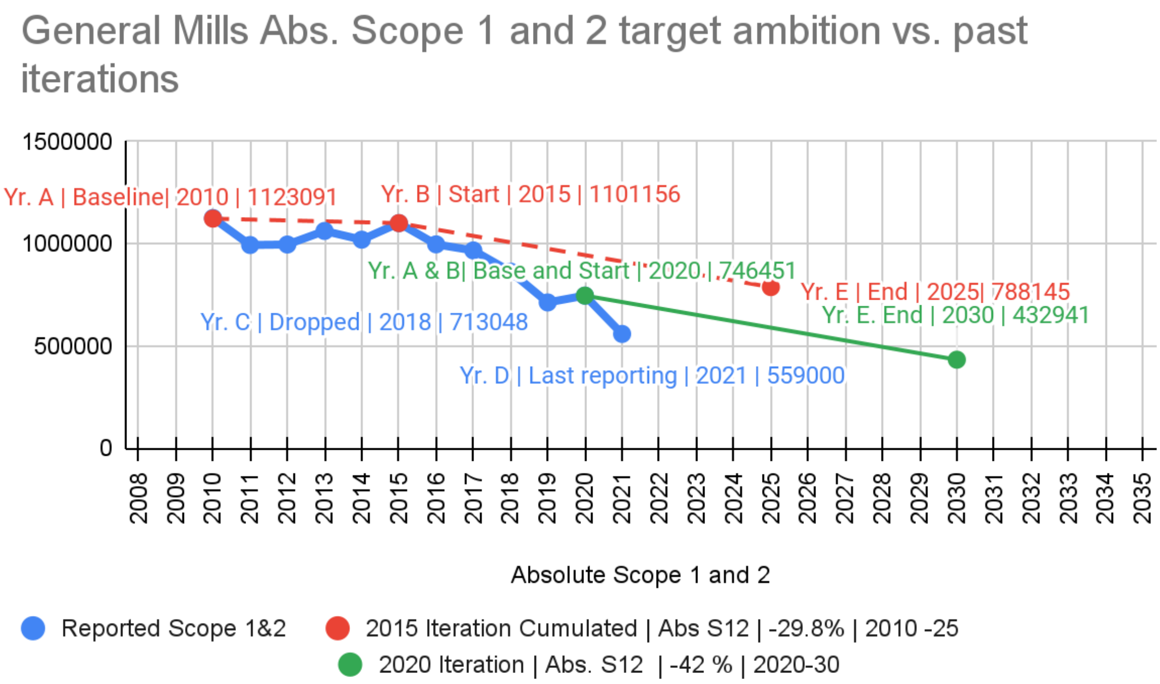


Figure 6.8: General Mills Absolute Scope 1 & 2 target ambition vs. past iteration. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

C1. Current target ambition compared to past target iteration

By comparing the slopes of line B-E for each target iteration, we obtain a first indication of the current target's level of ambition compared to previous target iterations. In percentage terms, the 2020 iteration requires a yearly reduction of 4.2 % compared to the start year in order to achieve the target on time. At a first glance this seems more ambitious than the 2.8 % reduction rate implied by the 2015 iteration.

Translated into absolute yearly reductions, however, the two targets are almost identical in ambition, each implying a yeary reduction of approximately 3200 tons from their respective starting years. When taking into account the company's performance in the last reporting year, the yearly reduction

[9] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

rate until 2030 drops to 1400 tons of CO2e between 2021 and 2030. The high variance of reported Scope 1+2 emissions between 2019 and 2021 also indicates that the relatively high 2020 baseline may induce an artificial upward bias in the level of ambition needed to reach the 2030 goal.

C1. Current target ambition compared to past target iteration			
Target iteration	**Yearly rate of change of past iteration as % of rate of change of current target**	**Interpretation**	**C1. Ambition score relative to past iteration**
2015 Iteration Cumulated | Abs S12 | -29.8% | 2010 -25 vs. 2020 Iteration | Abs. S12 | -42 % | 2020-30	0.24%	Same ambition	1

C2. Current target ambition compared to business as usual trajectory

Projecting the emissions trend forward by using a moving average calculated on 3 reporting years, provides additional evidence to the fact that General Mills' 2030 target does not represent an ambitious goal given the company's past achievements.

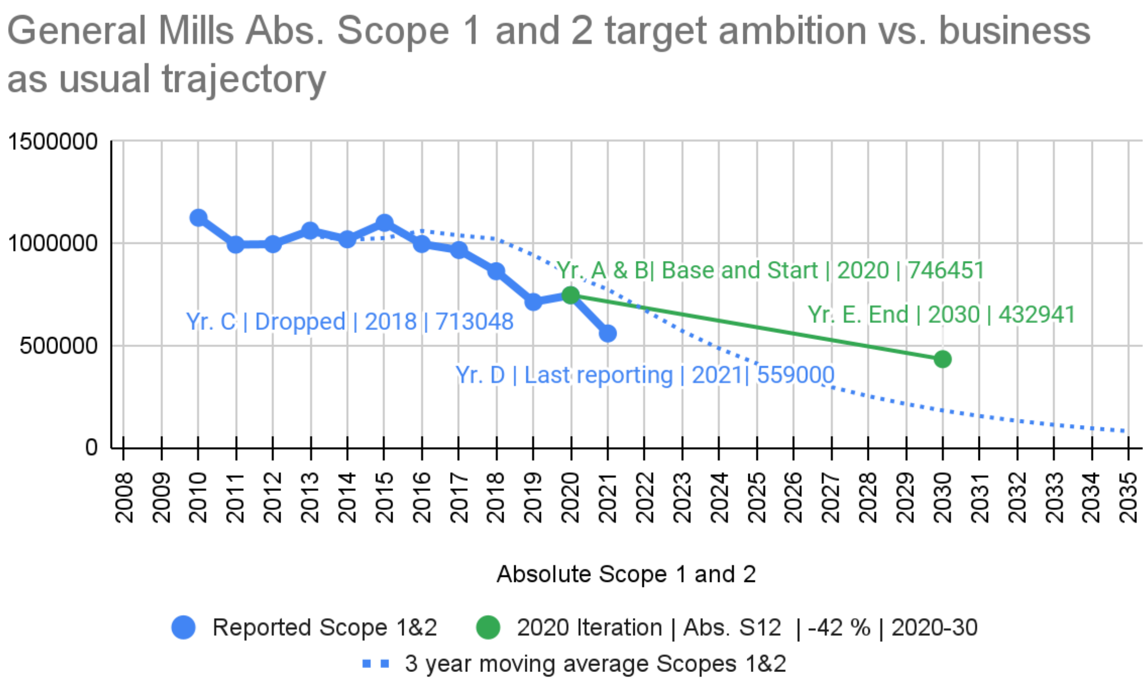


Figure 6.9: General Mills Absolute Scope 1 & 2 target ambition vs. business as usual trajectory.. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

According to this forward-looking calculation, General Mills is likely to achieve its target between 2022 and 2023, which suggests that following the target's decarbonization pathway would in fact lead to a worse outcome than would otherwise be achieved in the target's absence. In 2030, the company's Scope 1 and 2 emissions are projected to be 58% lower than the value obtained if General Mills achieves its objective on-target. Therefore, the resulting ambition score relative to business as usual trajectory is -1.

C2. Current target ambition compared to business as usual trajectory			
Target iteration	**(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E**	**Interpretation**	**Ambition score relative to business as usual trajectory**
2020 Iteration | Abs. S12 | -42 % | 2020-30 vs. S1&2 BAU emissions trajectory	-58%	Target is less ambitious that the business as usual trajectory	**- 1**

Adding the two scores, we obtain a target commitment score of 0, which suggests that General Mills had not significantly increased its ambition to decarbonize its Scope 1 and 2 emissions through its 2020 Scope 1 and 2 target.

Target commitment score			
Target iteration	**C1. Ambition score relative to past iteration**	**C2. Ambition score relative to business as usual trajectory**	**C Commitment ambition score = C1+C2**
2020 Iteration | Abs. S12 | -42 % | 2020-30	**1**	**- 1**	**0**

An important caveat worth mentioning here is that the forward-looking analysis performed above is built on the implicit assumption that the company is able to reduce its emissions linearly, ad infinitum. In reality, especially on Scopes 1 and 2, one would expect gains in carbon efficiency to plateau in the absence of significant technological innovations. Assessing when that point would be and what limits it would imply is beyond the Scope of this thesis and is therefore not factored into the comparative assessment of a target's ambition versus the projected trajectory of emissions.

Strategy score

In order to assess General Mills' strategy in decarbonizing its operations, it is important to first determine the key drivers of emissions in Scopes 1 and 2. According to the company's 2022 sustainability report, fuel accounted for 50% of total emissions for the two Scopes, and electricity drove a share of 36% (General Mills Inc., 2022e). As shown by the chart below, the strong decrease in total emissions for Scopes 1 and 2 can be broken down in contrasting individual trajectories for Scopes 1 and 2. While Scope 2 has been steadily decreasing since 2015, Scope 1 emissions have displayed a mostly stable trend, with a slight increase since 2018. To explore these differences, the company's strategy will be analyzed for the two Scopes individually.

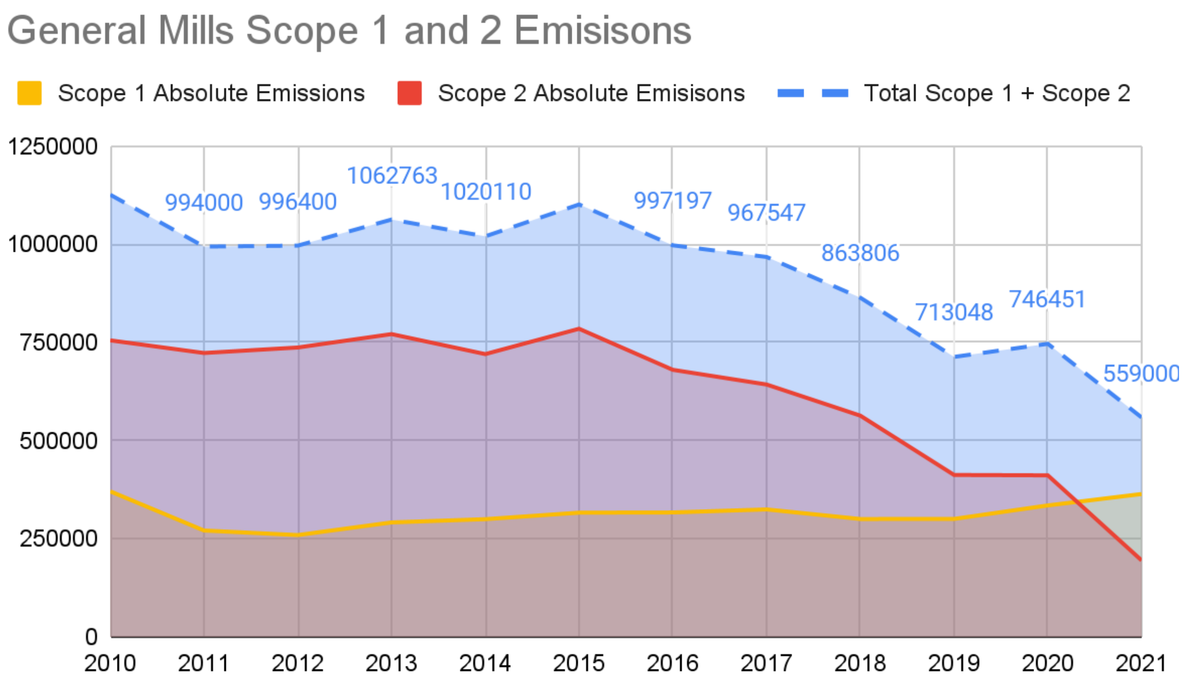
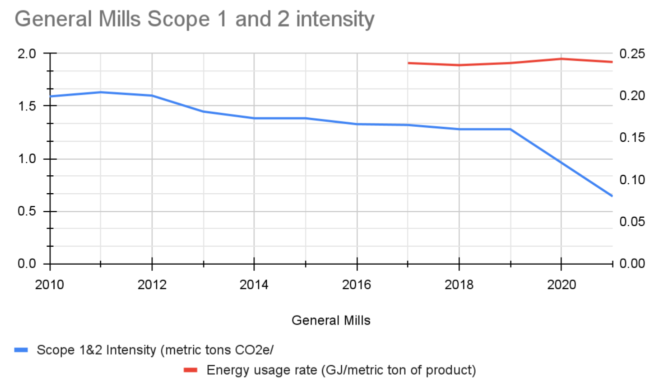


Figure 6.10: General Mills Absolute Scope 1 & 2 emissions breakdown.. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Scope 1

On Scope 1, General Mills has had a longstanding program for improving energy efficiency at the factory level. Year on year, each factory is required to reduce its energy use relative to production by 2 percent annually. Between 2015 and 2021, however, there is little evidence that the company has increased its ambitions or significantly changed its approach.



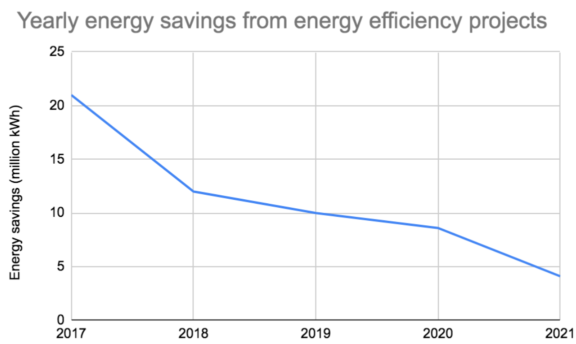


Figure 6.11 (left): General Mills Absolute Scope 1 & 2 intensity. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021.

Figure 6.12 (right): General Mills yearly energy savings from energy efficiency projects. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

As shown by the chart above, however, the energy usage rate in manufacturing has stayed relatively constant between 2017 and 2021. At the same time, the yearly energy savings expected from investments in energy efficiency projects has steadily declined since 2017.

However, the company's Scope 1 and 2 targets are approved by SBTI and are in alignment with a 1.5 degrees reduction pathway. Therefore the strategy score for Scope 1 is equal to 2.

S1. Scope 1	2020 score	2020 score explanation
2020 Iteration | Abs. S12 | -42 % | 2020-30	2	The company has a Scope 1 target which is aligned with 1.5 degrees scenario

Scope 2

Throughout its disclosure, General Mills' emphasis on tackling Scope 2 emissions is strongly apparent. Its 2021 CDP disclosure states that "the amount and type of energy we use are the key drivers of GHG emissions (and cost) in our General Mills operations" (General Mills Inc., 2022c). Starting 2017, General Mills has been investing in long-term wind power purchase agreements which are expected to cover 100% of its annual energy use for fully-owned US facilities (General Mills Inc., 2022e). In 2019, General Mills set a group-wide target of covering 100% of its electricity consumption from renewable sources by 2030. In 2020, it added a public dimension to its commitment by joining the RE100 (General Mills Inc., 2022c). In 2021, this target was reported as 63% achieved.

General Mills' strong focus on renewable energy souring is likely the key driver behind the steep downward trend displayed by the emissions intensity curve set above. In 2019, General Mills switched its Scope 2 GHG calculation methodology from location-based to market-based, which takes into account renewable energy certificates. In 2020, market-based Scope 2 emissions were 33% lower than location-based emissions, according to General Mills' CDP disclosure (General Mills Inc., 2022c). Between 2018 and 2019, the trend in emissions intensity displays an equivalent decrease of 33%. This lends credence to the assumption that in the absence of this methodology change, the emissions intensity metric would follow a trend much more like the energy use pathway.

Nonetheless, the target is approved by the SBTI and in line with a 1.5 degrees warming scenario, and therefore receives a score of 2.

S1. Scope 2	2020 score	2020 score explanation
2020 Iteration | Abs. S12 | -42 % | 2020-30	2	The company has a Scope 2 target which is aligned with 1.5 degrees scenario

Taking into account the elements presented above, General Mills receives a score 2 for its strategy on reducing Scope 1 and 2 emissions. The company's improvements in renewable energy sourcing are balanced out by its lack of progress on energy efficiency, which is interpreted as a moderate change in ambition.

S score	2020 Scores	2020 Average	Corresponding strategy score	Interpretation
S1 Scope 1	2	2	3 Strong	The company has an overall target for Scopes 1&2 and discloses quantitative reductions which are aligned with the SBTI's 1.5 degree scenarios
S1 Scope 2	2			

The target stretch score is obtained by subtracting the strategy score from the commitment score. The resulting score of -3 reflects a low level of difficulty, due to the company's relatively unambitious targets and strong strategy.

Target stretch score						
S and C scores	Commitment = 3	Commitment score = 2	Commitment score = 1	Commitment score = 0	Commitment score = -1	Commitment score = -2
Strategy score = 3	0	-1	-2	-3	-4	-5
Strategy score = 2	**1**	0	-1	-2	-3	-4
Strategy score = 1	2	1	0	-1	-2	-3
Strategy score = 0	3	2	1	0	-1	-2

The likelihood score, computed in the table below, is calculated by subtracting the startech score from the strategy score. The resulting likelihood score of 6 is equivalent to a completion rate of 75% in the target's end year.

Likelihood of meeting target	**Past Performance score**					
	Past Perf. = 3	**Past Perf. = 2**	**Past Perf. = 1**	**Past Perf. = 0**	**Past Perf. = -1**	**Past Perf. = -2**
Stretch score: 3	0	-1	-2	-3	-4	-5
Stretch score: 2	1	0	-1	-2	-3	-4
Stretch score: 1	2	1	0	-1	-2	-3
Stretch score: 0	3	2	1	0	-1	-2
Stretch score: -1	**4**	3	2	1	0	-1

Stretch score: -2	**5**	4	3	2	**1**	0
Stretch score: -3	**6**	5	4	3	2	1
Stretch score: -4	7	6	5	4	3	2
Stretch score: -5	8	7	6	5	4	3

Target 2: 30% reduction of absolute Scope 1,2 and 3 by 2030, on a 2020 baseline

In addition to its Scope 1 and 2 target, General Mills has pledged to reduce its total absolute emissions by 30% by 2030, on a 2020 baseline. It is important to note that General Mills uses the SBTI perimeter to calculate the target's Scope 3 parameters. Based on this methodology, General Mills excludes certain low volume ingredients (details are not disclosed), capital goods, commuting, franchises, downstream and retail storage, and consumer use from the target's baseline (General Mills Inc., 2022b). The resulting baseline figure is approximately 30% lower than what it would be if total reported GHG emissions were factored in.

For comparison purposes, the analysis below will reconstruct the company's target to reflect the company's full emissions perimeter. The two targets will then be assessed in parallel: values calculated via the SBTI methodology are marked with "SBTI", while those based on a full-Scope following GHG guidelines will include the mention "GHG" in their coding.

General Mills only started reporting consistently on all relevant Scope 3 categories in 2014. Prior to this, the company's Scope 3 CDP disclosures were incomplete and inconsistent. Therefore, the values for 2012 and 2013 have been plotted as a linear trajectory between 2010 (the baseline year, calculated in 2015) and 2014 and do not illustrate actual emissions.

All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[10]

Target iterations

General Mills' target-setting approach for Scopes 1,2 and 3 follows a similar pattern to Target 1 and Target 2 described in the sections above. Two major iterations can be distinguished: the first iteration category consisted of a pledge to reduce total emissions by 28% between 2010 and 2025, together with a long term goal of reducing absolute full Scope emissions by 60% until 2050, on a 2010 baseline.

[10] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

The second, and currently active iteration was set in 2020, targeting a reduction of 30% by 2030 from a 2020 baseline calculated according to the SBTI perimeter. This target iteration, together with its equivalent on a full GHG Scope baseline, is depicted as a dotted line in the chart below. General Mills' Scope 1,2 and 3 targets, both for 2030 and 2050, were abandoned in 2019, which is depicted as the last year of reporting on the target.

In the chart below, past target iterations are presented as dotted lines, and the current target iterations are represented as continuous lines.

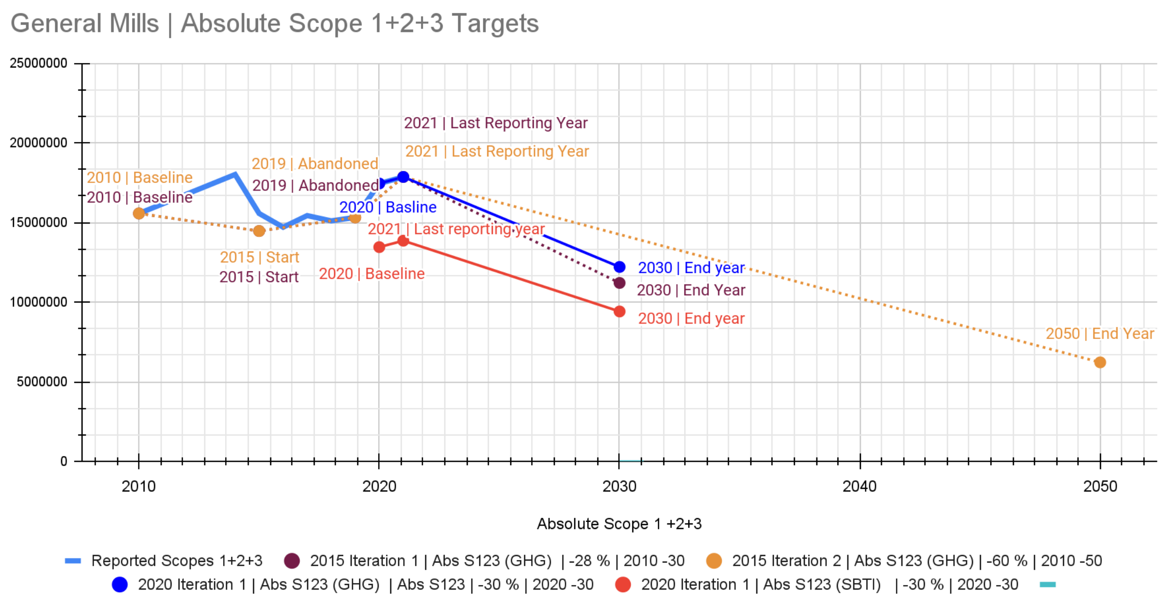


Figure 6.13: General Mills Absolute Scope 1,2 & 3 targets Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Although General Mills only discloses a full value chain target in its Net Zero ambition communication, it reports on a separate Scope 3 target in its CDP disclosures. As Scope 3 is the largest emissions driver for General Mills, it is not surprising that it is presented separately from the company's full value chain goals.

The company's target setting for Scope 3 is in line with the two major iterations identified for its other targets. Its 2015 iteration consists of goals to reduce Scope 3 emissions by 28% between 2010 and 2025. Two different versions of the 2015 iterations are distinguished below, to account for the significant variations in the reported baseline figures. General Mills last reported progress on the 2015 iteration in 2018, which is considered as the final reporting year for this target.

The target's current iteration was set in 2020, as part of the company's Net Zero ambition. Compared to the previous target setting phase, the 2020 version eliminates the long-term target setting horizon, focusing solely on the mid-term. In this iteration, the year 2020 represents both the baseline and the start year. The emissions value in 2021 is the last value reported on the target, as well as the reporting value of the Scope 3 gross emissions metric. The two versions plotted below correspond to the different baseline values under SBTI (the version which the company publicly disclosed) and GHG guidelines.

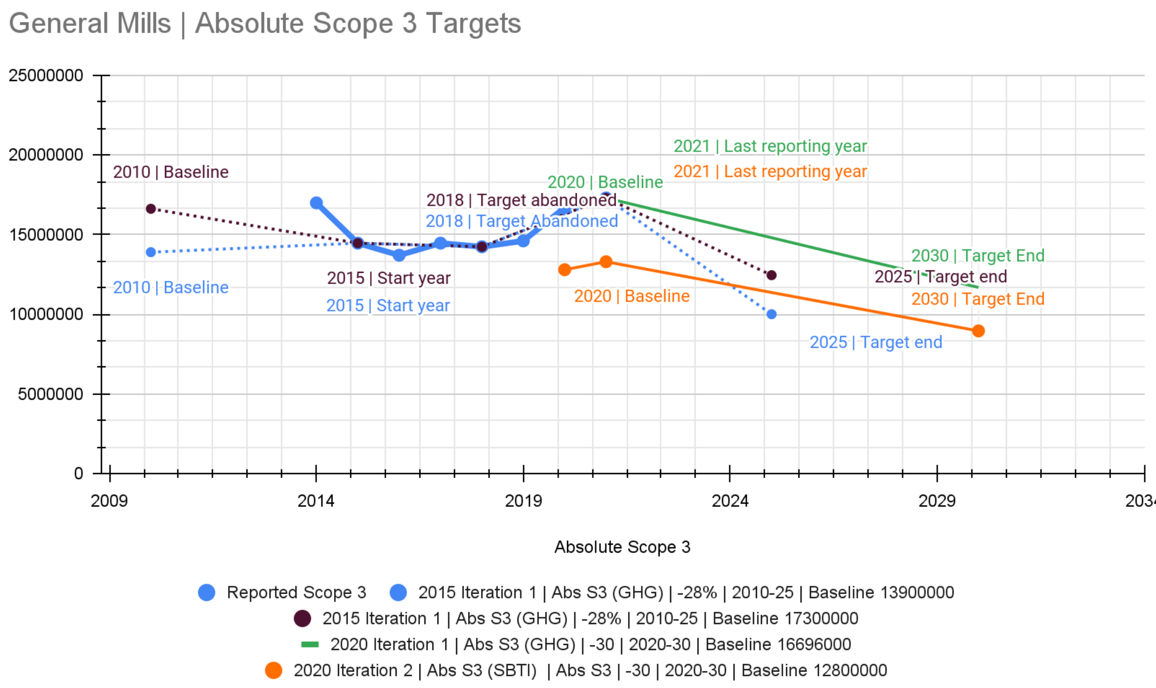


Figure 6.14: General Mills Absolute Scope 3 targets. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Past performance score

General Mills' performance score for its Absolute Scope 1,2 and 3 target is calculated separately for its full-Scope decarbonisation target and for its Scope 3 decarbonization target. All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[11]

P1. Emissions performance compared to past target iterations

To assess the company's performance in comparison to the 2015 target iterations, we compare reported figures in the last year of target reporting with projected figures in the same year, according to the target's trajectory. The linear trajectories between the targets' start year and expected value in their final years is plotted below.

[11] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

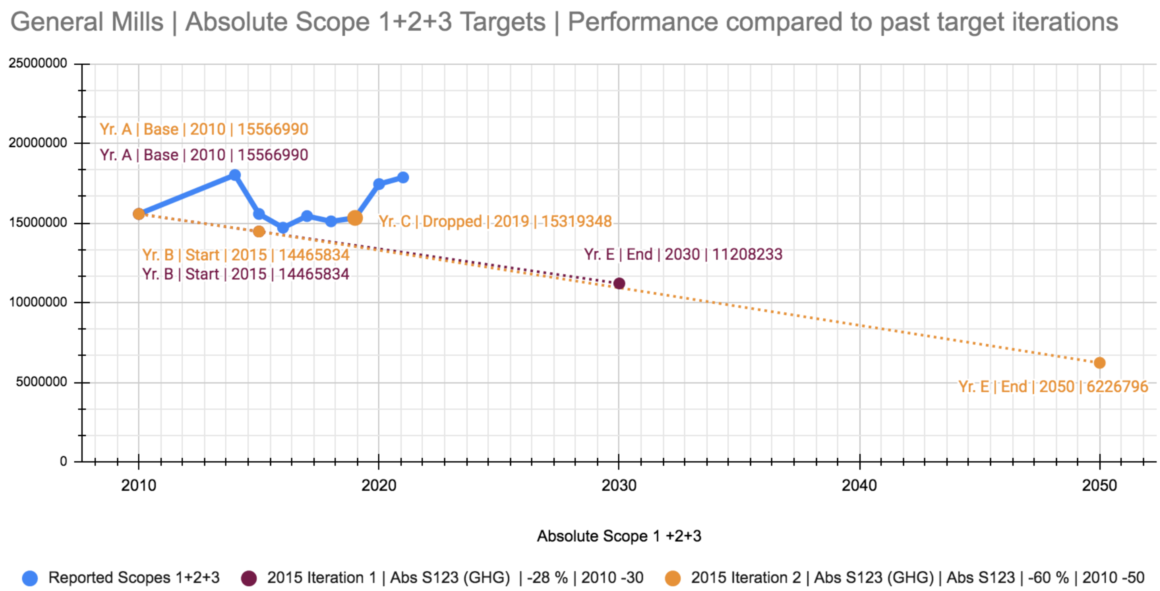


Figure 6.15: General Mills Absolute Scope 123 targets. Performance compared to past target iterations. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Looking at the company's full Scope 2015 target iteration, it is immediately visible that the curve depicting reported emissions for Scope 3 sits above the emissions reduction trajectory, which indicates an underperformance compared to the stated targets.

In 2019, when both targets were abandoned, total absolute emissions were down 1.6% compared to the baseline, which represents an overshoot of 12.6% compared to the projected value under the mid-term target. The overshoot figure increases to 13.2% of the company's long-term target iteration.

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
2015 Iteration 1 | Abs S123 | -28% | 2010-30	12.6 %	Underperforming	**-1**
2015 Iteration 1 | Abs S123 | -60% | 2010-50	13.2 %	Underperforming	**-1**

A similar pattern can be observed for the company's disaggregated Scope 3 targets, depicted in the chart below. Besides a brief exception in 2016, the reported emissions line sits above the target trajectories, regardless of the difference in baselines.

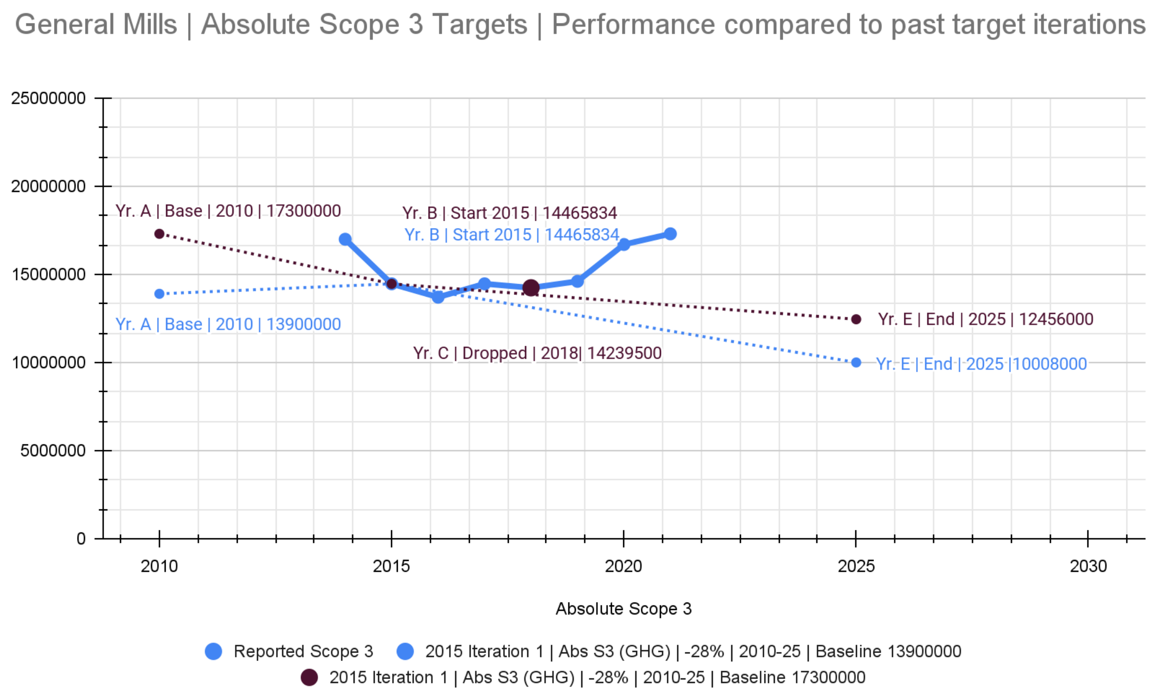


Figure 6.16: General Mills Absolute Scope 3 targets. Performance compared to past target iterations. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Taking into account the different baseline years used across both iterations, targeted yearly reductions between the start year and the end year ranged from 3.08% (2015 Iteration 1) to 1.4% (2015 Iteration 2). When the first iteration targets were abandoned in 2018, Scope 3 emissions had decreased only by -0.5% between 2015 and 2019, which is equivalent to an overshoot between 2.72% and 8.46% in 2018, compared to the projected figures in the various 2015 target iterations.

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
2015 Iteration 1 | Abs S 3 (GHG) | -28% | 2010-25 | Baseline 13900000	8.4 %	Underperforming	**-1**
2015 Iteration 2 | Abs S3 (GHG) | -28% | 2010-50 | Baseline 17300000	2.7 %	Underperforming	**-1**

As the analysis above demonstrates, General Mills' past Scope 3 targets have not succeeded in consistently and significantly reducing emissions on this Scope. In conclusion, the company has been consistently underperforming with respect to its target iterations on Scopes 1,2 and 3 combined, for all baseline iterations. The same conclusion applies to its past Scope 3 targets. For consistency reasons, the final score for past performance will be attributed to General Mills' Scope 3 target, on which the company's CDP reporting is based.

P2. Emissions performance compared to current target iteration

The second step in assessing the company's performance consists of comparing emissions in the last year of reporting (year D) with the projected emissions in the same year, according to the linear decarbonization trajectory implied by the current target. Targets for Scopes 1,2,3 and for Scope 3 are considered separately in the two charts below, which also depict the target trajectories given the SBTI and GHG baselines.

The company's full reported emissions in 2021, including all GHG emissions for Scopes 1,2 and 3 were 5.53% higher than the figure projected by the full Scope GHG reduction target. Compared to the SBTI-target Scope, the company's performance was 6.8% above the target trajectory in 2021.

