

# Quantifying your net-zero strategy

A balancing act between decarbonization  
risk and opportunity







Globally, organizations are increasingly committing to net-zero targets. Yet, as companies outline their ambitions, there is a growing recognition of the complexity of the challenge in developing plans to achieve them. These plans must not only consider decarbonization, but also the associated risks (and opportunities) of a company's transition.

With the help of an illustrative case study, this report walks through the five steps organizations will typically need to go through to build a robust net-zero plan: 1. Quantify baseline risk, 2. Set goals and targets, 3. Quantify bottom-up strategies, 4. Optimize cost-benefit roadmap, and 5. Implement, monitor and report. Using a quantitative approach, we show how organizations can achieve greater clarity of the cost-benefit of different decarbonization strategies, alongside views of the return on investment and an understanding of the decision-support tools that contemplate transition risks and opportunities.

### Authors

**Callum Ellis**

Senior Managing Consultant, Climate Resilience & Strategy, Marsh

**Nicholas Faull**

Head of Climate & Sustainability Risk and Innovation, Marsh

**Sam Vosper**

Senior Climate Economist, Resilience

**Tom Harvey**

Head of Product Management, Resilience

**Arthur Kennedy-Cochran-Patrick**

Client Implementation Specialist, Resilience

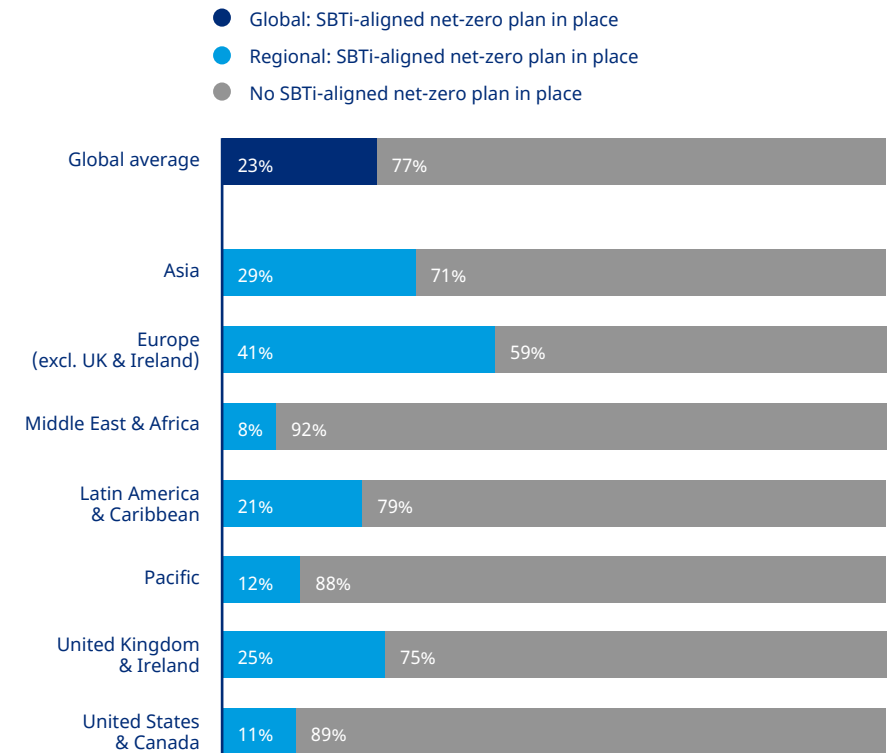
# Introduction

Globally, as governments and organizations continue to prepare for the 28th United Nations Conference of the Parties on Climate Change (COP28), the fundamental message remains, “the red line we must not cross is the line that takes our planet over the 1.5-degree temperature limit” ([UN Secretary-General António Guterres](#)). To deliver that ambition there is an increasing focus on the quality of companies’ plans to achieve net zero within their own operations. Between 2020 and 2021, the number of publicly traded companies setting net-zero targets increased by 32% (Net Zero Tracker; [zerotracker.net/insights/pr-net-zero-stocktake-2022](#)), and in the UK, for example, the government have announced plans to require all UK-listed businesses and certain financial institutions to publish decarbonization plans from 2023 ([transitiontaskforce.net/about/](#)).

While net-zero target setting by organizations surges, there remains a large proportion of corporates who have yet to put in place a net-zero strategy (based on Marsh analysis of over 400 companies throughout 2022, only ~23% have completed a transition plan in line with the Science Based Targets initiative (SBTi), as shown in Figure 1). For organizations that have not yet developed a transition plan, this has the potential to create business risks associated with a world that is decarbonizing, also known as “transition risks”. Transition risks may include: policy impacts resulting from increased government legislation, such as carbon taxes; reputational damage driven by changing consumer or investor priorities; or technological risks associated with implementing decarbonization initiatives.

