

QUANTIFYING YOUR NET-ZERO STRATEGY

A balancing act between decarbonisation, risk and opportunity

Centre for
Risk Studies



UNIVERSITY OF
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Marsh



Risilience



Globally, organisations 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 decarbonisation, but also the associated risks and opportunities of a company’s transition.

With the help of an illustrative case study, this report presents the five steps organisations will typically need to take to build a robust net-zero plan:

- 1. Quantify baseline risk
- 2. Set goals and targets
- 3. Quantify bottom-up strategies
- 4. Optimise cost-benefit roadmap
- 5. Implement, monitor and report

Using a quantitative approach, we show how organisations can achieve greater clarity of the cost-benefit of different decarbonisation strategies, alongside views of the return on investment and an understanding of the decision-support tools that contemplate transition risks and opportunities.

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Introduction

Globally, as governments and organisations continue preparations 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” . 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 per cent and in the UK, for example, the government has announced plans to require all UK-listed businesses and certain financial institutions to publish decarbonisation plans from 2023 .

While net-zero target setting by organisations surges, there remains a large proportion of corporates that have yet to put in place a net-zero strategy. Based on Marsh analysis of over 400 companies throughout 2022, only ~23 per cent have completed a transition plan in line with the Science Based Targets initiative (SBTi), as shown in Figure 1. For

organisations that have not yet developed a transition plan, this has the potential to create business risks associated with a world that is decarbonising, 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 preferences or investor priorities; or technological risks associated with implementing decarbonisation initiatives.

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

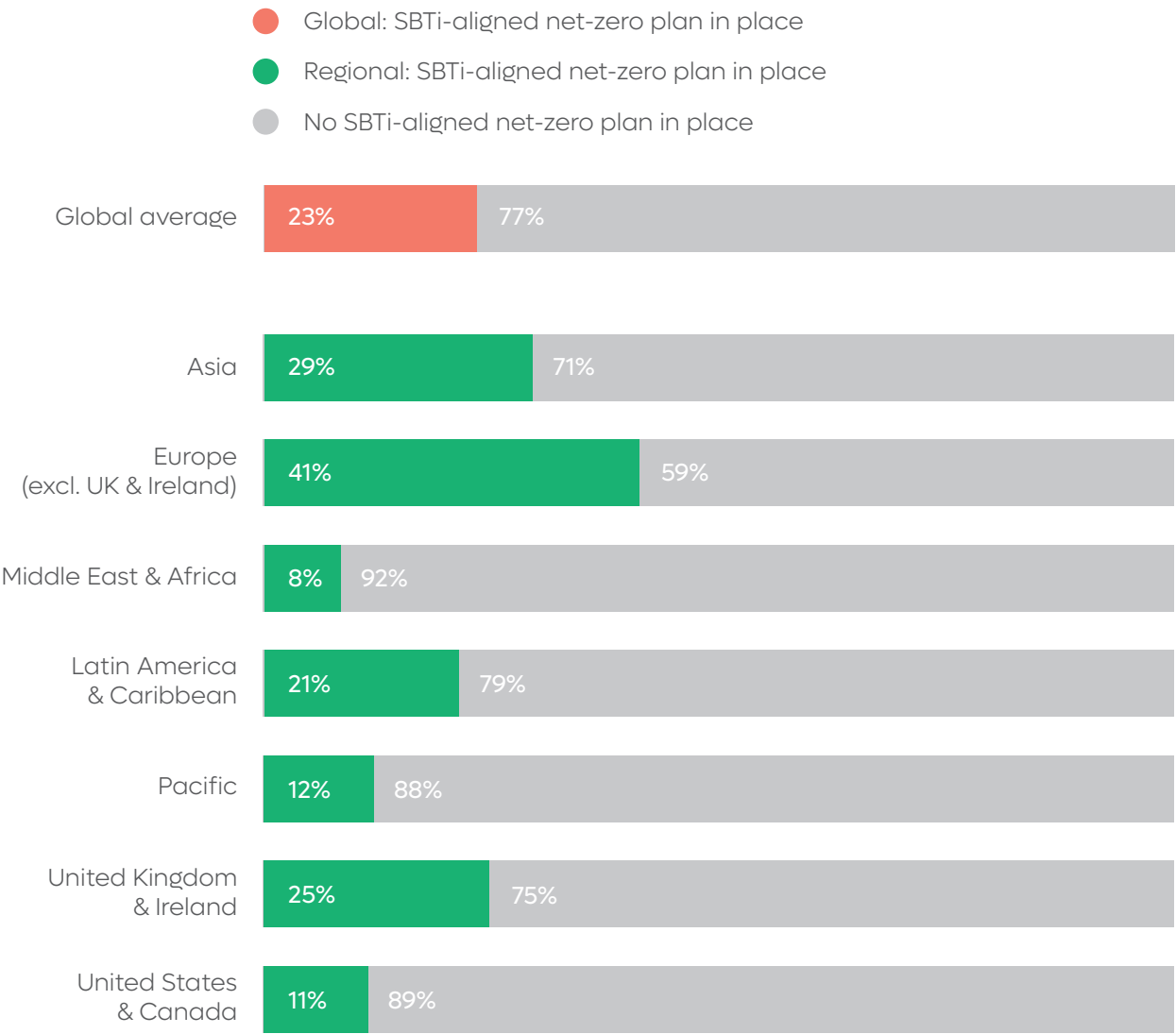


Figure 1: Proportion of companies by region adopting a net-zero transition plan aligned to SBTi

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?

A TYPICAL
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2 Set goals
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3 Quantify
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4 Optimise
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5 Implement,
monitor,
and report



To bring the process to life the following illustrative case study shows an organisation'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 ten by revenue outlined in Figures 2 and 3 below.