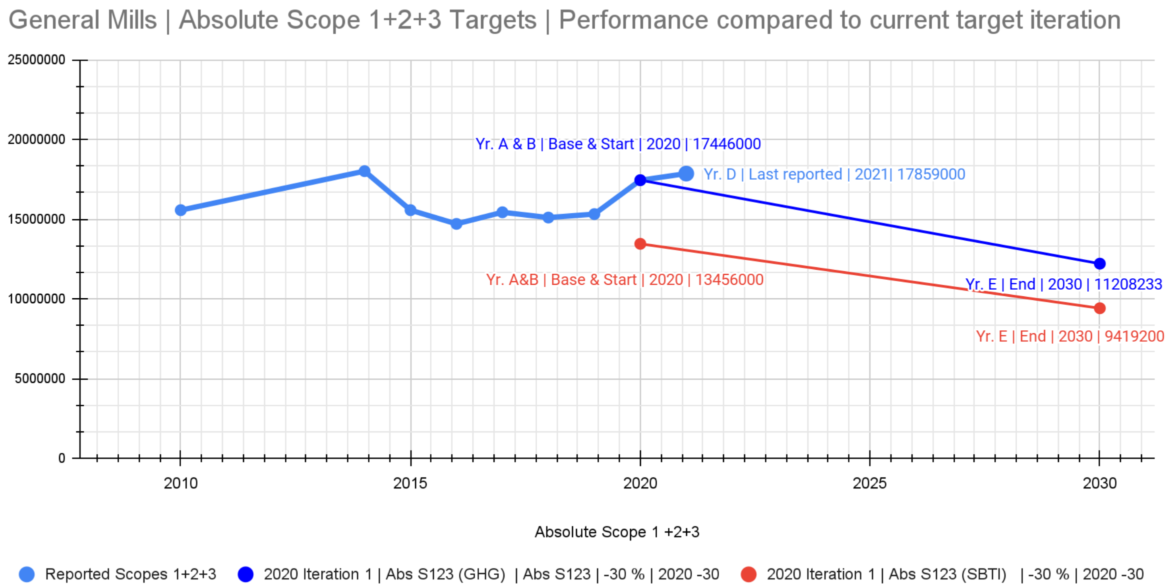


Figure 6.16: General Mills Absolute Scope 123 targets. Performance compared to current target iteration.. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

The company's Scope 3 emissions closely mirror the company's full Scope evolution compared to its current targets. On a full GHG Scope, General Mills' Scope 3 emissions were 6.8% higher than the target's pathway, which indicates an overshoot compared to the target. A similar gap emerges for the SBTI Scope as well, with an overshoot of 7.1% compared to the projected figure in 2021.

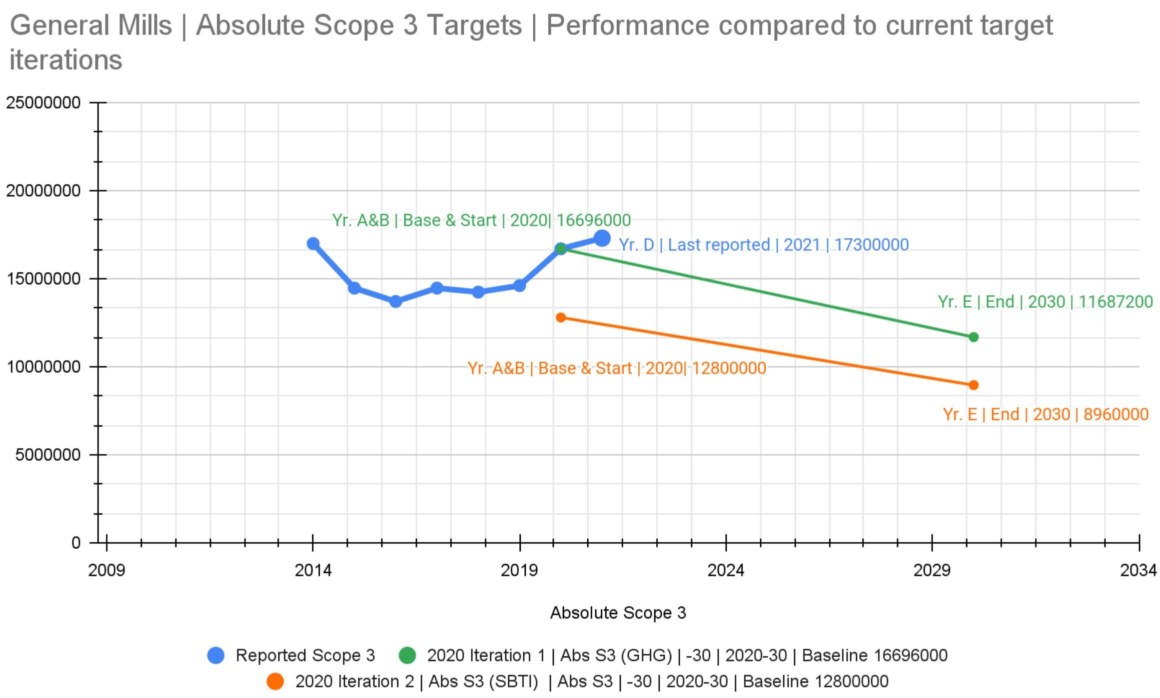


Figure 6.17: General Mills Absolute Scope 3 targets. Performance compared to current target iteration. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

To calculate the emissions performance score compared to the current target iteration, we only consider the targets submitted to the CDP, which are based on an SBTI baseline and refer only to Scope 3.

P2. Emissions performance compared to current target iteration			
Target iteration	**(Reported value in Yr. D - Projected value in Yr. D D)/ Projected value Yr. D**	**Interpretation**	**Performance score relative to currently active target**
2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000	7.2%	Company is underperforming relative to relative to its current target	**- 1**

A total Past Performance score for Scope 3 is obtained by adding the P1 and P2 scores.

P. Past Performance score			
Target iteration	**P1. Performance score relative to past target iterations**	**P2. Performance score relative to currently active target**	**P. Past Performance score = P1+P2**
Scope 3	**-1**	**-1**	**-2**

Target commitment score

To compare a target's level of ambition to that of its past iterations, we contrast the current target's decarbonization trajectory to 1) the decarbonization trajectory of previous target iterations and 2) to the likely trajectory of emissions in the absence of the target. As before, the analysis will be done separately for General Mills' Scope 1,2&3 target and for its Scope 3 target. All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology[12]

C1. Current target ambition compared to past target iteration

The chart below plots the current Scope 1,2 and 3 target, together with its previous iterations. Interestingly, the current target iteration, calculated on the SBTI perimeter, intersects with the decarbonization trajectory charted by the company's now expired long-term target, and introduces a steeper reduction rate.

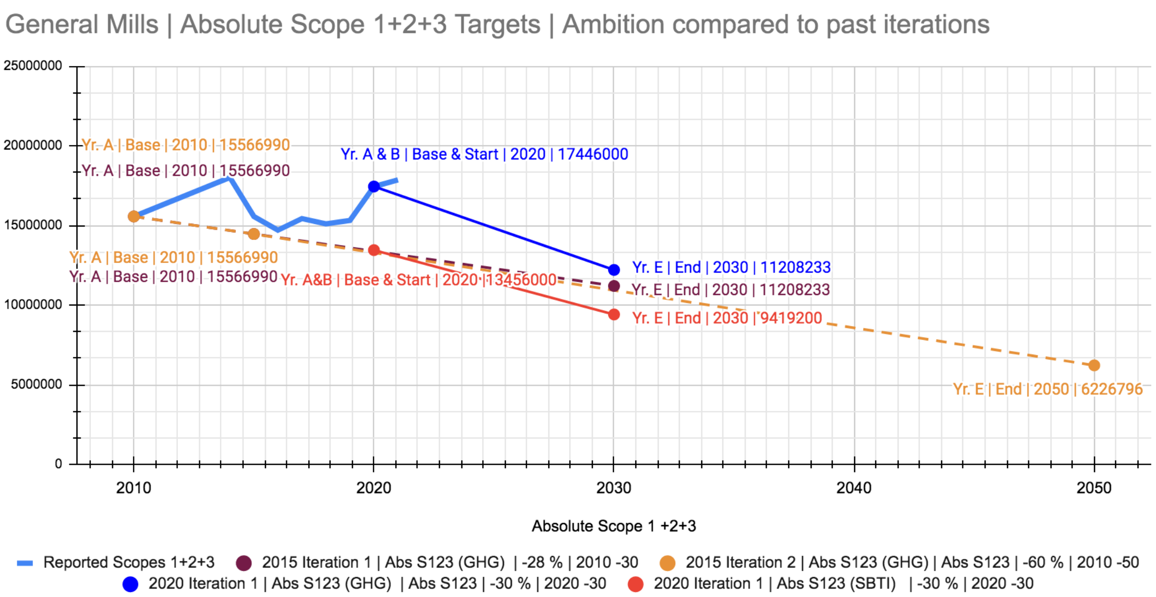


Figure 6.18: General Mills Absolute Scope 123 targets. Ambition compared to past target iteration. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

By calculating the slope of the emissions trajectory line linking each target iteration's start and end years, we obtain an indication of the yearly reduction rate needed to achieve each decarbonization goal. The numerical analysis confirms what is clearly observable visually: the reduction rate of the 2020 target iterations is almost twice as steep as that of preceding targets. Compared to the steepest of previous iterations, the 2020 SBTI target implies a decarbonization path about 1.7 times as stringent. The figure rises to 2.4 when compared to the GHG-based target.

[12] References: General Mills Inc., 2012; General Mills Inc., 2013; General Mills Inc., 2014; General Mills Inc., 2015; General Mills Inc., 2016;General Mills Inc., 2017;General Mills Inc., 2018;General Mills Inc., 2019;General Mills Inc., 2020;General Mills Inc., 2021.

Next, the same analysis is performed on the company's Scope 3 targets, which are represented visually in the chart below.

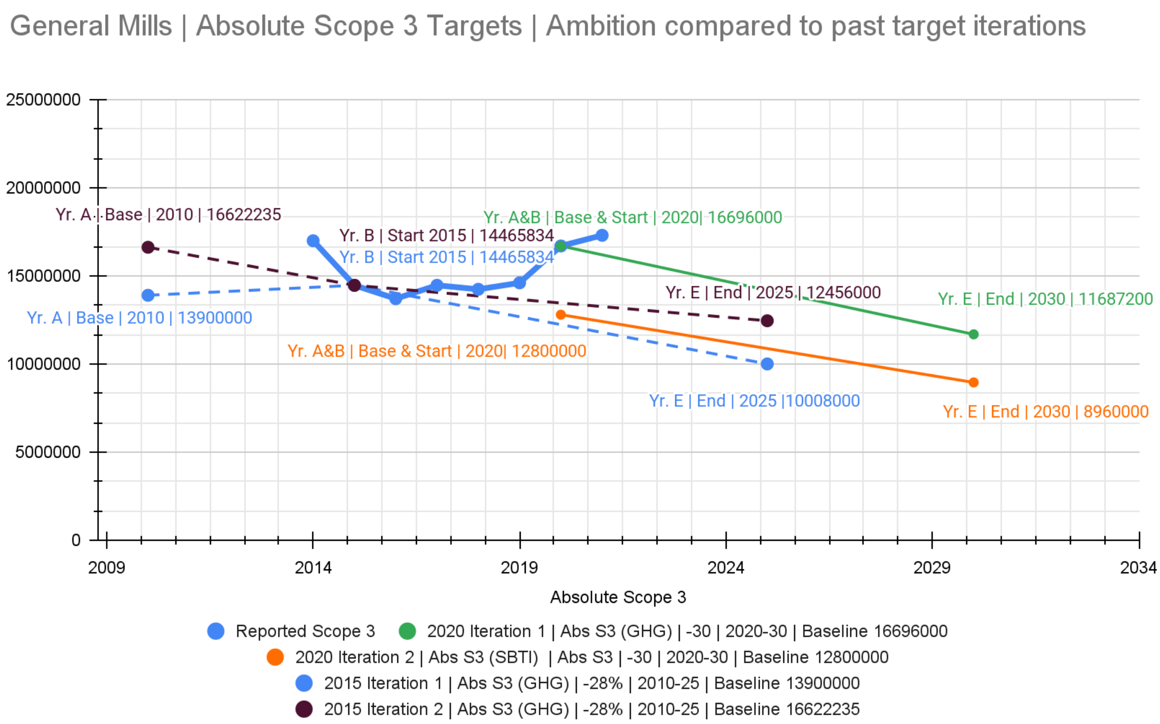


Figure 6.19: General Mills Absolute Scope 3 targets. Ambition compared to past target iteration. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

On Scope 3, the analysis shows that the current target, calculated on an SBTI baseline, would in fact be less ambitious compared to the company's 2015 iteration with a lower baseline, as indicated visually by the target trajectory line. However, compared to the last reported 2015 iteration (2015 Iteration 2, with a baseline of 16622235), the current target (2020 Iteration 2 SBTI) is 30.4% more ambitious in terms of the annual reduction rate needed to reach the target.

For consistency purposes, only the Scope 3 target which was reported to the CDP (2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000) is considered in calculating the ambition score compared to past target iteration.

C1. Current target ambition compared to past target iteration			
Target iteration	**Yearly rate of change of past iteration as % of rate of change of current target**	**Interpretation**	**C1. Ambition score relative to past iteration**
2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000	30.4%	Increase in ambition compared to past iteration	**2**

C2. Current target ambition compared to business as usual trajectory

The second step in assessing General Mill's commitment on its Scopes 1,2, 3 and Scope 3 target consists of comparing the target trajectories with the company's projected future emissions in a business as usual scenario.

First, the company's Scope 1,2 and 3 target is considered against the total emissions trajectory between 2021 and 2030. Between 2014 and 2021, General Mills' total emissions decreased by 0.85%. However, the company's increasing emissions trend between 2018 and 2021 puts it on an increasing future trajectory when applying a 3-year moving average trendline.

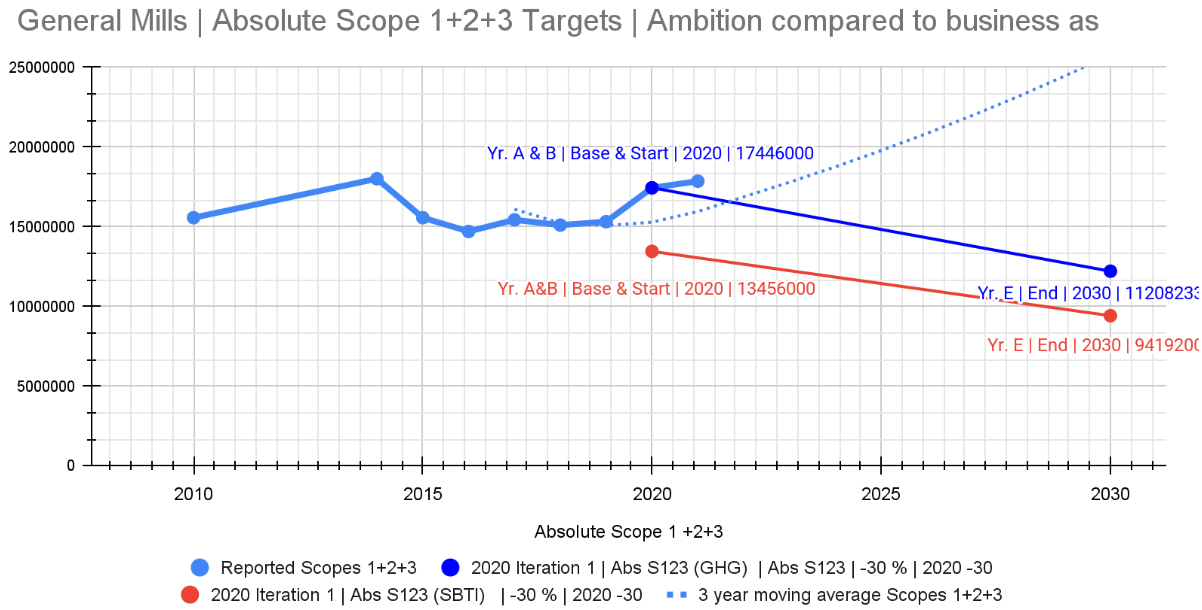


Figure 6.20: General Mills Absolute Scope 123 targets. Ambition compared to business as usual scenario. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Extrapolated to 2030, the current emissions trajectory for all emissions Scopes combined would result in a figure that is 61% higher than reported emissions in 2021, and 173% higher than its targeted emissions in 2030.

The chart below represents the same analysis applied to General Mills' Scope 3 emissions only. As for total emissions, General Mills' Scope 3 emissions are projected to grow by 68% by 2030, which is 185% higher than targeted emissions for the same year.

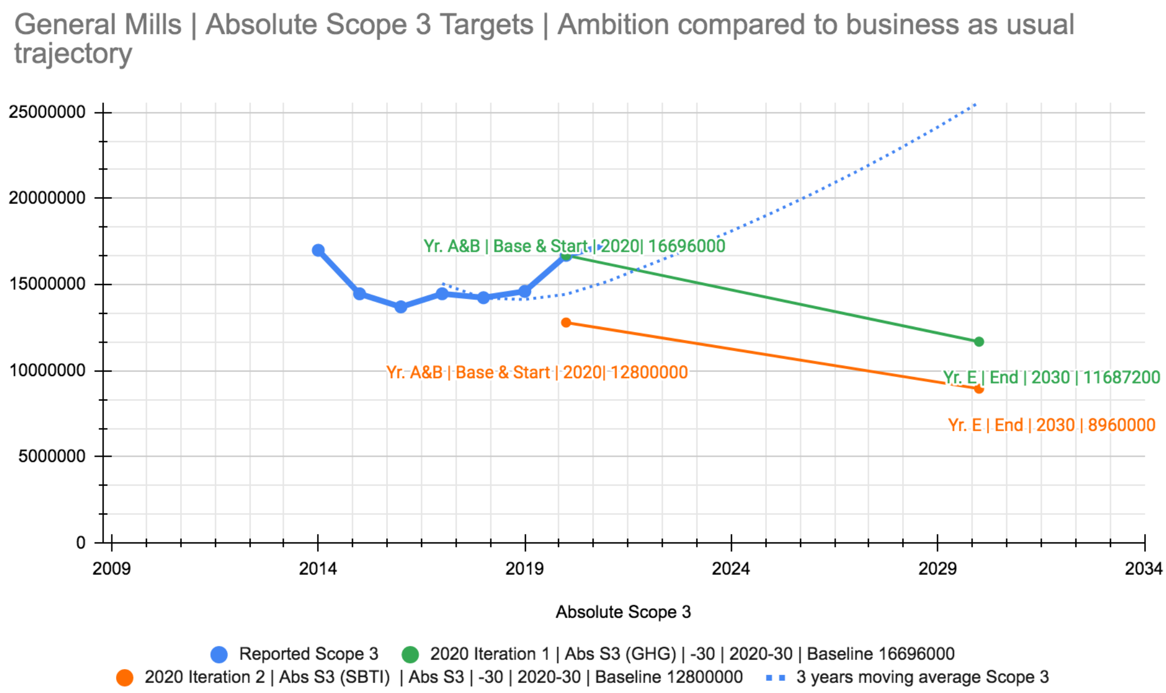


Figure 6.21: General Mills Absolute Scope 3 targets. Ambition compared to business as usual scenario. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

A total reduction of 30% therefore represents a very challenging goal compared to the company's future emissions outlook on all Scopes combined.

C2. Current target ambition compared to business as usual trajectory			
Target iteration	**(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E**	**Interpretation**	**C2. Ambition score relative to business as usual trajectory**
2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000	185%	Target is more ambitious that the business as usual trajectory	**1**

The exercise of assessing General Mills' Scope 1,2 and 3 target against its previous iterations and a business as usual scenario illustrates the scale of the challenge the company has committed to. Despite its failure to meet previously set targets, and in spite of its rising emissions trend, General Mills is setting substantially more ambitious targets going forward.

Target commitment score			
Target iteration	**C1. Ambition score relative to past iteration**	**C2. Ambition score relative to business as usual trajectory**	**C Commitment ambition score = C1+C2**
2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000	2	1	3

These factors combined could lead one to characterize the organization's ambition as a stretch target. Whether the company is in a position to benefit from the stretch goal, or whether it is in a potentially vulnerable position of promising more than it can deliver, will be explored in the next section.

Strategy score

This section will focus on the company's strategy for tackling Scope 3 emissions by further identifying its key drivers and the company's approach to tackle them.

Drivers of Scope 3 emissions

The chart below shows the breakdown of General Mills' Scope 3 sub-categories, according to the GHG protocol. The data is self-reported by the company as part of its CDP disclosure. For fiscal year 2021, General Mills has only published the total figure for its Scope 3 emissions, with the full CDP disclosure still pending. Therefore, the chart below only represents total emissions reported for 2021, and does not provide details of Scope 3 sub-components.

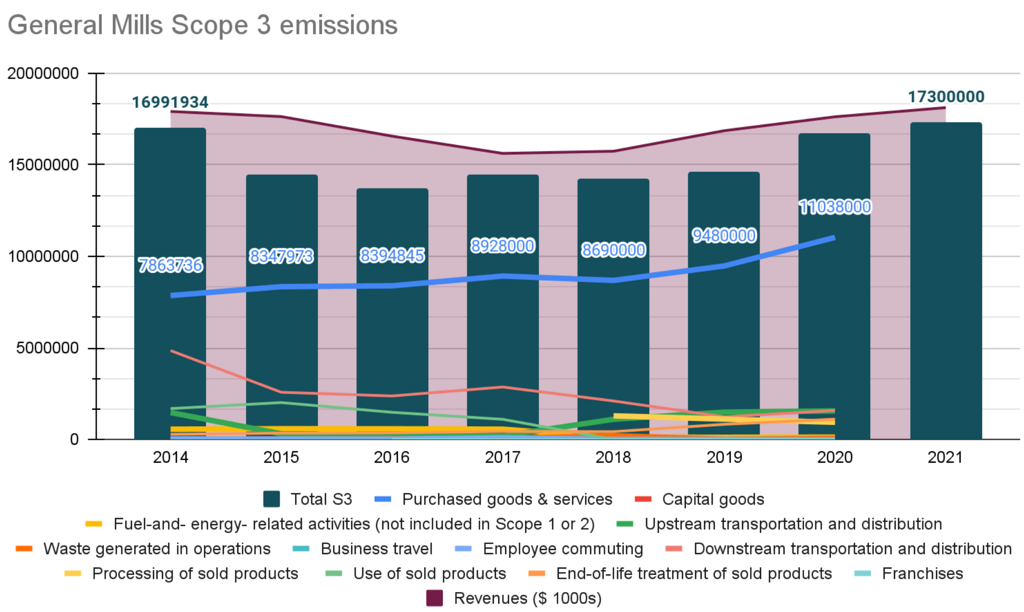


Figure 6.21: General Mills Absolute 3 emissions.. Source: own calculations and concept. Figures are sourced from General Mills' CDP Climate disclosures 2011 -2021

Across the years sampled, the Purchased Goods and Services category accounted for the majority of Scope 3 emissions. In 2020, it represented 66% of total Scope 3 emissions. According to the GHG protocol, this category includes all upstream, or "Cradle to Gate '' emissions stemming from activities such as the extraction, processing and manufacturing of purchased raw materials and goods as well as agricultural activities including land use and land-use change (Greenhouse Gas Protocol, 2011).

The second and third largest segments, upstream and downstream transportation and distribution, represent close to 10% each. The fourth largest category, the end of life treatment of sold products, makes up 6.7% of the total, but is excluded from General Mills' Scope 3 target. The processing of sold products is the fifth largest category with 5.7%. The remaining 7 categories disclosed by General Mills account for less than 1% each.

The weight of the Purchased Goods and Services category within Scope 3 has also increased over time. Between 2014 and 2020, Purchased Goods and Services saw an increase of 40%. The reductions in Fuel and Energy Related activities (-76%), Downstream transportation (-67%) and Use of Sold Products (-99%) over the same time period balance out this increase. The resulting 1.7% decrease of Scope 3 emissions between 2014 and 2021 is therefore not due to reductions in the key emission drivers of the Scope, but rather to incremental improvements on less critical factors.

A next step in the analysis, therefore, demands a closer look into the factors driving the upward trend in the Purchased Goods and Services pillar. While General Mills does not provide a further breakdown of the Purchased Goods and Services category, it does disaggregate its emissions by key value chain activities (General Mills Inc., 2022e). When matching each of the steps in the value chain to a category within the GHG protocol reporting system, the following distribution results:

Value chain element	% of total emissions	GHG protocol pillar
Agriculture and transformation	**57%**	**Scope 3 Purchased goods and services**
Row crops (wheat, dry corn, oats, sugar beets)	33%	Scope 3 Purchased goods and services
Dairy	28%	Scope 3 Purchased goods and services
Meat	20%	Scope 3 Purchased goods and services
Cocoa, soybean oil, sugarcane & others	19%	Scope 3 Purchased goods and services
Packaging supply chain	**10%**	**Scope 3 Purchased goods and services**
Fiber	41%	Scope 3 Purchased goods and services
Metal	33%	Scope 3 Purchased goods and services
Plastic	22%	Scope 3 Purchased goods and services

Other	4%	Scope 3 Purchased goods and services
Producing	**6%**	**Scopes 1&2**
Shipping	**14%**	**Scope 3 Transportation and distribution (Upstream and Downstream)**
Truck	75%	Scope 3 Transportation and distribution
Other Modes	22%	Scope 3 Transportation and distribution
Warehouse	3%	Scope 3 Transportation and distribution
Selling	**1%**	**Scopes 1 (Office buildings, shops) & 3 (Business travel, Employee commuting)**
Consuming	**12%**	**Scope 3 Use of Sold Products & Processing of sold products**

Table 6.2: General Mills emissions breakdown per activity. (General Mills Inc., 2022e)

Agriculture and transformation result as major emissions drivers within the Purchased Goods and Services category, followed by packaging. Within the agriculture and transformation sub-segment, raw materials such row crops, dairy, meat and cocoa emerge as the main sources of emissions.

The chart above shows that generally speaking, the company's emissions from Purchased Products and Services follow the same trendline as the company's gross sales figure. In the absence of sufficient data to explore the degree of correlation between the two, the CDP-reported data on the % of revenues dependent on key commodities offers additional insights into how General Mills' product portfolio is linked to raw material emissions. As shown in the table below, General Mills' dependence on key emitters such as row crops and dairy has stayed constant throughout the past three years.

Percentage of revenues linked to commodity		
Category	**FY 2017**	**FY 2020**
Wheat	10 - 20%	10 - 20%
Oats	10 - 20%	10 - 20%
Cattle	10 - 20%	10 - 20%
Palm Oil	10 - 20%	10 - 20%
Sugar	Not reported	20 - 40%

Table 6.3: General Mills commodities. . Sources: General Mills Inc., 2017, General Mills Inc., 2022c

Assessing the company's policies, actions and performance on raw material sourcing is therefore crucial to evaluating the feasibility of General Mills' full Scope targets. Should the company be committed to achieving the goals it set in 2020, one would expect to see significant changes in General Mills' raw material sourcing practices compared to the 2015-2020 period.

S1. Land-use change score

Although General Mills started collaborating on sustainable agriculture practices with non-profit organizations as early as 2010, it was only in 2015 that it defined its 10 priority raw materials, and set a goal to source 100% of its raw materials sustainably by 2020 (General Mills Inc., 2017). The table below reproduces General Mills' sustainable sourcing framework, as it was presented in the company's 2016 Sustainability Report (General Mills Inc., 2017, p.38).

General Mills' 2016 Sustainable Sourcing Policy			
Category	**FY 2020 target (% of spend sourced sustainably)**	**Primary challenges**	**Sustainability definition**
U.S. Wheat	100%	GHG emissions, water usage, biodiversity	Sourced from growing regions that demonstrate continuous improvement against the Field to Market framework or comparable environmental metrics
U.S. Corn (dry milled)	100%	GHG emissions, nutrient utilization, biodiversity	
U.S. Sugar Beets	100%	GHG emissions, soil loss, biodiversity	
U.S. Dairy	100%	GHG emissions, water usage, water quality, animal well-being	Our directly sourced fluid milk will originate from producing regions that demonstrate continuous improvement as measured by the Dairy Sustainability Framework (U.S.) or other comparable environmental metrics (globally)
Palm Oil	100%	Deforestation (biodiversity, endangered species, environmental impact), indigenous people's rights	Sourced by responsible and sustainable sources as defined by RSPO mass balanced, segregated sustainable palm, or green palm certificates
Oats	100%	Declining supply due to lower profitability vs. other crops	Sourced from growing regions that demonstrate continuous improvement against industry-based environmental metrics
Sugarcane	100%	Labor rights (child/forced labor, working conditions); lack of origin visibility due to supply chain complexity	Sourced from responsible and sustainable regions that are in compliance with Bonsucro or comparable standards; any high risk countries will be independently verified
Vanilla	100%	Smallholder farmer incomes, food security, quality of ingredients	Sourced through programs that improve the livelihoods of smallholder farmers and the quality of ingredients
Cocoa	100%	Smallholder farmer incomes, child labor, community	Sourced through programs that improve the livelihoods of smallholder farmers and the

		economic/ social development, education, deforestation/environment	quality of ingredients
Fiber Packaging	100%	Deforestation	Fiber packaging will be from recycled material or from virgin wood fiber regions that are known and not contributing to deforestation; any high risk countries will be independently verified

Table 6.4: General Mills sustainable sourcing policy. Source: General Mills Inc., 2017, p.38

The company's 2016 sourcing policy provides evidence that General Mills has assessed the risks associated with the key commodities it sources, and has developed commodity-specific strategies for each raw material. The policy follows a general approach of emphasizing traceability and third-party certification, by aligning purchasing criteria with recognized standards such as Field to Market, RSPO, or the U.S. Dairy Sustainability Framework. While this approach shows alignment with recognized best practices, it also suggests a rather hands-off approach to sustainability sourcing, based on external recognition rather than on engagement with suppliers.

General Mills considers that it has minimal exposure to risks of deforestation in its supply chain, a stance which has stayed consistent across the past 5 years of reporting. General Mills' 2016 Sustainable Sourcing policy identified Palm Oil and Fiber packaging as the only two commodities linked with deforestation risks (General Mills Inc., 2017). More recently, it has also added cocoa to the list of ingredients at risk of driving deforestation (General Mills Inc., 2022f). General Mills is a founding member of the Consumer Goods Forum (CGF) Forest Positive Coalition of Action, which was launched in September 2020 by companies wishing to address deforestation risks in their supply chains (General Mills Inc., 2022f).

Palm Oil

General Mills had already reached its commitment to source all its Palm Oil through RSPO standards in 2015 (General Mills Inc., 2017), delivering on its 2010 target. In 2014, it introduced its first statement on sustainable palm oil sourcing, as well as an annual supplier engagement process for direct palm suppliers (General Mills Inc., 2022f). Since 2016, it has focused on moving away from certificates and towards mass balance and segregated palm oil purchases. In 2020, 100% of the company's purchased palm oil was traceable to the mill level, and as of December 2021, 91% of its supplier volume was covered by a No Deforestation, No Peat, No Exploitation (NDPE) policy (General Mills Inc., 2022f). In a next step, General Mills is transitioning to a more active sourcing approach whereby it directly collects information on sourcing and production practices from its tier 1 palm oil suppliers, at the production mill level (General Mills Inc., 2022f).

Cocoa

General Mills became a signatory of the Cocoa and Forests Initiative in 2017, a public-private partnership focused on reducing cocoa-related deforestation in the Ivory Coast and Ghana by protecting and restoring forests, supporting sustainable agriculture and strengthening local farmer communities (General Mills Inc., 2021d). As part of this initiative, General Mills has committed to obtaining 100% farm-level traceability in its cocoa supply chains in the two countries by 2022.

Fiber packaging

Compared to its cocoa and palm oil policies, General Mill's policies and transparency for fiber packaging are more limited. The company's policy is centered around prioritizing sourcing from areas with low risk of deforestation. In high risk countries, which currently represent 1% of the company's total virgin fiber sourcing volume, General Mills prioritizes suppliers that have a Forest Stewardship Council Mix certification of better (General Mills Inc., 2022h). However, the company does not disclose the percentage of virgin materials that are traceable or certified overall, nor does it provide figures on the split between recycled and virgin fibers used in packaging. In its 2021 CDP Forests disclosure, General Mills admits to difficulties in obtaining certification volumes for its sourcing in Asia, and suggests areas of improvement in terms of raw material traceability and non-conformance management (General Mills Inc., 2022d).

Other raw materials

In its 2021 CDP Forests submission, General Mills did not disclose traceability indicators, sourcing policies or commodity-specific targets or any other raw materials such as soy, wheat or cattle products, which drive 10-20% of the company's revenue each. General Mills assesses its deforestation risk for soy and meat as minimal, given that most of its supply comes from producers in North America and Europe. For example, soy-related raw materials used in production and as animal feed are sourced almost exclusively from regions with insignificant deforestation risks, with a preference for North America (General Mills Inc., 2022d).

Despite the declared low deforestation risks for key commodities such as soy and meat, and its strong policies for Palm Oil and cocoa, General Mills' lack of transparency and quantifiable improvement objectives demonstrates a limited level of engagement on deforestation compared to its peers. Therefore, General Mills' strategy score for the Land Use pillar is 1, reflecting the company's incomplete approach to tackling deforestation in its upstream value chain.

S1. Land-based measures	**2020 score**	**2020 score explanation**
S1.1 Land-use change	1	The company provides evidence that it has achieved DCF for some but not all of its relevant high risk commodities.

S2. Regenerative agriculture score

Prior to 2019, the company's approach to regenerative agriculture was based on tailor-made solutions for each farm and type of crop (General Mills Inc., 2022g). Wheat and dairy were identified as priority materials, due to the commodities' high carbon impact and the company's significant purchasing volume (General Mills Inc., 2016b). For wheat and row crops more generally, the company's focus in 2015 lay heavily on building a data collection and monitoring methodology and infrastructure in partnership with industry groups, suppliers and growers. In North America, for instance, General Mills worked in 11 key growing areas to improve and monitor the crop rotation cycle. In Canada, General Mills collected data on yield, soil carbon, energy use and GHG emissions from more than 120000 acres of farmland and issued specific targets for oats, soybeans and pulses (General Mills Inc., 2016b).

General Mills’ engagements for raw milk sourcing were similarly focused on data collection rather than on driving change. In FY 2015, General Mills was running a US dairy sustainability program, which introduced a new system for measuring the carbon emissions, energy usage and water consumption from producing and transforming milk.

In 2019, when 91.5% of General Mills’ 10 key raw materials complied with General Mills’ sustainable sourcing policy (General Mills Inc., 2020a), the company reframed its raw material strategy around the concept of regenerative agriculture and away from separate objectives and approaches for individual raw materials. The focus on regenerative agriculture was pushed strongly to the forefront with the company’s announcement of its Net Zero goals in 2021. In the words of Mary Jane Melendez, Chief Sustainability and Global Impact Officer General Mills:

> “*A decade ago, our main planet initiatives and commitments focused on sustainability. But in order to make food for future generations, simply sustaining the current state of ecosystems and communities is not enough [...] We believe that regenerative agriculture is the most critical solution to deliver on our greenhouse gas commitments and to create positive outcomes for people, planet and communities*” (General Mills Inc., 2022e, p.20)

By 2030, General Mills pledged to transition 1 million acres of farmland to regenerative agriculture practices (General Mills Inc., 2020a), focusing on farmer economic resilience, soil health and biodiversity. The target builds on work done in FY 2018 to develop a Regenerative Agriculture Measurement Protocol and a self-assessment tool for farmers, boosted by a $5.5 million investment to advance soil health (General Mills Inc., 2020a).