As CEOs around the world continue to make statements outlining their commitments to “achieve net zero”, organizations should continue to balance organizational net-zero priorities alongside an understanding of what it will take to achieve and the potential transition risks associated with decarbonizing. Marsh and Risilience have collaborated to help organizations build robust net-zero plans, and this paper outlines how our approach can help organizations quantify the risks and opportunities associated with the transition to net-zero.

## 01| Proportion of companies by region adopting a net-zero transition plan aligned to SBTi



# Building a net-zero plan

To start developing a viable strategy there are a number of key questions to address, including the following:

- When does the company aim to achieve net-zero emissions by and are there interim targets?
- What are the main sources of emissions that need to be targeted?
- What emissions-reduction initiatives are currently available, how much do they cost, and how long will they take to implement?
- What impact will these initiatives have on the wider business?

Answers to these questions allow management to plan for investments as well as communicate to the board, investors, and customers. However, answering these requires the business to work collaboratively across departments and functions to make potentially difficult decisions about the right path forward. Input from these multiple stakeholders will invariably be needed to help form views on the return on investment (ROI) to different approaches. However, it is likely that the strategy may also unlock some indirect benefits, such as reputational improvement, shifting investor preference, new customer bases or increased access to capital. Given this, it is crucial that both direct and indirect benefits are quantified before being considered as part of a net-zero strategy.

## A TYPICAL PROCESS MAY LOOK LIKE THIS:



**1** Quantify baseline risk



**2** Set goals and targets



**3** Quantify bottom-up strategies



**4** Optimize cost-benefit roadmap



**5** Implement, monitor, and report

To bring the process to life the following illustrative case study shows an organization's journey through these steps.





# Case study

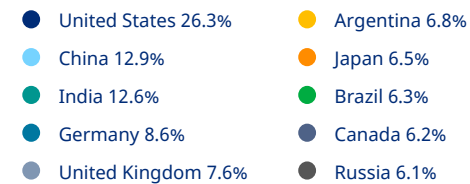
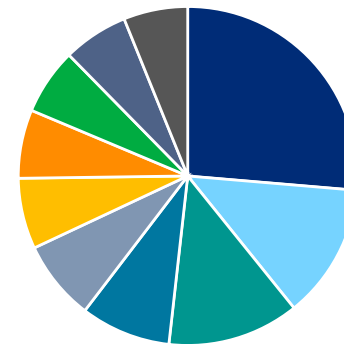
## NET-ZERO JOURNEY FOR AVOCADO LTD.

### Company background

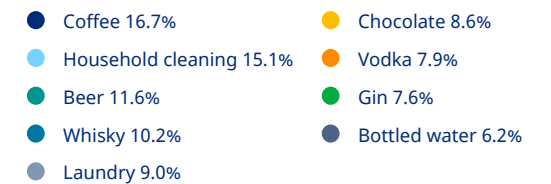
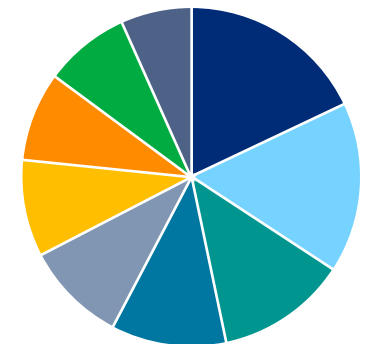
Let us consider a hypothetical company called Avocado Ltd, that is looking to develop a net-zero plan.

Avocado is a global food and beverages giant with annual revenues of \$12 billion. This revenue is segmented by product and country market, with the top 10 by revenue outlined in Figures 2 and 3 below.