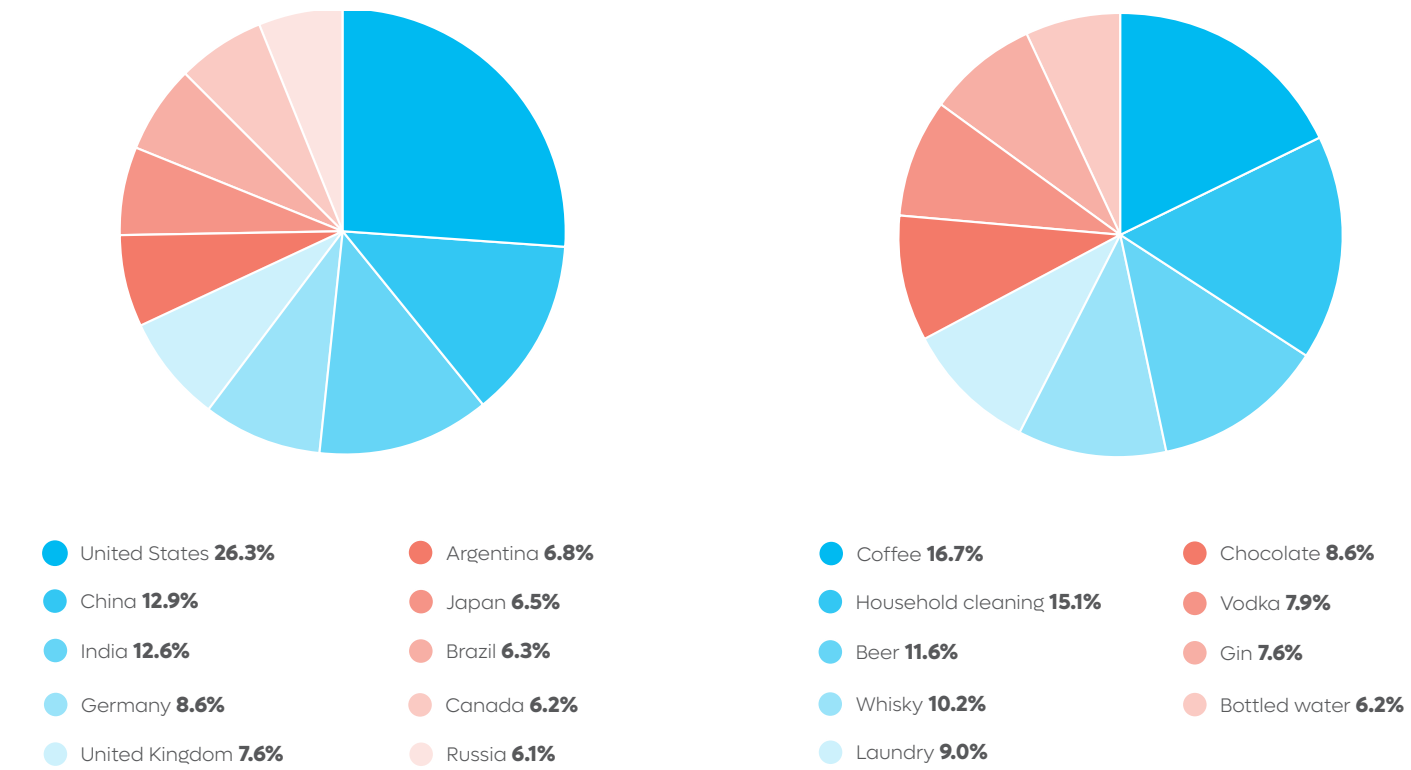
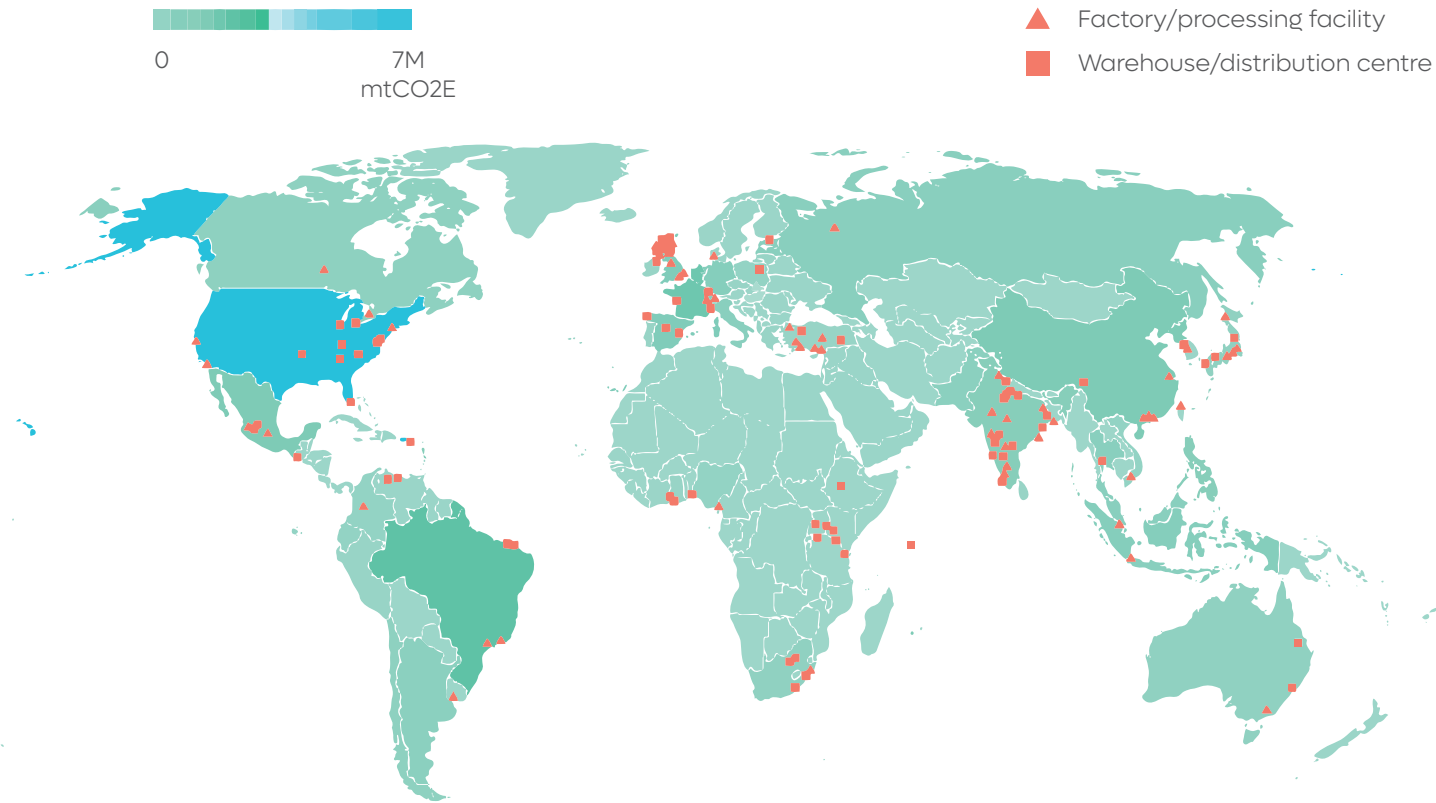