In 2021, General Mills reported that 115000 acres of land were enrolled in programs advancing regenerative management (General Mills Inc., 2022e), which is equivalent to 11.5% of the target, achieved in 3 years. Assuming a linear trajectory on increasing the land surface managed under regenerative agriculture principles, it is likely that General Mills will reach its target by 2030.

The fact that General Mills made a strategic shift in its raw materials sourcing strategy alongside its commitment to Net Zero, does not, however, by itself demonstrate that the desired decarbonization impact is in fact achievable via this policy alone. An overarching issue with General Mills’ regenerative agriculture policy is the fact that it lacks a methodology to attribute and measure decarbonization outcomes of regenerative agriculture practices. The set of regenerative agriculture guidelines published for farmers is general, and currently undergoing a process of experimentation and data collection (General Mills Inc., 2022g). Furthermore, the metric it uses to track progress lacks specificity, as it does not provide an assessment framework for what counts as “advancing regenerative management”.

General Mills’ ability to successfully develop and scale its regenerative agriculture practice will hinge on the breadth and strength of its supplier engagement. In 2017, two years after having set its decarbonization goals for 2020 and 2025, General Mills’ climate-related engagements with suppliers were centered around differentiated climate change and carbon data collection processes for key commodities, and covered 23% of the company’s Scope 3 emissions (General Mills Inc., 2019).

General Mills’ 2021 CDP reporting shows a change of strategy in supplier engagement, moving away from data collection towards promoting sustainability and regenerative agriculture. Nonetheless, the % of Scope 3 GHG emissions covered by these engagements stayed constant, reaching 27% in 2020 (General Mills Inc., 2021b), which raises doubts about General Mills’ ability to to scale up the program at the rate needed in order to reach its target.

In conclusion, the company’s strategy score for the Regenerative Agriculture pillar is 2, based on the World Benchmarking Alliance scoring criteria. The score acknowledges the company’s leadership in setting regenerative agriculture targets and reporting on them. However, it contains the caveat that General Mills discloses limited concrete evidence and strategies developed to reach this goal.

S2. Regenerative agriculture	**2020 score**	**2020 score explanation**
Pesticide and fertilizer use, enteric fermentation, soil carbon and agroforestry	2	The company has a time-bound target for the percentage of food (by volume or procurement spend) to be sourced from sustainable practices that improve soil health and/or increase agrobiodiversity AND reports progress against the target.

S3. Shifting Diets score

In its 2021 Accelerate strategy, General Mills details its plans for generating 2-3% growth in net organic sales in the coming years. The plan promises “outsized resources and investments” in the areas of Cereal, Pet Food, Ice Cream, Snack Bars, and Mexican Food, and by promoting Local Gem brands, such as Pillsbury, Annie’s, Yoplait, Totino’s, Wanchai Ferry, Yoki, and Kitano (General Mills Inc., 2021c).

The company’s strategy, which seems to be on track given General Mills’ portfolio reshaping work through acquisitions and divestitures (General Mills Inc., 2021c), can be evaluated as conservative in comparison to competitors’ innovations on less carbon - intensive products such as alternative milk products and proteins. It does not include a specific focus on developing alternatives to meat and dairy, nor does it have a clear stance on supporting its consumers to shift to less carbon intensive diets.

General Mills' lack of product innovation is problematic given the company's absolute decarbonization targets, which would require a decoupling between revenue and emissions. Increasing the carbon efficiency of its products therefore remains the main leverage area in support of General Mills' decarbonization goals. As a consequence, the company's strategy score for the "Shifting Diets" pillar is zero.

S3. Shifting diets	**2020 score**	**2020 score explanation**
Shift to plant-based diets	0	The company does not provide evidence of transitioning to a diversified protein portfolio.

S4. Food waste

Reducing food waste has long been an area of focus for General Mills. Its 2016 sustainability report was tracking progress compared to a target of halving total solid waste generation by 2015, on a 2005 baseline. In 2016, it set targets to achieve zero waste to landfill 30% of its facilities by 2020, and 100% by 2025. In 2016, General Mills reported that food waste represented less than 2% of its production volume (General Mills Inc., 2016b).

This figure further decreased in subsequent years, representing 0.5% of total production volumes in FY 2021 (General Mills Inc., 2022e). In FY 2021, 28% of the company's production facilities met the company's Zero Waste to Landfill criteria (General Mills Inc., 2022e). In 2020, the company has announced a target to reduce food waste in its operations by 50% until 2030, compared to a 2020 baseline. Furthermore, General Mills discloses various other initiatives to tackle food waste in collaboration with other industry partners, food retailers and philanthropic organizations. Therefore, General Mills received the highest strategy score for the Food Waste pillar.

S4. Reduce Food Waste	**2020 score**	**2020 score explanation**
Reduce food loss and waste	2	The company has a time-bound target to reduce FLW across its own operations, and reports progress against it. The company provides evidence of activities to collaborate with value chain partners to prevent FLW

Total strategy score

The total strategy score for General Mills' Scope 3 target is obtained by multiplying the scores for each pillar with their weights according to the methodology, and by translating the resulting figure into a strategy score.

Strategy pillars	2020 Metric	Weight	2020 metric weighted	Final metric based on WBA (sum of all weighted scores)	Corresponding strategy score
S1. Land-based measures	1	58%	0.58	1.3	2 Moderate Strategy
S2. Regenerative agriculture	2	29%	0.58		
S3. Shifting diets	0	7%	0		
S4. Reduce Food Waste	2	7%	0.14		

Target stretch score

In the next step, the commitment and the strategy scores are combined to calculate the target's level of stretch. The resulting stretch score of 1 is calculated by subtracting the strategy score from the commitment score. It represents a relatively high level of difficulty, as a result of the company's very ambitious commitment and moderately strong strategy.

Target stretch score						
S and C scores	Commitment = 3	Commitment score = 2	Commitment score = 1	Commitment score = 0	Commitment score = -1	Commitment score = -2
Strategy score = 3	0	-1	-2	-3	-4	-5
Strategy score = 2	**1**	0	-1	-2	-3	-4
Strategy score = 1	2	1	0	-1	-2	-3
Strategy score = 0	3	2	1	0	-1	-2

Target likelihood score

Finally, the target's likelihood score is calculated by subtracting the stretch score from the past performance score. The resulting likelihood score of -3 is equivalent to a target achievement level of 25%.

Likelihood of meeting	**Past Performance score**

target	Past Perf. = 3	Past Perf. = 2	Past Perf. = 1	Past Perf. = 0	Past Perf. = -1	Past Perf. = -2
Stretch score: 3	0	-1	-2	-3	-4	-5
Stretch score: 2	1	0	-1	-2	-3	-4
Stretch score: 1	2	1	0	-1	-2	**-3**
Stretch score: 0	3	2	1	0	-1	-2
Stretch score: -1	**4**	3	2	1	0	-1
Stretch score: -2	**5**	4	3	2	**1**	0
Stretch score: -3	**6**	5	4	3	2	1
Stretch score: -4	7	6	5	4	3	2
Stretch score: -5	8	7	6	5	4	3

Target 3: Achieve net zero greenhouse gas emissions by 2050

Net Zero Roadmap

General Mills' long term decarbonization targets originate in its 2016 climate policy. The company's "Path to 2050", reproduced below, was based on a full Scope reduction target of 28% by 2025, compared to a 2010 baseline. By 2050, General Mills was aiming to achieve a reduction of total emissions between 41% and 72%, by leveraging reduction opportunities across the different value chain areas depicted in the image. The 2016 version of General Mills' long term decarbonization pathway did not include an objective to neutralize emissions, focusing instead on reducing emissions in line with a science-based trajectory (General Mills Inc., 2016b, p35).

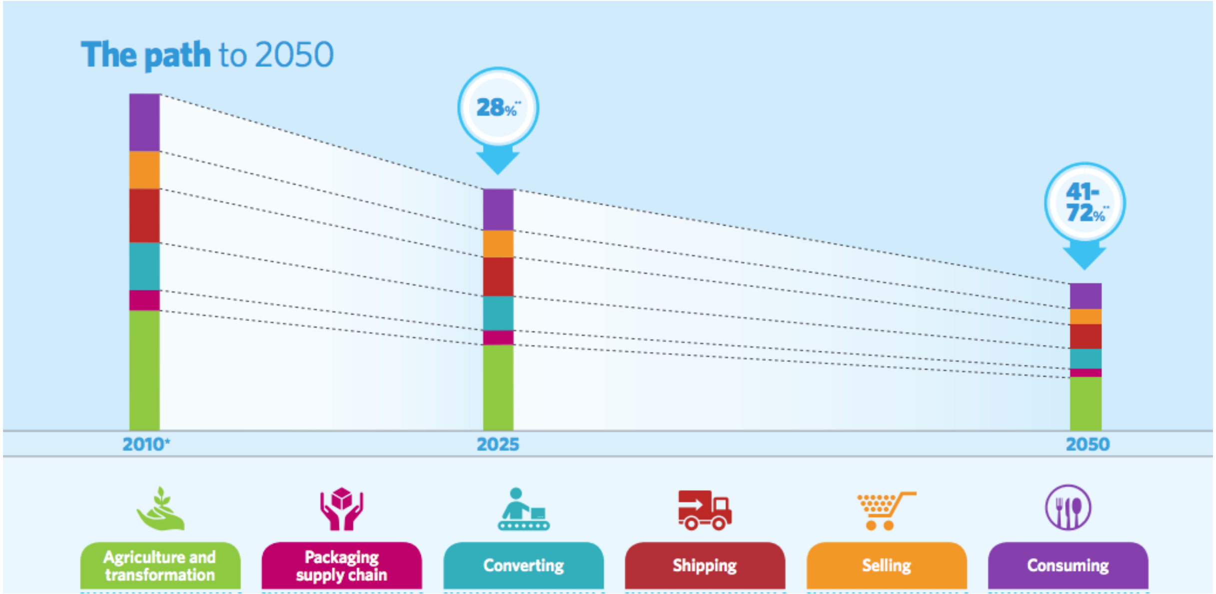
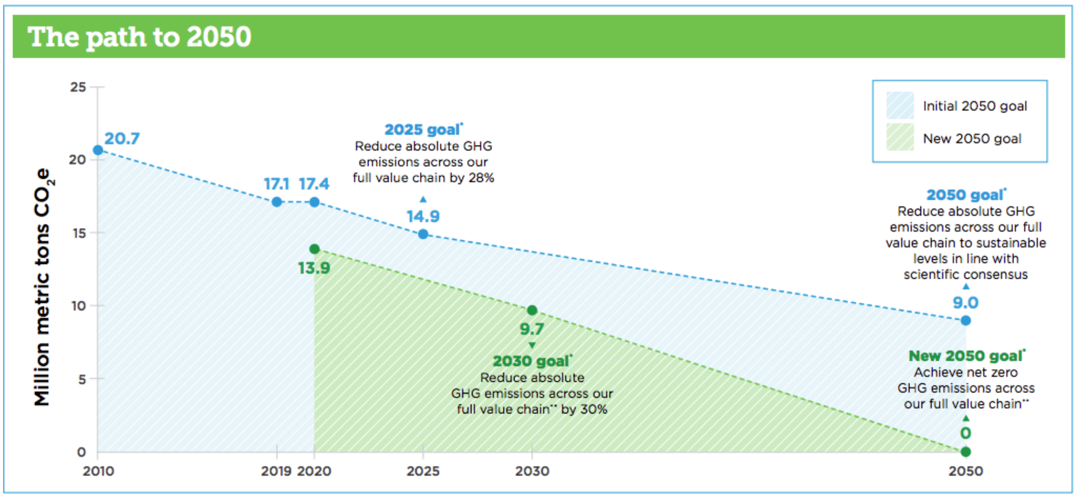


Figure 6.22: General Mills Path to 2050. Source: General Mills Inc., 2016b, p.35

General Mills announced its Net Zero ambition in 2020. Compared to its previous long-term target, the company's new pathway for 2050 sees total emissions equalling zero in 2050, decreasing at a steady pace between 2020 and 2050. The image below, taken from the company's 2021 sustainability report, compares the 2016 and 2020 versions of General Mills' long-term emissions reduction pathways, depicting an increase in ambition (General Mills Inc., 2021a).

Like many other companies setting long-term targets, General Mills' planning horizon is limited to the coming decade, and plans for achieving Net Zero are vague. In its 2050 pathway, reproduced below, General Mills does not provide an indication of when, in what proportion, and with what instruments it will neutralize its emissions. It does not provide an indication of targets that it might set after 2030, nor does it provide a more detailed decarbonization pathway for the decades between 2030 and 2050 (General Mills Inc., 2021a, p.22).



*Baseline for 2025 goal and initial 2050 goal is 2010. Baseline for 2030 goal and new 2050 goal is 2020.
**This goal focuses on the categories of GHG emissions that are the most impactful and actionable for General Mills, representing 13.9 million metric tons CO_2e in 2020 (81% of our total value chain GHG emissions footprint). The following GHG emissions are excluded from this goal, consistent with SBTi guidelines: some low volume ingredients, capital goods, employee commuting, franchises, downstream warehouse and storage at retail, consumer trips to store and end of life (consumer food waste).

Figure 6.23.Source: General Mills Inc.,(2021a, p 22)

Carbon removal

In its 2021 CDP disclosure, General Mills explains that unabated emissions once the 2030 targets will be met “will be neutralized through additional reductions, removals or other compensation. We expect the magnitude remaining to be millions of metric tons of CO2e'' (General Mills Inc., 2022c, p.18). The company’s current climate disclosures, however, provide very limited evidence that the company is actively seeking to develop and secure access to high quality carbon removal projects.

General Mills’ Cocoa Forests Initiative Action Plan from 2021 included forest restoration as one for the four pillars of action within its responsible cocoa sourcing policy. In the policy document, General Mills reported working with NGO partners to identify restoration and conservation opportunities for areas that were degraded through cocoa production in Ghana and the Ivory Coast, with an intention to develop direct origin investments in the future (General Mills Inc., 2021d).

However, General Mills does not provide evidence of carbon removal activities beyond this project. According to its CDP 2021 disclosure, it has not yet originated or purchased carbon offset credits, nor does it use an internal price of carbon (General Mills Inc., 2022c). While its disclosure mentions that General Mills intends to start activities in these two areas in the following years, General Mills’ lack of engagement in carbon offsets can potentially place the company at a disadvantage compared to peers such as Danone or Nestlé, which have invested heavily in reforestation and conservation projects.

Unabated emissions scenarios

While it is impossible to predict General Mills’ actions post 2030, an analysis of the company’s likely performance on its 2020 commitments can provide an estimation of the amount of emissions General Mills will need to neutralize in order to meet its Net Zero targets. In a first step, the company’s scores for each of the targets included in its Net Zero pledge are translated into the corresponding achievement percentage for each target. According to the analytical methodology, a likelihood score of 6 for the company’s Scope 1 and 2 target is equivalent to a likely completion rate of 75% by 2030. A score of -3 for the company’s Scope 3 target represents a likely completion rate of 25% in the target’s end year.

In a second step, three scenarios are defined for 2030. Scenario 1, the most optimistic, assumes that General Mills will achieve the best possible decarbonization rates according to its targets. In the best case scenario, all targets are met at 100%, on time. In the second scenario, targets are met on time, but to different extents, depending on their likelihood score. The third scenario depicts a future pathway in which decarbonization targets have no influence on the company’s emission trajectory, and are therefore 0% achieved.

Unabated emissions scenarios

	Name	Target	Likelihood score	% of target achieved by target end
1	Best Case Scenario	Scopes 1&2 (2020 Iteration | Abs. S12 | -42 % | 2020-30)	Not relevant	100%
		Scope 3 (2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000)	Not relevant	100%
2	Past Performance Scenario	Scopes 1&2 (2020 Iteration | Abs. S12 | -42 % | 2020-30)	**6**	75%
		Scope 3 (2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000)	**- 3**	25%
3	Business as usual	Scopes 1&2 (2020 Iteration | Abs. S12 | -42 % | 2020-30)	Not relevant	0%
		Scope 3 (2020 Iteration 2 | Abs S3 (SBTI) | Abs S3 | -30 | 2020-30 | Baseline 12800000)	Not relevant	0%

The chart below depicts the scenarios graphically. All scenarios have been constructed by first calculating the rate of change between 2020 and 2030 obtained in each scenario and converting it into an average yearly rate of change compared to the 2020 baseline. To estimate emissions in 2040 and 2050, the rate of change obtained above has been successively applied to the 2020 baseline to obtain a linear trajectory. In each scenario, the trajectories for Scopes 1+2 and Scope 3 are considered as separate, and are projected into the future according to their target trajectories (scenarios 1 and 2) or their past trendline (scenario 3). For this reason, the trendline in scenario 3 has a steeper slope incline than that of reported emissions, reflecting the very steep increase displayed by the company's Scope 3 emissions in the past.

In Scenario 1, emissions drop by 27% by 2030, and by 91% by 2050, assuming a continuous rate of decarbonization. In scenario 2, which is the most likely given the company's past performance, total emissions fall by 4.3% by 2030, and by 22.7% by 2050. The business as usual scenario sees emissions increasing by 38% by 2030, and by 189% by 2050.

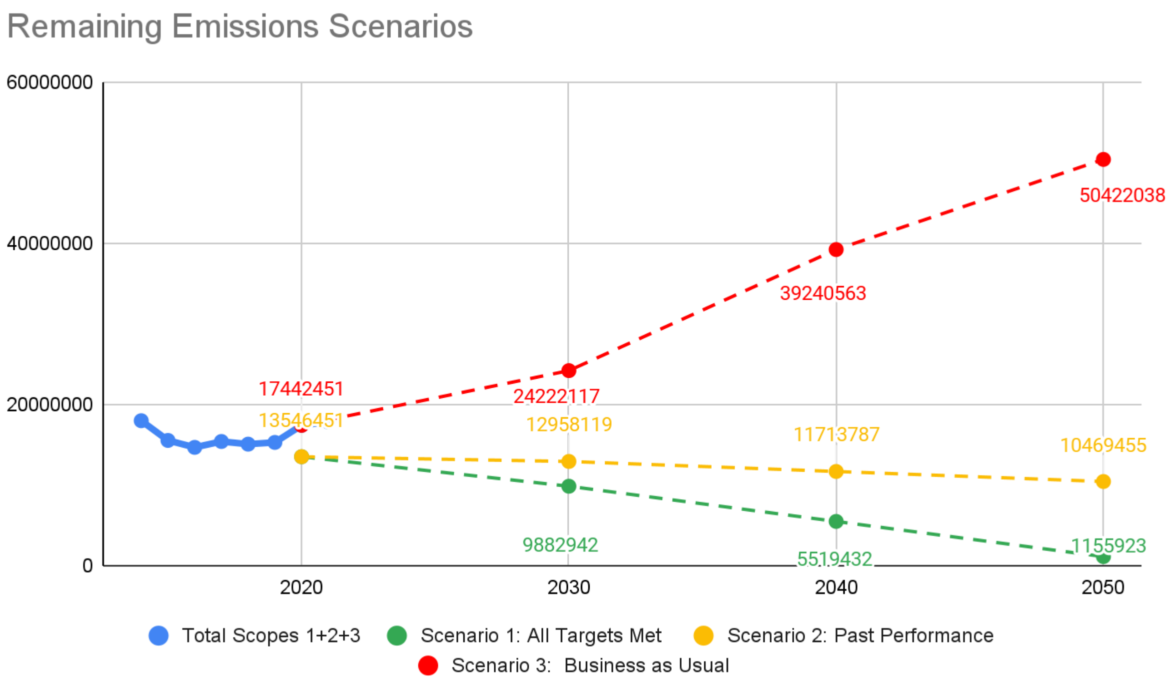


Figure 6.24. Remaining Emissions Scenarios. Source: own concept and calculations

Estimating the costs of reaching Net Zero

By calculating the amount of emissions left to decarbonize in 2030 for each scenario, one can estimate the yearly neutralization costs that the company would need to incur in order to reach its Net Zero goal. These figures represent the total costs of neutralization in the absence of additional measures to decarbonize the company's operations and product portfolio. Since General Mills has not yet set up an internal price of carbon, we assume the same range of prices per neutralized ton as for Danone. The table below illustrates this calculation for Scenario 1

Cost of carbon removal in year Y in Scenario 1				Price per ton of carbon removed			
Year	T CO2e emitted	T CO2 removed	T CO2 Unabated	$15.00	$35.00	$50.00	$100.00
2030	12958119	0	12958119	$194,371,784.03	$453,534,162.73	$647,905,946.75	$1,295,811,893.50
2050	10469455	0	10469455	$157,041,822.08	$366,430,918.18	$523,472,740.25	$1,046,945,480.50

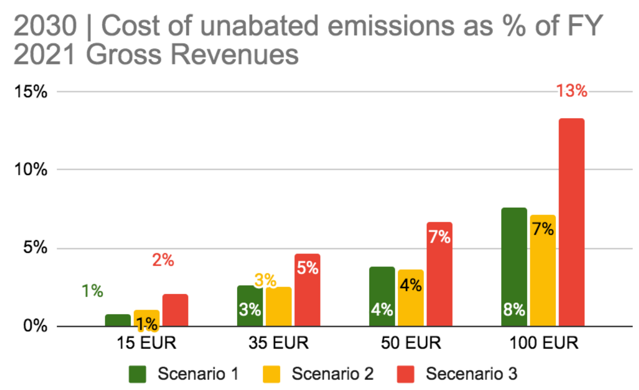
Table 6.5: General Mills carbon removal cost in 2030. Source: own numbers and concept.

To give an order of magnitude, we calculate the cost of neutralizing remaining emissions as a % of the company's key financial indicators for the last reporting year. In addition to the standard financial metrics, the calculation also includes General Mills' definition of a significant financial impact threshold, which equals $50 M (General Mills Inc., 2022c). As opposed to Danone's High Significance Threshold, General Mills' figure indicates a minimum threshold above which financial impacts are considered significant. The table below shows the calculations for 2030 in Scenario 1.

Cost of carbon removal in 2030 as % of FY 2021 KPIs		Cost of carbon removal in 2030 under different price scenarios			
		$15.00	$35.00	$50.00	$100.00
		€194,371,784	€453,534,163	€647,905,947	€1,295,811,894
FY 21 Revenue	$18,130,000,000.00	1.07%	2.50%	3.57%	7.15%
FY 21 EBITDA	$4,110,000,000.00	4.73%	11.03%	15.76%	31.53%
FY 21 Net Income	$2,340,000,000.00	8.31%	19.38%	27.69%	55.38%
FY21 NetProfit margin	$530,601,000.00	36.63%	85.48%	122.11%	244.22%
Significant financial impact threshold	$50,000,000.00	388.74%	907.07%	1295.81%	2591.62%

Table 6.6: General Mills carbon removal cost in 2030. Financial numbers from (Google Finance, 2022b)

In 2030, General Mill's cost of removing unabated carbon is expected to range between 6% of FY 2021's net income under scenario 1, to 457% respectively for Scenario 3. In Scenario 2, which is the most likely out of the three, General Mills will need to pay a minimum of 8% of its FY 2021 Net Income in order to abate its emissions, and up to 55% if carbon removal prices would increase to 100 EUR/ ton.



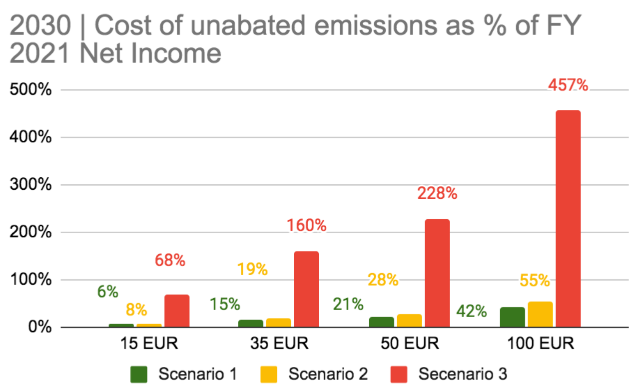
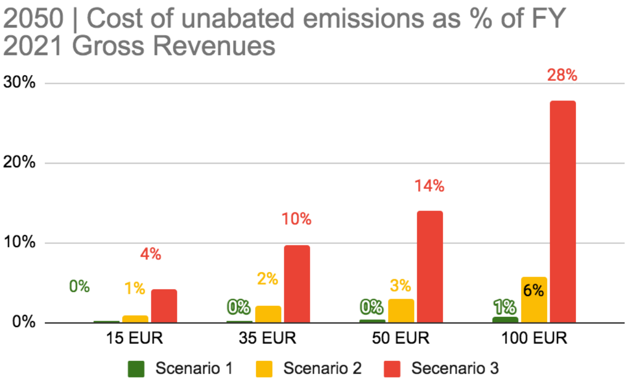


Figure 6.25 (left). 2030 Cost of unabated emissions as % of FY 2021 Gross Revenues. Source: own concept and calculations
Figure 6.26 (right) 2030. Cost of unabated emissions as % of FY 2021 Net Income. Source: own concept and calculations

In 2050, the cost of unabated carbon in Scenario 2 is likely to range between 7% and 45% of FY 2021 Net Income.



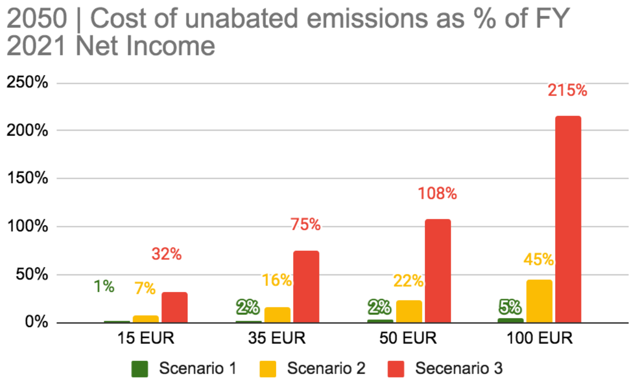


Figure 6.27 (left). 2050 Cost of unabated emissions as % of FY 2021 Gross Revenues. Source: own concept and calculations
Figure 6.28 (right) 2050. Cost of unabated emissions as % of FY 2021 Net Income. Source: own concept and calculations

General Mills Case Study Conclusions

Target 1: 42% reduction in Scopes 1+2 by 2030 from a 2020 baseline

On Scopes 1 and 2, the company benefits from a positive track record whereby it has consistently outperformed its targets for the two Scopes combined. The current target has an ambition level similar to past target iterations, and benefits from a strong implementation roadmap. The resulting likelihood score indicates that the company is likely to achieve its target at 75% by 2030. The estimated completion rate is not 100% as a result of the fact that General Mills' Scope 1 and 2 target kept a similar level of ambition to its old target (as opposed to lowering ambition, which would have given it the lowest Stretch Score).

Target 2: 30% reduction of absolute Scope 1,2 and 3 by 2030, on a 2020 baseline

In contrast, General Mills' target for Scope 3 displays several characteristics of a Stretch Goal, as conceptualized by Sitkin et. al. (2011). Despite several target iterations, General Mills' Scope 3 emissions have only decreased by 0.8% between 2014 and 2021. Despite experiencing a rising emissions trend since 2018 and overshooting past Scope 3 targets, General Mills has set a new target which is 30% more ambitious than its predecessor. General Mills' Scope 3 strategy does not rise up to the challenge, obtaining an overall score of 2. As a result, the likely completion rate of the company's Scope 3 target in 2030 is estimated at 25%.

General Mills supports its Scope 3 target with a quantified goal of switching to regenerative agriculture, which is considered a best practice by the World Benchmarking Alliance scoring system. However, while General Mills shows good progress against its target, its disclosure of concrete actions taken is limited. The information that is available points to the fact that General Mills is currently establishing the infrastructure for data collection and supplier engagement in parallel to piloting regenerative agricultural practices, but does not yet have a proven pathway to scalability.

Furthermore, the company has an incomplete no deforestation pledge and shows no evidence of shifting its portfolio to less carbon intensive products. It is therefore expected that the company's Scope 3 emissions will continue to mirror the company's revenue evolution as long as it does not accelerate the decarbonization of its agricultural practices and of its product portfolio.

Target 3: Achieve net zero greenhouse gas emissions by 2050

In contrast to its goals for Scopes 1,2 and 3, General Mills' target to reach Net Zero full-Scope emissions in absolute terms by 2050 has neither a comparable past iteration, nor a concrete plan for implementation. General Mills does not disclose details about the instruments considered for neutralizing carbon, nor does it provide a roadmap for decarbonization actions beyond 2030. Critically, the company has not yet originated or purchased any carbon credits, pointing to its vulnerable position in reaching its target. In the most likely scenario, whereby General Mills meets its Scope 1 and 2 targets at 75%, and its Scope 3 targets at 25%, the yearly cost of neutralizing residual carbon in 2050 would range between 7% and 45% of FY21's Net Income, assuming a price of carbon removal of 15 EUR and 100 EUR per ton, respectively.

The company's Net Zero target therefore stands out as very ambitious compared to the company's previous long-term targets, the upward trend in its emissions and the limited evidence of carbon removal within its value chain.

7 Case Study 2: Danone

Company overview

Danone is a leading global food and beverage company, with total sales amounting to EUR 24.3 Billion in 2021 (Danone S.A., 2019d). In terms of value, Danone is the #1 global player in fresh dairy products and in plant based foods and beverages. It is number 2 worldwide for packaged waters and early life nutrition, and number 1 in europe for adult nutrition. In 2021, 54% of the company's sales were in the Essential Dairy and Plant Based category (yogurts - Actimel, Activia and plant-based drinks - Alpro, Silk), followed by Specialized Nutrition (early life - Aptamil and medical nutrition - Nutricia) with 30% of sales, and water (Evian, Volvic) with 16% of sales (Danone S.A., 2021c). Its top 3 brands in terms of 2021 % sales are Activia, Aptamil and Silk (Danone S.A., 2021c).

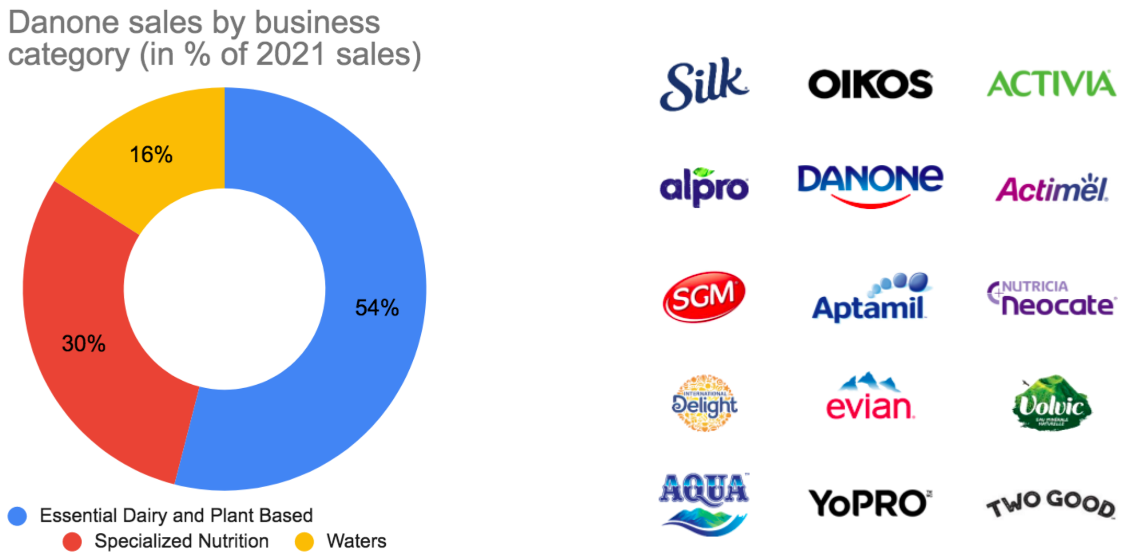


Figure 7.1: Danone sales Breakdown and brands. Source: Danone S.A., (2021c)

Danone is recognized as a responsible business leader in its sector and Emmanuel Faber's 7 years leadership performance was seen by many as exemplary in the field of sustainability. According to Forbes Magazine, "Emmanuel Faber will enter history as one of the leading executives promoting stakeholder capitalism and centering core business units around ESG" (Van Gansbeke, 2021). In 2021,62 % of its sales were covered by a B Corp certification, which means that it was on track to becoming the largest B Corp in the world (Danone S.A., 2022a). In 2020, Daone became the first listed company to adopt the French "société à mission" status in its bylaws, with the approval of 99% of its shareholders (Danone S.A., 2021d). Danone is also highly ranked among ESG rating agencies, being named a "Sector Leader" in the Food Products industry by Sustainalytics, and one of 14 companies worldwide to receive a trip A CDP score for three consecutive years (Danone S.A., 2019f).

In March 2021, Danone's CEO and chairman Emmanuel Faber was forced to resign following pressure from activist investors who criticized the company's consistent underperformance compared to industry peer Nestlé (Van Gansbeke, 2021). Over the previous 5 years, Danone's share performance exhibited a slightly negative trend, lagging behind Nestlé and Unilever which offered investors a cumulative positive performance of 45% and 30% (Van Gansbeke, 2021). A lack of focus on its core portfolio, inappropriate innovation efforts, sub-par execution and low investments (Danone S.A. Investor Relations, 2022) led to a 2017-2019 average sales growth of 2.7%, lower than the 3-4% market growth over the same period (de Saint-Affrique, 2022). In fact, the company had not seen a growth rate above 3% since 2014 and had not managed to achieve volume growth in several years, with volumes down at -0.6% in 2021 (Danone S.A., 2022a).

An “Insufficient contribution from purpose to value creation” (de Saint-Affrique, 2022) was one of the four reasons mentioned by the new Danone CEO Antoine de Saint-Affrique as negative levers driving the company’s underperformance. Within Danone’s 2022 “Renew Danone” strategic plan, the company’s new Chief Sustainability Officer has a mandate to “unify, to streamline and to refocus our sustainability efforts with the ambition of having even more impact where it truly matters” (Danone S.A., 2022a, p16), in support of the company’s overall aim to achieve an organic sales growth between +3 and +5% starting 2022 and through 2024 (Danone S.A. Investor Relations, 2022).

Carbon footprint

Over 90% of Danone’s GHG emissions originate in its indirect activities, summarized in the table below as gross Scope 3 emissions. According to the company’s latest disclosure, its Gross Scope 1 and 2 emissions represented 3 % of emissions (Danone S.A., 2022a).

