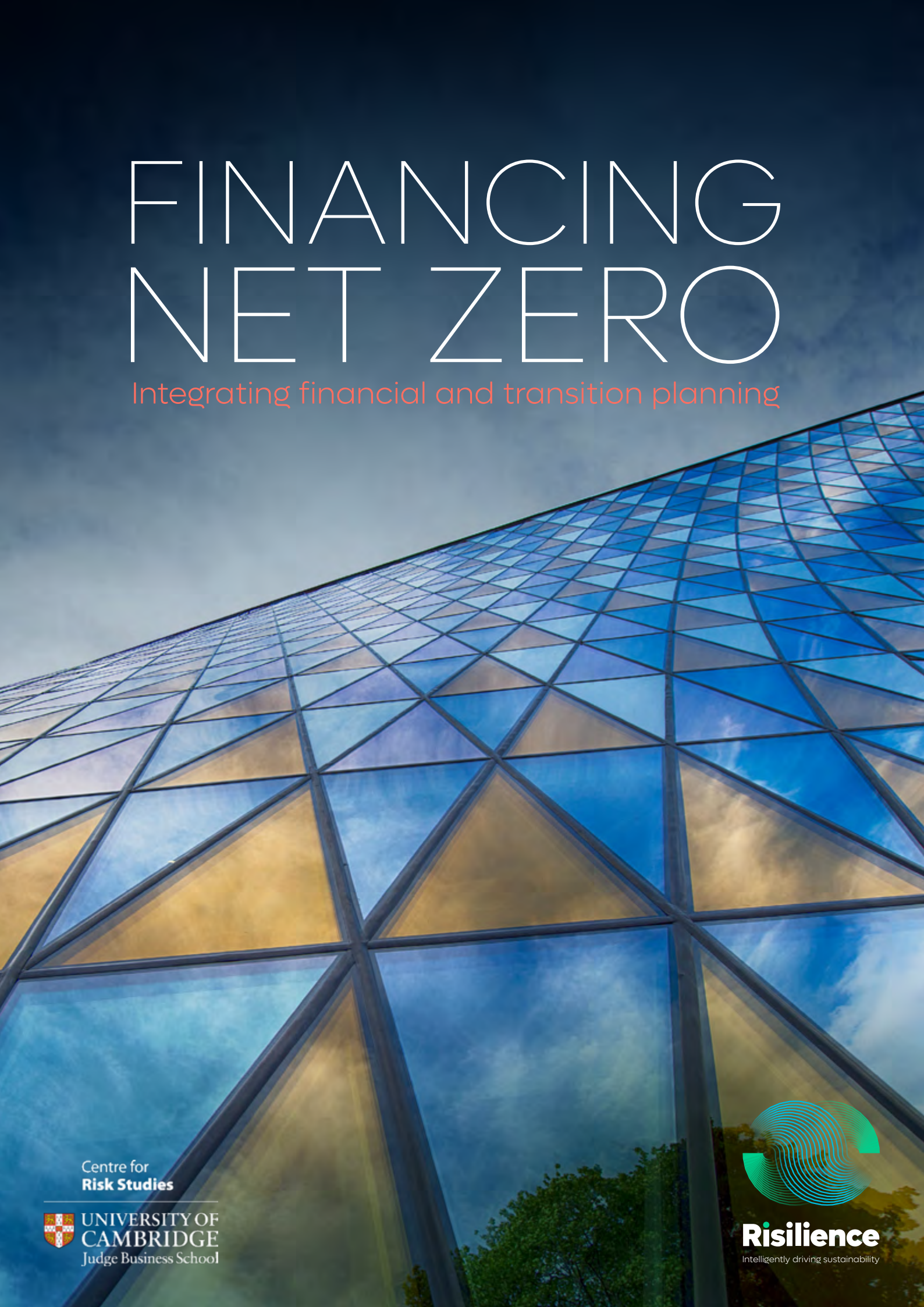
FINANCING NET ZERO

Integrating financial and transition planning



Centre for Risk Studies

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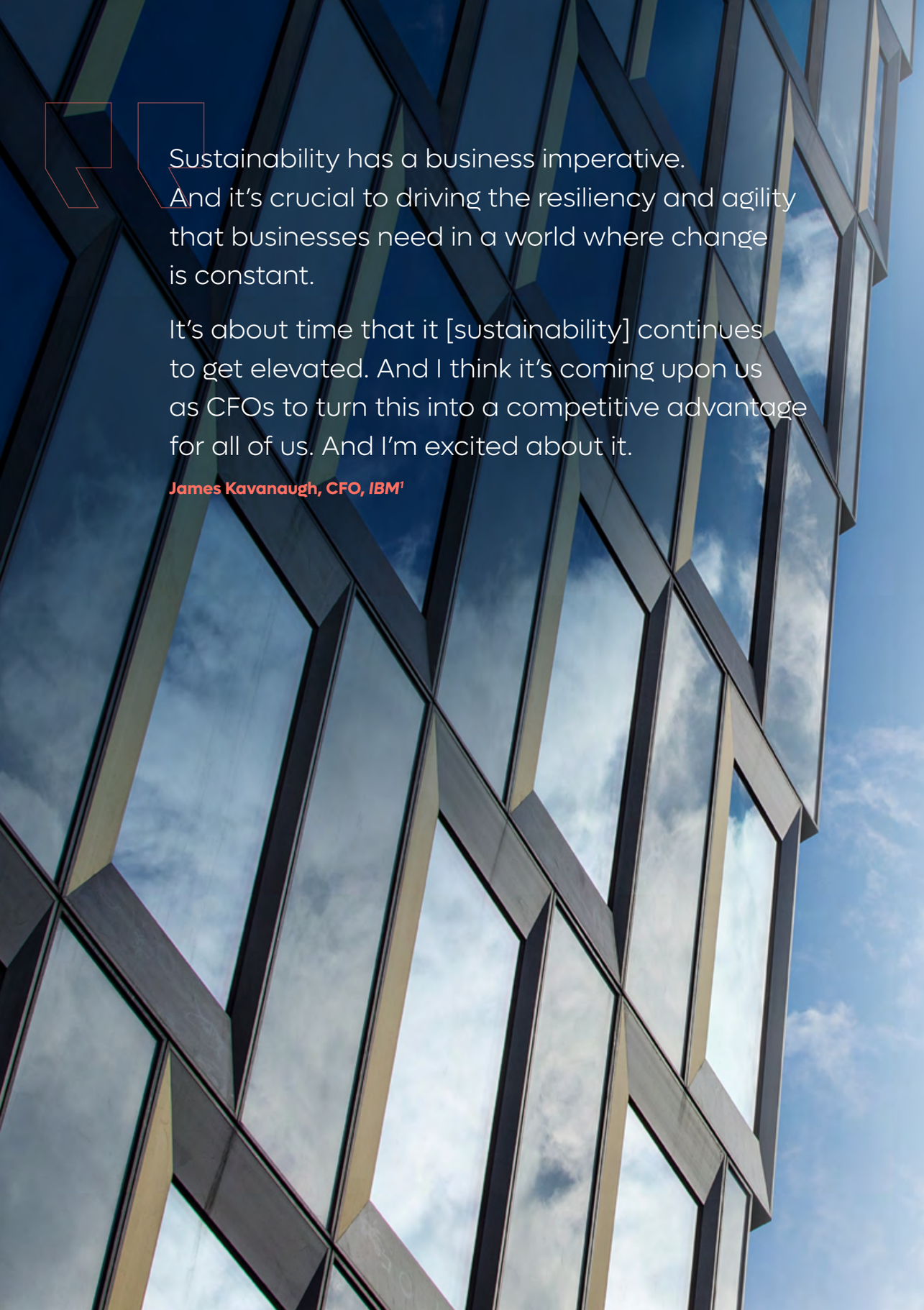
Risilience
Intelligently driving sustainability



> Sustainability has a business imperative. And it's crucial to driving the resiliency and agility that businesses need in a world where change is constant.
>
> It's about time that it [sustainability] continues to get elevated. And I think it's coming upon us as CFOs to turn this into a competitive advantage for all of us. And I'm excited about it.
>
> **James Kavanaugh, CFO, *IBM*[1]**

New responsibilities for the C-suite

An influential paper in the Harvard Business Review[2] shows that sustainability is the latest disruptive power in the economy: "a mother lode of organisational and technological innovations that yield both bottom-line and top-line returns."

This disruptive wave is seen in a raft of new international regulations; notably Europe's Corporate Sustainability Reporting Directive (CSRD) and the International Sustainability Standards Board's (ISSB) disclosure requirements. And responsibility for declaring the potential losses that could accrue from climate change is now firmly in the hands of the CEO and CFO.