Figure 2: Revenue by country

Figure 3: Revenue by product



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

Figure 4: Greenhouse gas emissions by country

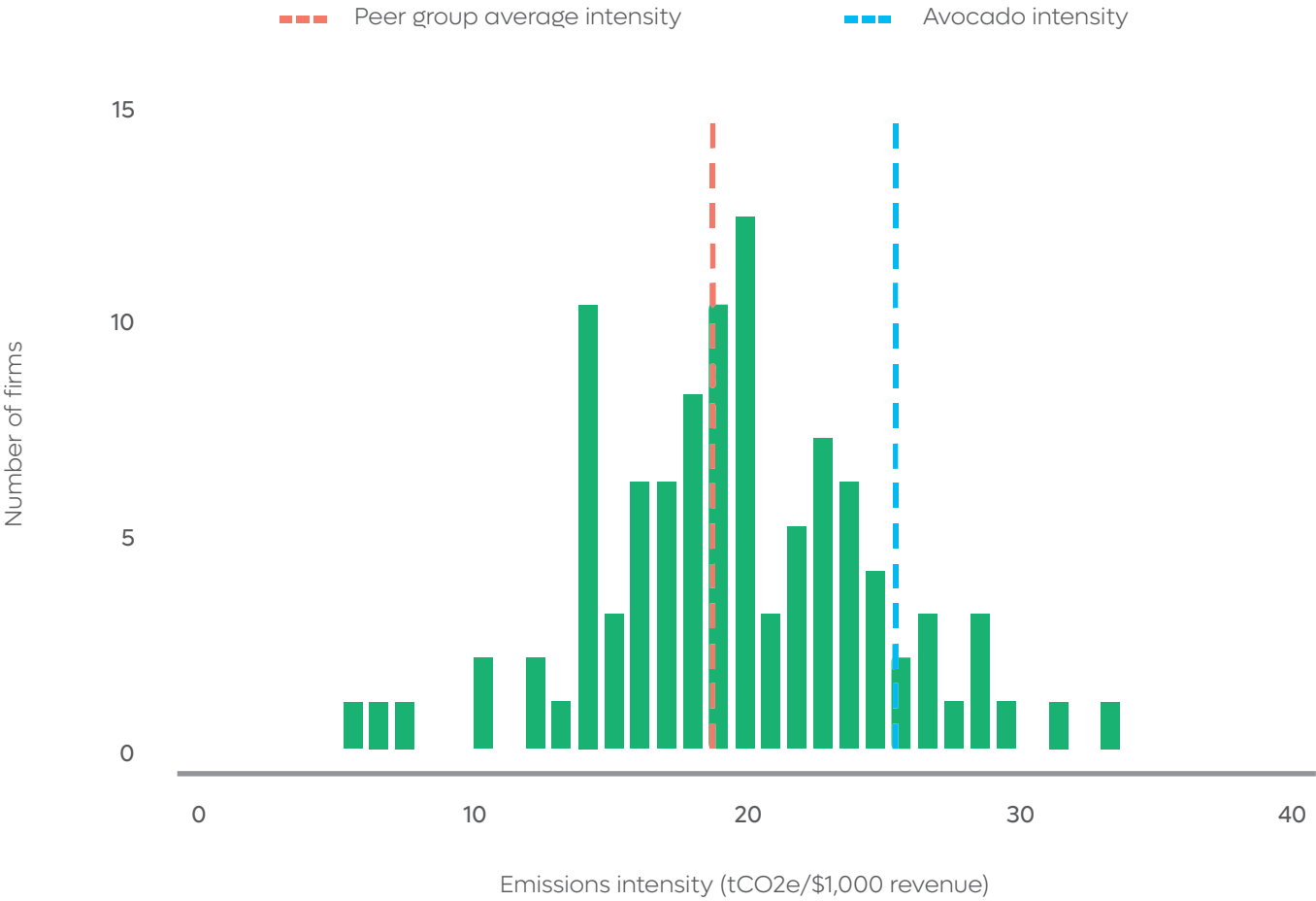


Figure 5: Illustrative distribution of emissions intensity of large multinational food and beverage companies

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 (CO₂e) across its direct (Scope 1) and indirect (Scope 2 and 3) sources. The vast majority of this footprint is in Scope 3 – over 26 mtCO₂e. The remainder is comprised of direct Scope 1 emissions of approximately 3 mtCO₂e and Scope 2 purchased electricity emissions of approximately 0.5 mtCO₂e. Figure 4 represents this aggregated footprint geographically.