Danone’s 2021 Extra-financial disclosure	Metric tons of CO2e	As % of total emissions
Gross Scope 1	683000	2.76%
Gross Scope 2 (market based)	295000	1.19%
Gross Scope 3	23,734,000	96.04%

Table 7.1: Danone’s FY 2021 emissions breakdown. Source: (Danone S.A., 2022a)

Between 2013 and 2021, Danone’s total GHG emissions have increased by 31%, largely driven by the 34% increase in Scope 3 emissions over the same time period. A further breakdown of Scope 3 emissions reveals that in 2021, 80% of Scope 3 emissions came from the company’s upstream activities. While upstream Scope 3 emissions have increased by 34% over the past 8 years, downstream emissions have only increased by 19.5% (Danone S.A., 2021f).

The company’s overall emissions trajectory is, therefore, largely driven by its upstream activities, and by the Purchased Services and Goods category in particular. In 2021, this category represented 81.6% of the company’s Scope 3 emissions, and had grown by 42% between 2013 and 2021.

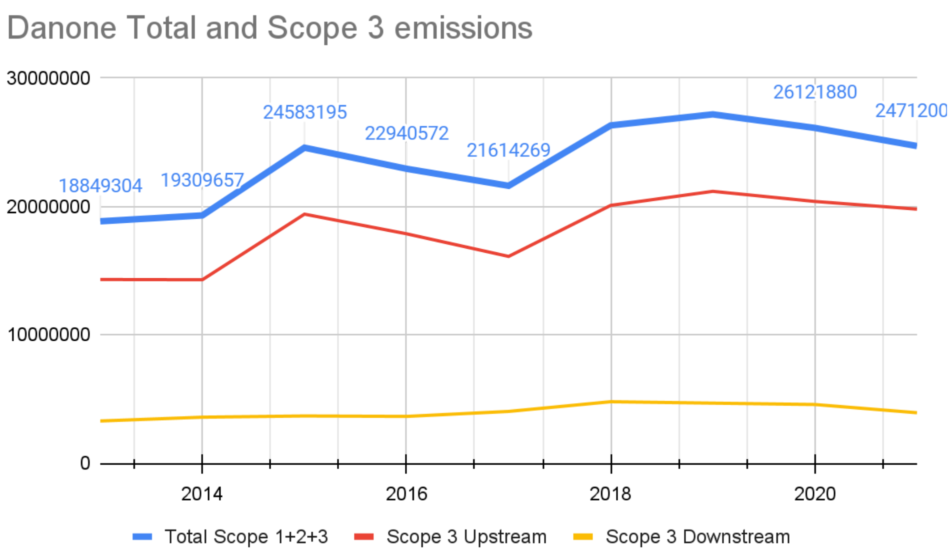


Figure 7.2: Danone Total and Scope 3 emissions. Source: own calculations and concept. Figures from company CDP disclosures

Decarbonization commitments

Danone's decarbonization commitments can be traced to the company's 2015 Climate Policy, which announced the company's promise to become carbon neutral by 2050. In its 2021 CDP disclosure, Danone reports on two key decarbonization goals: Three specific targets to work towards this goal (Danone S.A., 2019g):

- **Target 1**: a 30% absolute reduction of Scope 1 and 2 emissions by 2030 compared to a 2015 baseline
- **Target 2**: to reduce Scope 1,2 and 3 intensity by 50% by 2030 compared to a 2015 baseline
- **Target 3**: become carbon neutral by 2050

Danone's mid-term decarbonization targets (targets 1 and 2) were approved by the Science-Based Targets Initiative in 2017, in line with a 2 degrees warming scenario. In 2019, the company signed the Business Ambition for 1.5°C pledge and declared its intention to re-align its commitments to SBTI's 1.5 degrees scenario, but did not release new decarbonization goals as of its 2021 reporting (Danone S.A., 2019g)

Target 1: a 30% absolute reduction of Scope 1 and 2 emissions by 2030 compared to a 2015 baseline

All numbers presented in this section were sourced from the company's CDP disclosures as described in step 2.1 of the Methodology.

Target iterations

Danone's absolute Scope 1 and 2 target was set in 2017 and was still active in 2021. Although no past iteration is fully comparable to the currently active targets, Danone has a long track record of setting intensity and absolute reduction targets on its “Direct Responsibility Scope”. The Danone Direct Responsibility Scope includes Scopes 1 and 2, as well as Scope 3 streams upon which Danone considers it has an unmediated impact: packaging, waste in operations, upstream & downstream transportation and distribution, fuel and energy related activities, and end of life treatment (Danone S.A., 2018a). In 2015, emissions counted in the DDR Scope represented about 32% of the company’s total footprint. According to the company’s statements, the 46% intensity reduction achieved between 2007 and 2015 has resulted in an increase in absolute GHG emissions of only 1%, despite the fact that Danone’s sales volumes increased by 51% during the same period (Danone S.A., 2015)

Past performance

P1. Emissions performance compared to past target iterations

Between 2008 and 2011, Danone has set successive year-on-year intensity reduction targets for its Direct Responsibility Scope. For three consecutive years, Danone has surpassed its targets of reducing its DDR metric tonnes CO2e per metric tonne of product by between 6 and 7% year on year. By 2016, when Danone stopped reporting on the DDR intensity metric, the company had achieved a 37.4% reduction in intensity compared to its 2007 baseline, slightly underperforming compared to its mid-term target trajectory of reducing the emissions intensity by 50% between 2007 and 2020.

Danone’s 2015 Climate Policy materialized in a pledge to keep absolute emissions on its DDR Scope unchanged between 2015 and 2020, in what it claimed to be an attempt to decouple business growth from GHG emissions (Danone S.A., 2015). The chart below plots the target’s trajectory together with Danone’s absolute emissions that constitute its DDR Scope[13].The target was abandoned after just one year, but had it still been valid until 2020, Danone would have outperformed the target by close to 18%.

[13] The 2015 baseline figure for DDR absolute emissions was taken from Danone’s 2016 CDP disclosure. It did not report figures for its DDR Scope in any other year. The DDR figures for the years 2016 through 2021 were estimated by adding each individual component according to Danone’s definition of the DDR Scope.

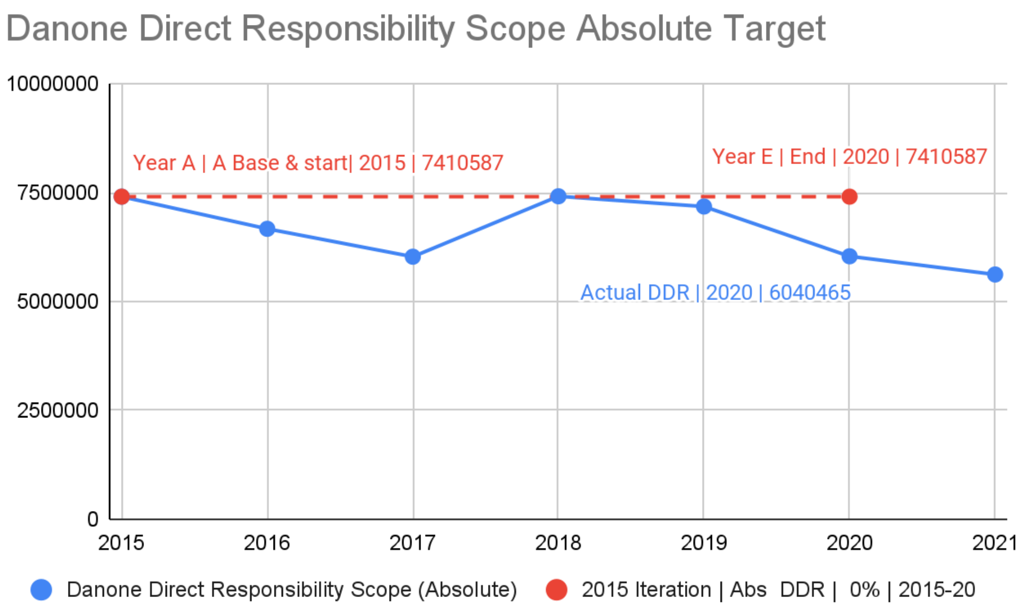


Figure 7.3: Danone Direct Responsibility Scope Target. Source: own calculations and concept. Figures from company CDP disclosures.

According to Danone's 2016 CDP disclosure, keeping absolute emissions under the DDR Scope stable between 2015 and 2020 would have resulted in an absolute emissions reduction of 8% on Scopes 1 and 2 combined. The target can therefore be reframed as aiming to reduce Scope 1 and 2 emissions by 8% by 2020, on a 2015 baseline. Its trajectory, together with the company's reported emissions, are plotted in the chart below. Had the target still been active in 2020, Danone's Scope 1 and 2 emissions would have outperformed the target by approximately 19.5%.

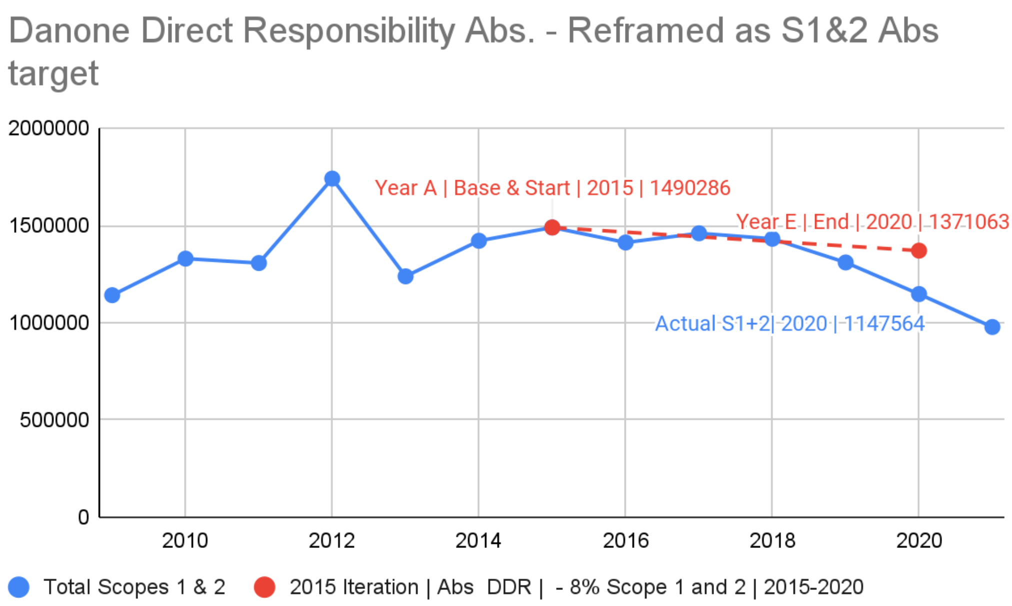


Figure 7.5: Danone Direct Responsibility Scope Target reframed as an Absolute Scope 1 and 2 target . Source: own calculations and concept. Figures from company CDP disclosures

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
2015 Iteration | Abs DDR | 0% | 2015-20	-3.65%	Exceeding projections	2

P2. Emissions performance compared to current target iteration

A similar performance is observed when comparing the company's reported Scope 1 and 2 emissions with the current target's trajectory, depicted in the chart below.

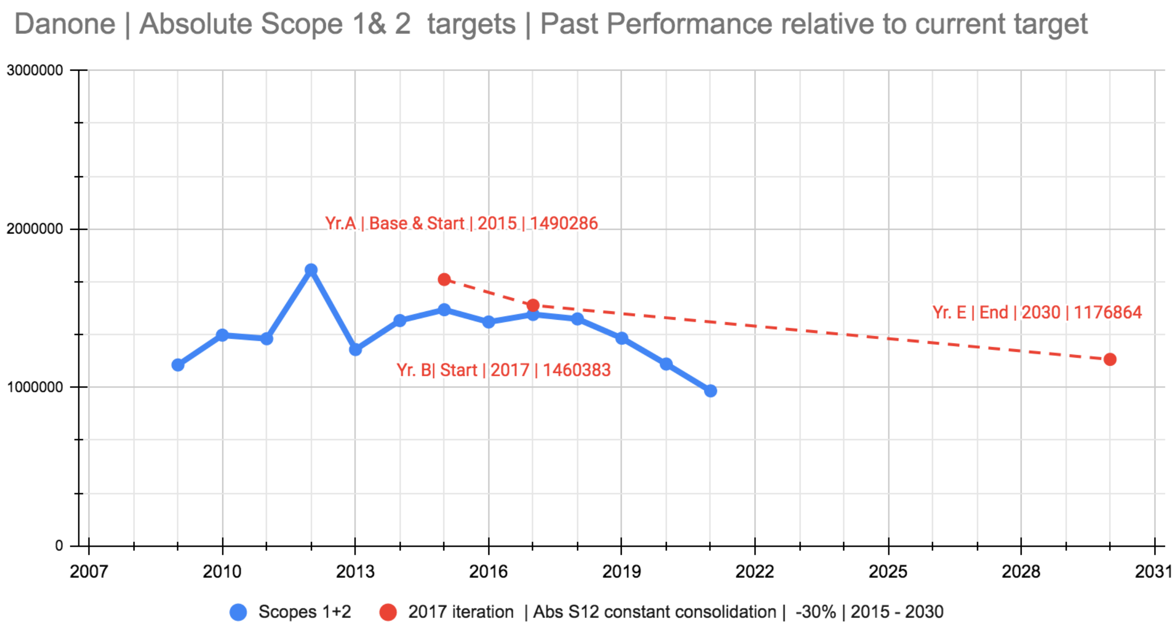


Figure 7.6: Danone Absolute Scope 1 and 2 target . Past Performance relative to current target. Source: own calculations and concept. Figures from company CDP disclosures.

In 2021, the last available year of emissions reporting, Danone's Scope 1 and 2 emissions were 28.72% lower than projected emissions, which results in a P2 score of 1.

P2. Emissions performance compared to current target iteration			
Target iteration	**(Reported value in Yr. D - Projected value in Yr. D D)/ Projected value Yr. D**	**Interpretation**	**Performance score relative to currently active target**
2017 iteration | Abs S12 actuals | -30% | 2015 -2030	-28.72%	Company is overperforming relative to its current target	1

A total Past Performance score is obtained by adding the P1 and P2 scores.

P. Past Performance score			
Target iteration	P1. Performance score relative to past target iterations	P2. Performance score relative to currently active target	P. Past Performance score = P1+P2
Scopes 1 and 2	2	1	3

Target commitment score

By translating Danone's DDR intensity target into a target on absolute Scope 1 and 2, one can use it as a past benchmark for assessing the current target's relative degree of ambition. The chart below plots the two iterations together : the continuous green line represents the currently active target, and the dotted red line depicts its closest past iteration.

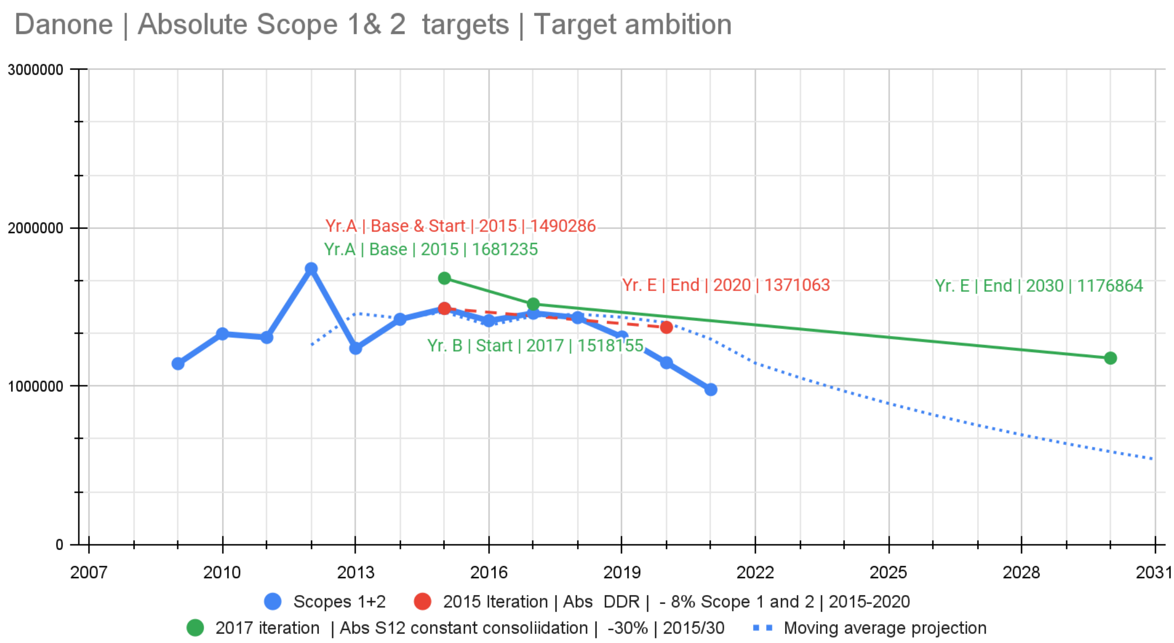


Figure 7.7: Danone Absolute Scope 1 and 2 target. Target Ambition. Source: own calculations and concept. Figures from company CDP disclosures

C1: Current target ambition compared to past target iteration

Although both targets have 2015 as their baseline year, the baseline value used in the current target is higher than the absolute Scope 1 and 2 emissions declared to the CDP. Danone does not provide an explanation for this discrepancy, which results in a baseline that is 12.8% higher than reported emissions for the baseline year. Two calculations are therefore necessary to compare the level of ambition of the two targets relative to each other: a first one, assessing the yearly rates of change taking into account the different baseline values and a second one assuming that both targets use the reported Scope 1 and 2 emissions as their baseline. In the first case, the yearly rate of change implied by the currently active target is 9% higher than that of its past iteration. When considering a baseline of 1490286 tons of CO2e for both targets, this figure increases to 34.7%. This leads to the conclusion that the current decarbonization target for Scopes 1 and 2 is more ambitious than its previous iteration.

C1. Current target ambition compared to past target iteration			
Target iteration	**Yearly rate of change of past iteration as % of rate of change of current target**	**Interpretation**	**C1. Ambition score relative to past iteration**
2017 iteration | Abs S12 constant consolidation | -30% | 2015 - 2030	9.17%	Increase in ambition compared to past iteration	**2**

C2: Current target ambition compared to business as usual trajectory

Having determined that the current target is more ambitious than its previous iteration, we evaluate the current target's ambition compared to the emissions trajectory on the relevant Scopes. In 2021, the last year of reporting, Danone was already over-performing compared to its target. Depending on the baseline considered in calculating the target, Danone had already achieved between 114% and 139% of its target. If Danone's Scope 1 and 2 emissions were to follow a trajectory comparable to that over the past 3 years, the projected value in 2030 would be approximately 50% lower than the end value implied by the target. This suggests that the company's goal of reducing Scope 1 and 2 emissions by 30% by 2030 is unlikely to drive meaningful decarbonization efforts, since following a business as usual scenario leads to a better decarbonization outcome than by following the target's trajectory.

C2. Current target ambition compared to business as usual trajectory			
Target iteration	**(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E**	**Interpretation**	**C2. Ambition score relative to business as usual trajectory**
2017 iteration | Abs S12 constant consolidation | -30% | 2015 - 2030	-50%	Target is less ambitious that the business as usual trajectory	**- 1**

The two ambition scores cancel each other out and result in a total commitment score of 1. This suggests that although Danone has set a target which is more ambitious than past comparable targets, it is unlikely to drive meaningful decarbonization actions compared to the company's business as usual target trajectory.

Target commitment score			
Target iteration	**C1. Ambition score relative to past iteration**	**C2. Ambition score relative to business as usual trajectory**	**C Commitment ambition score = C1+C2**
2017 iteration | Abs S12 constant consolidation | -30% | 2015 - 2030	2	- 1	1

Strategy

The chart below zooms in on Danone's Scope 1 and 2 emissions. By disaggregating Scopes 1 and 2, their different trajectories become apparent, with reductions on Scope 2 emerging as the key driver in reducing Danone's emissions within its direct control. While Scope 2 emissions have been steadily decreasing since 2015, Scope 1 emissions have historically had a more unstable path, with an increasing trend since 2013. As a result, each Scope will be considered separately in the analysis below.

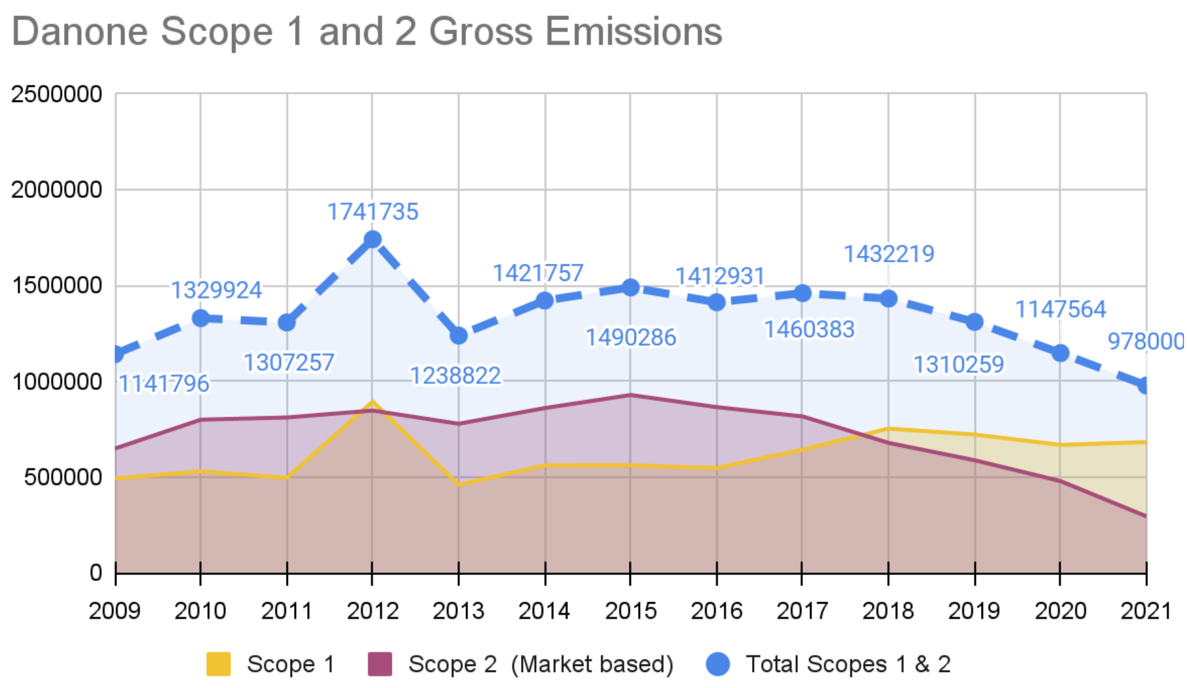
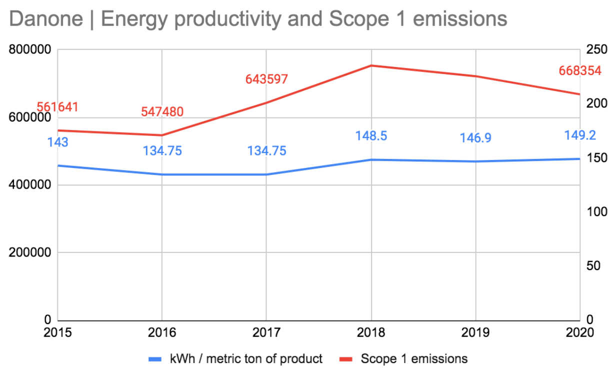


Figure 7.8: Danone Scope 1 and 2 Gross Emissions. Source: own calculations and concept. Figures from company CDP disclosures

Scope 1

For Danone, Scope 1 emissions derive from the consumption of fuel in combustion and refrigerant facilities located in the company's operational perimeter. In 2021, Scope 1 emissions had increased by 21.6% compared to a 2015 baseline. Danone's strategy to deliver on its energy efficiency commitment relies on two levers of action: producing more electricity locally and using energy more efficiently (Danone S.A., 2022a).

Figure 7.9 shows the company's investments in CO2 reduction projects on the left axis, and the use of renewable energy as a percentage of total energy used on the right axis. The year 2015 represented a peak in terms of investments in CO2 emissions reduction projects, especially with regards to renewable energy initiatives. For the years 2017 and 2018 Danone does not provide separate figures for energy efficiency and renewable energy projects, but reports total amounts that show a decreasing trend in investments. Starting 2019, total investments picked up again with a heavy focus on renewable energy projects.



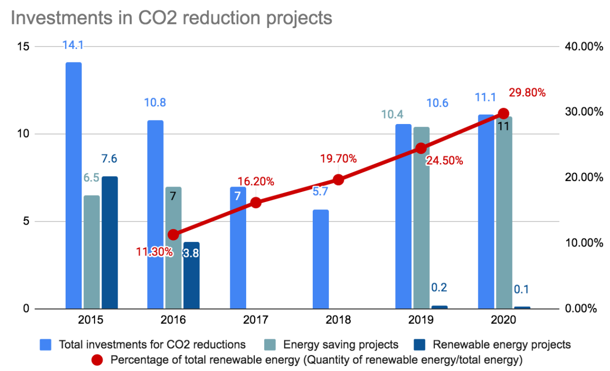


Figure 7.9 (Left): Danone Energy productivity and Scope 1 Emissions. Source: own calculations and concept. Figures from company CDP disclosures
Figure 7.10 (Right): Danone Investments in CO2 reduction projects. Source: own calculations and concept. Figures from company CDP disclosures

Although it is difficult to establish causal relationships solely based on the information available in corporate reports, the data indicates that Danone's investments in renewable energy in 2015 and 2016 are yielding positive results, as illustrated by the steady increase of the share of renewable energy out of the company's total energy use (represented as a red line quantified on the right axis in Figure 7.9). Danone provides examples of actions aimed at switching away from fossil-fuel based production processes by investing in biofuels, methane digesters, and wood-fired boilers to replace gas and coal-power fired boilers, and switching production to more efficient plants (Danone S.A., 2021a).

Despite a target to reduce its energy intensity by 60% until 2020, compared to a 2000 baseline, Danone has shown little consistent improvement with regards to its energy efficiency per ton of product manufactured. As chart 7.9 shows, the company's energy productivity improved slightly in 2016 and 2017, only to start rising again from 2018 onwards. In 2021, the company's energy productivity was in fact 35.6% higher than the expected figure according to the target, implying that the company is underperforming compared to its operational target. In 2021, only 7% of Danone's production volumes were covered by an ISO 50001 certification (Danone S.A., 2021e), also indicating that there is room for improvement in terms of Danone's energy efficiency in operations.

Starting with 2019, however, Danone's investments in energy efficiency projects have risen considerably, reaching a 6-year high in 2020 (Figure 7.10). Although the company has not issued new targets for energy efficiency and it has not otherwise indicated a strategy for energy efficiency, the increased investment figures suggest that the company may have taken renewed ownership over tackling its Scope 1 emissions.

S1. Scope 1	2020 score	2020 score explanation
2017 iteration | Abs S12 constant consolidation | -30% | 2015 - 2030	1	The company does not have a target for Scope 1 but discloses quantitative reductions for its Scope 1 emissions.

Scope 2

In 2021, Danone's Scope 2 emissions (market based) decreased by 68.2% compared to a 2015 baseline. Scope 2 emissions are associated with the electricity, steam, heat or cold that is produced outside of the company's operational perimeter, but is purchased and used in Danone's direct operations (Danone S.A., 2022a).

Danone joined RE100 in 2017 and pledged to transition to 50% renewable energy by 2020 and 100% by 2030 (Danone S.A., 2022a), which represents a high level of ambition according to the RE100 initiative. In 2021, 68% of the company's total electricity purchased was from renewable sources, up from 54.3% in 2020 (Danone S.A., 2021e). This places the company well on track to fulfill its renewable electricity target by 2030. Furthermore, the increased investments in energy efficiency are likely to further accelerate the company's reduction of its Scope 2 emission by lowering its energy demand overall. However, Danone does not provide details into the constructs it uses for procuring renewable energy and does not indicate whether the target is aligned with a 1.5 degree scenario. Therefore, Danone's score for its Scope 2 strategy is 1.5.

S2. Scope 2	2020 score	2020 score explanation
2017 iteration | Abs S12 constant consolidation | -30% | 2015 - 2030	1.5	The company has a target (not aligned with 1.5°C) to reduce 2 emissions and reports progress against the target

The final strategy score for Scopes 1 and 2 is obtained as an average of the individual scores for each Scope.

S score	2020 Scores	2020 Average	Corresponding strategy score	Interpretation
S1 Scope 1	1	1.25	2 Moderately Strong	The company has an overall target for Scopes 1&2 and discloses quantitative reductions. However, Danone is overshooting operational targets on Scope 1 and does not communicate a strategy or further targets. On Scope 2, it is exceeding expectations on current targets but provides incomplete disclosure on its renewables procurement strategy.
S.2 Scope 2	1.5			

The target stretch score is obtained by subtracting the strategy score from the commitment score. The resulting score of -1 reflects a moderate level of difficulty, due to the company's relatively ambitious targets and moderately strong strategy.

Target stretch score						
S and C scores	Commitment = 3	Commitment score = 2	Commitment score = 1	Commitment score = 0	Commitment score = -1	Commitment score = -2
Strategy score = 3	0	-1	-2	-3	-4	-5
Strategy score = 2	**1**	0	-1	-2	-3	-4
Strategy score = 1	2	1	0	-1	-2	-3
Strategy score = 0	3	2	1	0	-1	-2

The likelihood score, computed in the table below, is calculated by subtracting the startech score from the strategy score. The resulting likelihood score of 4 is equivalent to a completion rate of 75% in the target's end year.

Likelihood of meeting target	**Past Performance score**					
	Past Perf. = 3	**Past Perf. = 2**	**Past Perf. = 1**	**Past Perf. = 0**	**Past Perf. = -1**	**Past Perf. = -2**
Stretch score: 3	0	-1	-2	-3	-4	-5
Stretch score: 2	1	0	-1	-2	-3	-4
Stretch score: 1	2	1	0	-1	-2	-3
Stretch score: 0	3	2	1	0	-1	-2
Stretch score: -1	**4**	3	2	1	0	-1

Stretch score: -2	**5**	4	3	2	**1**	0
Stretch score: -3	**6**	5	4	3	2	1
Stretch score: -4	7	6	5	4	3	2
Stretch score: -5	8	7	6	5	4	3

Target 2: to reduce Scope 1,2 and 3 intensity by 50% by 2030 compared to a 2015 baseline

Danone's second active target pledges a 50% reduction in its full emissions Scope intensity by 2030, from a 2015 baseline. The target's Scope covers the company's emissions generated from 95% of its sales volumes, and includes Scopes 1 and 2 as well as upstream and downstream Scope 3 streams. The pledge is approved as a Science-Based target aligned with the 2 degrees scenario, and is defined in gCO2e/kg of sold products (Danone S.A., 2022a). According to Danone's 2021 CDP disclosure, the target is expected to reduce absolute Scope 3 emissions by 25% by 2030, and Scope 1 and 2 emissions by 30% (Danone S.A., 2022a).

However, Danone's corporate annual reports from 2020 and 2021 have stopped reporting progress towards this target. Instead, they highlight the "CO2 volume reduction full Scope like for like" in comparison to the previous two years, and no longer track progress against the 2015 baseline (Danone S.A., 2021c). Although this metric is not defined in the company's reporting, it does suggest that Danone may be moving towards setting absolute decarbonization targets in the future.

Therefore, there is a discrepancy between the targets communicated publicly through corporate reporting, and those submitted to the CDP for evaluation. In the interest of consistency with the other case studies presented in this thesis, the following analysis will focus on the targets reported though the CDP and will disregard the wording used in the company's annual reports.

Target iterations

Although the target was first mentioned in the company's 2015 Climate Policy, it was only reported to the CDP in 2017. According to the company's CDP disclosures since 2010, Danone has not set another target that covers its full emissions Scope, neither formulated in intensity terms, nor as an absolute reduction pledge. While the company's target on its Direct Responsibility Scope does cover certain categories in Scope 3, it excludes the Purchased Goods and Services category, which represents 81.6% of Scope 3, and can therefore not be considered as a comparable past iteration.

Past performance

P1. Emissions performance compared to past target iterations

Since Danone has not set a comparable target in the past, the past performance score compared to its past target iteration will be considered zero.

P1. Emissions performance compared to past target iterations			
Target iteration	**(Reported value in Yr. C - Projected value in Yr. C C)/ Projected value Yr. C**	**Interpretation**	**Performance score relative to past target iterations**
N/A	N/A	No past iteration	0

P2. Emissions performance compared to current target iteration

The second component of the past performance score assesses the company's performance against its currently active target. As illustrated by the chart below, the company's Scope 1,2 and 3 intensity in the last year of available reporting are above the trajectory implied by the active target.

A noteworthy observation revealed by this analysis is the disparity between the progress communicated by the company and the observable emissions trajectory resulting from the company's CDP disclosures. Danone reports its progress on the intensity target on a like for like basis compared to its 2015 basis. Based on this perimeter, Danone declares that in 2019 it has achieved a 24.8% reduction against its 2015 baseline. At the same time, it reports an intensity metric of 0.74007[14] in 2019, which represents a 3.2 % increase compared to the baseline (Danone S.A., 2021a). While the company's CDP disclosure allows one to compare the company's interpretation of progress to actual reported figures, Danone's external communication only highlights the like-for-like calculation, thus presenting an overly optimistic interpretation (Danone S.A., 2019d).

[14] The actual reported metric is 740.07 Grams of CO2e per kilogram of sold products. It has been converted to Kg of CO2e per kilogram of sold products in alignment with the company's prior reporting.