According to the UN Global Compact-Accenture's largest CEO study on sustainability, 98 per cent of CEOs believe that sustainability is core to their role.[3] The study further found that 66 per cent of these CEOs are also taking action, engaging in long-term strategic partnership to build resilience into their business.

Under the CSRD, climate-related risks, as well as a wider array of environmental and social risks, need to be specifically quantified and certified. The ISSB has similar, climate-focussed requirements, which are being adopted as mandatory disclosure requirements in jurisdictions including the UK, Australia and Brazil.

The CEO and CFO are also responsible for reporting the plans that an organisation is implementing to reduce their greenhouse gas (GHG) emissions and to mitigate their risk. This process of governance is increasingly being carried out in collaboration with a sustainability department led by a Chief Sustainability Officer (CSO). Companies are finding they must overhaul governance and reporting practices in order to meet the demands of new regulations.

Risks to a business can occur from a multitude of directions. Physical risks, including extreme weather events and chronic environmental changes, driven by water and heat stress, have the potential to disrupt supply chains and challenge the viability of existing operations. Transition risks emerge as society transforms towards net zero and nature positive and can hit a company's bottom line via new regulations, market-demand shifts, technological change and reputational damage.

In almost all scenarios, losses could be financially material to a firm under business-as-usual. If a large consumer company failed to put into place any plans to reduce its GHG emissions, it could expect to lose five to ten per cent of its earnings over the next five years, as national governments around the world follow their stated policies to decarbonise.

Combinations of extreme scenarios can be devastating. Events such as key jurisdictions moving more aggressively towards achieving climate targets; consumers shifting more quickly towards preferring low-carbon products; the company being subject to unexpected litigation actions; and suffering unusually extreme climate-driven operational disruptions, can lead to a business experiencing a future earnings loss of 30 per cent or more. Low margin businesses can be particularly vulnerable.

1 https://www.mckinsey.com/featured-insights/sustainable-inclusive-growth/future-of-america/a-cfos-perspective-on-sustainable-inclusive-growth

2 Why Sustainability Is Now the Key Driver of Innovation, by Nidumolu, Prahalad, and aReview, Sept 2009. https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation

3 https://www.accenture.com/content/dam/accenture/final/accenture-com/document/Accenture-CEO-Study-United-Nations-Global-Compact.pdf#zoom=50

Increasingly, investors are making their own assessments of the potential impacts to business from climate change, to evaluate their asset portfolios and decide on investment strategies that limit their downside exposure to climate-related impacts. They demand increased transparency from firms and scrutinise a company's climate-related data to understand how risks will erode future returns.

Mitigation of the business risks posed by climate change may involve a range of measures. Reducing emissions across the value chain is critical to reducing a company's exposure to transition risks, and adaptation measures to protect operations and diversify supply chains are necessary to weather extreme events and acclimatise to increasingly hostile conditions. Companies that are tackling this best are considering deep changes to their business model, including diversification of suppliers, adjusting the product portfolio, redesigning products and substituting raw materials, to manage the impacts and dependencies of their business activities on climate and nature.

Achieving these plans can be costly if not designed appropriately. The companies that do this most cost-effectively will achieve profitable growth from sustainability.

Increasing commitment to net zero

Following a decade of corporate intent on climate change, companies are now facing the most meaningful challenge to execute a credible transition plan. Corporates have faced three decisive waves of climate action, and now the third wave will determine if and how companies can navigate the route to net zero with a credible and prudent transition plan:

Wave one | evaluation of the organisation's GHG emissions and establish climate risk as a material issue

Wave two | commitment to setting public net-zero targets

Wave three | execution of a credible climate transition plan

The landscape for climate transition planning is progressing rapidly. Climate transition plan disclosure is now required by several standards, including International Financial Reporting Standards (IFRS) S2, adopted as the mandatory reporting standard in multiple global jurisdictions, and the EU's CSRD. In addition, the UK Transition Plan Taskforce (TPT) published its final Disclosure Framework with the UK Financial Conduct Authority (FCA), which provides guidance to organisations disclosing transition plans. All these frameworks are converging around a coherent approach and consistent indicators for assessing the credibility of climate transition plans.