As a global organisation, 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, Avocado's 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 prioritise decarbonisation efforts across its operations. However, for the board, developing views around the potential ROI of different decarbonisation solutions is essential. While using emissions intensity (Figure 5) is an effective starting point, organisations 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 organisation 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 organisation 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 Risilience transition-risk modelling 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 per cent of the total earnings value of the company over the next five years.

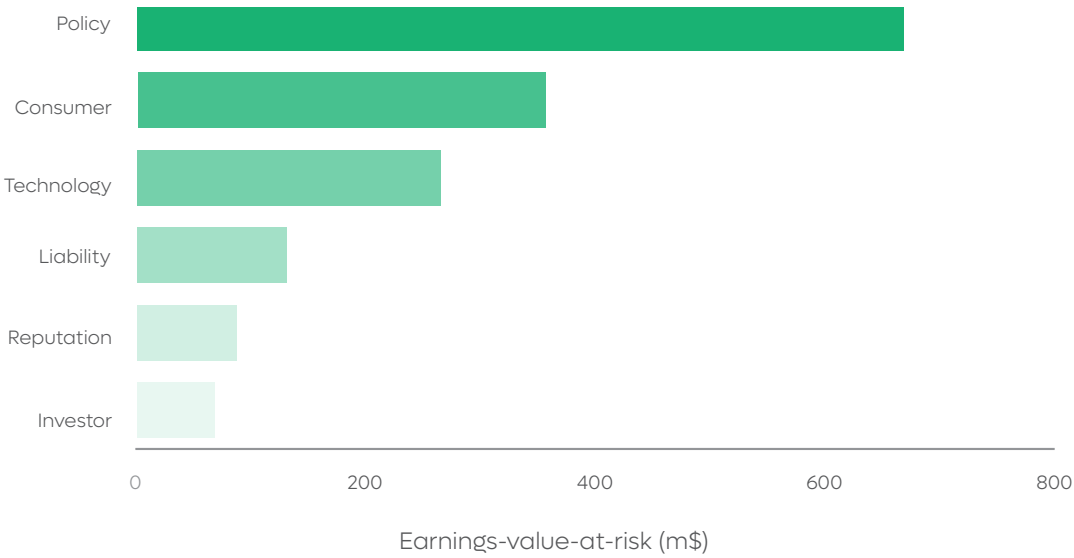


Figure 6: Transition risk to Avocado’s earnings value over the next five years

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 per cent reduction
- **2040:** 80 per cent reduction
- **2050:** Achieve net zero

However, these targets need to be supported by a robust set of analytics to determine their achievability. 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 decarbonisation strategy requires a number of components. Each component is iterative, in that organisations can continually adjust, improve and re-align the strategy ,as they have a better view on how to achieve decarbonisation. Principally, these components are:

- 3A:** Establishing an emissions trajectory
- 3B:** Identifying decarbonisation initiatives across operations and emissions scopes
- 3C:** Quantifying decarbonisation-emissions reduction for each initiative
- 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 decarbonisation. Estimates can be informed based on analyses of historic financial and emissions reporting. However, it is important to recognise 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.

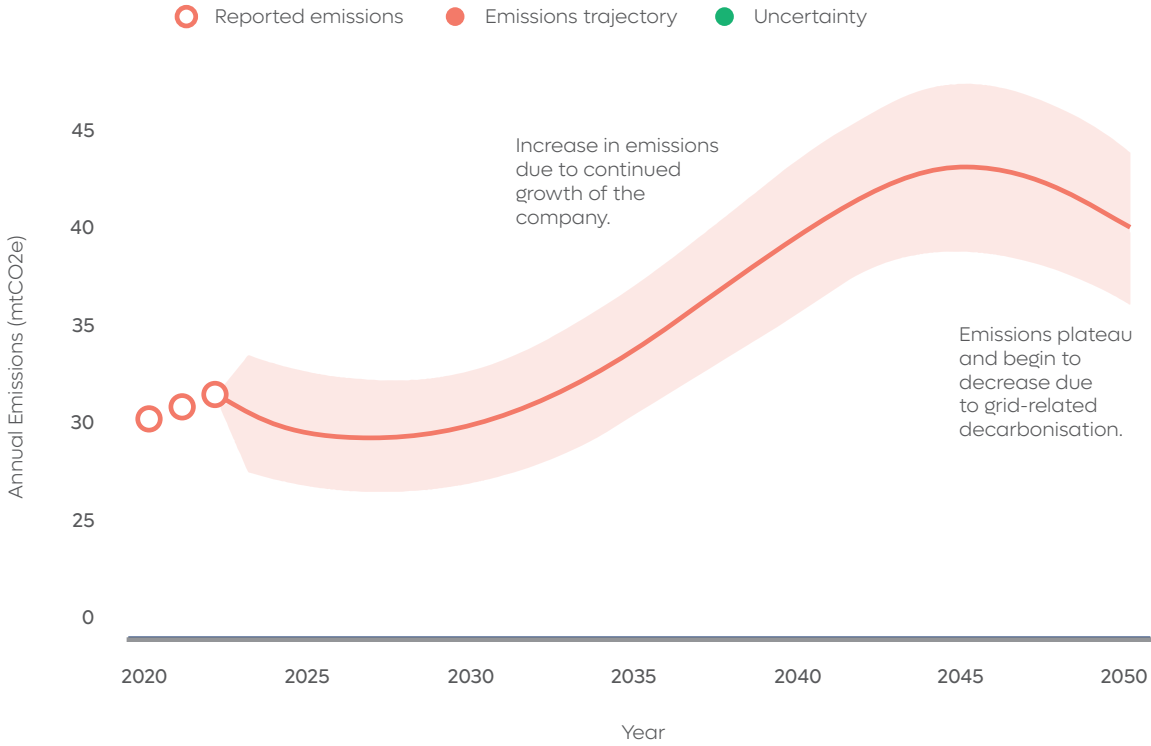


Figure 7: An estimated emissions trajectory for Avocado (assuming emissions are unabated)

3B: Identifying decarbonisation initiatives

The next component is to identify initiatives that can form part of the decarbonisation 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). Decarbonising 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 prioritise more sustainable organisations.
- Working with existing suppliers to find ways for them to decarbonise their own operations.