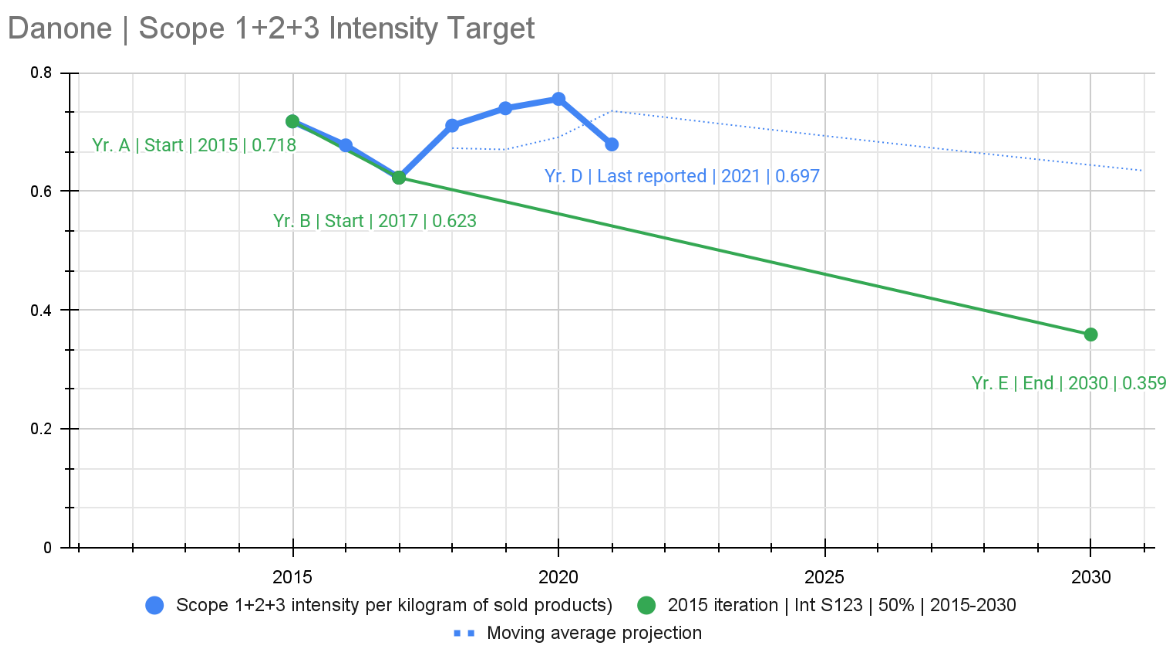


Figure 7.10 : Danone Scope 1+2+3 Intensity Target. Source: own calculations and concept. Figures from company CDP disclosures

Between 2015 and 2021, the full Scope emissions intensity should have decreased by 20% assuming a linear reduction trajectory. However, the company's reported emissions show a reduction of only 5.4%, which implies an overshoot of 18% in 2021 compared to the projected figure.

A gap of a similar magnitude between the target's intended end result and the company's projected trajectory can be observed if the intensity target is converted into an absolute reduction target. In its CDP reporting, Danone estimates that if the intensity target is achieved in full and on time, it will reduce absolute emissions on Scopes 1 and 2 by 30%, and Scope 3 emissions by 25% (Danone S.A., 2022a). The equivalent full Scope absolute target implies a reduction of total gross emissions of 25.3% by 2030, compared to a 2015 baseline, which is illustrated in the chart below. In 2021, the last year of reporting, Danone's total emissions were 11.84% higher than those projected by the target's trajectory.

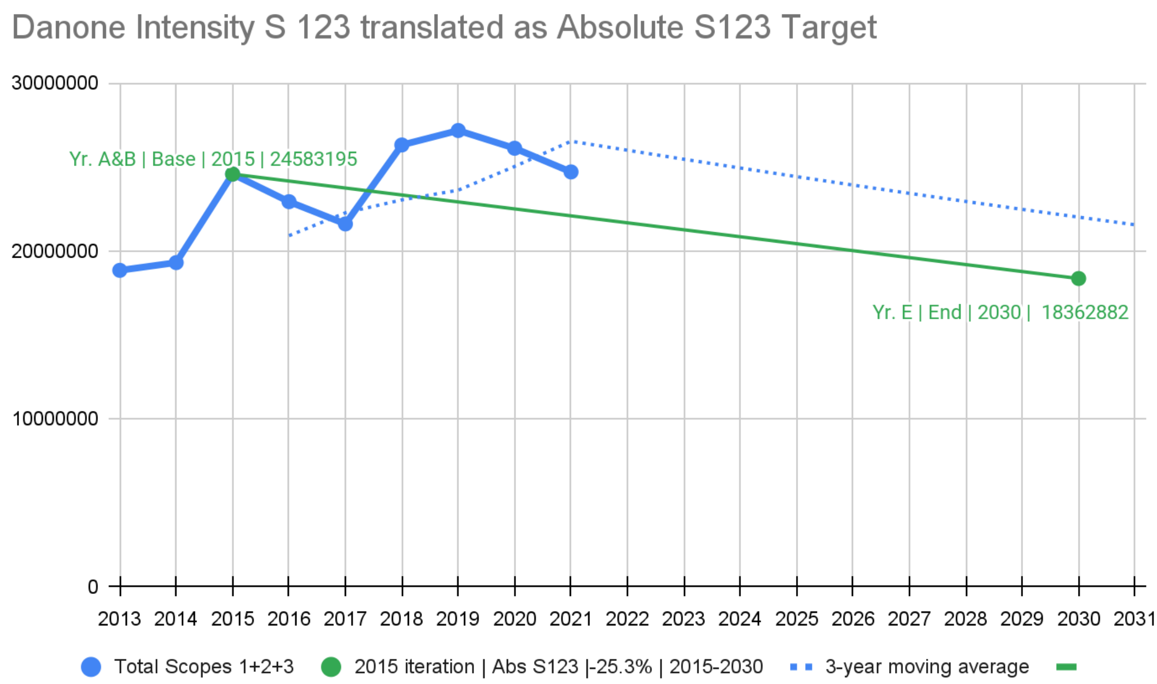


Figure 7.11 : Danone Scope 1+2+3 Intensity Target translated as Absolute S123 Target. Source: own calculations and concept. Data sourced from company CDP disclosures.

As a result, Danone's past performance relative to its currently active target is -1.

P2. Emissions performance compared to current target iteration			
Target iteration	**(Reported value in Yr. D - Projected value in Yr. D D)/ Projected value Yr. D**	**Interpretation**	**Performance score relative to currently active target**
2015 iteration | S123 | 50% | 2015-2030	18.2%	Company is underperforming relative to its current target	**-1**

The final score for past performance on Danone's intensity target is obtained by adding up the two subcomponents, P1 and P2. The past performance score of -1 indicates that Danone is underperforming compared to at least one of its targets. The fact that Danone is underperforming compared to its current target signals that it has set a target that is unfeasible given its past strategy and resources dedicated to achieving the goal.

P. Past Performance score			
Target iteration	**P1. Performance score relative to past target iterations**	**P2. Performance score relative to currently active target**	**P. Past Performance score = P1+P2**
2015 iteration | S123 | 50% | 2015-2030	**0**	**-1**	**-1**

Target commitment score

Assessing the level of ambition of a decarbonization pledge consists of two steps: 1) comparing the target's implied yearly reduction rate to the yearly reduction rate of its previous iterations, and 2) comparing the current pledge's end goal value to projected emissions under the organization's current operating model and capacities.

C1. Current target ambition compared to past target iteration

Since there are no closely comparable past iterations of Danone's full Scope intensity target, the first component is assessed with a score of zero.

C1. Current target ambition compared to past target iteration			
Target iteration	**Yearly rate of change of past iteration as % of rate of change of current target**	**Interpretation**	**A1. Ambition score relative to past iteration**
2015 iteration | S123 | 50% | 2015-2030	N/A	No past iteration	**0**

C2. Current target ambition compared to business as usual trajectory

To calculate the second component we compare the expected value should the target be met fully and on time with the projected value under a business as usual scenario. According to a moving 3-year average calculation (Figure 7.11), the end value reached in 2030 based on the company's current trajectory would be 79% higher than the value implied by the target. Therefore, the target commitment score relative to the company's projected emissions under a business as usual scenario is 1.

An analysis of the intensity target translated into absolute terms results in a similar conclusion. Using a 3-year moving average to estimate total emissions in 2030, we obtain a figure which is 20% higher than the target's expected result.

C2. Current target ambition compared to business as usual trajectory			
Target iteration	**(BAU GHG in Yr.E - Targeted GHG in Yr.E) / Targeted GHG in Yr.E**	**Interpretation**	**Ambition score relative to business as usual trajectory**
2015 iteration | S123 | 50% | 2015-2030	79.5%	Target is more ambitious that the business as usual trajectory	1

The final target commitment score is obtained by summing up the scores obtained for C1 and C2, resulting in a score of 1.

Target commitment score			
Target iteration	**C1. Ambition score relative to past iteration**	**C2. Ambition score relative to business as usual trajectory**	**C. Commitment score = C1+C2**
2015 iteration | S123 | 50% | 2015-2030	0	1	1

Strategy score

Drivers of Scope 3 emissions

The evolution of Danone's Scope 3 emissions since 2010 is illustrated in the chart below. It is important to note that Danone only started reporting on all Scope 3 sub-streams in 2015, and therefore the figures between 2010 and 2014 are not representative of the company's performance on Scope 3. As the chart shows, changes in total Scope 3 emissions between 2015 and 2021 closely follow the evolution of the Purchased Goods and Services sub-component, while all other upstream and downstream categories stay relatively constant over the same period.

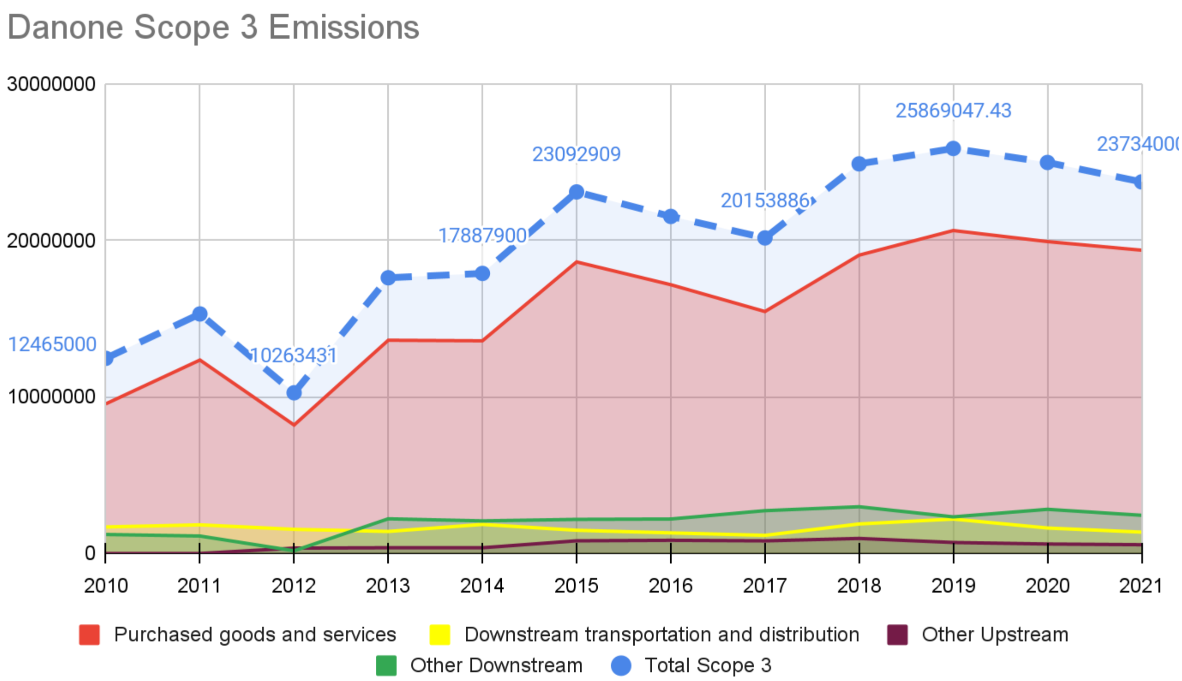


Figure 7.12 : Danone Scope 3 emissions. Source: own calculations and concept. Figures from company CDP disclosures

A breakdown of Danaone's emissions per commodity purchased (Danone S.A., 2021e) reveals emissions from agricultural commodities represent 77.3% of total emissions in the Purchased Goods and Services category, and 60.6% of Danone's total emissions in 2021. Furthermore, emissions related to purchases of milk and other dairy-related ingredients accounted for more than 65% of emissions in the Purchased Goods and Services pillar and 52.1% of total emissions in 2021 (Danone S.A., 2021e).

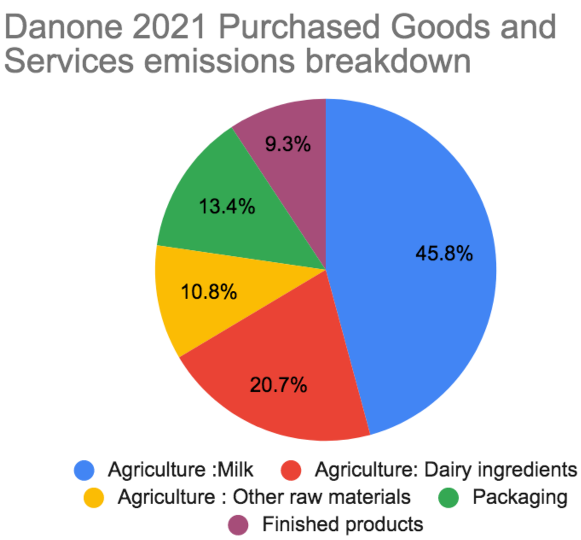


Figure 7.13 : Danone 2021 Purchased Goods and Services emissions breakdown. Source: Danone S.A., (2021e).

Agricultural raw materials also represent a high proportion of Danone's cost of goods sold, and represent a significant degree of complexity in its value chain. Agricultural inputs represented 50 % of Danone's material costs in 2022 (4.8 B€) 75% of its agricultural inputs are sourced directly from approximately 130000 producers (Soubeiran, 2018). The remaining 25% comes from around 400000 farms via indirect sourcing. In total, Danone counts 1.5 million agricultural hectares across its value chain, responsible for 60% of the company's CO2 footprint (Soubeiran, 2018).

Therefore, in order to assess Danone's strategy to achieve its emissions reduction target on its full emissions Scope, it is essential to understand its approach to tackling emissions derived from the sourcing of raw materials.

S1. Land-use change score

The centrality of land-based solutions in delivering Danone's decarbonization targets was already apparent in its 2015 climate policy, whereby it committed to work towards "net positive" climate impacts by sequestering more carbon in soils, forests and other ecosystems and by increasing the resource efficiency of dairy farming practices (Danone S.A., 2016a). Among the four strategic levers mentioned in Danone's 2015 Climate Policy, two are land-based mitigation measures: sequestering more carbon in soil through improving agricultural practices and eliminating deforestation along the supply chain. (Danone S.A., 2019g).

In 2015, timber, palm oil and soy (as a primary raw ingredient and cattle feed) were covered by the company's pledge to eliminate deforestation impacts from its supply chain by 2020 (Danone S.A., 2017b). Danone was committed to eliminating deforestation from its supply chain by 2020, and to the principles of no deforestation, no development on peat, and no exploitation of rights of workers, indigenous peoples and local communities (NDPE). Specific sourcing policies for palm oil and timber had already been in place prior to 2015, including commodity-specific targets for some of its key raw materials. More broadly, Danone's practices on protecting terrestrial ecosystems were guided by a 2014 White Paper on Sustainable Agriculture. In 2020, these policies remained the foundation of Danone's work to prevent Land Use Change, while Danone worked to deepen the level of traceability and quality of certification for each commodity.

Timber

Danone's Forest Footprint policy, dating from 2012, pledged that 100% of the company's Paper & Board will be either certified or recycled by 2020, while maintaining zero deforestation and forest degradation. In 2015, 98.5% of Danone's Paper & Board sourcing met this criterion (Danone S.A., 2017b). However, only 17% of the company's virgin paper based packaging were FSC or PEFC certified, and 11-20% of the quantity consumed was traceable (Danone S.A., 2017b). In 2020, 98% of the company's paper and board came from recycled or virgin certified fibers. The share of virgin wood that is certified has also increased to 94% (Danone S.A., 2022b).

Palm oil

In 2015, 100% of the company's palm oil purchases were traceable and certified through RSPO. Palm oil products were traceable until the mills, with a target of obtaining traceability to the producers in the upcoming year (Danone S.A., 2017b). Danone's responsible sourcing policy for Palm Oil also mandated high conservation value (HCV) management, high carbon stock (HCS) management and no peatland conversion (Danone S.A., 2017b). By 2020, 85% of Danone's Palm oil was traceable to the plantation, and the remaining 15% was traceable to the mill.

Soy

In 2015, Danone was piloting approaches to reduce its reputational risks associated with its soy supply chain, whereby only 1-5% of its soy consumption was traceable. Its actions in 2015 included finding cost competitive substitutes to soy as cow feed and a pilot in Brazil to assess deforestation risks in the value chain (Danone S.A., 2017b)).

By 2020, Danone had made significant progress on ensuring traceability for the soy it sources directly. Soy used for manufacturing its Alpro drink, for example, is grown in Europe, the United States and Canada, in areas with limited deforestation risks. However, it estimated that 27% of the soy it uses for animal feed is not traceable and prone to deforestation risks (Danone S.A., 2022a).

S1. Land-based measures	**2020 score**	**2020 score explanation**
S1.1 Land-use change	2	The company provides evidence that it has achieved 100% DCF supply chains for all its relevant high-risk commodities

S2. Regenerative agriculture score

Danone's sharpened focus on regenerative agriculture can be traced back to COP 23 in 2017, where it defined the three pillars constituting its approach to regenerative agriculture: 1) protecting soil, water and biodiversity, 2) empowering a new generation of farmers and 3) promoting animal welfare (Danone S.A., 2019g).

In 2015, Danone was in the early days of its work on improving sustainability practices in its dairy sourcing. Its policies and actions derived mainly from the Dairy Sustainable Framework and Global Dairy Agenda for Action, which identified 11 areas of progress including reducing Greenhouse Gas Emissions, improving soil nutrients and protecting biodiversity. The resulting Quality Charter for Milk Producers promoted practices to increase dairy farm productivity while reducing methane and nitrogen from manure management, fertilizer and feed. Based on the company's 2016 CDP disclosure, these actions appeared to be limited in terms of dissemination and were not subject to quantifiable and time-bound targets.

In 2020, the company's achievements in the sphere of regenerative agriculture are considerable compared to 2015. It has developed a Regenerative Agriculture Scorecard, which promotes better practices for fertilizer management, crop rotation, tilling, etc. For dairy farming specifically, Danone is promoting methane, nitrous oxide and carbon dioxide reductions through its Cool farm tool, which covers the majority of the company's dairy sourcing. Danone's 2020 Water Policy pledged to optimize the company's use of fertilizers and agro-chemical inputs in 75% of milk, fruits, almond and soy volumes by 2030, and to increase buffer zones by at least 15% within farms by 2030

Danone's regional business units have shown leadership in operationalizing the group-wide pledge. In 2018, Danone North America committed up to 5 million EUR to a 5-year research partnership on increasing soil carbon sequestration. Danone France committed to sourcing 100% of its ingredients produced in France via regenerative agriculture, and donated 1 day of its revenues (amounting to 5 million EUR) to support farmers in shifting their agricultural practices. The company expected to see a resulting emissions reduction of 15% by 2025 thanks to these efforts (Danone S.A., 2019g). In 2014, Danone launched the Livelihoods Fund for Family Farming (Livelihoods 3F) program, as an investment vehicle aimed at supporting small scale farmers adopt sustainable agricultural projects. Up to 120 million Euros were expected to flow towards farmers in Africa, Asia and Latin America for 10 years, in support of over 40 projects (Danone S.A., 2016b).

However, best practices remain local or at best regional in terms of roll-out and future strategy. Quantifiable evidence of the emissions reductions achieved through better dairy farming is currently only disclosed for certain markets and projects. For instance, Danone US has implemented its Regenerative Dairy program country-wide, and has taken steps to apply it to other crops such as almonds, resulting in 80000 tons of CO2 reduced. A separate project implemented in France ("Les Deux Pieds sur Terre"), resulted in a 3.6% decrease in the carbon intensity of a liter of milk as of 2020.

Danone applies the same project-based approach to setting targets for renewable agriculture. For instance, "Les Deux Pieds sur Terre" project aims to reduce the carbon emissions of French farmers by 15% by 2025, in contribution to a wider country-wide target of sourcing 100% of ingredients produced in France from regenerative agriculture by 2025. Pledges from brands have also followed suite, with Bledina aiming to procure 100% of its ingredients from regenerative agriculture. The company's North America branch has committed to invest 6M$ in research on regenerative agriculture between 2018 and 2023, and is expecting investments of up to $20 million dollars for supporting farmers to adopt regenerative agriculture practices.

Quantifiable, time-bound targets are disclosed for certain projects, but company-level targets remain vague. In its 2021 annual report, Danone discloses that 19.7% of its key ingredients were sourced from companies which had started the transition towards regenerative agriculture, compared to a target of 15% in the same year, and to 8% in the previous year. However, Danone does not provide a definition for the key terms in its target, and does not commit to a future target (Danone S.A., 2022d).

S2. Regenerative agriculture	2020 score	2020 score explanation
Pesticide and fertilizer use, enteric fermentation, soil carbon and agroforestry	1.5	The company does not have a time-bound target, but provides evidence for the percentage of food (by volume or procurement spend) sourced from regenerative agriculture practices

S3. Shifting Diets score

Danone is currently the number 1 player globally in dairy alternative protein products with strong positions in the Beverages, Yogurt, Ice Cream and Cheese categories (de Saint-Affrique, 2022).

With the acquisition of WhiteWave in 2017, Danone positioned itself as a leader in plant-based beverages and organic dairy products, sold under the brand Alpro (Danone S.A., 2022d). Between 2019 and 2020, the company's revenues from plant-based products had increased by 15%, and accounted for 9.3% of the company's revenue in 2020 (Danone S.A., 2022d) Going forward, Danone plans to capitalize on the flexitarian and alternative protein trend to use its leading plant-based brand Alpro as a growth driver in Europe (de Saint-Affrique, 2022).

S3. Shifting diets	2020 score	2020 score explanation
Shift to plant-based diets	1.5	The company does not have a sales-based target, but discloses an increase in alternative proteins sales.

S4. Food waste

Danone has become increasingly more efficient at both eliminating food waste from its production process and recovering the waste produced. The chart below illustrates the company's food waste consolidated at production site Scope with the exception of facilities producing water and covers finished product, raw material and by-products (Danone S.A., 2021e) Between 2017 and 2021, the total quantity of food waste generated relative to production has decreased by 37%, while the proportion of food waste which is recovered grew by 6.8% (Danone S.A., 2018c), (Danone S.A., 2021e).

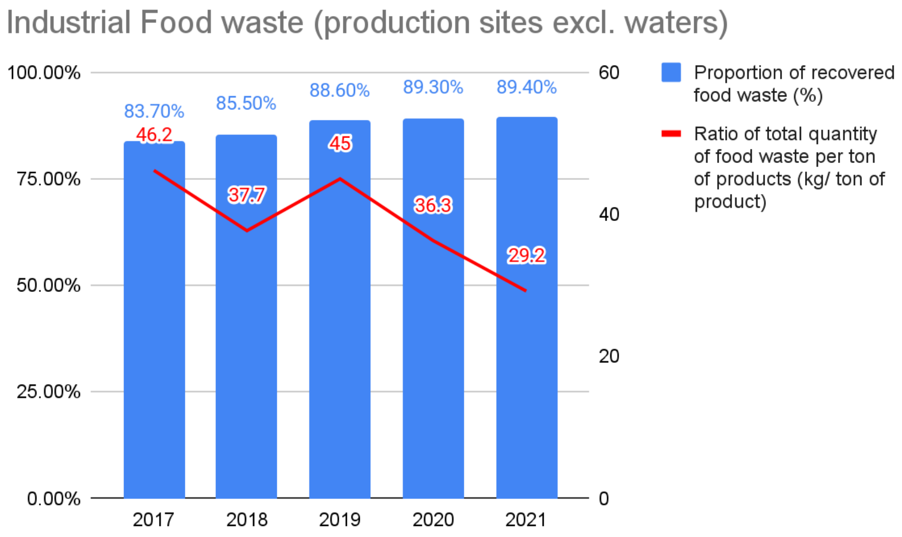


Figure 7.14 : Danone industrial Food waste. Source: Danone S.A.,(Danone S.A., 2018c), (Danone S.A., 2021e).

A similar reduction pattern is also observable on an extended perimeter which covers not only Danone's industrial operations, but also the waste generated along its supply chain. Since 2020, Danone also consolidates food waste generated in the Scope 3 downstream sub-Scope in its food waste metrics (Danone S.A., 2020b) When taking into account food waste produced in the supply chain, the intensity of food wasted per ton of product manufactured increases by 22% in 2021. Between 2017 and 2021, however, Danone has succeeded in reducing this intensity by 28%. In 2021, Danone was recovering 81% of the food waste generated along its supply chain, which is 5% more than in 2017.

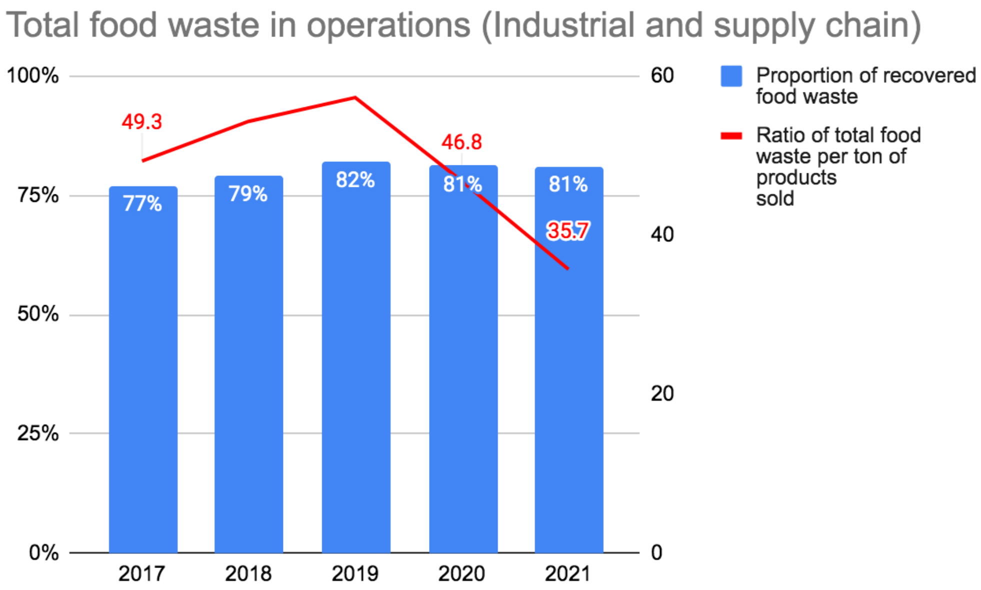


Figure 7.15 : Danone total food waste in operations. Source: Danone S.A.,(Danone S.A., 2018c), (Danone S.A., 2021e).

In 2016, Danone set a The Food Loss and Waste Protocol compliant (Danone S.A., 2016a) target to reduce non-recovered waste (waste to landfill, incinerated without energy recovery or discharged in wastewater) in its industrial operations and supply chain by 50% by 2025, from a 2016 baseline. The company's progress against this target is illustrated below.

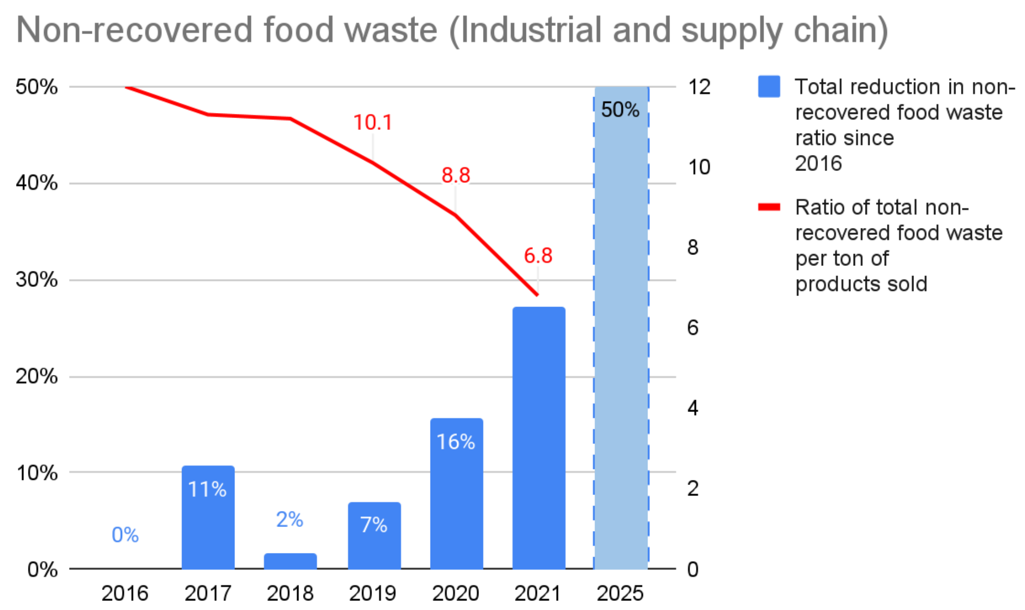


Figure 7.16 : Non-Recovered food waste. Source: Danone S.A.,(Danone S.A., 2018c), (Danone S.A., 2021e).

The target remained active in 2021, when the company reported a 27.2% reduction compared to its baseline. Danone's 2021 performance places it slightly behind on its target. In 2019, 74% of entities at which food waste in operations occurs had implemented at least one concrete measure to improve their waste recovery rate (Danone S.A., 2022a).

In 2020 Danone broadened its commitment and aligned it to the SDG framework, committing to halving food losses within its supply chain by 2030 (Danone S.A., 2021b). In 2021, the company reported that it had engaged 20 of its suppliers in making the same commitment (Danone S.A., 2022d).

S4. Reduce Food Waste	**2020 score**	**2020 score explanation**
Reduce food loss and waste	2	The company has a time-bound target to reduce FLW across its own operations, and reports progress against it. The company provides evidence of activities to collaborate with value chain partners to prevent FLW

Total strategy score

To obtain the final strategy score for the company's Scope 3 target, the scores of each sub-category are multiplied by the weights derived from Roe et al (reference), as shown in the table below:

Strategy pillars	2020 Metric	Weight	2020 metric weighted	Final metric based on WBA (sum of all weighted scores)	Corresponding strategy score
S1. Land-based measures	1.5	58%	1.15	1.825	3 Strong strategy
S2. Regenerative agriculture	1.5	29%	0.4275		
S3. Shifting diets	1.5	7%	0.105		
S4. Reduce Food Waste	2	7%	0.14		

Target stretch score

In the next step, the commitment and the strategy scores are combined to calculate the target's level of stretch. The resulting stretch score of -2 is calculated by subtracting the strategy score from the commitment score. It represents a medium level of difficulty, owing to the company's strong strategy and average commitment.

Target stretch score						
S and C scores	Commitment = 3	Commitment score = 2	Commitment score = 1	Commitment score = 0	Commitment score = -1	Commitment score = -2
Strategy score = 3	0	-1	-2	-3	-4	-5
Strategy score = 2	**1**	0	-1	-2	-3	-4
Strategy score = 1	2	1	0	-1	-2	-3
Strategy score = 0	3	2	1	0	-1	-2

Target likelihood score

Finally, the target's likelihood score is calculated by subtracting the stretch score from the past performance score. The resulting likelihood score of 1 is equivalent to a target achievement level of 50%.

Likelihood of meeting target	Past Perf. = 3	Past Perf. = 2	Past Perf. = 1	Past Perf. = 0	Past Perf. = -1	Past Perf. = -2
Stretch score: 3	0	-1	-2	-3	-4	-5
Stretch score: 2	1	0	-1	-2	-3	-4
Stretch score: 1	2	1	0	-1	-2	-3
Stretch score: 0	3	2	1	0	-1	-2
Stretch score: -1	4	3	2	1	0	-1
Stretch score: -2	5	4	3	2	**1**	0
Stretch score: -3	6	5	4	3	2	1
Stretch score: -4	7	6	5	4	3	2
Stretch score: -5	8	7	6	5	4	3

Target 3: Achieve Carbon Neutrality until 2050

Net Zero Roadmap

The intermediary targets evaluated above contribute to Danone's longer term target of achieving carbon neutrality by 2050. Its Net Zero roadmap, reproduced below, indicates that the company's emissions will peak between 2020 and 2025, after which they will decrease at a linear rate until 2050 (Danone S.A., 2021c, p.6)

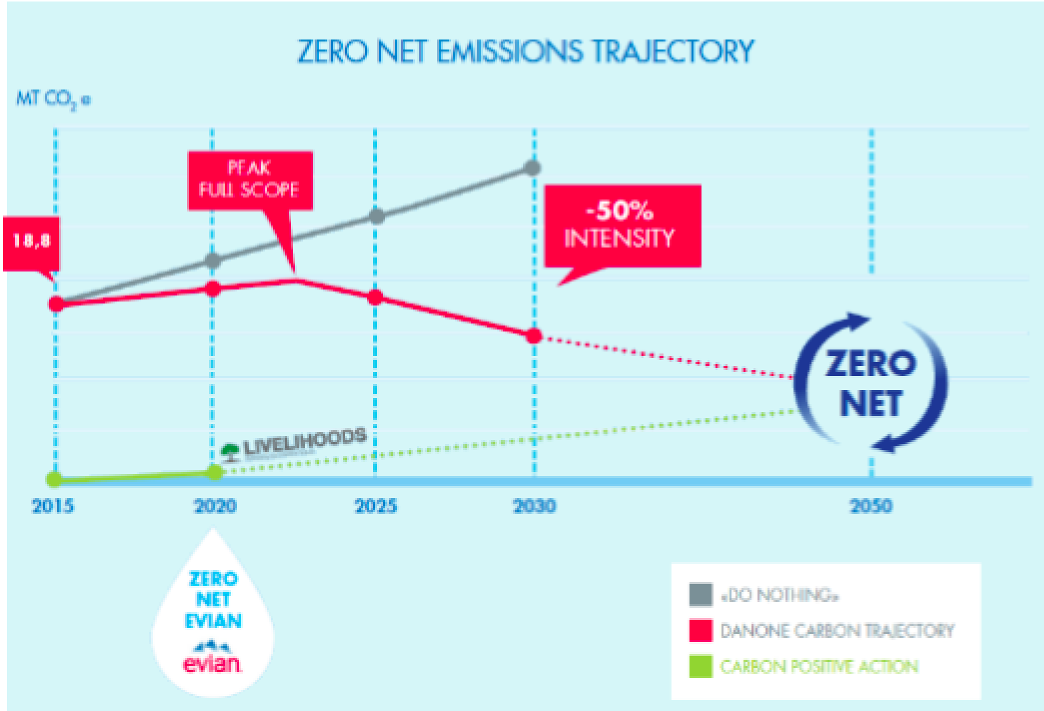


Figure 7.17 : Danone Zero Net Emissions Trajectory. Source: Danone S.A., (2016b, p.6)

In the best case scenario depicted by this roadmap, the company's full Scope emissions intensity will halve every 15 years, assuming that Danone will reach its Scope 1,2 and 3 emissions target fully and on time, and that Danone will continue decarbonizing its value chain at the same rate until 2050. Having determined that a 50% reduction in full Scope emissions intensity is equivalent to an absolute reduction of 25.3%, the trajectory described in this image would result in full Scope absolute emissions reductions of about 60% compared to the 2015 baseline. At the same time, "Carbon Positive Actions" resulting from Livelihoods Fund projects are expected to be scaled up to a level where they can compensate for the remaining 40% of emissions, which can be considered residual.