At a macro-level, Risilience has witnessed three waves of corporate action towards achieving future climate goals. The first wave, Evaluation, which started in earnest over a decade ago, saw a growing number of companies quantify and report the Scope 1, 2 and 3 emissions they were responsible for across their value chain. The second wave, Commitment, which began five to seven years ago, saw a growing number of companies recognise the potential impact of climate-related financial risks and publicly commit to achieving net-zero targets. The third wave, Execution, is the most recent and only started to take root in the last couple of years. This wave is about building a credible transition plan which dictates how a company will meet its reduction targets and what it will cost. While this phase is the most challenging for business, it also offers the greatest benefits for those companies that do it well.

It is a challenge to build a credible transition plan that can achieve future targets and give confidence to investors, customers, employees and regulators that climate-related risks are being considered seriously and addressed. This phase is the most critical as it requires the allocation of financial resources and a much deeper appreciation for the transformation the business will inevitably endure.

The first wave | Evaluation

Over the last decade, we have seen thousands of new companies start to measure and publicise their carbon footprint. Since 2015, the Task Force on Climate Related Financial Disclosures (TCFD) has provided a framework for companies to voluntarily assess and disclose their climate risks. In 2020, around 9,500 companies disclosed their carbon emissions to the Carbon Disclosure Project (CDP).[4] By 2023, the number of companies disclosing climate impacts had risen to around 23,000 – a 240 per cent increase in just three years.[5] According to CDP, 86 per cent of companies from S&P 500 and 94 per cent of those from FTSE 100 now disclose some form of climate-related impacts. While there are still many companies that are only just embarking on the quantification of their footprint, many companies now have a good understanding about the emissions they are responsible for.

The second wave | Commitment

While a company's footprint only represents the current emissions in a single base-year, achieving future-emission reductions requires a commitment to achieving future targets. The Science Based Targets initiative (SBTi) aims to provide guidance to companies on the establishment of ambitious corporate climate action. Science-based targets, therefore, show business how much and how quickly they need to reduce their GHG emissions to prevent the worst effects of climate change, as aligned with the Paris ambition of global net zero by 2050. The total number of companies that have now set science-based targets has grown from 585 in 2020 to 13,419 in 2024[6]– more than a 2,000 per cent increase over four years.

[4] https://www.cdp.net/en/companies/cdp-2023-disclosure-data-factsheet#2023trends

[5] https://www.cdp.net/en/companies/cdp-2023-disclosure-data-factsheet#2023trends

[6] https://sciencebasedtargets.org/search?q=net+zero+plans

The third wave | Execution

The third wave is companies defining and implementing a transition plan that charts their pathway to achieve future emission-reduction targets and become net zero. Crucially this entails defining the budget that an organisation is proposing to spend on decarbonsation. The CDP finds that a quarter of companies that have disclosed through the CDP, totalling nearly 6,000 firms, have a 1.5°C-aligned climate transition plan in place; a 44 per cent increase on 2023.[7] A further 8,600 (36 per cent of CDP respondents) have committed to develop a transition plan within two years.

A comprehensive transition plan includes details on a company's emissions reduction targets, governance, strategy, risk and opportunities, and engagement with value chain stakeholders (Figure 1).

Figure 1: Number of organisations that disclose to CDP and the number of organisations disclosing a climate transition plan from 2021 to 2023.

[7] https://cdn.cdp.net/cdp-production/cms/reports/documents/000/007/783/original/CDP_Climate_Transition_Plans_2024.pdf?1720436354

Today, just two per cent of companies that report having a transition plan are currently disclosing in alignment with all 21 indicators that CDP defines to judge credibility. The quality and comprehensiveness of disclosures leaves much room for improvement, and most companies are only hitting a few of the quality indicators. The state of transition planning is also highly variable across regions and sectors: corporates in Japan, the EU and the UK show a greater level of maturity relative to their global peers. Certain sectors, including power generation, infrastructure and financial services, are leading the way, on account of their stringent regulation and high emission intensity, but many key sectors that drive a large share of global emissions are still immature in disclosing detailed transition plans.

Key barriers to having a credible transition plan include having a comprehensive corporate climate strategy, translating headline targets into achievable KPIs at the functional level, and incorporating decarbonisation actions into financial planning.

While full financial disclosure of climate transition plans is not a current disclosure requirement, the process of internal budget setting and publishing a financially viable transition plan are important steps. It is crucial that net zero plans are comprehensive in scope and consider the relative merits of decarbonising different functions across the business. A successful plan is built on a solid GHG footprint and robust information about how the business is expected to grow across different functions and regions of the world.