3C: Quantifying decarbonisation emissions reduction

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

For simplicity, here we assume that Avocado has decided upon five decarbonisation initiatives, one which focuses on reducing Scope 1 emissions and four which focus on reducing Scope 3 emissions. A summary of all five 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 decarbonisation 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 mtCO2e 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 mtCO2e 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 mtCO2e 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 CO2e 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:

ΔE = emissions reduction (tCO2e)

EF_d = emissions factor of diesel 2.700 tCO2e/kilolitre)

EF_{bd} = emissions factor of biodiesel (0.167 tCO2e/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 CO2e** – 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 CO2e abated as ~\$40 – i.e. 1,065m x \$0.1 / 2.7 mtCO2e.

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 optimise the decarbonisation strategy.

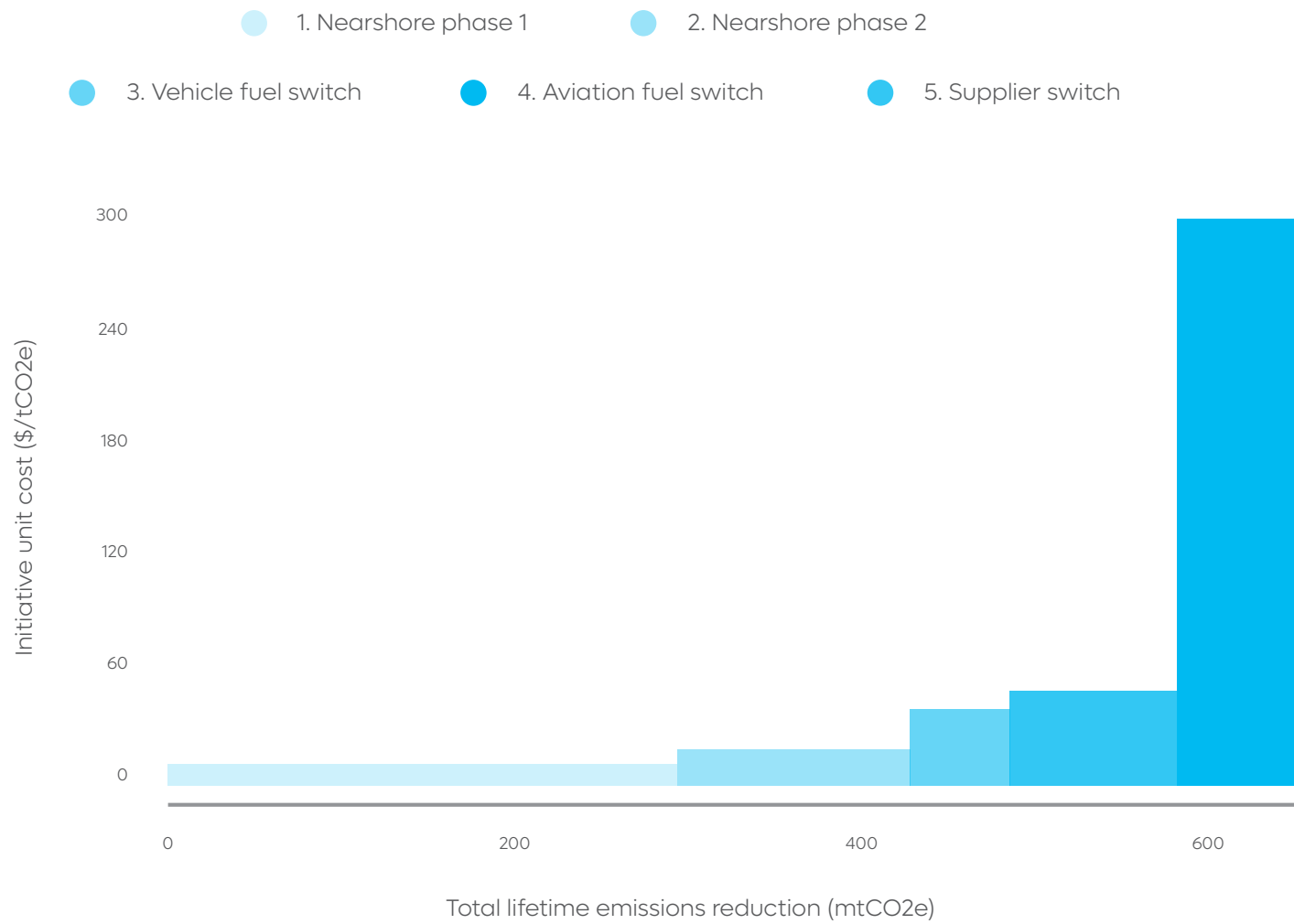


Figure 8: Marginal abatement cost curve of lifetime costs and emissions of each initiative

3D: Adjusting the emissions trajectory

Having decided on a set of decarbonisation 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 angle itself towards achieving. This is represented graphically in Figure 9. Different initiatives can be implemented at various time horizons with some initiatives being phased out before 2050, while others ramp up in impact over time.