However, Danone's Zero Net Emissions trajectory is at best a sketch of a best case scenario, leaving several crucial elements undefined. Firstly, the company has not disclosed any targets for reducing Scope 1,2 and 3 emissions after 2030. As a result, it is not possible to estimate the amount of emissions that will need to be removed by 2050. Secondly, It does not provide a target for scaling up carbon removals, and does not indicate the extent to which it is planning to rely on offsets to reach its Net Zero objective. Thirdly, the company does not indicate whether it considers carbon removal mechanisms that go beyond the nature-based solutions provided by its livelihood funds, making it difficult to estimate the associated costs and technological maturity of its foreseen carbon removal measures.

To better understand the conditions necessary for Danone to meet its Net Zero target by 2050, the following analysis will rely on three estimations: 1) the company's investments in carbon removal projects as an indicator of its access and know-how to high quality carbon offset projects, 2) the unabated carbon based on the company's likelihood of meeting its current targets and 3) the resulting cost of abating carbon relative to the company's current financial performance.

Carbon removal

Danone has been developing “carbon positive” programs since 2008, when it established the Danone Fund for Nature in collaboration with two conservation NGOs to restore degraded ecosystems, supporting local economies and generating high-quality carbon credits (Livelihoods Fund, 2021). The first Livelihoods Carbon Fund

Following its successful delivery of a large-scale mangrove restoration project, the Danone Nature Fund for conservation became an independent entity in 2011, under the new name of the Livelihoods Carbon Fund. The Livelihoods Carbon Fund #1 was backed by 9 other corporates who, together with Danone, invested 40M EUR in projects that sequester carbon through mangrove restoration, agro-forestry and improved cooking stoves (Livelihoods Fund, 2021a). The fund delivers high quality carbon credits by supporting local communities to build livelihoods around activities that deliver environmental benefits alongside economic sustainability. Thanks to the fund, more than 130 million trees (equivalent to 50000 hectares) were planted, which are expected to sequester 10 million tons of CO2 over 20 years. The second fund was launched in 2017, was endowed with €65 million and was projected to remove 12 million tons of CO2 from the atmosphere within 20 years (Livelihoods Fund, 2021a).

In 2021, the third Livelihoods Fund was launched, with a first closing at €150 million, and an expected delivery of up to 30 million carbon offsets over the duration of the fund. This marks a considerable scaling of the Livelihoods model compared to its previous iterations, and introduces a new ownership model focused on the delivery of carbon credits for its investors. In return for their investments, the fund’s 14 investors receive carbon offset credits instead of dividends, and are actively involved in the fund’s decisions. The carbon credits are certified by leading schemes such as the Gold Standard and VERRA, and are calculated based on actual quantities of carbon sequestered or reduced, and not on estimates of future reductions (Livelihoods Fund, 2021b).

Danone’s continued investment and leadership into high-quality carbon offset credit development represents a best practice in the Food and Beverage industry, and provides evidence that Danone is well positioned to gain future access to nature-based carbon offsetting solutions. To date, however, Danone’s benefits in the form of carbon offsets have been limited, and used mainly for brand-specific offsets. In 2020, Danone reported that it had purchased over 420000 carbon credits through projects implemented via its funds, the same year when its water brand Evian has reached carbon neutrality (Danone S.A., 2016b). Through a similar mechanism, the Villavicencio brand in Argentina has claimed to have prevented the deforestation of 48 million m2 of native forest (Danone S.A., 2022a).

According to Danone’s sustainability officer, the company’s water brands Evian and Volvic are the only leading global FMCG brands to have achieved full-Scope carbon neutrality, a sustainability performance linked to substantial financial benefits for the two brands (Danone S.A., 2022c). In 2018, Evian’s planet & plastic proactiveness campaign led to a 35% uplift on differentiation, a 15% uplift on purchase intention and a 10% uplift on recommendation (reference). While the practice of “insetting” is controversial (Day et al., 2022) Danone’s push for carbon neutrality on core brands does create a positive reinforcement loop between business performance and decarbonization, and demonstrates a strategic level of integration between its business objectives and its carbon removal work via the Livelihoods Funds.

However, beyond the investment and carbon credit origination targets disclosed for its funds, Danone does not provide quantifiable goals for ecosystem restoration, nor does it specify the amount of credits it aims to use in order to neutralize its own emissions. It is therefore only possible to estimate the future evolution of the Livelihoods Fund, and the extent to which they will contribute to eliminating Danone's residual emissions.

Unabated emissions scenarios

The amount of carbon left unabated, and which will therefore need to be neutralized, can be understood as the company's emissions which are left once its targets have been met. Three scenarios are constructed based on the probability that Danone will be able to meet its current targets, and continue to decarbonize at the same rate between 2030 and 2050. Three scenarios are considered: 1) A best case scenario, in which Danone meets its 2030 targets in full and on time, and continues to reduce emissions on the respective Scopes in a linear manner compared to the baseline; 2) A "Past Performance" scenario, which estimates different target completion levels based on the likelihood scores compiled in the previous sections. The resulting decarbonization rates are then projected forward to 2050 using a simple linear trajectory. Finally, scenario 3) represents the worst case scenario, in which the current emission trajectory continues unabated. The resulting scenarios are summarized in the table below.

Unabated emissions scenarios				
	Name	**Target**	**Likelihood score**	**% of target achieved by target end**
1	Best Case Scenario	Scopes 1&2 (2017 iteration | Abs S12 constant consolidation | -30% | 2015 -2030)	Not relevant	100%
		Scope 3 (2015 iteration | Int S123 | 50% | 2015-2030)	Not relevant	100%
2	Past Performance Scenario	Scopes 1&2 (2017 iteration | Abs S12 constant consolidation | -30% | 2015 -2030)	**5**	75%
		Scope 3 (2015 iteration | Int S123 | 50% | 2015-2030)	**1**	50%
3	Business as usual	Scopes 1&2 (2017 iteration | Abs S12 constant consolidation | -30% | 2015 -2030)	Not relevant	0%
		Scope 3 (2015 iteration | Int S123 | 50% | 2015-2030)	Not relevant	0%

The resulting emissions trajectories are calculated by multiplying the targeted reduction for each decarbonization goal with the % of the target achieved in each scenario, and applying the result to the baseline for each target. The resulting yearly reduction rate between the target's baseline and the target's end year is then applied repeatedly to estimate remaining emissions in 2040 and 2050. The resulting trajectories for each scenario are depicted by the chart below.

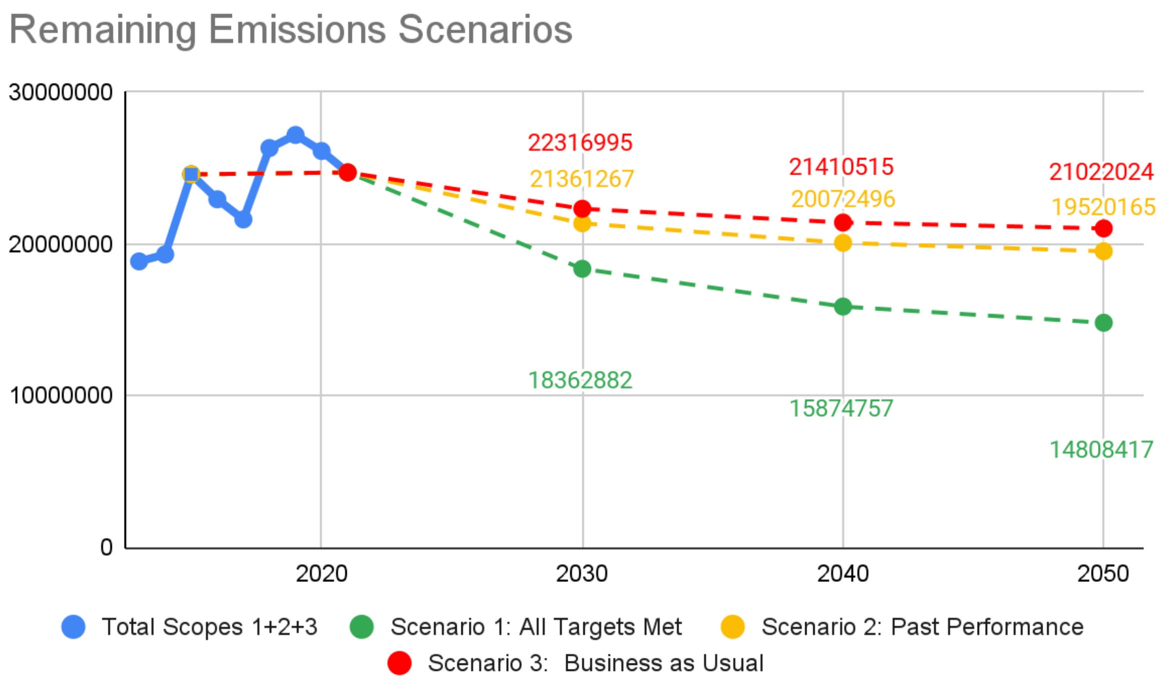


Figure 7.18 : Danone Remaining Emissions Scenarios. Source: own calculations and concept.

In Scenario #1, Danone reduces its full Scope emissions by 2.26% every year, cumulating a 33.8% absolute emissions reduction in 2030, compared to 2015. By 2040 and 2050, emissions drop by 54.8% and 66% respectively. Scenario #2, which is the most likely outcome resulting from the analysis conducted above, would have a slower decarbonization outcome of 15%, 22.4% and 25.9% reductions in 2030, 2040 and 2050 respectively, compared to 2015. In Scenario #3, where no action is taken to curb emissions, emissions decline by 10.15%, 14.8% and 16.9% by 2030, 2040 and 2050 respectively.

Given that Danone has invested substantially in carbon removal projects, it is possible to adjust the trajectories calculated above by subtracting the carbon removed from the company's residual emissions. The remaining carbon emissions represent the gap that needs to be closed in order for Danone to reach Net Zero.

From the information that is publicly available on the Livelihoods Carbon Funds, it is possible to estimate the number of carbon credits received by each fund investor on a yearly basis. The graph below illustrates this calculation, which is based on a series of simplifications: 1) the total number of credits will be distributed equally among partners and 2) one ton of carbon sequestered is equal to one carbon offset credit and 3) the total amount of carbon removals delivered by each fund is equally distributed across the lifespan of the fund. For instance, LCF #1 is expected to remove a total of 20 million tons of carbon in 20 years, and is backed by 10 partners. Given the assumptions listed above, each partner would receive a total of 50000 carbon offsets per year. In the years 2021 -2031, when all three funds are expected to generate carbon credits concomitantly, Danone, who is invested in all three funds, could expect to receive yearly around 232000 carbon credits from all three carbon fund investments.

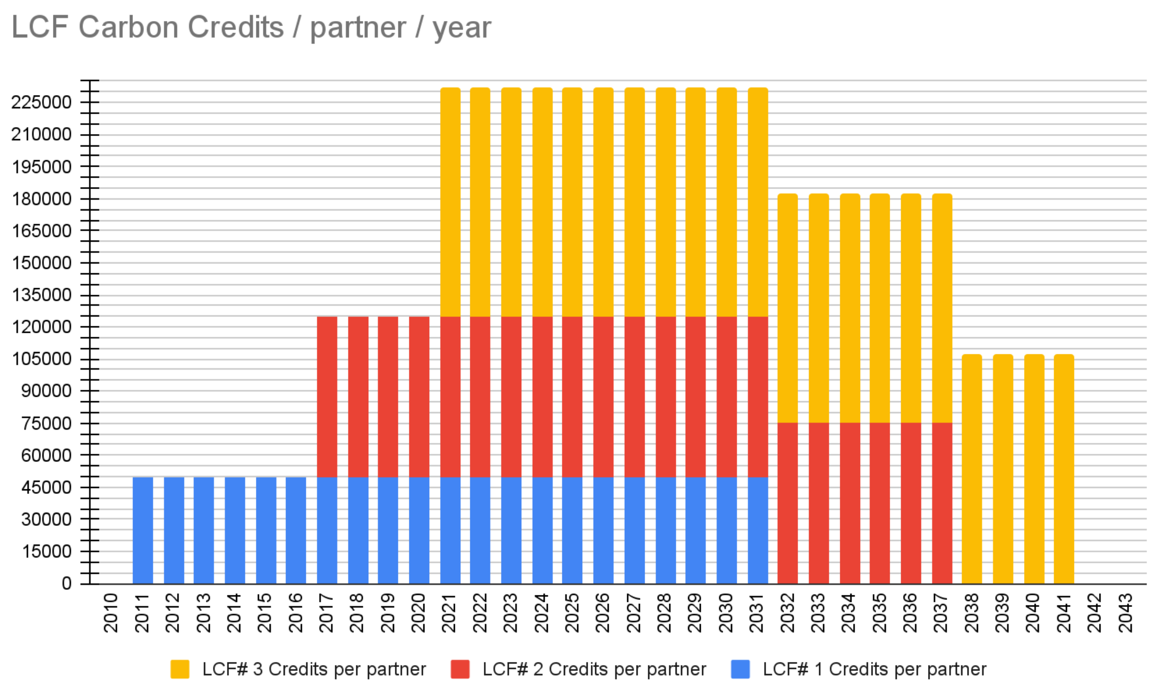


Figure 7.19 : Danone LCF Credits/ Partner / Year. Source: own calculations and concept, figures from Livelihoods Fund, (2021b)

In the interest of simplicity, we will assume that Danone will continue to receive a minimum 232000 carbon credits per year until 2050, as a result of its direct investment in carbon neutralization projects. By deducting this amount from the remaining permissions in years 2030, 2040 and 2050, we obtain the following “Net” emissions scenarios, depicted by continuous lines in the chart below.

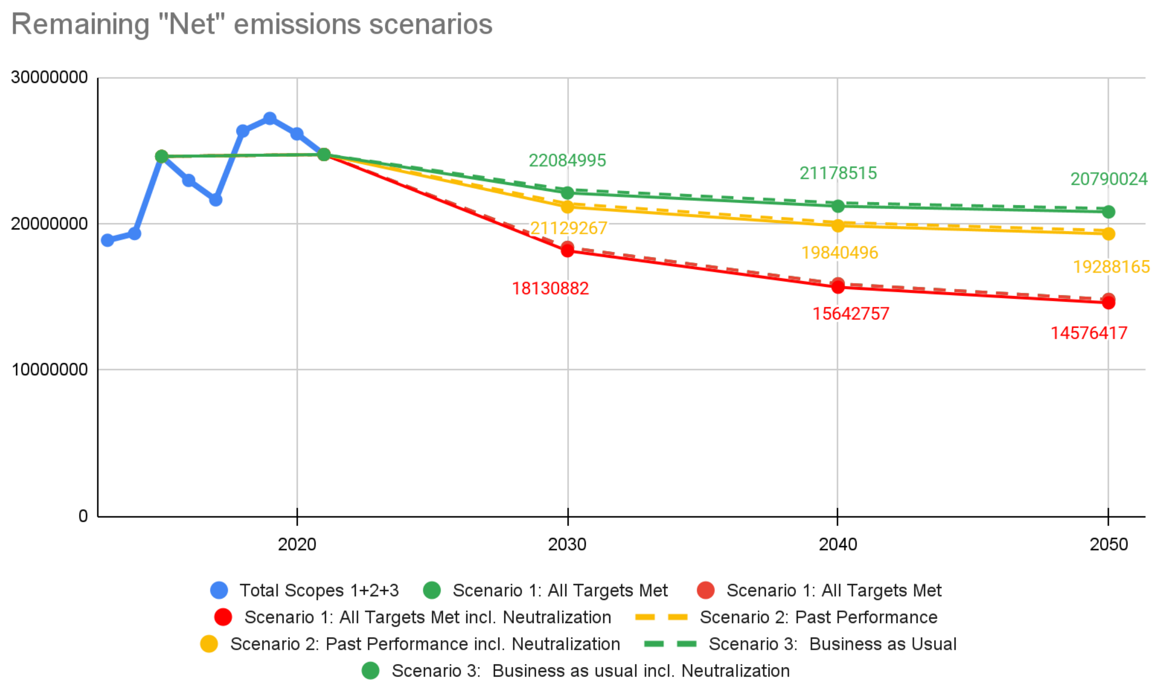


Figure 7.19 : Danone "Net" Emissions Scenarios. Source: own calculations and concept.

Estimating the costs of reaching Net Zero

Calculating the cost of neutralizing remaining emissions in 2030 and 2050 represents an intuitive, albeit imperfect, way of putting the potential financial implications of neutralizing remaining emissions into the company's present business context. For each scenario, several steps are used to translate the emissions scenarios into abatement cost estimates. The calculations presented below pertain to Scenario 1 only, and are included for illustrative purposes. The full set of calculations are available in the annex.

Firstly, remaining emissions are calculated for each scenario in 2030 and 2050, the two important milestones in Danone's decarbonization strategy. Emissions in 2030 are calculated by applying the emissions reduction target multiplied by the % achieved by the target year end to the baseline. The resulting rate of change between 2015 and 2030 is then applied linearly as a constant yearly reduction until 2050.

Cost of carbon removal in year Y				Price of carbon			
Year	T CO2e emitted	T CO2 removed	T CO2 Unabated	€15.00	€35.00	€50.00	€100.00
2030	22386218	232000	22154218	€332,313,263	€775,397,613	€1,107,710,876	€2,215,421,753
2050	21022024	232000	20790024	€311,850,354	€727,650,825	€1,039,501,179	€2,079,002,358

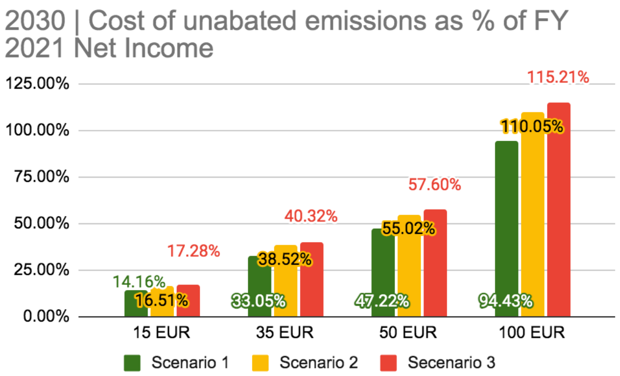
The second step consists of multiplying the remaining emissions in each year with the price of removing carbon. Four different price points have been included in the simulation: 1) the price of 15 EUR represents the current price of REDD+ V22 carbon offsets (OPIS, 2022). 2) The price of 35 EUR/

ton of carbon is Danone's internal price of carbon disclosed to the CDP in 2021 (Danone S.A., 2022a). 3) The price of 50 EUR/ tonne represents Danone's estimation of a likely carbon tax imposed by the EU ETS by 2030 (Danone S.A., 2022a). 4) the price of 100 EUR/ tonne represents an extreme scenario with significant increases in the price of carbon. This exercise can only be illustrative given the high level of uncertainty regarding the evolution of voluntary and compliance carbon markets several decades from now, and the lack of clarity regarding their application to different industries and Scopes.

In a third step, the resulting total costs are calculated as percentages of several financial indicators pertaining to Danone's fiscal year 2021: gross revenues, EBITDA, net revenues and the profit margin (Google Finance, 2022a). A fifth indicator included in the calculation is the "High financial impact threshold", an indicator disclosed by Danone as part of its CDP reporting, in answer to the following question: "How does your organization define substantive financial or strategic impact on your business?" . According to Danone's disclosure, the quantifiable threshold for a substantive financial impact is defined as a cost greater than 1% of net income, or greeted that 20 M EUR (Danone S.A., 2022a). Any cost above 500 M EUR is considered as having "High financial or strategic impact" on the business (the highest level available to select in the CDP disclosure). For illustration purposes, the table below summarizes the calculations performed for Scenario 1 for 2030.

Cost of carbon removal in 2030 as % of FY 2021 KPIs		**Cost of carbon removal in 2030 under different price scenarios**			
		€15.00	€35.00	€50.00	€100.00
		€332,313,263	€775,397,613	€1,107,710,876	€2,215,421,753
FY 21 Revenue	€24,280,000,000	1.37%	3.19%	4.56%	9.12%
FY 21 EBITDA	€4,540,000,000	7.32%	17.08%	24.40%	48.80%
FY 21 Net Income	€1,920,000,000	17.31%	40.39%	57.69%	115.39%
FY21 Net Profit margin	€1,922,976,000	17.28%	40.32%	57.60%	115.21%
High financial impact threshold	€500,000,000	66.46%	155.08%	221.54%	443.08%

The following charts compare outcomes of the calculations for the three scenarios under the four price assumptions. Chart 1 below shows the costs of unabated emissions in the year 2030 relati.ve to its gross revenues in 2021. The percentages represent the relative amount that would need to be spent by Danone in 2030 to remove its emissions in that year. Under all scenarios and all price assumptions, costs go beyond the 1% of net income threshold. The second chart presents the same figures as percentages of the company's high impact threshold. Under the company's current internal price of carbon of 35 EUR, all scenarios will result in costs that exceed this threshold.



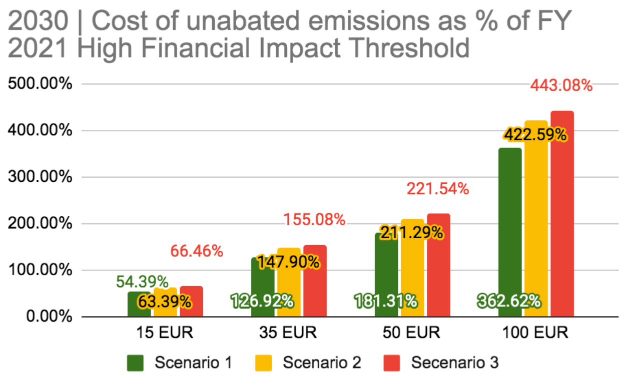
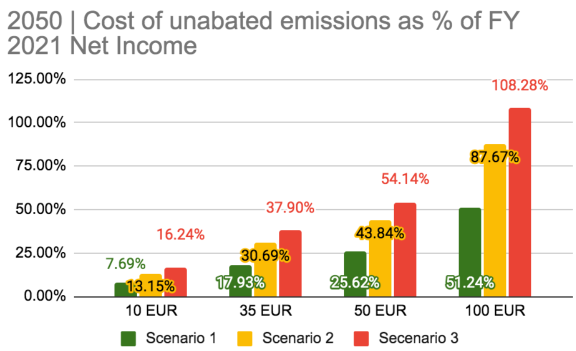


Figure 7.20 (Left) : Danone Cost of Unabated Emissions in 2030 as % of FY 2021 Net Income. Source: own calculations and concept.
Figure 7.21 (Right) : Danone Cost of Unabated Emissions in 2030 as % of FY 2021 High Financial Impact Threshold. Source: own calculations and concept.

By 2050, assuming two further decades whereby emissions decrease at the same rate as they did between 2015 and 2030, a price of up to 50 EUR/ ton of carbon removed could keep costs below the company's 500 M EUR threshold. For any other scenario, the company would only be able to remain below the limit if the cost of carbon removal is below 35EUR.



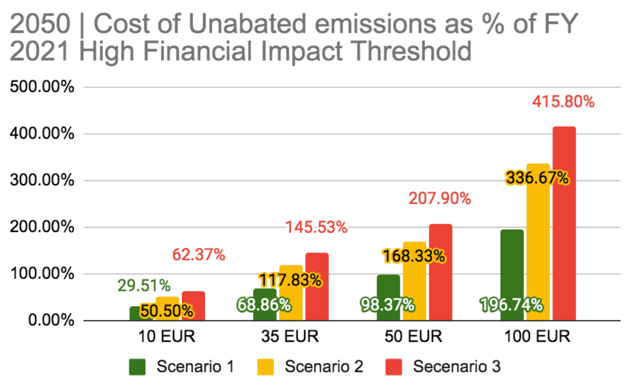


Figure 7.22 (Left) : Danone Cost of Unabated Emissions in 2050 as % of FY 2021 Net Income. Source: own calculations and concept.
Figure 7.23 (Right) : Danone Cost of Unabated Emissions in 2050 as % of FY 2021 High Financial Impact Threshold. Source: own calculations and concept.

Danone Case Study Conclusions

In recent years, Danone has not shown evidence of significant progress in aligning high-level targets, policies and strategies in the field of decarbonization. The company's key climate policy document has not been updated since 2016, and the company has yet not published new targets in line with SBTI's 1.5°C scenario, despite pledging to do so in 2019. Further inconsistencies between the company’s own reporting and its CDP disclosures have added another layer of difficulty to the analysis.

Target 1: a 30% absolute reduction of Scope 1 and 2 emissions by 2030 compared to a 2015 baseline

Danone’s Direct Responsibility Scope targets, active since 2008, have provided the company with ample experience in tackling Scope 1 and 2 emissions. Indeed, Danone has consistently reported Scope 1 and 2 emissions which are lower than the target trajectories, compared to both previous and current target iterations. Although Danone’s current target for Scopes 1 and 2 is more ambitious than previous target iterations, it is nonetheless less ambitious than the business as usual trajectory extrapolated until 2030. On a strategy level, the methodology penalizes Danone for not having aligned its targets with the 1.5°C scenario, and for its limited progress in tackling Scope 1 emissions. The moderately strong strategy, combined with a medium target stretch score, results in a most likely scenario whereby Danone would achieve its Scope 1 and 2 target at 75% by 2030.

Target 2: to reduce Scope 1,2 and 3 intensity by 50% by 2030 compared to a 2015 baseline

Danone’s second target pledges to halve the company’s full Scope emissions intensity by 2030, on a 2015 baseline, which is equivalent to an absolute emissions reduction of 30% on Scopes 1 and 2, and 25% on Scope 3. The target, set in 2015, is Danone’s first decarbonization pledge that also addresses Scopes 3 Emissions from the Purchased Goods and Services category. As a result of the lack of a comparable predecessor, the company receives a neutral score of zero on P1 (emissions performance compared to past target iterations) and C1 (current target ambition compared to past target iteration) for this target. The final P score of -1 highlights the company’s current underperformance compared to its target trajectory, while the C score of 1 reflects the fact that the target is aiming for a substantial emissions reduction compared to Danone’s estimated business as usual trajectory for 2030.

Danone’s strategy score of 3 for its full-Scope target reflects the substantial progress the company has made between 2015 and 2021 in terms of eliminating deforestation from its supply chain, its strategic pursuit of market leadership in the plant-based product category and its actions to combat food waste. While the company has made significant advances in research and policies around regenerative agriculture policies, it has not yet issued a group-level target for the percentage of its sourcing originating from regenerative agriculture. Although this prevents the company from obtaining the maximum score for the Regenerative Agriculture sub-category, its overall policies and actions on tackling Scope 3 emissions are indicative of an overall strong strategy.

Taken together, the Commitment and the Strategy scores for the company’s full Scope intensity reduction target result in a Stretch score of -2, which indicates moderate levels of novelty and difficulty. A likelihood score of 1 results by combining the performance score with the stretch score, which is equivalent to an estimation that the company will achieve 50% of its target by 2030.

Target 3: Achieve Carbon Neutrality until 2050

In contrast to the two targets elaborated above, Danone’s carbon neutrality target lacks specificity. The company only provides a graphical depiction of its Net Zero trajectory, which does not offer a quantified trajectory for neither emissions nor removals after 2030.

Danone stands out in terms of its carbon removal efforts, which have been driven by successive iterations of its Livelihood funds which invest in high-quality reforestation and conservation projects. While the company’s model of federating key industry players to invest directly into carbon removal projects is a sector-leading innovation, the amount of credits generated is negligible compared to the company’s projected residual emissions. Furthermore, the path to potential scalability remains opaque.

In the most likely scenario, Danone fulfills 75% of its Scope 1 and 2 target and 50% of its full Scope intensity target. Under this scenario, Danone would need to spend 55% of its FY 2021 Net Income to offset its emissions in that year, considering Danone’s estimation that the price of carbon in 2030 will be around 50 EUR/ ton. In 2050, this figure is projected to be 43%, assuming the price of carbon stays stable. Under a scenario whereby the price of removing carbon is 100 EUR / ton, the cost of removing carbon is projected to be 115% and 108% of FY 2021’s Net Income, in 2030 and 2050 respectively.

8 Conclusions

Research objectives

This thesis has sought to develop a methodology for assessing the feasibility of reaching Net Zero targets, based on a company's track record. In order to answer the question "How can insights from a company's decarbonization track record help to assess the feasibility of its Net Zero targets?", the thesis has developed and tested three quantifiable indicators: 1) a company's past performance compared to a target, 2) a target's degree of commitment and 3) a company's strategy in meeting its targets.

This thesis builds on academic and practitioner-driven research to construct and prototype a methodology for assessing the feasibility of reaching Net Zero targets. Combining Sitkin et al.'s (2011) work on the Paradox of Stretch Targets, and MSCI's approach in assessing the robustness of decarbonization targets, the methodology proposes a 10-step process for assessing the feasibility of Net Zero targets. The model derives unabated emissions scenarios based on a company's track record in setting and working towards decarbonization targets, combined with the level of "stretch" (broadly understood as level of ambition) displayed by a target. These scenarios are then used to estimate the cost of removing residual carbon as a percentage of a company's latest financial indicators. The methodology is then tested on two in-depth case studies from the Food and Beverage industry.

Overall, the methodology has provided a model for reducing the ambiguity inherent to long-term Net Zero targets through three key indicators: a company's track record, a target's level of ambition and a company's strategy in tackling its goals. The model has shown that by combining these indicators into a target achievement probability, it is possible to quantify the emissions that need to be removed in order to reach Net Zero and therefore to estimate associated costs. The methodology's strength consists in its ability to model different scenarios of target achievement given a company's decarbonization track record. The model can be further developed by improving forward-looking analysis and by encompassing the full CDP target dataset.

The following sections provide detailed conclusions and discussion points with regards to the key pillars of the methodology (the past performance score, the target commitment score, the strategy score, the stretch score, the likelihood score and the remaining emissions scenarios) as well as findings for the Food and Beverage industry.

What insights does past performance score offer for assessing the feasibility of decarbonization targets?

Past iterations of targets for Scopes 1,2 and 3 represent a crucial stepping stone for setting Net Zero targets. On one hand, they signal that a company has accumulated experience and resources in reducing its carbon footprint, and therefore is better prepared to tackle a more complex and long-term goal such as reaching Net Zero. On the other hand, the magnitude and timeline of Net Zero targets are dependent on the carbon budget that remains to be neutralized once all internal reduction measures have been fully exploited. Net Zero pledges are therefore predicated on a company's ability to meet its Scope 1,2 and 3 targets, and cannot be considered as isolated objectives

The methodology developed in this thesis has offered a simple, scalable way of assessing how a company has performed historically compared to expired and current targets. A company with a good track record in meeting and setting decarbonization targets has likely accumulated experience and has integrated best practices into its operations and culture. One would therefore expect that companies with good performance would have a strong strategy score. This relationship is most evident regarding companies' Scope 1 and 2 emissions, for which both Danone and General Mills have obtained high scores for both past performance and strategy.

The relationship is less visible, however, on targets relating to Scope 3 emissions. Although both Danone and General Mills have performed below the expectations set by their past and current Scope 3 targets, their strategy scores were in the middle-upper range. This finding can be explained in several ways. Firstly, it echoes the findings of Watanabe and Panagiotopoulos (2021) and Freiberg, Grewal and Serafeim (2021) who discover that the simple fact of having set targets improves future decarbonization outcomes. One can therefore argue that setting a target and missing it provides experience that can be used in working better against future targets. Secondly, it may be that past performance should be assessed differently based on the maturity of available solutions. While Scope 1 and 2 emission figures have benefitted from the advances in renewable energy, Scope 3 emissions in the Food and Beverage sector have only benefited from the emergence of the renewable agriculture movement in the past 5 years.

Past performance is therefore a valuable indicator of feasibility to the extent to which it reflects the company's set of feasible actions at a certain point in time. To borrow a term used by Sustainalytics, past performance can provide useful insights into an organization's ability to mobilize resources to reach a goal as long as it refers to "manageable risk" (Sustainalytics, 2021), and not to factors which lie outside a company's sphere of influence.

What insights does target commitment score offer for assessing the feasibility of decarbonization targets?

The methodology has attempted to simplify the assessment of a target's commitment compared to the company's past targets and business as usual trajectory. Taken as an independent construct, the comparative assessment of target ambition is useful to critically deconstruct companies' use of Net Zero as a reputational boost. While generally this research has not come across instances whereby adopting a Net Zero pledge implies a decrease in ambition compared to previous targets and previous performance, it has found that Net Zero pledges only represent an increase of ambition in certain cases. In the Food and Beverage industry, this discrepancy is most visible concerning the effects of adopting Net Zero targets on existing Scope 1&2 and Scope 3 targets.

The impact of reframing corporate climate action around Net Zero appears to have little effect on the level of ambition of targets addressing Scopes 1 and 2. Representing usually less than 5% of a company's total carbon footprint, and benefiting from technologically mature decarbonization solutions, Scope 1 and 2 emissions have generally shown a trend which is decreasing sharply, outrunning their respective targets. In the present sample, adopting a Net Zero standard did not appear to prompt a recalibration of targets for Scope 1 and 2, which would result in a better outcome compared to a business as usual scenario. On Scope 3, however, a contrasting dynamic is apparent. Companies adopting a Net Zero target either renew their Scope 3 targets or communicate commitments for the first time. In all the case studies assessed in this research, targets covering Scope 3 represent a very high level of ambition, which, if realized, would significantly reduce companies' value chain emissions compared to a business as usual scenario.

A high level of ambition compared to a past target on its own, however, provides little information regarding the feasibility of reaching Net Zero. It is only when considered jointly with a company's past performance and its strategy that the commitment score provides insights of a potentially predictive value. A high commitment score therefore contributes positively to the likelihood of achieving a target only if it is accompanied by a high past performance and strategy score for that target. In effect, the higher the past performance and strategy scores, the lower the "stretch" level of a target.

What insights does the strategy score offer for assessing the feasibility of decarbonization targets?

The strategy score represents the company's level of awareness and preparedness in tackling its objectives. As explained in Chapter 4, it can be conceptualized as a company's level of slack resources, assuming that the organization is able to carry out its strategy. This methodology has selected an external benchmark approach to scoring a company's strategy, which has its merits and its limitations. On one hand, a benchmark provides information about the best available practices in a given industry, providing a robust set of measurement criteria. If, for example, a company's Scope 3 emissions have been increasing over a certain period of time, while most of its peers have achieved a decrease over the same perimeter, one could conclude that the company has missed readily available opportunities to decarbonize. Secondly, benchmarking a company's strategy not only against science-based decarbonization pathways but also against the best practices of peers can provide a more realistic understanding of what is feasible in a given sector.