CDP Climate transition plan element	CDP Climate transition plan sub-element
Governance	Board-level oversight Executive incentives linked to climate performance indicators
Scenario analysis	Details of scenario analysis
Risk and opportunities	Climate-related risks — risks, potential financial impact and response strategy Climate-related opportunities — opportunities, potential financial impact and response strategy
Strategy	Link between identified (and potential) climate-related risks, opportunities and company strategy Existence of a 1.5°C world-aligned transition plan within business strategy and shareholder feedback mechanism
Financial planning	Link between identified (and potential) climate-related risks, opportunities and financial planning Financial planning details associated with a 1.5°C world
Targets	Emission-reduction targets — absolute and/or intensity Net-zero targets
Scope 1, 2 and 3 accounting with verification	Comprehensive and third-party verified emissions accounting
Policy engagement	Alignment of public policy engagement with climate ambition and strategy
Value chain engagement	Value chain engagement Details of low-carbon products and/or service

Figure 2: Elements of a comprehensive climate transition plan. Source: CDP (2024) The State of Play.[8]

Corporates that have started their transition planning are already witnessing rewards. In a competitive market, knowledge on how the costs and benefits of different low-carbon technologies will evolve allows corporates to optimise when investment should take place. For example, some carbon-reducing initiatives, such as the use of HVO[9] fuels used for transportation, could face supply constraints as demand is predicted to outstrip supply over the short-term. Being first to market to secure long-term contracts for the supply of low-carbon fuels reduces costs and ensures availability.

Corporates also need to consider the risks of not achieving their climate commitments. What are the financial risks arising from not meeting regulatory compliance standards? Is there potential for consumer backlash? Could litigation be brought against the company for a failure of fiduciary duty, greenwashing and not taking climate commitments seriously?

[8] https://cdn.cdp.net/cdp-production/cms/reports/documents/000/007/783/original/CDP_Climate_Transition_Plans_2024.pdf?1720436354

[9] Hydrotreated Vegetable Oil is a low carbon drop-in fuel substitute for diesel.

Defining a route to net zero

A net-zero transition requires deep intervention across the value chain and an array of actions to address emissions at source. Companies have manageable options within their own operations but must also consider more radical action in collaboration with their suppliers and customers.

Meeting a net zero target may require widespread changes to the business model. This calls for a transformation of technology and processes in the company's own operations (Scope 1 and 2), including manufacturing, transportation and logistics, and facilities management.

However, for many companies, over 90 per cent of their emission footprint are in Scope 3, which are the emissions produced both upstream and downstream of core business activity. These emissions are reported as Scope 1 by the emitting third party, but Scope 3 accounting reflects the shared responsibility for these emissions by parties across the supply chain.

Businesses typically do not have direct agency or control over the emissions of their suppliers, particularly indirect suppliers deep within the supply chain: often a disparate array of small-to-medium-sized companies. The same is true for downstream emissions, where a business does not have direct control over how end-consumers may use or dispose of the products they purchase.

In response, companies have a few key levers to manipulate.

They can seek to reduce the emissions intensity of their existing purchased goods and raw materials, through deep engagement with their suppliers to incentivise and enable investment in lower-carbon processes. Increasingly, such partnerships are seeing companies share the cost of decarbonisation by investing in new technologies upstream in return for favoured access to lower-GHG goods. This is critical in the agriculture sector, for example, where retailers are supporting their farmers to embrace better practices and finance new technologies.

Alternatively, businesses may seek to switch their suppliers to other geographies with cleaner energy and more efficient practices, or to prefer suppliers who are further along the decarbonisation journey. Nearshoring supply chains can significantly reduce transport-related emissions and costs, and is a strategy that may appeal where it also minimises geopolitical risks.

More radical interventions require bold changes to the way a company does business. Firms are seeking to green their product portfolios with sustainable alternatives, embrace new markets, and divest or discontinue products that will stagnate in a low-carbon economy. Anticipating the rate of market change is tricky: the electric-vehicle market has recently demonstrated that overcommitment to innovative technology can leave a competitive disadvantage if consumers are not ready to embrace the change.