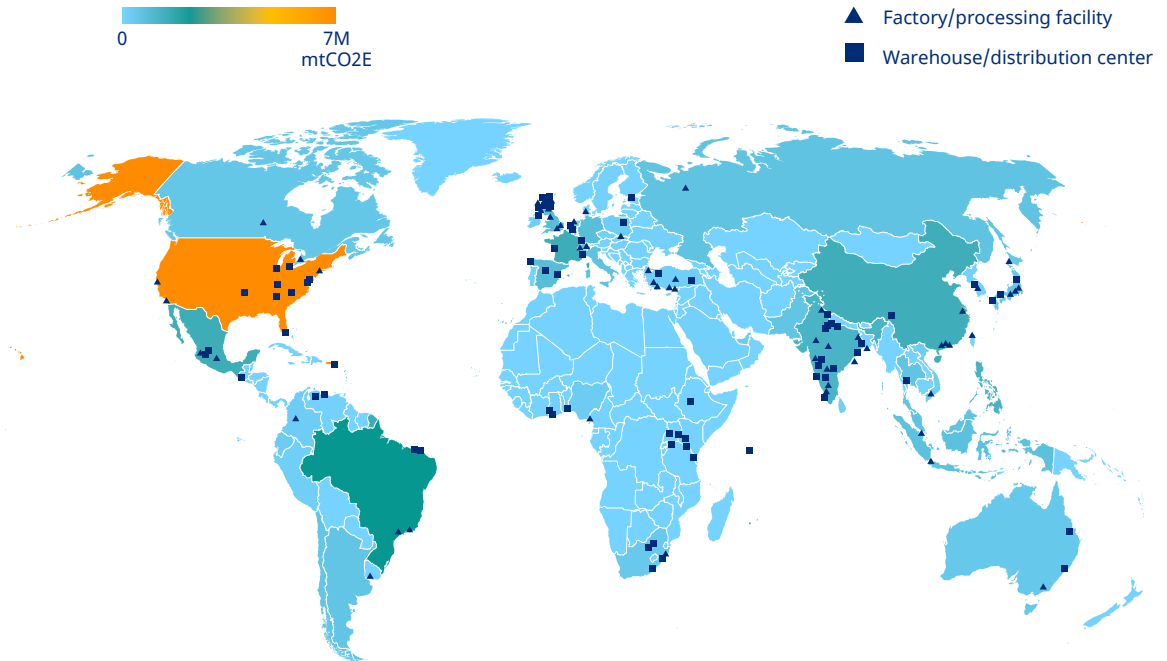
### 02| Revenue by country



### 03| Revenue by product



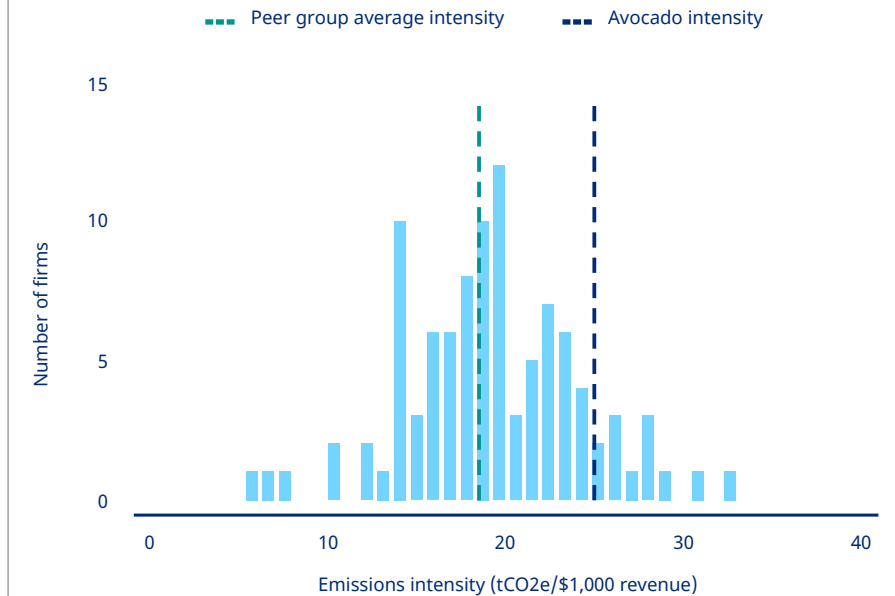
#### 04| Greenhouse gas emissions by country\*



\*Note: Greenhouse gas data includes total across scope 1, 2 and 3 (upstream and downstream) emissions.

Avocado has a widely distributed production system with complex supply chains, hence the company has a large and distributed carbon footprint (which would typically need to be quantified with the support of a carbon accounting specialist). The company produces in excess of 30 mt of carbon dioxide equivalent (CO<sub>2</sub>e) across its direct (Scope 1) and indirect (Scope 2 and 3) sources. The vast majority of this footprint is in Scope 3 — over 26 mtCO<sub>2</sub>e. The remainder is comprised of direct Scope 1 emissions of approximately 3 mtCO<sub>2</sub>e and Scope 2 purchased electricity emissions of approximately 0.5 mtCO<sub>2</sub>e. Figure 4 represents this aggregated footprint geographically.

#### 05| Illustrative distribution of emissions intensity of large multinational food and beverage companies



As a global organization, one of the core drivers of Avocado's direct and indirect emissions is its reliance on fossil-fuel powered transport to ship products around the world. This can be seen from the distribution of key factories and warehouses, also in Figure 4. These locations represent the primary areas where the company can seek to innovate and decrease its emissions intensity.

When the structure of Avocado and its operations are compared to other companies in its peer group, its emissions intensity sits above average relative to peers (Figure 5).

## Step 1: Quantify baseline risk

As a consequence of Avocado's relatively large emissions footprint, the company is under pressure to transform aspects of its business and transition to a cleaner and more sustainable model.

As a first step, Avocado could use its understanding of the most carbon-intensive parts of its business to prioritize decarbonization efforts across its operations. However, for the board, developing views around the potential ROI of different decarbonization solutions is essential. While using emissions intensity (Figure 5) is an effective starting point, organizations may also wish to look at the issue through a 'risk' lens.