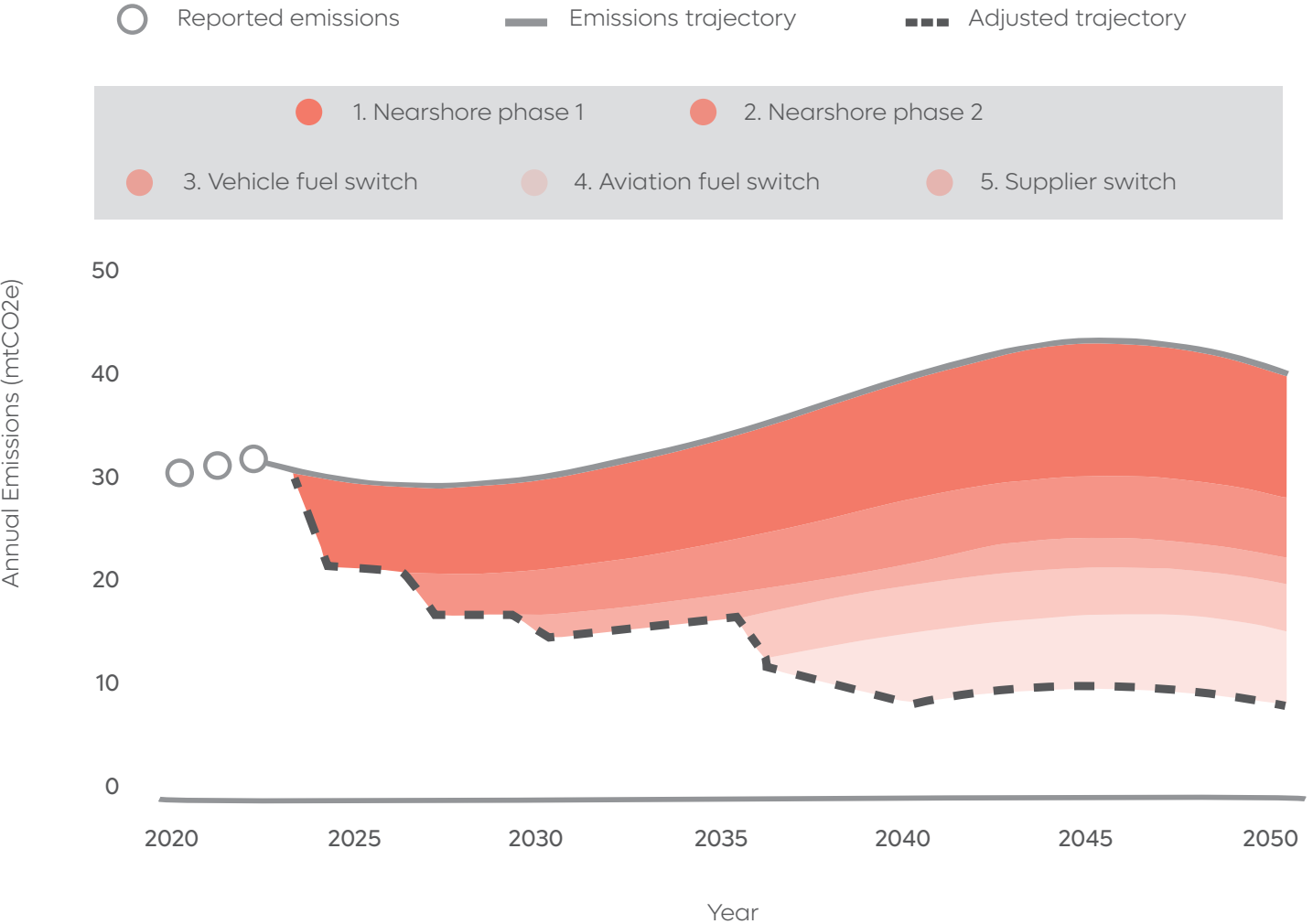


Figure 9: An updated emissions trajectory for Avocado after initiatives are applied

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 per cent reduction; 2040: 80 per cent reduction; 2050: achieve net zero. This is shown in Figure 10.