Nevertheless, at the stage in a company's net-zero pathway when all the non-disruptive actions have been taken, companies may be forced to consider measures that uproot 'business-as-usual'. For example, an apparel company that relies on air freight to meet the demands of fast fashion may need to find an alternative means of distribution. Instead, they may need to engage with consumers to educate and incentivise them to adopt more sustainable purchasing behaviours that also maintain profitability.

Business should not underestimate the effort, time and cost that will be required to meet emission-reduction targets across their entire value chain.

As corporates look to achieve their net-zero targets, they will need to embrace many different initiatives across their full value chain.

Figure 3 shows a taxonomy of decarbonisation initiatives that a corporate can deploy to achieve their net-zero goals. It is likely that, to meet ambitious science-based targets by the middle of the century, a company will deploy many of these initiatives together.

Figure 3: Taxonomy of decarbonisation initiatives

Initiative category	Example initiatives	Scope 1		Scope 2	Scope 3	
		Facilities	Vehicles	Purchased electricity	Upstream	Downstream
Low-carbon energy use	Switch energy provider to renewables	●	●	●		
Low-carbon energy production	Build renewable energy capacity for direct operations	●	●	●		
Industrial processes	Equipment replacement Process material substitution/efficiency Carbon capture and storage	●		●		
Transportation	Vehicle efficiency (e.g. sustainable fuels) Vehicle replacement Switch transport mode (e.g. rail)		●		●	
Energy efficient production	Electrification Smart control systems Energy/water technology and recovery	●		●	●	
Energy efficient buildings	Insulation Energy management Heating and air conditioning	●		●		
Supply chain engagement	Third party and peer engagement Raw material substitution and procurement practices Policy advocacy				●	●
Waste and material circularity	Product design and packaging Material substitution, reuse and recycling Waste reduction				●	●
Fugitive emissions	GHGs reduction or capture Agriculture (methane, fertilisers) Industrial plants/pipe leakages	●	●		●	●
Behavioural change	Internal carbon pricing Travel policy, commuting and teleworking	●	●	●	●	●
Business model	Product portfolio transformation Divest investment portfolio Consumer engagement and sustainable behaviours	●	●	●	●	●
Voluntary offsets	GHG avoidance/reduction GHG removal/sequestration	Carbon credits may only be used to offset up to 10% of residual emissions after achieving reduction of absolute emissions				

	Goals	Key questions and decision points
1 Baseline GHG emissions inventory	• Produce a comprehensive GHG footprint. • Identify and prioritise GHG emissions hotspots. • Define a business-as-usual growth scenario. • Project a business-as-usual forecast of GHG emissions.	• What are the core drivers of GHG emissions? • How do these drivers change with business growth? • How will the company's strategic and financial plans influence GHG emissions in the future?
2 Establish emissions reduction targets	• Set internal targets on emissions reductions. • Define science-based targets with sector-specific guidance. • Validate science-based targets with SBTi. • Define a science-based offset strategy for residual emissions.	• What should the target scope, boundary, base year, and target year be? • Is there sufficient information and readiness to adopt SBTi? • Are GHG estimation methods likely to change in the future and will targets require rebasing?
3 Discover candidate initiatives	• Identify drivers (i.e. vehicles) of activity data (i.e. fuel) which produces emissions. • Conduct stocktake of current initiatives being undertaken. • Consult with stakeholders to identify initiative opportunities, including supply chain partners. • Identify new initiatives to address key emitting activities.	• What initiatives are technically feasible? • What time frames are relevant for roll-out? • Which business functions need to be consulted (procurement, finance, operations, etc.)?
4 Quantify emissions reductions & costs	• Calculate emissions reduction potential of an initiative. • Quantify operational and capital cost of an initiative. • Assess the technical feasibility of initiatives. • Produce MAC curves to compare the relative cost and abatement potential of initiatives.	• What are the technically feasible limits of each initiative? • What timeframes are feasible for roll out? • What are the risks and opportunities associated with initiatives, including dependencies on external factors?
5 Optimise emissions reduction pathway	• Use metrics incl. MAC and total cost to optimise the costs and timing of decarbonisation initiatives. • Define aggregated decarbonisation plan. • Stress-test plan against different transition risk scenarios, including market or regulatory changes. • Assess emissions gaps and evaluate further initiatives.	• What practical constraints limit optimisation? • Have the key stakeholders understood and accepted the strategy? • What are the economic costs of different technologies and how do these change over time?
6 Sign-off optimised transition plan	• C-suite and board approval of transition plan. • Integrate transition plan into routine financial and strategic planning. • Relevant business functions and stakeholders approve implementation of plan.	• Who are the key decision-makers and budget holders who will help to enact the plan? • What time horizon can budgets be secured for?
7 Publish optimised transition plan	• Use reporting standards (CSRD, ISSB, UK TPT) to disclose a credible and comprehensive plan. • Define KPIs to monitor progress towards transition plan. • Specify mechanisms to update disclosures as the business evolves (e.g. updated emissions data).	• How should the transition plan be publicised to ensure commitments are credible and transparent, and avoid greenwashing? • Who should review and audit the plan and check alignment to standards?
8 Implement & monitor transition plan	• Provide implementation teams with mandate and training to deliver initiatives. • Allocate annual budgets to relevant business functions that align with the overall transition plan • Set-up monitoring framework.	• What additional support systems may be required? • What are the timelines for delivery? • What are the relevant KPIs for delivery?