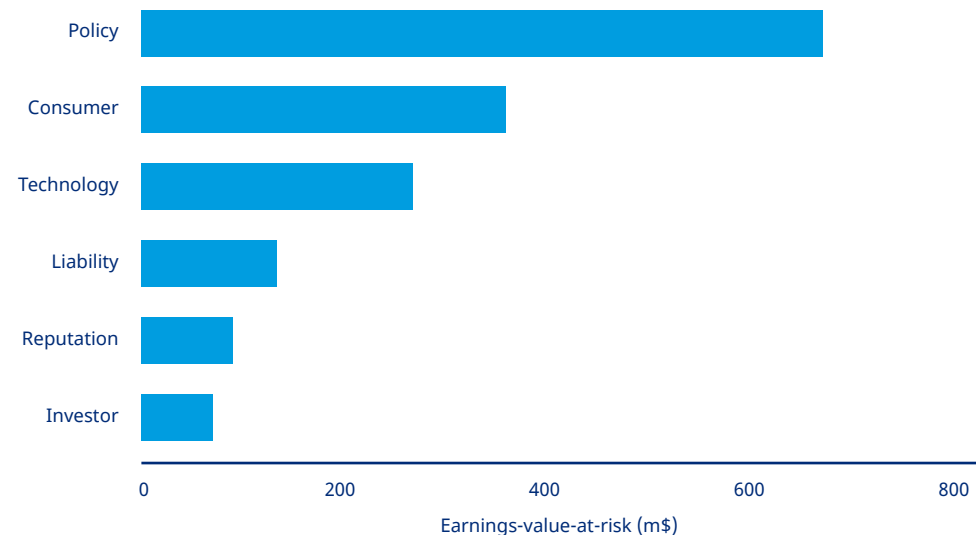
Under its current business model, Avocado may be exposed to a number of transition risks that could impact the organization financially. For example, rising fuel costs driving up product prices as a consequence of supply-chain transport or increases to the cost of capital from lenders as a result of the organization being carbon intensive. These transition risks can be quantified for a given company as a risk of losses to its earnings value (for instance, financial impacts to a discounted cash flow over a set period).

Leveraging the Resilience transition risk modeling platform, Avocado has assessed and quantified its core transition risks (as prescribed by the Task Force for Climate-Related Financial Disclosures (TCFD) which it is subject to):

- **Policy:** Prices and penalties for greenhouse gas emissions as legislated by governments.
- **Consumer:** Transforming markets due to preference shifts towards sustainable alternatives of products and services.
- **Technology:** Impairment and stranding of carbon-intensive assets and operations following changes in key economic sectors.
- **Liability:** Litigation against companies alleging liability for causing climate change damages.
- **Reputation:** Customer sentiment volatility influenced by a company's actions to address climate change.
- **Investor:** Updated investor priorities for returns from lower-carbon companies, driving cost of capital and valuation changes.

Some of these risks are significant, as shown in Figure 6. In total this is \$1.6bn earnings-value-at-risk representing ~16% of the total earnings value of the company over the next 5 years.

## 06| Transition risk to Avocado's earnings value over the next 5 years





## Step 2: Set goals and targets

Given the significant earnings-value-at-risk identified, Avocado's board would like to reduce some of this transition risk, primarily through setting tangible emissions targets.

Aspirationally, Avocado would like to pledge to reduce absolute greenhouse gas emissions as follows (all relative to a baseline year of 2023):

- 2030: 50% reduction
- 2040: 80% reduction
- 2050: Achieve net zero

However, these targets need to be supported by a robust set of analytics to determine the achievability of the targets. Thus, the sustainability team has the task of determining whether these targets are achievable, and which investment initiatives will achieve the promised emissions-reduction targets while also reducing the potential transition risk to Avocado.





### Step 3: Quantify bottom-up strategies

Defining a decarbonization strategy requires a number of components. Each component is iterative, in that organizations can continually adjust, improve and re-align the strategy as they have a better view on how to achieve decarbonization. Principally, these components are:

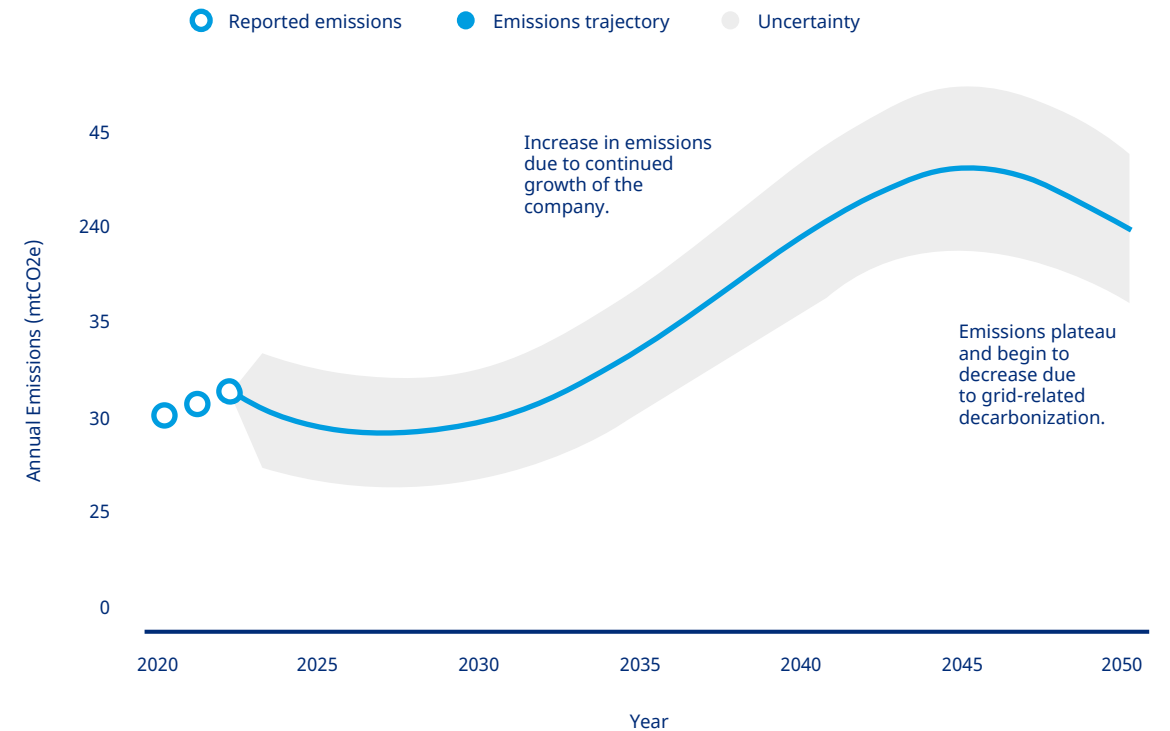
- 3A. establishing an emissions trajectory,
- 3B. identifying decarbonization initiatives across operations and emissions scopes,
- 3C. quantifying decarbonization emissions reduction for each initiative, and,
- 3D. adjusting reduction in emissions trajectory.

Each is discussed in turn below.

#### 3A: Establishing an emissions trajectory

To make actionable plans for reducing Avocado's emissions, it is useful to first establish the current trajectory of emissions growth (or decline) based on factors such as market growth, operational scale and grid decarbonization. Estimates can be informed based on analyses of historic financial and emissions reporting. However, it is important to recognize that in virtually all cases such estimates will have some level of uncertainty. Figure 7 shows the estimated emissions trajectory for Avocado assuming no action is taken to reduce future emissions.

### 07| An estimated emissions trajectory for Avocado (assuming emissions are unabated)





### 3B: Identifying decarbonization initiatives

The next component is to identify initiatives that can form part of the decarbonization strategies. Given that a large portion of Avocado's direct emissions (Scope 1) are attributed to the use of fossil fuel-based transportation, viable solutions might include:

- The substitution to renewable biofuels.
- Low carbon technologies such as electric vehicles.

Separately, reducing its indirect emissions from purchased electricity (Scope 2) would rely on a combination of energy-based measures. Here, solutions might include:

- Energy efficiency initiatives to reduce operational demand within Avocado.
- Purchasing electricity from renewable providers / on-site renewables.

The largest portion of Avocado's emissions are in its indirect upstream and downstream category (Scope 3). Decarbonizing supply chains can be challenging but with the right strategic approaches it is achievable. For Avocado this might include:

- Altering products to move away from carbon intensive products / raw materials.
- Nearshoring production to reduce load on transportation emissions.
- Sourcing low-carbon transport options.
- Switching suppliers to prioritize more sustainable organizations.
- Working with existing suppliers to find ways for them to decarbonize their own operations.

### 3C: Quantifying decarbonization emissions reduction

Deciding on the approach and scale of decarbonization initiatives will depend on their relative costs and benefits.

For simplicity, here we assume that Avocado has decided upon 5 decarbonization initiatives, one which focuses on reducing Scope 1 emissions and four which focus on reducing Scope 3 emissions. A summary of all 5 initiatives is shown below. In addition, we detail the Scope 1 initiative (Reducing Scope 1 transport-based emissions through alternative fuel selection) as a way to highlight the calculation steps taken.

#### A description of Avocado's decarbonization initiatives

##### 1. Nearshoring phase 1      Scope 3 upstream      2024 – 2050

Avocado could immediately shift production away from the least efficient production (and supplier) sources to comparable but more accessible sources. This would reduce Scope 3 upstream emissions by 31% versus the existing baseline.

##### 2. Nearshoring phase 2      Scope 3 upstream      2027 – 2050

Further nearshoring of operations, particularly through selection of lower-carbon production, would reduce Scope 3 emissions by a further 14% from the baseline.