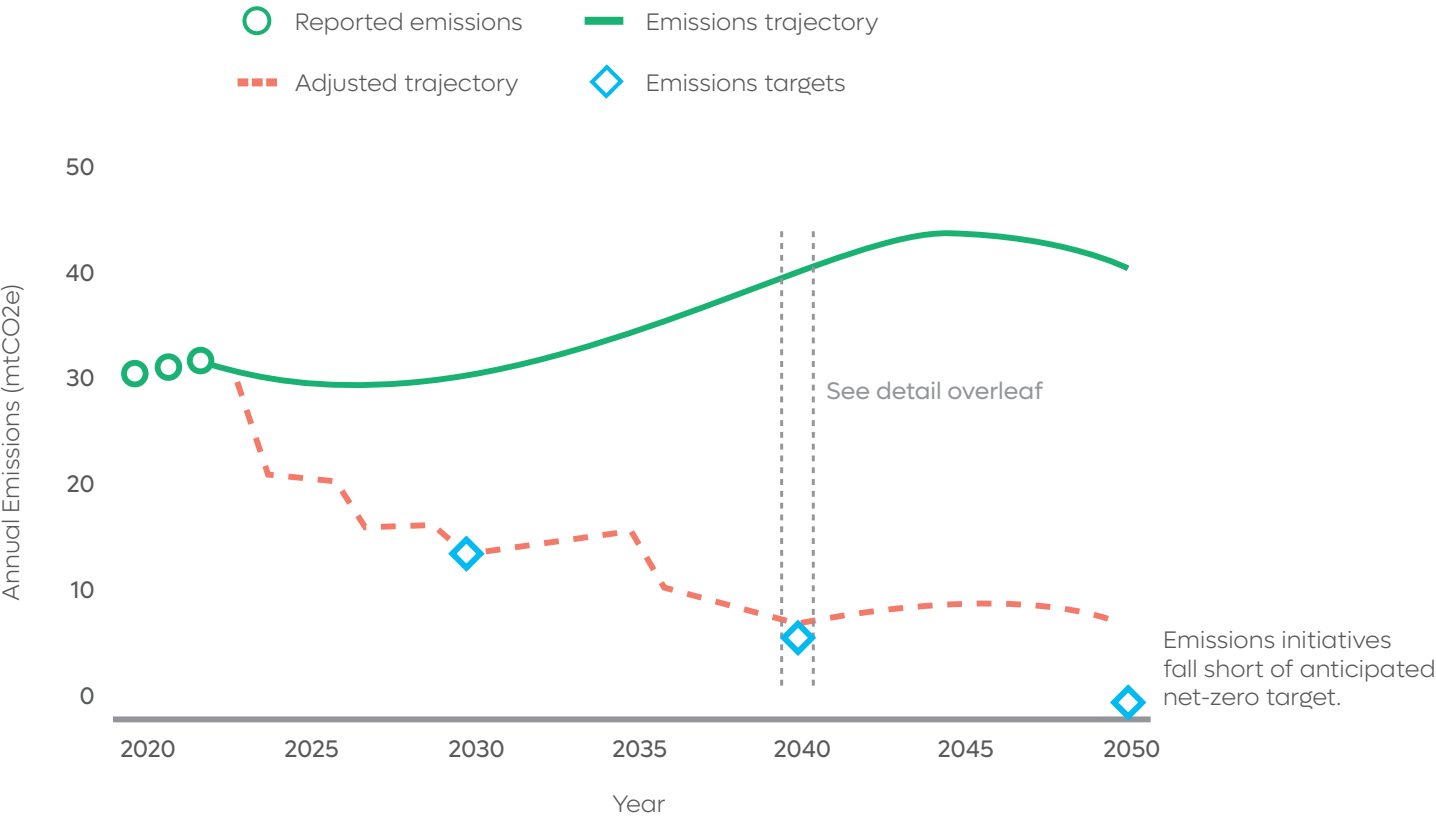


Figure 10: Comparison of Avocado's post-initiative emissions trajectory and its pledged targets

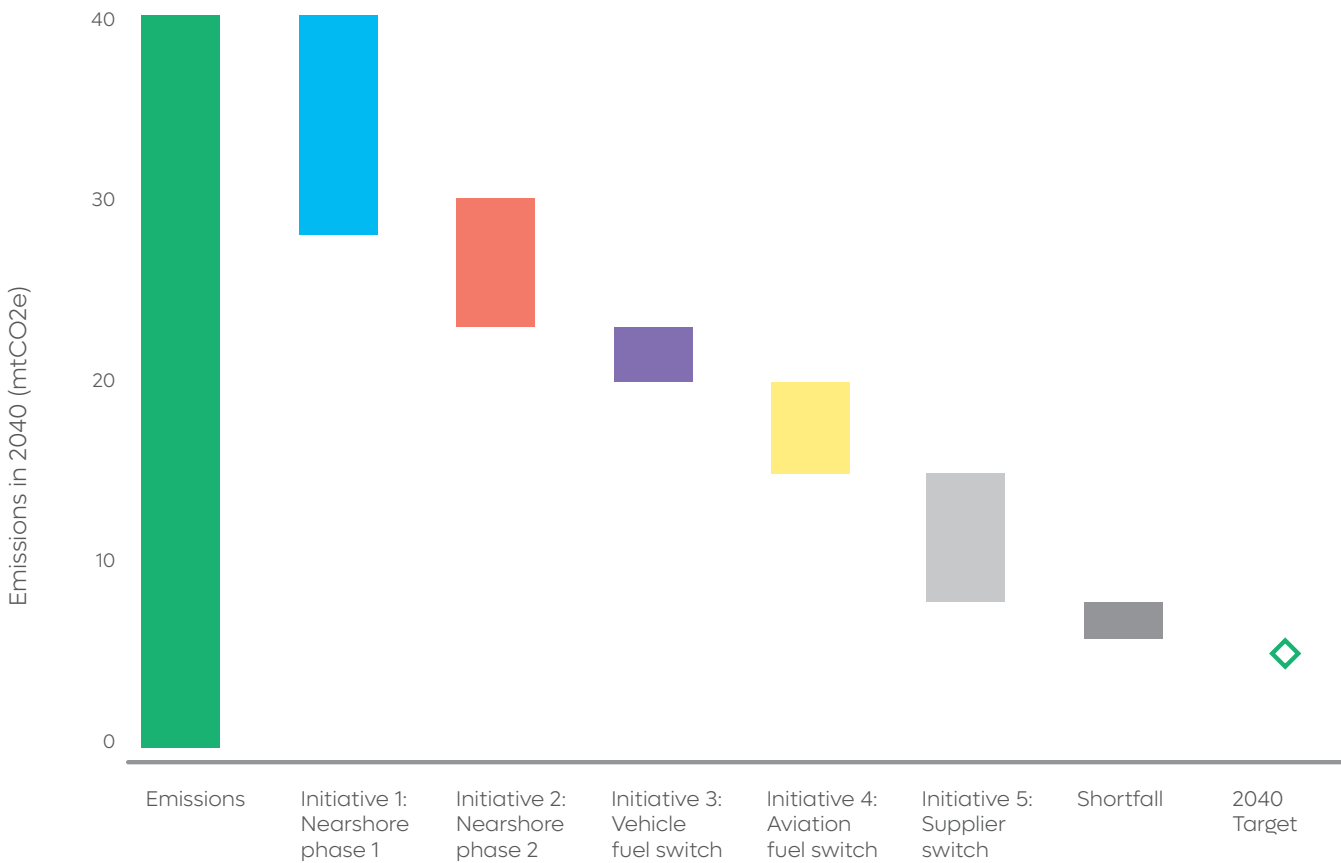


Figure 11: Waterfall chart of Avocado's projected emissions, decarbonisation initiatives and pledged target for 2040