On the other hand, sector benchmarks only reflect *existing* best practices in a certain industry, and are therefore not the best indicators of how a company is positioning itself as an innovator. Integrating fundamental analysis on a company's R&D capacity, its involvement in breakthrough technologies, organizational agility and long-term business strategy could enhance the methodology and provide a stronger theoretical link to the concept of organizational slack.

What insights does the stretch score offer for assessing the feasibility of decarbonization targets?

The research has shown that Net Zero pledges are part of a continuum and comprise several sub goals which extend and build on previous decarbonization targets. From this perspective, Net Zero pledges do not fit the criteria of extreme novelty or extreme difficulty described by Sitkin et al. (2011). However, taken separately, the goal of reaching Net Zero emissions once all other targets have been reached represents uncharted territory for all businesses assessed in this sample and can therefore be considered as a stretch target. Furthermore, companies' historic failure to tackle their

Scope 3 emissions despite having set successive target iterations points to the difficulty of decarbonizing supply chains in Food and Beverage. Therefore, albeit to a more limited extent, this paper would conclude that upstream Scope 3 targets in the Food and Beverage industry can also be considered stretch targets.

A first finding of this research is that companies' Net Zero pledges are not formulated as a single Net Zero target, but in fact are constituted by several independent commitments, often separated between Scopes 1 & 2 and Scope 3. The commitment to neutralize emissions in order to reach a zero net emissions is often formulated as a continuation of a company's decarbonization journey, once other targets have been met, and not as a standalone target declared in absence of other commitments. Results obtained from the small sample of companies analyzed for this research suggests that large, consumer-facing companies with a track record of climate action adopt Net Zero pledges as a way of complementing their internal emissions reduction measures, and not as an overhaul of their decarbonization policies.

As a result of this, this research finds that many of the headline targets included in Net Zero pledges are in fact not new. Scope 1 and 2 targets, particularly, have for a long time been the main focus of corporate climate action, which has historically been centered around reducing emissions which a company can control directly. The sample of companies analyzed has revealed the existence of a wide array of target constructs for Scopes 1 and 2, in terms of target lengths, their formulation as intensity or absolute goals, and their translation into operational targets. The most common construct combines mid-term absolute reduction targets with year-on-year emissions intensity targets, supported by operational energy productivity and renewable energy targets.

Including Scope 3 emissions in decarbonisation targets is comparatively newer, and significantly more complex. Compared to direct Scope targets, Scope 3 targets in the study sample were set over longer time periods, and were formulated as either absolute or intensity reduction targets, but not a combination of the two. While companies have started setting Scope 1 and 2 targets towards the beginning of the 2010 decade, Scope 3 targets have entered the corporate decarbonization realm post- 2015. As expected, Scope 3 objectives are operationalized through targets relating to the sub-categories over which the company has most control: reduction of food waste in operations, improving the efficiency of logistics and introducing circular economy models for packaging. Tackling emissions in the upstream supply chain remains a challenge however, with most companies assessed in this sample demonstrating a low level of engagement with their suppliers, and a low level of awareness of the agricultural practices taking place within their supply chains.

The poor quality of Scope 3 emissions data in the food value chain is another key limiting factor for the scalability of emissions reduction measures on the downstream segments of Scope 3. While emissions data for Scopes 1 and 2 has been available already for close to two decades, companies in the analyzed sample have only started consistently reporting on all relevant Scope 3 categories around the mid 2010s. Despite this progress, Scope 3 data remains largely an exercise of approximation, as direct data collection systems are not available and are costly to implement. This is all the more critical in the Food and Beverage industry, whereby Scope 3 emissions represent upward of 80% of a company's total carbon footprint. In a best practice scenario, food and beverage manufacturers calculate their Scope 3 emissions based on information on agricultural practices collected directly from their suppliers, which is then expressed as CO2 emissions. In most cases, however, companies which simply purchase and process raw materials do not have access to this information, and therefore estimate their Scope 3 footprint by using databases of emission factors based on the growing region and type of crop, and not on the actual practices promoted by each farmer. The very high number of suppliers and their geographic diversity further complicates the data collection process.

Importantly, the case studies assessed within this paper have provided little evidence that companies have prior experience in netting out remaining emissions, nor do they have precise roadmaps on how to achieve Zero. The paper therefore concludes that Net Zero targets taken as individual components of a wider Net Zero pledge can in fact be characterized as stretch goals. In fact, many companies communicate transparently about their lack of experience, and lack of a plan, when it comes to achieving Net Zero. Indeed, all but one company assessed in this study provides a quantitative estimate of the amount of carbon they plan to neutralize in order to reach Net Zero, and none have set Scope 1,2 or 3 targets for years beyond 2030. Companies rarely disclose clear positions and guidelines on the type of carbon removal mechanisms they foresee, the quality standards they endorse, and the situations in which they are to be used. It is here that the innovative potential, and the risk of pitfalls, lies: Net Zero promises an acceleration of stakeholder capitalism, but at the same time lacks defined pathways. Companies pledging Net Zero targets currently find themselves in a window of opportunity whereby Net Zero pledges are hailed as best practices although they are not quantified, are set for very long time horizons, and lack certainty in terms of availability, durability and technological feasibility.

What insights does the likelihood score offer for assessing the feasibility of decarbonization targets?

The likelihood score combines past performance, commitment and strategy scores into an intuitive indicator which assesses the extent to which a target is likely to be fulfilled by its end date. It has been constructed to reflect Sitkin et al.'s (2011) Paradox of Stretch Goals theory, according to which companies with a negative track record and limited resources are more likely to set stretch targets than companies which enjoy recent success as well as excess resources.

The case studies considered in this research have provided evidence that the Paradox of Stretch targets does indeed apply. The phenomenon is most visible when contrasting target-setting behaviors on Scopes 1 and 2 versus on Scope 3. Decarbonization goals concerning Scopes 1 and 2 have been much more conservative compared to those on Scope 3. Despite the fact that most companies have succeeded in reducing their Scope 1 and 2 emissions beyond what they set out to achieve with previous targets, the companies included in this study have set targets which are not significantly more ambitious than their predecessors. This can be interpreted as evidence of the "complacency trap" described by Sitkin et al (2011), whereby past success triggers risk aversion and limits ambition.

Scope 3 and Net Zero targets, which are strongly interdependent, display a markedly different dynamic. Despite historically failing to curb Scope 3 emissions, several companies in the study sample have chosen to commit to aggressive absolute decarbonization targets. Similarly, companies which have not participated in any carbon removal activities historically are pledging to become Net Zero by 2040, which is 10 years before the Paris-aligned deadline.

The attribution of likelihood scores to a certain level of future achievement, is, however, only a means to illustrate a certain level of risk that a company might not deliver on its target. While it cannot have a predictive role in feasibility, it does allow for a comparison between several targets and between companies.

What insights do remaining emissions scenarios offer for assessing the feasibility of decarbonization targets?

Perhaps the most important conclusion of this research is that the feasibility of Net Zero targets can be assessed on two dimensions 1) based on the likelihood that a company will deliver on its quantifiable, time-bound targets for Scopes 1,2 and 3; and 2) based on the likelihood that a company will be able to offset its remaining emissions. This reflects the fact that reaching Net Zero is, given the carbon removal means that are currently available, a stretch target.

The remaining emissions scenarios attempt to quantify the two dimensions proposed above. Firstly, by estimating the amount of unabated emissions in 2030, 2040 and 2050, the methodology attempts to quantify Net Zero goals. Secondly, by calculating the costs of removing residual carbon as a percentage of current financial figures, the model provides a sense of proportion to the potential challenge ahead. Results from the Danone and General Mills case studies show that in the best case scenario, where all interim goals are met on time, and carbon offset prices are around 15 EUR/ ton, the cost of carbon removal is likely to be between 1% and 7% of FY 2021's Net Income figure. In scenario 2, which reflects the most likely outcome given their track record, target ambition and strategy, the figure ranges from 7% to 13%.

However, the forward-looking methodologies used to estimate future emissions trajectories in this thesis are limited by several factors. Firstly, they only rely on past decarbonization performance (which encompasses past target setting behavior, past emissions trajectory and the evolution of climate action strategy) as an indicator for the future evolution of a company's emissions. In reality, a company's emissions, as well as its strategy to tackle them, depend on many internal and external factors, such as its competitive position on the market, the prices of key inputs, its financial performance, changes in regulations, the evolution of carbon offset prices and technological advances, to just name a few. The same limitation applies when assessing the financial impact of carbon removal on a company's key financial indicators, which may not be representative of a company's financial standing several decades in the future.

A more accurate estimation of a company's future emissions trajectory needs to include a fundamental analysis of the specific determinants of each major contributor to the carbon footprint. For instance, in order to better estimate the likelihood of dairy-heavy companies to reach their Scope 3 targets, it would be important to understand the available solutions for reducing emissions from ruminant enteric fermentation, their cost and feasibility of implementation, the mechanisms underpinning the costs of milk as a raw material, the complexity of the supply chain as well as the company's bargaining power within it.

Secondly, the three-year moving average formula used to calculate future emission trajectories does not factor in the extent to which the last two averages are representative of the company's overall performance. Research aiming to derive future emission trajectories based on past performance could enrich the current methodology by selecting the years that are most representative of the company's business as usual performance. For example, an analysis taking into account a company's carbon footprint in the years during the COVID-19 pandemic should first examine the impact of the crisis on the company's performance, in order to avoid basing future predictions on outliers. Another possibility for assessing the conditions under which a future trajectory can be met is to compare it to similar reduction rates achieved in the past, instead of contrasting it with an overall tendency. This could be realized, for example, by understanding what factors have allowed a company to obtain and sustain a certain performance level in the span of a few years, and then assess whether the same conditions are likely to apply in the future in order to maintain the same trajectory.

Similarly, the present research can be enriched by a more thorough modeling of future developments of voluntary carbon markets. The future price of carbon offsets, as well as the availability, degree of permanence and traceability of carbon credits will be a determining factor in companies strategies regarding Net Zero. In the case of a high and mandatory GHG tax, for example, companies in the dairy business might find it opportune to accelerate their shift to plant-based products, for example.

How can the methodology be scaled?

A major limitation of this study is the reliance on manually collected data from companies' CDP disclosures and company reports. As a result of this constraint, the data available for analysis consisted of few data points and was prone to data collection errors. This has prevented the inclusion of company benchmarks into the methodology's development, and has resulted in an over-reliance on theoretical models to compensate for the lack of data-driven insights. Full access to the CDP database of GHG emissions and decarbonization targets, as well as to other financial and sustainability databases can significantly increase the quality and quantity of data available for analysis. For instance, by examining bulk historical data on decarbonization target setting can much more accurately contextualize the level of ambition and feasibility of Net Zero target setting. Despite its current constraints, therefore, the methodology probed in this thesis has a large potential for scalability when integrating databases which are routinely used in the ESG industry.

However, applying the methodology to specific case studies has shown that while certain elements can be addressed in the same way for all case studies, others need to be addressed on a case by case basis. The in-depth analysis of General Mills and Danone has suggested that the methodology used to assess a target's ambition and a company's performance against past and current targets is mainly numerical and can therefore be easily scaled to yield comparable results across companies and industries. The strategy component, on the other hand, requires a higher degree of tailoring to reflect the individual emissions drivers for each company. For instance, a key difference between Danone and General Mills is their reliance on different agricultural inputs. While Danone's business is highly dependent on dairy products, row crop agricultural inputs are more material for General Mills. Each commodity's decarbonization pathway and best practices need to be taken into consideration when assessing a company's strategy, thus limiting the potential of relying on the well-developed sector-specific ESG assessment methodologies available on the market.

What did the case studies reveal about Net Zero targets in the Food and Beverage industry?

Within the Food and Beverage sector, Net Zero pledges can be viewed as stepping stones towards the emerging FLAG-specific target setting rules. Under the upcoming (to be launched on September 28th 2022) SBTI guidelines for FLAG science-based target setting, companies in food related industries will need to set FLAG-related targets in addition to their pre-existing targets. This implies that companies will need to better tackle the measurement of Scope 3 emissions, and the roll-out of supply chain strategies for obtaining both carbon emissions reductions and removal. Although it is not yet clear how the new standards will impact Net Zero target setting practices in this industry, the current drive to set Net Zero targets has enhanced companies' readiness to conform to the upcoming standards, by refocusing their attention on land-based emissions.

Net Zero targets have shaped practices within corporate climate action in the Food and Beverage sector in several ways. Firstly, they were used by companies as opportunities to re-emphasize, and in some cases to strengthen, their existing climate commitments. All of the companies examined in this research issued a communication portraying their adoption of a Net Zero pledge as a new, more ambitious chapter on their decarbonization journey. Targets already set in the past were presented in the announcements as part of the new approach to climate action, allowing organizations to recommit to those targets, and benefit from reputational gains.

Secondly, the Net Zero framework has allowed organizations to extend their climate action commitments beyond what is achievable with their current decarbonization practices. Stripped down to its essential meaning, reaching Net Zero in a corporate context implies that a company removes the emissions it cannot avoid by investing in carbon removal actions outside of its value chain. The innovation brought about by the Net Zero framework is the centrality of carbon removal, which was priorly a measure seen mostly in philanthropic and CSR realms.

Companies in the Food and Beverage industry are particularly well positioned to develop carbon removal projects within their own value chains. According to the upcoming SBTI guidelines for target setting within the FLAG sector, companies along the supply chain can set net reduction targets, in which emission removals from enhancing natural carbon sinks on their own perimeter can be counted towards reaching their FLAG-related targets. As a result of adopting a Net Zero approach in defining climate commitments, companies within the food industry have re-focuses their decarbonization strategies on Scope 3, and specifically towards reducing the Purchased Goods and Services sub-category.

Targets relating to raw materials have traditionally focused on commodity-specific certification schemes ensuring traceability and providing assurance of non-deforestation and the respect of human rights along supply chains. Companies' engagement within the supply chain was mainly carried out through the dissemination of corporate sustainability and sustainable sourcing standards, with the aim of recommending, rather than mandating, best practices in agriculture. As shown by the panel of companies considered in this paper, the adoption of Net Zero pledges has had a considerable impact on raw material sourcing policies, and on companies' role in shaping suppliers' practices. Land-based practices, with "Regenerative Agriculture" in the foreground, have become the centerpieces of companies' strategies to compensate for residual emissions.

Although a promising decarbonization leverage for many in the food and beverage industry, a radical shift in agricultural practices to turn net emitters into carbon sinks is rife with challenges. Firstly, as explained in the previous section on Regenerative Agriculture, there is still considerable scientific uncertainty regarding the best methods to capture and durably store carbon within soils. This lack of scientific congruence also hinders the accurate measurement and monitoring of GHG emission reductions resulting from improved agricultural practices, preventing companies from factoring them into their Scope 3 inventories and target setting. Many pilot projects exist to reduce greenhouse gas emissions resulting from dairy farming, but overall efforts remain nascent, isolated and lacking solid scientific foundations. On the implementation side, regenerative agriculture poses an issue of scalability. Regenerative methods yield the best results when they are adapted to the individual characteristics of every soil, crop and climate in which they are implemented, and cannot therefore be rolled out using well-known instruments such as generic sustainable sourcing policies and protocols.

Further developing the scientific foundations for land-based carbon removal projects, and developing processes for efficiently disseminating tailor-make know-how across a complex supply chain and monitoring are therefore likely to become pivotal differentiating factors for companies' abilities to fulfill their upstream Scope 3 targets. The current analysis has revealed a sharp increase in investments in the field of Regenerative Agriculture, mostly in the creation of research partnerships with specialized institutions and in creating pilot projects with producers. In the future, attempts to measure companies' progress in these areas would need to assess the degree to which companies are able to transition from the current experimental phase towards a more systematic understanding, implementation and monitoring of regenerative agriculture practices.

Reference list

Accenture and United Nations Global Compact (2021). *The 2021 United Nations Global Compact-Accenture CEO Study*. [online] Available at: https://www.accenture.com/_acnmedia/PDF-166/Accenture-UNGC-CEO-Study-Sustainability-2021.pdf#zoom=40 [Accessed 21 Mar. 2022].

ADEME (2021). *Aavis de l'ADEME - La neutralité carbone*. [online] *La librairie ADEME*. Available at: https://librairie.ademe.fr/changement-climatique-et-energie/4524-avis-de-l-ademe-la-neutralite-carbone.html [Accessed 13 Mar. 2022].

Anderson, C., Bicalho, T., Wallace, E., Letts, T. and Stevenson, M. (2022). *FLAG Science Based Target Setting Guidance. Draft for Public Consultation*. [online] *Science Based Targets Initiative*. Available at: https://sciencebasedtargets.org/resources/files/FLAG-Guidance-Public-Consultation.pdf [Accessed 30 Jan. 2022].

Bain. (2022). *One third of businesses missed their 2020 decarbonization targets; here's what they must change to meet their 2030 goals*. [online] Available at: https://www.bain.com/about/media-center/press-releases/2022/one-third-of-businesses-missed-their-2020-decarbonization-targets-heres-what-they-must-change-to-meet-their-2030-goals/ [Accessed 23 May 2022].

Banchik, L., Rehm, W. and Siccardo, G. (2021). *On target: How to succeed with carbon-reduction initiatives*. [online] McKinsey & Company. Available at: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/on-target-how-to-succeed-with-carbon-reduction-initiatives [Accessed 12 Apr. 2022].

Beevor, J. and Alexander, K. (2022). *Missed Targets: A brief history of aviation climate targets of the early 21st century*. [online] *Possible*. Available at: https://static1.squarespace.com/static/5d30896202a18c0001b49180/t/6273db16dcb32d309eaf126e/1651759897885/Missed-Targets-Report.pdf [Accessed 12 May 2022].

Black, R., Cullen, K., Fay, B., Hale, T., Mahmood, S. and Smith, S. (2021). *Taking Stock: A global assessment of net zero targets*. [online] *Energy & Climate Intelligence Unit*. Available at: https://ca1-eci.edcdn.com/reports/ECIU-Oxford_Taking_Stock.pdf?v=1616461369 [Accessed 22 Feb. 2022].

Boehm, S., Lebling, K., Levin, K., Fekete, H., Jaeger, J., Wilson, R., Geiges, A. and Schumer, C. (2021). *State of Climate Action 2021 : Systems Transformations Required to Limit Global Warming to 1.5°C*. [online] *World Resources Institute*. doi:10.46830/wrirpt.21.00048.

Bolton, P. and Kacperczyk, M.T. (2021). Firm Commitments. *SSRN Electronic Journal*, [online] Columbia Business School Research Paper. doi:10.2139/ssrn.3840813.

Bromiley, P. and Harris, J.D. (2014). A comparison of alternative measures of organizational aspirations. *Strategic Management Journal*, [online] 35(3), pp.338–357. doi:10.1002/smj.2191.

Bruxelles, H. (2022). *Sustainability as a Driver of Economic Performance*. [online] Danone.com. Available at: https://www.danone.com/investor-relations/publications-events/investor-seminars.html [Accessed 3 Sep. 2022].

Carillo Pineda, A., Chang, A. and Faria, P. (2020). *Foundations for Science-Based Net Zero Target Setting in the Corporate Sector*. [online] *Science-Based Targets Initiative*. Available at: https://sciencebasedtargets.org/resources/files/foundations-for-net-zero-full-paper.pdf [Accessed 27 Mar. 2022].

Carrington, D. (2021). *How to spot the difference between a real climate policy and greenwashing guff*. [online] the Guardian. Available at: https://www.theguardian.com/commentisfree/2021/may/06/difference-real-climate-policy-greenwashing-emissions [Accessed 26 May 2022].

CDP and Oliver Wymann (2022). *CDP Europe Report 2021*. [online] *CDP*. Available at: https://cdn.cdp.net/cdp-production/cms/reports/documents/000/006/132/original/CDP_Europe_Report_-_Now_For_Nature.pdf?1646826774 [Accessed 9 May 2022].

Clarke, C., Ferguson, C., Crocker, T. and Marcell, K. (2019). *Fast Moving Consumers. Which Consumer Goods Companies Are Ready for the low-carbon transition?* [online] *CDP*. Available at: https://cdn.cdp.net/cdp-production/cms/reports/documents/000/004/163/original/CDP_Consumer_Goods_report.pdf [Accessed 2 Aug. 2022].

Collins, J.C. and Porras, J.I. (2011). *Built to last : successful habits of visionary companies*. [online] New York, Ny: Harperbusiness. Available at: https://www.perlego.com/book/588549/built-to-last-pdf?queryID=1f9b8c4365e1923657b057815f6c7397&index=prod_BOOKS&gridPosition=1 [Accessed 20 May 2022].

Coniam, M. (2022). *Unilever CEO Has 'No Idea' How It Will Meet Full Net-Zero Target*. [online] Bloomberg.com. Available at: https://www.bloomberg.com/news/articles/2022-06-21/jope-has-no-idea-how-unilever-will-meet-full-net-zero-target [Accessed 21 Jul. 2022].

Coppola, M., Krick, T. and Blohmke, J. (2019). *Feeling the heat?* [online] *Deloitte Sustainability*. Available at: https://www2.deloitte.com/content/dam/Deloitte/de/Documents/risk/DI_Feeling-the-heat-sustainability.pdf [Accessed 14 Mar. 2022].

Dahlmann, F., Branicki, L. and Brammer, S. (2019). *Managing Carbon Aspirations: The Influence of Corporate Climate Change Targets on Environmental Performance*. [online] ResearchGate. Available at: https://www.researchgate.net/publication/321011793_Managing_Carbon_Aspirations_The_Influence_of_Corporate_Climate_Change_Targets_on_Environmental_Performance [Accessed 22 Mar. 2022].

Damert, M., Paul, A. and Baumgartner, R.J. (2017). Exploring the determinants and long-term performance outcomes of corporate carbon strategies. *Journal of Cleaner Production*, [online] 160, pp.123–138. doi:10.1016/j.jclepro.2017.03.206.

Danone S.A. (2011). *Danone - CDP Climate Change 2010*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2012). *Danone - CDP Climate Change 2011*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2013). *Danone - CDP Climate Change 2012*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2016a). *Danone - CDP Climate Change 2015*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2016b). *Danone Climate Policy - Full Version*. [online] Danone.com. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/about-us-impact/policies-and-commitments/en/2016/2016_05_18_ClimatePolicyFullVersion.pdf [Accessed 17 Aug. 2022].

Danone S.A. (2016c). *Danone Integrated Annual Report 2015*. [online] *Danone.com*. Available at: https://www.danone.com/investor-relations/publications-events/integrated-reports.html [Accessed 15 Jul. 2022].

Danone S.A. (2017a). *Danone - CDP Climate Change 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2017b). *Danone - CDP Forests 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2018a). *Danone - CDP Climate Change 2017*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2018b). *Danone Integrated Annual Report 2017*. [online] *Danone.com*. Available at: https://www.danone.com/investor-relations/publications-events/integrated-reports.html [Accessed 2 Jul. 2022].

Danone S.A. (2018c). *Exhaustive 2018 Extra-financial Data*. *https://www.scribd.com/document/439035750/Danone-Exhaustive-Extra-financial-2018-Data*.

Danone S.A. (2019a). *Danone - CDP Climate Change 2018*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2019b). *Danone Company Dashboard 2019*. [online] Available at: https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-sustainability/reports-and-data/cross-topic/2030-goals-company-dashboard-2019.pdf [Accessed 27 Aug. 2022].

Danone S.A. (2019c). *Danone Integrated Annual Report 2018*. [online] *Danone.com*. Available at: https://www.danone.com/investor-relations/publications-events/integrated-reports.html [Accessed 2 Jul. 2022].

Danone S.A. (2019d). *Danone's data & results - Danone*. [online] Danone. Available at: https://www.danone.com/about-danone/at-a-glance/danone-data.html [Accessed 1 Sep. 2022].

Danone S.A. (2019e). *Exhaustive 2019 Extra-financial Data*. *https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-sustainability/reports-and-data/cross-topic/danone-exhaustive-extra-financial-data-2019.pdf*.

Danone S.A. (2019f). *External recognition - Danone*. [online] Danone.com. Available at: https://www.danone.com/about-danone/at-a-glance/external-recognition.html [Accessed 7 Sep. 2022].

Danone S.A. (2019g). *Towards carbon neutrality - Danone*. [online] Danone. Available at: https://www.danone.com/impact/planet/towards-carbon-neutrality.html [Accessed 5 Sep. 2022].

Danone S.A. (2019h). *What is the GHG Protocol?* [online] Danone. Available at: https://www.danone.com/impact/planet/blank-page.html [Accessed 12 Aug. 2022].

Danone S.A. (2020a). *Danone - CDP Climate Change 2019*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2020b). *Exhaustive 2020 Extra-financial Data*. *https://integrated-annual-report-2020.danone.com/wp-content/uploads/Danone-exhaustive-2020-extra-financial-data.pdf*.

Danone S.A. (2021a). *Danone - CDP Climate Change 2020*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2021b). *Danone Annual Integrated Report 2021: Methodology Note*. [online] Danone.com. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-sustainability/reports-and-data/cross-topic/methodologynote2021.pdf [Accessed 4 Sep. 2022].

Danone S.A. (2021c). *Danone Integrated Annual Report 2020*. [online] *Danone.com*. Available at: https://www.danone.com/investor-relations/publications-events/integrated-reports.html [Accessed 4 Jul. 2022].

Danone S.A. (2021d). *Danone Regenerative Agriculture 2021*. [online] Danone.com. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/about-us-impact/policies-and-commitments/en/2021/Danone-regenerative-agriculture-2021.pdf [Accessed 15 Sep. 2022].

Danone S.A. (2021e). *Exhaustive 2021 Extra-financial Data*. *https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-sustainability/reports-and-data/cross-topic/danoneexhaustive2021extrafinancialdatav2.pdf*.

Danone S.A. (2022a). *Danone - CDP Climate Change 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2022b). *Danone - CDP Forests 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/4311/Danone?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3DDanone&queries%5Bname%5D=Danone [Accessed 8 Jul. 2022].

Danone S.A. (2022c). *Danone – Investor Relations - Transcript produced by Global Lingo*. [online] *Danone.com*. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-investor-seminars/2022/transcript/transcriptcme.pdf [Accessed 28 Aug. 2022].

Danone S.A. (2022d). *Danone Integrated Annual Report 2021*. [online] *Danone.com*. Available at: https://www.danone.com/investor-relations/publications-events/integrated-reports.html [Accessed 2 Jul. 2022].

Danone S.A. Investor Relations (2022). *Renew Danone*. [online] *Danone.com*. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/medias/medias-en/2022/corporatepressreleases/press-release-cme-20220308.pdf [Accessed 26 Aug. 2022].

Davis-Peccoud, J., Stone, P. and Tovey, C. (2016). *Achieving Breakthrough Results in Sustainability*. [online] Bain. Available at:

https://www.bain.com/insights/achieving-breakthrough-results-in-sustainability [Accessed 26 Apr. 2022].

Day, T., Mooldijk, S., Smit, S., Posada, E., Hans, F., Fearnehough, H., Kachi, A., Warnecke, C., Kuramochi, T. and Höhne, N. (2022). *Corporate Climate Responsibility Monitor 2022*. [online] *New Climate Institute*. Available at: https://newclimate.org/wp-content/uploads/2022/02/CorporateClimateResponsibilityMonitor2022.pdf [Accessed 20 Mar. 2022].

de Saint-Affrique, A. (2022). *CEO Presentation: Strategic Framework*. [online] Danone.com. Available at: https://www.danone.com/investor-relations/publications-events/investor-seminars.html [Accessed 12 Sep. 2022].

Deloitte and Earth on Board (2021). *'Net-Zero' Debunked – A field guide for Board and C-suite executives to respond effectively to the climate emergency*. [online] *Deloitte*. Available at: https://www2.deloitte.com/fr/fr/pages/sustainability-services/articles/net-zero-debunked.html [Accessed 13 Mar. 2022].

Dietz, S., Fruitiere, C., Garcia-Manas, C., Irwin, W., Rauis, B. and Sullivan, R. (2018). An assessment of climate action by high-carbon global corporations - LSE Research Online. *Nature Climate Change*. [online] Available at: http://eprints.lse.ac.uk/90489/ [Accessed 13 May 2022]. ISSN 1758-678X.

Dyke, J., Watson, R. and Knorr, W. (2021). *Climate scientists: concept of net zero is a dangerous trap*. [online] The Conversation. Available at: https://theconversation.com/climate-scientists-concept-of-net-zero-is-a-dangerous-trap-157368 [Accessed 3 Mar. 2022].

Eavis, P. and Krauss, C. (2021). What's Really Behind Corporate Promises on Climate Change? *The New York Times*. [online] 12 Feb. Available at: https://www.nytimes.com/2021/02/22/business/energy-environment/corporations-climate-change.html [Accessed 17 Mar. 2022].

Fankhauser, S., Smith, S.M., Allen, M., Axelsson, K., Hale, T., Hepburn, C., Kendall, J.M., Khosla, R., Lezaun, J., Mitchell-Larson, E., Obersteiner, M., Rajamani, L., Rickaby, R., Seddon, N. and Wetzer, T. (2021). The meaning of net zero and how to get it right. *Nature Climate Change*, [online] 12(1), pp.15–21. doi:10.1038/s41558-021-01245-w.

Freiberg, D., Grewal, J. and Serafeim, G. (2021). Science-Based Carbon Emissions Targets. *Harvard Business School*, [online] Working Paper 21-108. doi:10.2139/ssrn.3804530.

General Mills Inc. (2012). *General Mills - CDP Climate 2011*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2013). *General Mills - CDP Climate 2012*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Frespons es%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2014). *General Mills - CDP Climate 2013*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2015). *General Mills - CDP Climate 2014*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2016a). *General Mills - CDP Climate 2015*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2016b). *General Mills Global Responsibility 2016*. [online] globalresponsibility.generalmills.com. Available at: https://globalresponsibility.generalmills.com/2016/HTML1/default.htm [Accessed 30 Jul. 2022].

General Mills Inc. (2017). *General Mills - CDP Climate 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2018). *General Mills - CDP Climate 2017*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2019). *General Mills - CDP Climate 2018*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2020a). *2020 Global Responsibility Report*. [online] *www.generalmills.com*. Available at: https://www.generalmills.com/news/stories/2020-global-responsibility-report [Accessed 9 Sep. 2022].

General Mills Inc. (2020b). *General Mills Financial Highlights*. [online] *investors.generalmills.com*. Available at: https://investors.generalmills.com/financial-information/annual-reports/default.aspx [Accessed 16 Jul. 2022].

General Mills Inc. (2020c). *General Mills to Reduce Absolute Greenhouse Gas Emissions by 30% Across its Full Value Chain Over Next Decade*. [online] investors.generalmills.com. Available at:

https://investors.generalmills.com/press-releases/press-release-details/2020/General-Mills-to-Reduce-Absolute-Greenhouse-Gas-Emissions-by-30-Across-its-Full-Value-Chain-Over-Next-Decade/default.aspx [Accessed 20 Jul. 2022].

General Mills Inc. (2021a). *2021 Global Responsibility Report*. [online] *generalmills.com*. Available at: https://www.generalmills.com/news/stories/2021-global-responsibility-report [Accessed 3 Sep. 2022].

General Mills Inc. (2021b). *General Mills - CDP Climate 2020*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2021c). *General Mills Outlines 'Accelerate' Growth Strategy at 2021 CAGNY Conference*. [online] *General Mills Inc.* Available at: https://investors.generalmills.com/press-releases/press-release-details/2021/general-mills-outlines-accelerate-growth-strategy-at-2021-cagny-conference/default.aspx [Accessed 20 Jul. 2022].

General Mills Inc. (2021d). *Initial Company Action Plan to End Deforestation and Promote Forest Restoration and Protection in the Cocoa Supply Chain*. [online] *generalmills.com*. Available at: https://www.generalmills.com/how-we-make-it/healthier-planet/sustainable-and-responsible-sourcing/cocoa [Accessed 5 Sep. 2022].

General Mills Inc. (2022a). *2022 Proxy Statement and Annual Report*. [online] *investors.generalmills.com*. Available at: https://investors.generalmills.com/financial-information/annual-reports/default.aspx [Accessed 12 Jul. 2022].

General Mills Inc. (2022b). *Climate policy - General Mills*. [online] www.generalmills.com. Available at: https://www.generalmills.com/how-we-make-it/healthier-planet/environmental-impact/climate-change/climate-policy [Accessed 16 Jul. 2022].

General Mills Inc. (2022c). *General Mills - CDP Climate 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 13 Jul. 2022].

General Mills Inc. (2022d). *General Mills - CDP Forests disclosure 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/7156?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dgeneral%2Bmills&queries%5Bname%5D=general+mills [Accessed 10 Sep. 2022].

General Mills Inc. (2022e). *Global Responsibility 2022*. [online] *globalresponsibility.generalmills.com*. Available at: https://globalresponsibility.generalmills.com/images/General_Mills-Global_Responsibility_2022.pdf [Accessed 17 Jul. 2022].

General Mills Inc. (2022f). *Palm Oil*. [online] www.generalmills.com. Available at: https://www.generalmills.com/how-we-make-it/healthier-planet/sustainable-and-responsible-sourcing/palm-oil [Accessed 11 Sep. 2022].

General Mills Inc. (2022g). *Regenerative Agriculture*. [online] generalmills.com. Available at: https://www.generalmills.com/how-we-make-it/healthier-planet/environmental-impact/regenerative-agriculture [Accessed 5 Sep. 2022].

General Mills Inc. (2022h). *Sustainable and Responsible Sourcing*. [online] generalmills.com. Available at: https://www.generalmills.com/how-we-make-it/healthier-planet/sustainable-and-responsible-sourcing [Accessed 6 Aug. 2022].

Global Canopy, The Accountability Framework initiative, WWF and The Science Based Targets initiative (2022). *Why Net Zero Needs Zero Deforestation Now*. [online] *Race to Zero*. Available at: https://climatechampions.unfccc.int/wp-content/uploads/2022/06/Why-net-zero-needs-zero-deforestation-now-June-2022.pdf [Accessed 12 Aug. 2022].

Google Finance (2022a). *Danone SA (BN) Stock Price & News - Google Finance*. [online] Google.com. Available at: https://www.google.com/finance/quote/BN:EPA?sa=X&ved=2ahUKEwibuefatI_6AhU7gf0HHczSBesQ3ecFegQIIxAa [Accessed 13 Sep. 2022].

Google Finance (2022b). *General Mills, Inc. (GIS) Stock Price & News - Google Finance*. [online] Google.com. Available at: https://www.google.com/finance/quote/GIS:NYSE?sa=X&ved=2ahUKEwj_hsvlva76AhVRxosKHbu2DyEQ3ecFegQIUBAa [Accessed 20 Sep. 2022].