##### 3. Vehicle fuel switch      Scope 1      2030 – 2050

As described in the calculations, Avocado could directly substitute fossil diesel for sustainable biodiesel in its vehicle fleet to reduce emissions by 2.7 mtCO<sub>2</sub>e per year.

##### 4. Aviation fuel switch      Scope 3 upstream      2036 – 2050

Avocado could pay a premium for sustainable aviation fuel to reduce upstream transport emissions by, on average, 4.5 mtCO<sub>2</sub>e per year.

##### 5. Supplier switching      Scope 3 upstream      2036 – 2050

Supporting suppliers to switch their operational practices to greener, renewable energy alternatives could ramp up to save Avocado up to 7.5 mtCO<sub>2</sub>e per year.

#### REDUCING SCOPE 1 TRANSPORT-BASED EMISSIONS THROUGH ALTERNATIVE FUEL SELECTION

While smaller in magnitude, it is the sole responsibility of Avocado to reduce its direct Scope 1 emissions. Given the transportation of products for Avocado uses fossil-fuel, one potential solution could be to move from using traditional diesel to biodiesel within its vehicle fleet.

In the case of sustainable biodiesel, the emissions factor (emissions per tonne of fuel) is significantly lower than that of traditional diesel. To calculate the tonnes of CO<sub>2</sub>e emissions saved by this initiative, we can subtract the difference in emissions factor between traditional diesel and biodiesel and then multiply this by the amount of fuel switched by Avocado. This calculation can be represented as follows:

$$\Delta E = (EF_D - EF_{BD}) \times Vol$$

Where:

$\Delta E$  = emissions reduction (tCO<sub>2</sub>e)

$EF_D$  = emissions factor of diesel  
2.700 tCO<sub>2</sub>e/kilolitre)

$EF_{BD}$  = emissions factor of biodiesel  
(0.167 tCO<sub>2</sub>e/kilolitre)

$Vol$  = volume of fuel switched by Avocado in one year  
(1,065,000 kilolitres)

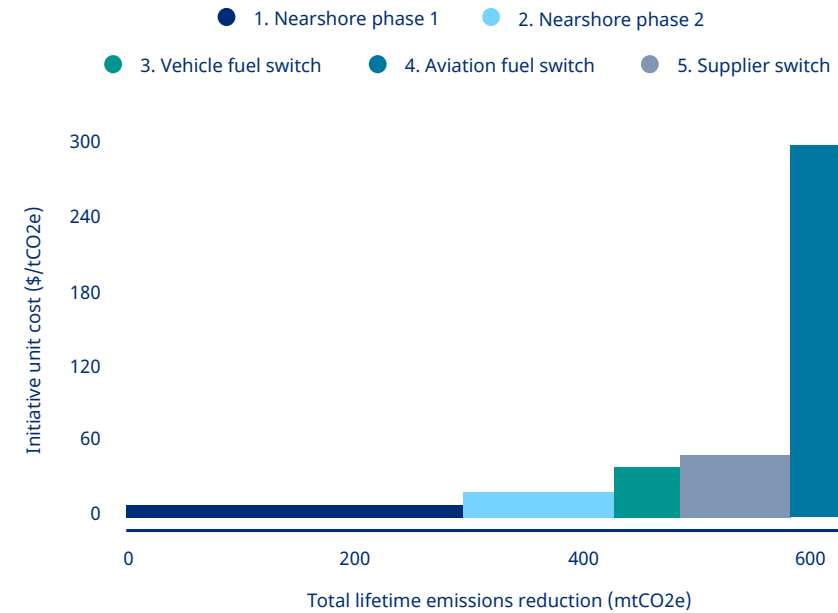
Using the formula, this would produce an annual emissions reduction for Avocado of: **~2.7 million tonnes CO<sub>2</sub>e** (i.e. (2.700 – 0.167) x 1,065,000).

Assuming a premium of ~\$0.10 per litre for biodiesel over traditional diesel, Avocado can then calculate the cost per tonne of CO<sub>2</sub>e abated as ~\$40 (i.e. 1,065m x \$0.1 / 2.7 mtCO<sub>2</sub>e).



While the initial description of the initiatives may sound impactful, it is important to consider whether these represent the most efficient route for Avocado to achieve its targets. An effective way to test this is by using marginal abatement cost curves, which plot the emissions reductions of an initiative (x axis) versus the per-unit emissions reduction cost (y axis). Figure 8 shows this analysis for the above initiatives. In the case of Avocado, it is evident that the two nearshoring initiatives (Initiatives 1 and 2) are relatively cost effective with comparatively large total reductions. However, sustainable aviation fuel use (Initiative 4) appears to be an outlier with extremely high per-unit costs for only a moderate reduction in emissions. There may be an argument for substituting this initiative for another more economical and/or impactful approach when seeking to optimize the decarbonization strategy.