It is clear that the proposed initiatives are effective in helping Avocado reach its 2030 target of 50-per-cent 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 decarbonisation initiatives and pledged target match up. Specifically, it highlights that an additional 1.2 mtCO2e of decarbonisation 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: Optimise the cost-benefit roadmap strategies

Evaluating decarbonisation initiatives by looking at their emissions-reduction potential only provides a view of their contribution towards the organisation's net-zero roadmap. Crucially, once an organisation 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 per cent (\$670m) across the next five years, as shown in Figure 12. The amount of risk reduction, however, differs across each type of transition risk:

- **Policy:** ~30 per cent (\$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 per cent (\$250m) reduction driven by Avocado's exposure to increasing consumer appetite for sustainably-generated products.
- **Technology:** ~37 per cent (\$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 per cent (\$50m) reduction driven by reducing potential litigation costs in the near-term as Avocado continues to move towards its pledged emissions targets.
 - **Reputation:** ~56 per cent (\$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 per cent (\$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 decarbonisation 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.

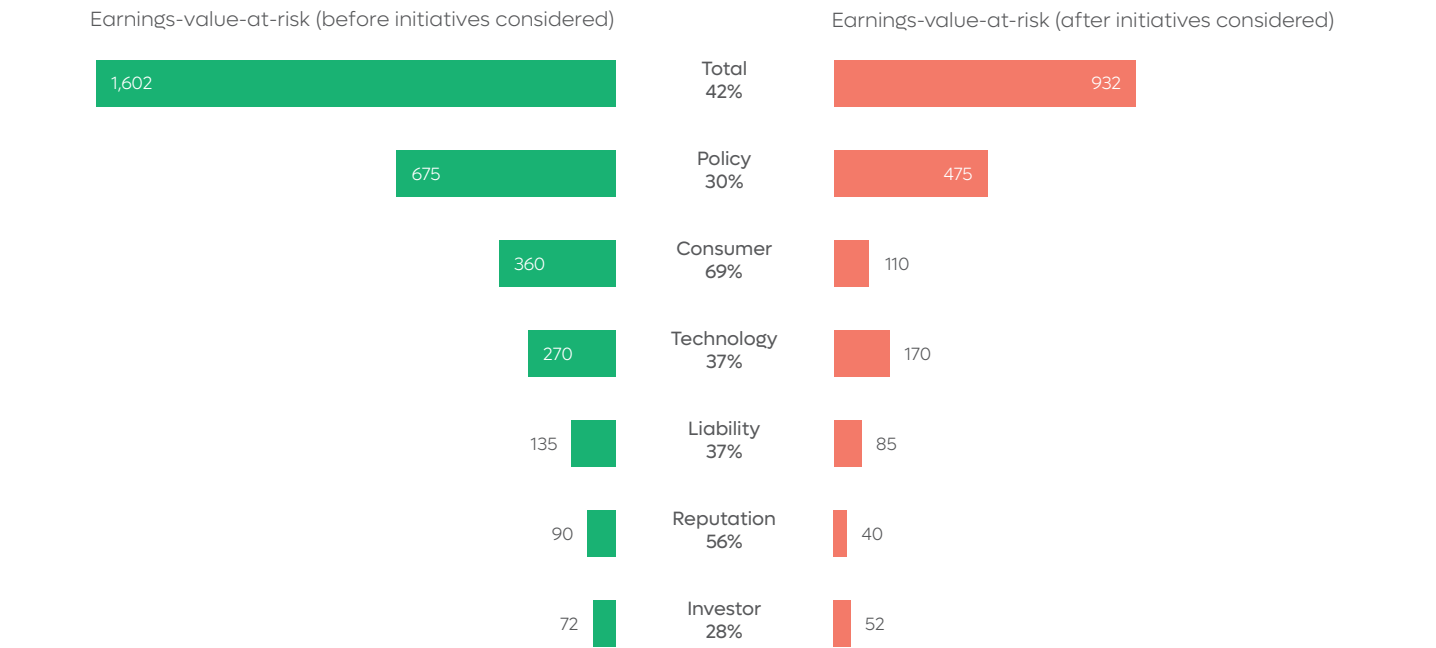


Figure 12: Re-evaluated transition risks to Avocado's earnings value over the next five years

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, refining the strategy over time as circumstances require.



Conclusion

When it comes to net-zero planning, organisations will often begin with top-down net-zero target-setting followed by bottom-up decarbonisation 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 prioritisation.
- **Adjusting the organisation’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 its net-zero strategy.

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





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Risilience is a climate-analytics platform that enables organisations to understand and quantify the impact of physical and transition climate risks, in financial terms, to plan and manage a commercially-successful path to net zero.

Our technology is founded on over a decade of influential frameworks pioneered by the Risilience founders out of the Cambridge Centre for Risk Studies at the University of Cambridge Judge Business School.

Our multi-disciplinary team has deep academic roots, including world-leading researchers in climate science, economics, applied mathematics and corporate finance. We translate risk insights into financial impact for corporate businesses, informing strategic decision-making on risk and resilience.

Risilience puts data analytics and climate science at the core of its reporting tools. This enables businesses to meet varying climate-disclosure rules around the globe.

To find out more about how Risilience can support you, get in touch:

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