Gow, D. (2009). *Europe's energy chiefs aim for carbon-neutral electricity by 2050*. [online] the Guardian. Available at: https://www.theguardian.com/environment/2009/mar/19/europe-energy-power-climate [Accessed 3 May 2022].

Graham Brown, M. (2020). *Keeping score : using the right metrics to drive world class performance*. [online] New York: Taylor and Francis. Available at: https://www.perlego.com/book/1509274/keeping-score-using-the-right-metrics-to-drive-world-class-performance-pdf [Accessed May 2022].

Greenhouse Gas Protocol (2011). *Greenhouse Gas Protocol : Corporate Value Chain (Scope 3) Accounting and Reporting Standard*. [online] Washington, Dc: World Resources Institute ; [Geneva, Switzerland. Available at: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf [Accessed 5 Jun. 2022].

Greenhouse Gas Protocol (2022). *Greenhouse Gas Protocol Land Sector and Removals Initiative Project Overview*. [online] *Greenhouse Gas Protocol*. Available at: https://ghgprotocol.org/sites/default/files/standards/LSR_Overview.pdf [Accessed 25 Jul. 2022].

Harvey, S. (2022). *Unilever criticised by investor Fundsmith Equity for 'losing the plot'*. [online] Just Food. Available at: https://www.just-food.com/news/unilever-criticised-by-investor-fundsmith-equity-for-losing-the-plot/ [Accessed 21 Jul. 2022].

Heskett, J. (2008). *Has the Time Come for 'Stretch' in Management?* [online] HBS Working Knowledge. Available at: https://hbswk.hbs.edu/item/has-the-time-come-for-stretch-in-management [Accessed 8 May 2022].

Heskett, J. (2019). *Are Super Stretch Goals Only for the Very Young?* [online] HBS Working Knowledge. Available at: https://hbswk.hbs.edu/item/are-super-stretch-goals-only-for-the-very-young [Accessed 8 May 2022].

Hu, C., Song, M. and Liang, D. (2019). Past Performance, Organizational Aspiration, and Organizational Performance: the Moderating Effect of Environmental Jolts. *Sustainability*, [online] 11(15). doi:10.3390/su11154217.

Impact Taskforce (2021). *Time to deliver: mobilising private capital at scale for people and planet*. [online] Available at: https://www.impact-taskforce.com/media/gq5j445w/time-to-deliver-final.pdf [Accessed 25 May 2022].

Ioannou, I., Li, S.X. and Serafeim, G. (2016). The Effect of Target Difficulty on Target Completion: The Case of Reducing Carbon Emissions - Article - Faculty & Research - Harvard Business School. *Accounting Review*, [online] 91(5). Available at: https://www.hbs.edu/faculty/Pages/item.aspx?num=50057 [Accessed 3 May 2022].

IPCC (2022). Summary for Policymakers. In: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. [online] Cambridge, UK and New York, NY, USA: Cambridge University Press. Available at: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf [Accessed 29 May 2022]. [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)].

IPCC, (2018) Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 541-562, doi:10.1017/9781009157940.008.

Katz, J. (2021). *It's time to scale up natural climate solutions--here's how*. [online] McKinsey & Company. Available at: https://www.mckinsey.com/capabilities/sustainability/our-insights/sustainability-blog/its-time-to-scale-up-natural-climate-solutions-heres-how [Accessed 1 Sep. 2022].

Kerr, S. and Landauer, S. (2004). Using stretch goals to promote organizational effectiveness and personal growth: General Electric and Goldman Sachs. *Academy of Management Perspectives*, [online] 18(4), pp.134–138. doi:10.5465/ame.2004.15268739.

Kobayashi, N. and Richards, M. (2021). *The Global Sector Strategies: Recommended Investor Expectations for Food and Beverage*. [online] *Climate Action 100+*. Available at: https://www.climateaction100.org/wp-content/uploads/2021/08/Global-Sector-Strategies-Food-and-Beverage-Ceres-PRI-August-2021.pdf [Accessed 18 Aug. 2022].

KPMG International (2021). *Net-zero commitments: Where's the plan?* [online] *KMPG*. Available at: https://assets.kpmg/content/dam/kpmg/xx/pdf/2021/10/net-zero-commitments-where-is-the-plan.pdf [Accessed 6 Apr. 2022].

Leyva-de la Hiz, D.I., Ferron-Vilchez, V. and Aragon-Correa, J.A. (2018). Do Firms' Slack Resources Influence the Relationship Between Focused Environmental Innovations and Financial Performance? More is Not Always Better. *Journal of Business Ethics*, [online] 159(4), pp.1215–1227. doi:10.1007/s10551-017-3772-3.

Lichtenau, T., Karlsson, M.C., Hight, C. and Davis-Peccoud, J. (2022). *From Carbon Ambition to Delivery*. [online] Bain. Available at: https://www.bain.com/insights/from-carbon-ambition-to-delivery/ [Accessed 21 May 2022].

Livelihoods Fund (2021a). *History – Livelihoods Funds*. [online] Livelihoods.eu. Available at: https://livelihoods.eu/about-us/history/ [Accessed 1 Sep. 2022].

Livelihoods Fund (2021b). *Press Release: Launch of a new Livelihoods Carbon Fund*. [online] *Livelihoods.eu*. Available at: https://www.danone.com/content/dam/danone-corp/danone-com/medias/media-othernews-en/2021/corporatepressreleases/pr-third-livelihoods-carbon-fund.pdf [Accessed 3 Sep. 2022].

McLaren, D. (2020). *A brief history of climate targets and technological promises*. [online] Carbon Brief. Available at: https://www.carbonbrief.org/guest-post-a-brief-history-of-climate-targets-and-technological-promises [Accessed 9 May 2022].

Michael Cyert, R. and March, J.G. (2020). *A behavioral theory of the firm*. [online] Barakaldo Books. Available at: https://www.perlego.com/book/3019696/a-behavioral-theory-of-the-firm-pdf [Accessed 30 Apr. 2022].

MSCI (2021a). *Implied Temperature Rise Methodology*. *https://www.msci.com/documents/1296102/27422075/Implied-Temperature-Rise-Methodology-Summary.pdf*.

MSCI (2021b). *Who has the most robust carbon target – ExxonMobil or Chevron?* [online] *msci.com*. Available at: https://www.msci.com/documents/10199/e399c871-b02a-10a3-b22c-134ab7728891 [Accessed 14 Sep. 2022].

MSCI (2022). *General Mills Inc.* [online] www.msci.com. Available at: https://www.msci.com/our-solutions/esg-investing/esg-ratings-climate-search-tool/issuer/general-mills-inc/IID000000002135125 [Accessed 13 Sep. 2022].

Murray, J. (2021). *Net zero faces fierce criticism | Greenbiz*. [online] Greenbiz.com. Available at: https://www.greenbiz.com/article/net-zero-faces-fierce-criticism [Accessed 21 Feb. 2022].

Nestlé S.A. (2012). *Nestlé - CDP Climate 2011*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2014). *Nestlé - CDP Climate 2013*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2015). *Nestlé - CDP Climate 2014*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2016). *Nestlé - CDP Climate 2015*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2017). *Nestlé - CDP Climate 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2018). *Nestlé - CDP Climate 2017*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2019). *Nestlé - CDP Climate 2018*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2020). *Nestlé - CDP Climate 2019*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2021a). *Nestlé - CDP Climate 2020*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Nestlé S.A. (2021b). *Nestlé's Net Zero Roadmap*. [online] *nestle.com*. Available at: https://www.nestle.com/sites/default/files/2020-12/nestle-net-zero-roadmap-en.pdf [Accessed 2 Jun. 2022].

Nestlé S.A. (2022). *Nestlé - CDP Climate 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/12942/Nestle?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dnestle&queries%5Bname%5D=nestle [Accessed 1 Aug. 2022].

Oliver Wyman (2021). *Running Hot : Accelerating Europe's Path to Paris*. [online] *CDP*. Available at: https://cdn.cdp.net/cdp-production/cms/reports/documents/000/005/578/original/Running_hot_-_accelerating_Europe's_path_to_Paris.pdf?1615190423 [Accessed 28 Feb. 2022].

OPIS (2022). *Global Carbon Offsets Report*.

Owen-Burge, C. (2021). *Unilever and the race to halve emissions by 2030 - Climate Champions*. [online] Climate Champions. Available at: https://climatechampions.unfccc.int/unilever-and-the-race-to-halve-emissions-by-2030/#:~:text=Unilever%20has%20set%20science%2Dbased,our%20value%20chain%20by%202039. [Accessed 25 Jun. 2022].

Panwar, R. (2021). Optimism Amid Despair: How to Avoid a Net-Zero Debacle. *Business & Society*. [online] doi:10.1177/00076503211053816.

PepsiCo Inc. (2011). *PepsiCo - CDP Climate 2012*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2012). *PepsiCo - CDP Climate 2011*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2014). *PepsiCo - CDP Climate 2013*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2015). *PepsiCo - CDP Climate 2014*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2F en%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2016). *PepsiCo - CDP Climate 2015*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2017). *PepsiCo - CDP Climate 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2018). *PepsiCo - CDP Climate 2017*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2019). *PepsiCo - CDP Climate 2018*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2020). *PepsiCo - CDP Climate 2019*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2021a). *PepsiCo - CDP Climate 2020*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

PepsiCo Inc. (2021b). *Pepsico's Climate Action Strategy*. [online] Available at: https://www.pepsico.com/docs/default-source/sustainability-and-esg-topics/pepsico's-climate-action-strategy.pdf?sfvrsn=5b310dfa_3 [Accessed 12 Jul. 2022].

PepsiCo Inc. (2022). *PepsiCo - CDP Climate 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/14605/PepsiCo-Inc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Futf8%3D%25E2%259C%2593%26queries%255Bname%255D%3Dpepsico&queries%5Bname%5D=pepsico [Accessed 1 Aug. 2022].

Pinkse, J. and Busch, T. (2013). The Emergence of Corporate Carbon Norms: Strategic Directions and Managerial Implications. *Thunderbird International Business Review*, 55(6), pp.633–645. doi:10.1002/tie.21580.

Polman, P. and Winston, A.S. (2021). *Net Positive: How Courageous Companies Thrive by Giving More Than They Take*. Boston, Ma Harvard Business Review Press.

PwC (2020). *The Food Industry in the Spotlight of Climate Change*. [online] *PwC*. Available at: https://www.pwc.de/en/retail-and-consumer/climate-change-and-the-food-industry.html [Accessed 1 Aug. 2022].

PwC (2022). *PwC's 25th Annual Global CEO Survey*. [online] *PWC*. Available at: https://www.pwc.com/gx/en/ceo-survey/2022/main/content/downloads/25th_CEO_Survey_PDF_report.pdf [Accessed 2 Feb. 2022].

Race to Zero (n.d.). *Race to Zero Lexicon*. [online] *Race to Zero*. Available at: https://racetozero.unfccc.int/wp-content/uploads/2021/04/Race-to-Zero-Lexicon.pdf [Accessed 1 Feb. 2022].

RE 100 (2022). *Technical Guidance*. [online] Available at: https://www.there100.org/technical-guidance [Accessed 19 Aug. 2022].

Reguzzoni, A. (2018). *What Does the New Regenerative Organic Certification Mean for the Future of Good Food?* [online] Civil Eats. Available at: https://civileats.com/2018/03/12/what-does-the-new-regenerative-organic-certification-mean-for-the-future-of-good-food/ [Accessed 22 Aug. 2022].

Roe, S., Streck, C., Obersteiner, M., Frank, S., Griscom, B., Drouet, L., Fricko, O., Gusti, M., Harris, N., Hasegawa, T., Hausfather, Z., Havlík, P., House, J., Nabuurs, G.-J., Popp, A., Sánchez, M.J.S., Sanderman, J., Smith, P., Stehfest, E. and Lawrence, D. (2019). Contribution of the land sector to a 1.5 °C world. *Nature Climate Change*, [online] 9(11), pp.817–828. doi:10.1038/s41558-019-0591-9.

Schmid, D. (2022). *Accelerating Our Commitment to Net-Zero*. [online] SAP News Center. Available at: https://news.sap.com/2022/01/accelerating-net-zero-commitment/ [Accessed 24 Apr. 2022].

Schrempf, B., Herrera, G. and Schmidt, S. (2020). *Hungry for Change. Are companies driving a sustainable food system?* [online] *CDP*. Available at: https://cdn.cdp.net/cdp-production/cms/reports/documents/000/005/461/original/SFS_book_final.pdf?1605921880 [Accessed 15 Aug. 2022].

Science-Based Targets Initiative (2022). *Companies taking action - Science Based Targets*. [online] Science Based Targets. Available at: https://sciencebasedtargets.org/companies-taking-action#table [Accessed 23 Aug. 2022].

Searchinger, T. and Ranganathan, J. (2020). *INSIDER: Further Explanation on the Potential Contribution of Soil Carbon Sequestration on Working Agricultural Lands to Climate Change Mitigation*. [online] World Resources Institute. Available at: https://www.wri.org/insights/insider-further-explanation-potential-contribution-soil-carbon-sequestration-working [Accessed 22 Aug. 2022].

Searchinger, T., Waite, R., Hanson, C. and Ranganathan, J. (2018). *Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050. Synthesis Report*. [online] *World Resources Institute*. Available at: https://files.wri.org/d8/s3fs-public/creating-sustainable-food-future_2.pdf [Accessed 7 Aug. 2022].

Sitkin, S.B., Miller, C.C. and See, K.E. (2017). The Stretch Goal Paradox. *Harvard Business Review*. [online] Available at: https://hbr.org/2017/01/the-stretch-goal-paradox [Accessed 1 May 2022].

Sitkin, S.B., See, K.E., Miller, C.C., Lawless, M.W. and Carton, A.M. (2011). The Paradox of Stretch Goals: Organizations in Pursuit of the Seemingly Impossible. *Academy of Management Review*, [online] 36(3), pp.544–566. doi:10.5465/amr.2011.61031811.

Smith, P., Bustamante, M., Ahammad, H. and Clark, H. (2014). *Agriculture, Forestry and Other Land Use (AFOLU)*. [online] Available at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf [Accessed 21 Aug. 2022].

Soubeiran, E. (2018). *Climate & Regenerative Agriculture. Investor Seminar*. [online] Available at: https://www.danone.com/content/dam/danone-corp/danone-com/investors/en-investor-seminars/2018/Climate%20and%20agriculture.pdf [Accessed 6 Jul. 2022].

Speed, M. (2021). *Fashion industry to miss emissions target despite COP26 pledge*. [online] @FinancialTimes. Available at: https://www.ft.com/content/92d64022-415c-4fa2-93a7-bc277c417544 [Accessed 27 May 2022].

Standard Chartered Bank (2020). *Zeronomics*. [online] *Zeronomics*. Available at: https://assets.turtl.co/pdfs/tenant=standardcharteredbank/zeronomics.pdf [Accessed 7 May 2022].

Sustainalytics (2021). *ESG Risk Ratings - Methodology Abstract Version 2.1*. [online] Available at: https://connect.sustainalytics.com/hubfs/INV/Methodology/Sustainalytics_ESG%20Ratings_Methodology%20Abstract.pdf [Accessed 13 Sep. 2022].

Sustainalytics (2022a). *General Mills Inc.* [online] sustainalytics.com. Available at: https://www.sustainalytics.com/esg-rating/general-mills-inc/1008152961 [Accessed 13 Sep. 2022].

Sustainalytics (2022b). *Overview of Sustainalytics' ESG Risk Ratings*. [online] Available at: https://connect.sustainalytics.com/hubfs/SFS/Sustainalytics%20ESG%20Risk%20Ratings_Issuer%20Backgrounder.pdf [Accessed 15 Sep. 2022].

The « 4 per 1000 » Initiative (2020). *Strategic plan*. [online] *The '4 per 1000' Initiative*. Available at: https://4p1000.org/wp-content/uploads/2021/01/strategic_plan_EN.pdf [Accessed 12 Aug. 2022].

The international "4 per 1000" initiative (2022). *Discover - 4 per 1000*. [online] 4 per 1000. Available at: https://4p1000.org/discover/?lang=en [Accessed 20 Aug. 2022].

Thompson, K.R., Hochwarter, W.A. and Mathys, N.J. (1997). Stretch targets: What makes them effective? *Academy of Management Perspectives*, [online] 11(3), pp.48–60. doi:10.5465/ame.1997.9709231663.

Un.org. (2022). *Expert Group on the Net-Zero Emissions Commitments of Non-State Entities | United Nations Secretary-General*. [online] Available at: https://www.un.org/sg/en/content/sg/personnel-appointments/2022-03-31/expert-group-the-net-zero-emissions-commitments-of-non-state-entities%C2%A0 [Accessed 14 Apr. 2022].

Unilever plc (2012). *Unilever plc - CDP Climate 2011*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2013). *Unilever plc - CDP Climate 2012*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2014). *Unilever plc - CDP Climate 2013*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2015). *Unilever plc - CDP Climate 2014*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2016). *Unilever plc - CDP Climate 2015*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2017). *Unilever plc - CDP Climate 2016*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2018). *Unilever plc - CDP Climate 2017*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2019). *Unilever plc - CDP Climate 2018*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2F en%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2020). *Unilever plc - CDP Climate 2019*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2021). *Unilever plc - CDP Climate 2020*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Unilever plc (2022a). *Unilever Climate Transition Action Plan*. [online] *unilever.com*. Available at: https://assets.unilever.com/files/92ui5egz/production/bbe89d14aa9e0121dd3a2b9721bbfd3bef57b8d3.pdf/unilever-climate-transition-action-plan-19032021.pdf [Accessed 7 May 2022].

Unilever plc (2022b). *Unilever plc - CDP Climate 2021*. [online] *CDP*. Available at: https://www.cdp.net/en/responses/19829/Unilever-plc?back_to=https%3A%2F%2Fwww.cdp.net%2Fen%2Fresponses%3Fper_page%3D10%26queries%255Bname%255D%3Dunilever%26sort_by%3Dproject_year%26sort_dir%3Ddesc&queries%5Bname%5D=unilever [Accessed 8 Jul. 2022].

Van Gansbeke, F. (2021). *Sustainability And The Downfall Of Danone CEO Faber (1/2)*. [online] Forbes. Available at: https://www.forbes.com/sites/frankvangansbeke/2021/03/20/sustainability-and-the-downfall-of-danone-ceo-faber-12/?sh=276097475b16 [Accessed 30 Aug. 2022].

Vigeo Eiris (2019). *Carrefour Solicited Sustainability Rating*. [online] *Carrefour*. Available at: https://www.carrefour.com/sites/default/files/2021-11/2020%2002%2019%20Carrefour_SR%20version%20finale.pdf [Accessed 27 Apr. 2022].

Watanabe, K. and Panagiotopoulos, A. (2021). *Breaking Down Corporate Net-Zero Climate Targets*. [online] *MSCI*. Available at: https://www.msci.com/documents/10199/9172b38f-5d67-4346-a15b-9b8233f81da0 [Accessed 4 Mar. 2022].

Watts, J. (2021). *Johan Rockström: 'We need bankers as well as activists… we have 10 years to cut emissions by half'*. [online] Ampproject.org. Available at: https://amp-theguardian-com.cdn.ampproject.org/c/s/amp.theguardian.com/environment/2021/may/29/johan-rockstrom-interview-breaking-boundaries-attenborough-biden [Accessed 12 Mar. 2022].

World Benchmarking Alliance (2020). *Benchmarking | World Benchmarking Alliance*. [online] World Benchmarking Alliance. Available at: https://www.worldbenchmarkingalliance.org/benchmarking/ [Accessed 1 Sep. 2022].

World Benchmarking Alliance (2021a). *2021 Food and Agriculture Benchmark -scoring guidelines*. [online] Available at:

https://assets.worldbenchmarkingalliance.org/app/uploads/2021/09/2021-Food-and-Agriculture-Benchmark-scoring-guidelines.pdf [Accessed 2 Sep. 2021].

World Benchmarking Alliance (2021b). *How it started | World Benchmarking Alliance*. [online] World Benchmarking Alliance. Available at: https://www.worldbenchmarkingalliance.org/how-it-started/ [Accessed 1 Sep. 2022].

World Benchmarking Alliance (2021c). *Methodology for the Food and Agriculture Benchmark*. [online] *World Benchmarking Alliance*. Available at:
https://assets.worldbenchmarkingalliance.org/app/uploads/2021/02/Food-and-Agriculture-Benchmark-methodology-report.pdf [Accessed 2 Sep. 2022].

World Benchmarking Alliance (2022). *2021 Food and Agriculture Benchmark Insights Report*. [online] Available at:
https://assets.worldbenchmarkingalliance.org/app/uploads/2022/03/2021-Food-and-Agriculture-Benchmark-Insights-Report.pdf [Accessed 1 Sep. 2022].

World Economic Forum (2021). *Net-Zero Challenge: The supply chain opportunity*. [online] Available at:
https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf [Accessed 17 Aug. 2022].

ANNEX : BIBLIOGRAPHY OVERVIEW

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
Target ambition	**Commitment to CDP/ SBTi (binary yes/no)**		**Target emissions baseline**		Negative	Empirical - regression analysis	Bolton and Kacperczyk (2021)	SBTi & CDP Not Net Zero Specific	Companies making decarbonization commitments strategically choose base years when emissions are largest	N/A
	Commitment to SBTi	Science target takes the value of one in the year a target becomes a SBT and for every year after, zero otherwise	**Target difficulty**		Positive	Empirical - regression analysis	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	Targets of science firms that adopt SBT standards increase in difficulty between around 23.1% and 27.8% on average, depending on target coverage, relative to the targets of science firms that do not adopt SBT standards	Adopting external standards for target setting is related to increased target difficulty.
	Decarbonisation commitment	We categorised companies into four groups, based on their decarbonisation commitments, from the most serious (Group 1, representing companies with science-aligned net-zero commitments or commitments-inprogress) to the least (Group 4, comprising companies that have not made a net-zero or carbon-neutral commitment to date	**Likelihood to have a carbon target in corporate strategy**		Positive	Empirical - survey, non scientific	PwC, (2022)	Net Zero	We found that the more significant the decarbonisation commitment, the more likely the company is to have emission targets in its corporate strategy. This is true for 70% of our Group 1 companies, but for only 44% of companies whose commitment is not science aligned—and for only 9% of companies that have not made any type of commitment	
Carbon dependency	**Firm carbon dependency**		**Target difficulty**	The targeted percentage reduction in carbon emissions from the base year level.	Negative	Empirical - regression analysis	Ioannou, Li and Serafeim (2016)	Decarbonization targets, no standard	Average target difficulty is 15.4% for firms in heavy polluting industries versus 20.3% in low polluting industries.	Firms in heavy polluting companies will, on average, set lower targets due to the need to change core processes and business models, adopt longer time horizons, and undertake larger investments in carbon reduction projects, compared to firms in low pollution industries

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Firm carbon dependency		**Likelihood of making an SBTi or CDP commitment (binary yes/no)**		Negative	Empirical - regression analysis	Bolton and Kacperczyk (2021)	SBTi & CDP Not Net Zero Specific	Lower scope 1 and scope 3 emissions increase the likelihood of making decarbonization commitments through CDP and SBTi.	N/A
	Firm carbon dependency	high-emitting (and hard-to-abate) industries	**Likelihood to make a net zero commitment**	/	Positive	Empirical - survey, non scientific	PwC, (2022)	Net Zero	At the sector level, among those that have made net-zero commitments, energy and power and utilities are the most highly represented. among CEOs of companies that have not made a commitment to achieve carbon neutrality, CEOs from the technology (74%), business services (72%) and insurance (71%) sectors were most likely to place themselves in this category.	/
	Firm carbon dependency		**Target horizon**	The total time planned for completing the target (measured in years), i.e. target year - base year	Positive	Empirical - regression analysis	Ioannou, Li and Serafeim (2016)	Decarbonization targets, no standard	Average target horizon is 7.8% for firms in heavy polluting industries versus 6.7% in low polluting industries.	Firms in heavy polluting companies will, on average, set lower targets due to the need to change core processes and business models, adopt longer time horizons, and undertake larger investments in carbon reduction projects, compared to firms in low pollution industries
	Firm carbon dependency		**Likelihood to set carbon targets**		Positive	Empirical - survey, non scientific	(Coppola, Krick and Blohmke, 2019)	Decarbonization targets, no standard	The energy, utilities and mining sector is the only one in which a majority of CFOs report that they have targets in place	
	Emissions / sales	Carbon intensity of a firm measured as metric tons of CO2 equivalent per million USD of sales revenue	**Likelihood of adopting an external standard for target setting (tested for SBTi)**	**Science firm |** a time-invariant indicator equal to 1 if a firm adopted at least one SBT over the sample period (2011-2019), and 0 otherwise	Positive	Empirical - regression analysis	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	A one-standard deviation increase in emissions/sales from its mean is associated with an increased likelihood of setting a SBT of 35%	Firms with greater economic incentives to address climate change are more likely to adopt external standards for target setting

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Low Carbon Revenue	Self-reported in CDP - percentage of total revenues from products and/or services that the firm generates from products that enable a third party to avoid greenhouse gas emissions	**Likelihood of adopting an external standard for target setting (tested forSBTi)**	**Science firm |** a time-invariant indicator equal to 1 if a firm adopted at least one SBT over the sample period (2011-2019), and 0 otherwise	No evidence found	Empirical - regression analysis	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	do not find evidence that higher revenues from low-carbon products (low carbon revenue) increases the probability of setting a SBT	Firms with greater economic incentives to address climate change are more likely to adopt external standards for target setting
	Upstream scope 3 emissions		**Likelihood of making an SBTi or CDP commitment (binary yes/no)**		Negative	Empirical - regression analysis	Bolton and Kacperczyk (2021)	SBTi & CDP Not Net Zero Specific	The level of scope 3 upstream emissions is shown to significantly reduce a company's willingness to commit. At the other end of the spectrum, the technology, media and telecommunications (TMT) industry seems at present to be flying under the radar when it comes to climate change. TMT executives do not feel particularly pressured to act from any given stakeholder, except their own employees, in part because the sector's emissions are relatively low. (TMT = 5% have Paris- aligned targets. 22% have set own targets, non-Paris aligned)	N/A
Track record	**Organizational goals of the previous time period**	/	**Organizational goals**	/	Significant, but undefined	Theoretical	(Michael Cyert and March, 2020)	General targets, not carbon-specific	None- theoretical study	In any time period, organization goals reflect "1) organizational goals of the previous time period, 2) organizational experience with respect to that goal in the previous period; 3) experience of comparable organizations with respect to the goal dimension in the previous time period

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Organizational experience with respect to that goal in the previous period	/	**Organizational goals**	/	Significant, but undefined	Theoretical	(Michael Cyert and March, 2020)	General targets, not carbon-specific	None- theoretical study	In any time period, organization goals reflect "1) organizational goals of the previous time period, 2) organizational experience with respect to that goal in the previous period; 3) experience of comparable organizations with respect to the goal dimension in the previous time period
	Past performance	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.
	Recent performance	/	**Likelihood of adopting stretch goals**	/	Negative	Theoretical	Sitkin et al., (2011)	Stretch goals - extreme goals	Proposition 3: Stronger recent performance is associated with a lower likelihood that an organization will use stretch goals.	/
	Past target completed	Past target completed | binary variable, 1 if at at least one target achieved in the past, 0 otherwise)	**Likelihood of adopting an external standard for target setting (tested for SBTi)**	**Science firm |** a time-invariant indicator equal to 1 if a firm adopted at least one SBT over the sample period (2011-2019), and 0 otherwise	Positive	Empirical - regression analysis	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	Having achieved a past targets increases the likelihood of adopting a SBT, relative to keeping targets aligned with internal standards For otherwise average firms, the predicted probability of adopting a SBT is 30% greater for firms that have completed a target in the past than for firms that have not	Firms with more difficult past targets and achievement of past targets are more likely to adopt external standards for target setting

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Past target ambition	**Past target ambition** | CDP assessment	**Likelihood of adopting an external standard for target setting (tested for SBTi)**	**Science firm |** a time-invariant indicator equal to 1 if a firm adopted at least one SBT over the sample period (2011-2019), and 0 otherwise	Positive	Empirical - regression analysis	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	The difficulty of past targets increases the likelihood of adopting a SBT, relative to keeping targets aligned with internal standards One-standard deviation increase in target ambition from its mean (holding other covariates at their means) is associated with an increased likelihood of SBT adoption of 34%	Firms with more difficult past targets and achievement of past targets are more likely to adopt external standards for target setting
	Perceived customer trust	we asked CEOs about the nature of their engagement with customers across six dimensions of	**Likelihood of setting NZ targets**		Positive	Empirical - survey, non scientific	PwC, (2022)	Net Zero	The CEOs of companies that ranked highest on our customer trust index are significantly more likely to lead organisations that have made a net-zero	
Performance compared to competitors	**Experience of comparable organizations with respect to the goal dimension in the previous time period**	/	**Organizational goals**	/	Significant, but undefined	Theoretical	(Michael Cyert and March, 2020)	General targets, not carbon-specific	None- theoretical study	In any time period, organization goals reflect “1) organizational goals of the previous time period, 2) organizational experience with respect to that goal in the previous period; 3) experience of comparable organizations with respect to the goal dimension in the previous time period
	Competitor performance	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Performance of benchmark-level companies in similar businesses	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.
	Industry peers committed to SBTi and/or to CDP		**Likelihood of making an SBTi or CDP commitment (binary yes/no)**		Positive	Empirical	Bolton and Kacperczyk (2021)	SBTi & CDP Not Net Zero Specific	The higher the number of industry peers making commitments, the higher the likelihood that an individual company will make a climate commitment.	N/A
	Analyst coverage		**Likelihood of making an SBTi or CDP commitment (binary yes/no)**		Positive	Empirical	Bolton and Kacperczyk (2021)	SBTi & CDP Not Net Zero Specific	The greater the analyst coverage of a firm, the greater the firm's incentives to make decarbonization commitments	N/A
	Pressure from stakeholders	Number of stakeholders companies feel pressured by to act	**Likelihood of taking action to to manage, mitigate or adapt to climate change**		Positive	Empirical - survey, non scientific	(Coppola, Krick and Blohmke, 2019)	Decarbonization targets, no standard	One-third of the companies that are not under significant pressure from any particular stakeholder say they are not taking any action to manage, mitigate or adapt to climate change. But in companies that feel pressurised by three or more stakeholders, only three per cent are failing to take action (figure 5).	

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
Organizational capabilities	**Organizational slack**		**Aspiration level adjustment to major external shifts**		Negative	Theoretical	(Michael Cyert and March, 2020)	General targets, not carbon-specific	None- theoretical study	Slack has a modulating effect on organizational aspirations in two important ways: "1) by absorbing excess resources, it retards upward adjustment of aspirations during relatively good times; 2) by providing a pool of emergency resources, in permits aspirations to be maintained (and achieved) during relatively bad times"
	Firm size	Number of employees	**Likelihood to set a carbon target**		Positive	Empirical	Dahlmann, Branicki and Brammer, (2019)	Decarbonization targets, no standard	larger firms are more likely to set a climate change target	/
	Firm size	Revenues	**Likelihood to make a net zero commitment**		Positive	Empirical - survey, non scientific	PwC, (2022)	Large companies are also highly represented: nearly two-thirds of those with revenues of US$25bn or more have made a net-zero commitment, compared to 10% of companies with revenues of less than US$100mn		
	Firm size	Revenues	**Concern about climate change as a top threat in the short term**	How do you anticipate your company could be impacted by these threats over the next 12 months? (Answer options: cyber attacks, health risks, macroeconomic volatility, climate change, geopolitical conflict, social inequality)	Positive	Empirical - survey, non scientific	PwC, (2022)		Large companies are also highly represented: nearly two-thirds of those with revenues of US$25bn or more have made a net-zero commitment, compared to 10% of companies with revenues of less than US$100mn	Also low on the list of concerns is climate change; an exception here are CEOs of companies with revenues exceeding US$10bn, for whom it is the top threat.

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Firm size	Revenues	**Level of maturity on advancing net-zero business models and solutions**	3 levels - advanced, intermediate and basic	Positive	Empirical - survey, non scientific	(Accenture and United Nations Global Compact, 2021)		Companies with annual revenues in excess of USD 1 billion are further along the journey. That is, 78% of CEOs of the largest companies in the world say they have begun advancing net-zero business models and solutions, compared to 61% of CEOs of the smallest companies (less than USD 25 million in annual revenue).	
	Level of organizational slack	/	**Likelihood of adopting stretch goals**	/	Negative	Theoretical	Sitkin et al., (2011)	Stretch goals - extreme goals	Proposition 4: Greater slack is associated with a lower likelihood that an organization will use stretch goals.	/
	Analysis of technical capabilities and resource constraints	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	IV details	Dependent variable (DV)	DV details	Relationship between IV and DV	Type of research	Reference	Type of targets assessed	Results / Summary	Hypotheses
	Evidence that the achievement of the goal / level will make the organization more competitive	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.
	Feedback from employees and suppliers involved with the goal	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.

What drives the ambition level of decarbonization targets?										
	Independent variable (IV)	**IV details**	**Dependent variable (DV)**	**DV details**	**Relationship between IV and DV**	**Type of research**	**Reference**	**Type of targets assessed**	**Results / Summary**	**Hypotheses**
	Analysis of how goal achievement may impact other measures	/	**Organizational goals**	/	Significant, but undefined	Theoretical	Graham Brown (2020)	General targets, not carbon-specific	None- theoretical study	Goals should be based on the following considerations: 1) past performance, 2) competitor performance, 3) performance of benchmark-level companies in similar businesses, 4) analysis of technical capabilities and resource constraints, 5) evidence that the achievement of the goal / level will make the organization more competitive, 6) feedback from employees and suppliers involved with the goal, 7) analysis of how goal achievement may impact other measures.
	Likelihood risk, timeframe risk and magnitude risk	firm responses to CDP survey questions about the risks they perceive that relate to regulatory, physical, and other impacts of climate change	**Likelihood of adopting an external standard for target setting (tested forSBTi)**	**Science firm |** a time-invariant indicator equal to 1 if a firm adopted at least one SBT over the sample period (2011-2019), and 0 otherwise	Positive	Empirical	Freiberg, Grewal and Serafeim (2019)	SBTi Not Net Zero specific	Firms perceiving more imminent climate change risks to their business, and firms perceiving a greater magnitude of impact from these risks, are more likely to set a SBT. Timeframe risk (magnitude risk) by one standard deviation from its mean increases the likelihood of adopting a SBT by 26% (30%)	Firms with greater economic incentives to address climate change are more likely to adopt external standards for target setting