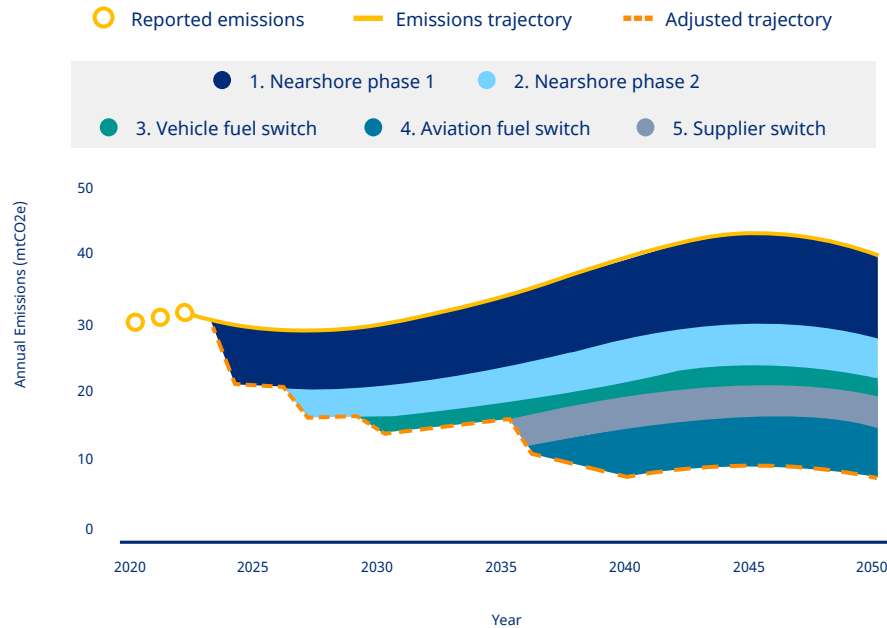
## 08| Marginal abatement cost curve of lifetime costs and emissions of each initiative



### 3D: Adjusting the emissions trajectory

Having decided on a set of decarbonization initiatives, one can plot their impact against the projected emissions trajectory. Subtracting the emissions reductions from the trajectory over time produces an updated emissions trajectory that the company can position itself towards achieving. This is represented graphically in Figure 9. Different initiatives can be initiated at various time horizons with some initiatives being phased out before 2050 while other ramp up in impact over time.

#### 09| An updated emissions trajectory for Avocado after initiatives are applied



Having established a new emissions trajectory for the company it is possible to compare how these initiatives align with the targets set out by Avocado’s board (as a reminder, 2030: 50% reduction; 2040: 80% reduction; 2050: Achieve net zero). This is shown in Figure 10.

#### 10| Comparison of Avocado’s post-initiative emissions trajectory and its pledged targets



### 11| Waterfall chart of Avocado's projected emissions, decarbonization initiatives and pledged target for 2040



It is clear that the proposed initiatives are effective in helping Avocado reach its 2030 target of 50% reduction. However, there will likely be a shortfall of emissions reductions needed to reach the later targets. Further evidence of this is presented in the waterfall chart in Figure 11. This chart looks at the year 2040 and how the projected emissions, proposed decarbonization initiatives and pledged target match up. Specifically, it highlights that an additional 1.2 mtCO2e of decarbonization would be required by 2040 to meet the target.

Avocado will therefore need to determine additional emissions-reduction initiatives and quantify their impact if they are to achieve the 2040 and 2050 targets.