Each initiative will have different costs and impacts to the business. Some initiatives will require large upfront capital investment, as is the case with onsite renewable energy, electric vehicles, and retrofitting buildings and equipment. While capital expenditure costs can be significant, some payback periods are short – photovoltaic solar panels in sunny climates for example, but others may appear less compelling. If these costs are depreciated over the full life of the asset, and full-life emissions reductions are accounted for, such investments can provide a relatively low marginal cost of abatement. These investments are suitable for businesses with strong balance sheets, available capital or the ability to negotiate preferable financial terms with low financing costs. This requires analysts to take a longer-term view to financial planning.

Other initiatives, such as business-model advances, behavioural change and logistics optimisation, do not require upfront capital investment and can be implemented without the purchase of expensive new capital assets. Alternatives, such as purchasing renewable energy, can be used to achieve targets without significant upfront investment. And many initiatives also have co-benefits that go beyond simply reducing emissions and offer other value-adds to the business.

When whole-life costs are considered, some initiatives can be shown to save the organisation money when compared to the higher carbon alternative. Other co-benefits could include reputational impacts, which show that the company takes its climate commitments seriously. Reducing emissions also lowers climate-related transition risks, minimising the potential impact from future carbon prices, litigation, market demand and reputational damage.

Sharing the cost burden across the supply chain

Scope 3 can make up around 90 per cent of an organisations emissions. Distributing the costs of meeting supply-chain emissions targets brings with it significant opportunities for businesses taking this approach.

The cost of a low-carbon technology is not necessarily reflective of the cost incurred to a company's cash flow. It is particularly difficult to assess the costs of Scope 3 interventions when the company in question is not directly taking action. Understanding how third parties might pass through their investment costs is not a conversation all suppliers are willing to have. Nevertheless, supply-chain partners are increasingly recognising the strategic benefits of long-term collaboration and opportunities to share the cost burden, and so greater transparency is enabling companies to budget for decarbonisation outside of their own operations.

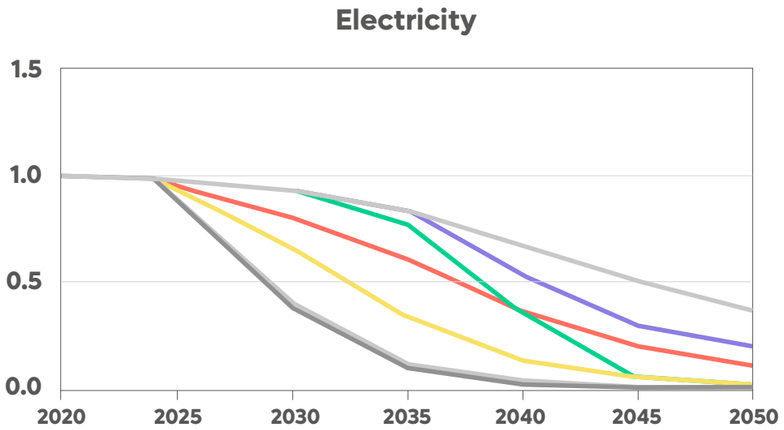
Companies can also stand to benefit from emissions reductions that will come 'for free'; that is, emissions that can be expected to reduce as a result of the efforts of others, such as suppliers and counterparties investing in their own decarbonisation activities.