### Step 4: Optimize the cost-benefit roadmap

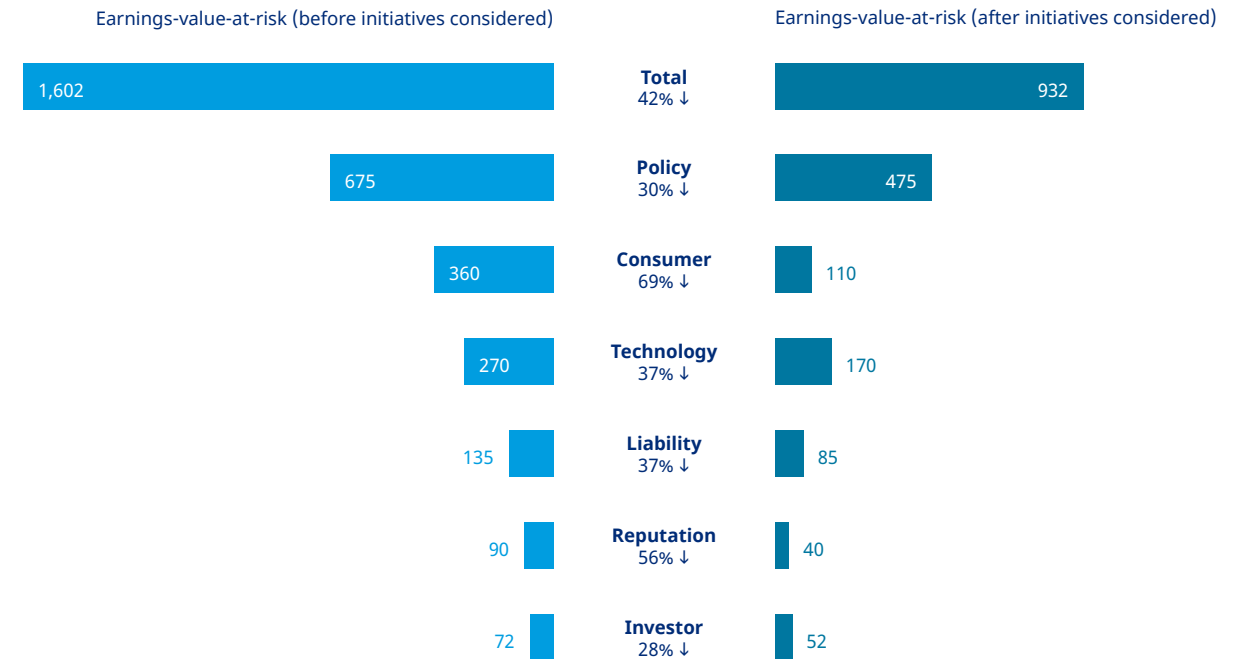
Evaluating decarbonization initiatives by looking at their emissions-reduction potential only provides a view of their contribution towards the organization’s net-zero roadmap. Crucially, once an organization has quantified its initiatives, it is also useful to re-evaluate the transition earnings-value-at-risk (as per Step 1, Figure 6).

Based on the initiatives Avocado is implementing, this re-evaluation shows a significant additional benefit in terms of a reduction in earnings-value-at-risk of ~42% (\$670m) across the next 5 years, as shown in Figure 12. The amount of risk reduction, however, differs across each type of transition risk:

- **Policy:** -30% (\$200m) reduction driven by Initiatives 1, 2 and 5 (supplier switching and nearshoring operations) reducing the impact of carbon taxation costs across the company value chain
- **Consumer:** -69% (\$250m) reduction driven by Avocado’s exposure to increasing consumer appetite for sustainably-generated products
- **Technology:** ~37% (\$100m) reduction driven by Initiatives 3 and 4 (aviation and vehicle fuel switching) reducing risk of asset impairment through Avocado investments into low-carbon technologies
- **Liability:** ~37% (\$50m) reduction driven by reducing potential litigation costs in the near-term as Avocado continues to move towards its pledged emissions targets
- **Reputation:** ~56% (\$50m) reduction driven by its year-on-year reduction in emissions bringing Avocado more in-line with peers and less likely to be subject to adverse publicity
- **Investor:** ~38% (\$20m) reduction driven by its year-on-year reduction in emissions improving investor perceptions and potentially giving rise to greater access to capital

Given that Avocado’s decarbonization initiatives show substantial financial benefits beyond just emissions reduction, these can be usefully factored into a business case for pursuing such a net-zero strategy.

### 12| Re-evaluated transition risks to Avocado’s earnings value over the next 5 years



# 5

## Step 5: Implement, monitor and report

Working through the previous four steps will put Avocado's sustainability team in a strong position to implement the net-zero strategy underpinned by the selected initiatives. The rollout of the strategy will require involvement from various departments and in some cases external engineering contractors. However, Avocado will likely be required to monitor the progress and impacts of the initiatives in-house and report on these to senior management and refine the strategy over time as circumstances require.



# Conclusion

When it comes to net-zero planning, organizations will often begin with top-down net-zero target setting followed by bottom-up decarbonization initiative planning to create their roadmap. Evaluating initiatives using a quantitative approach therefore provides critical input into the planning process. Using Avocado as a hypothetical case study, we have explored the following:

- **Using marginal abatement cost curves to determine the cost effectiveness of initiatives.** In the case of Avocado, it was found that one initiative in particular was much less cost effective than the others, a fact which could be used to inform prioritization.
- **Adjusting the organization's projected emissions trajectory based on implementation of initiatives to validate how emissions targets will be met.** In the case of Avocado, it was found that while its initiatives will enable it to meet its 2030 target, it would not be on track to meet its 2040 target or to be operationally net zero by 2050, therefore further initiatives may need to be considered.
- **Re-evaluating the transition earnings-value-at-risk based on implementation of initiatives to determine their impact.** In the case of Avocado, it was found that there was a significant reduction in earnings-value-at-risk, which could be used to support the business case for pursuing their net-zero strategy.

Taking a quantitative approach early in their net-zero journey gives organizations the opportunity to fully explore their decarbonization initiatives. This means organizations should be able to develop a more informed and robust net-zero strategy and be able to communicate more effectively to key internal and external stakeholders the potential benefits.





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