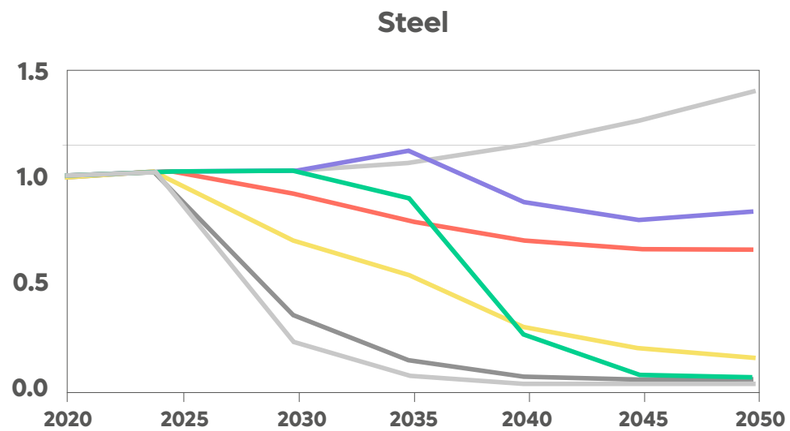
This is particularly helpful in the case of energy: as national grids are transitioned from fossil fuel to renewable-energy sources, the emission intensity of electricity used in industrial and manufacturing processes will decrease. While some of the cost of this shift may be embedded in energy prices, it can be considered a given initiative in that the whole system will transition together without the company having to be the direct initiator.

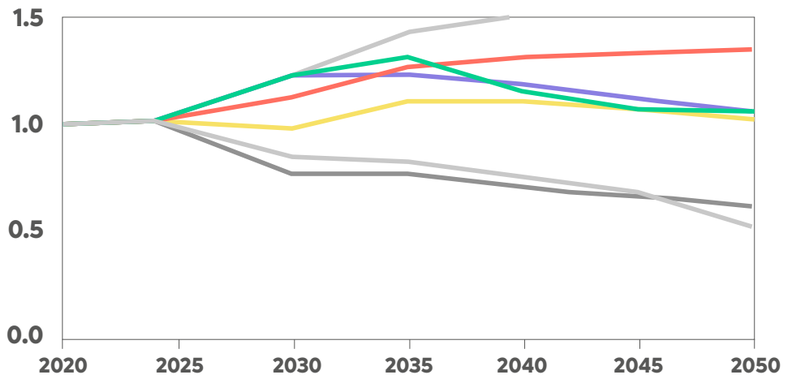
Other industries may, similarly, undergo 'sectoral decarbonisation' independently of an individual company's influence. The macro-scale decarbonisation of some sectors, including heavy industry, transport and capital goods, can be forecast to show the potential emissions reductions that a company could inherit in its Scope 3.

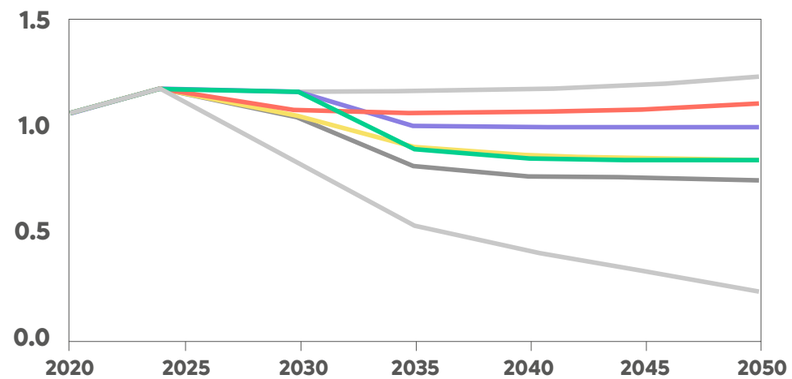
Risilience provides forecasts of sectoral decarbonisation for use in transition planning, with its Intelligent Futures Scenario Model (IFSM): a global macroeconomic analysis that projects the activity and emissions of global regions and sectors under different transition scenarios. (Figure 4 shows an example for the cement industry).

It is likely that companies will have to pay a green premium for purchased goods to access this transition but the principle of sector decarbonisation is important to demonstrate that emissions reductions are achievable in sectors that are often written off as (too) hard-to-abate. These scenarios also demonstrate the need for aspirational public policy and should encourage companies to lobby policy makers for incentives and enablers to support the transition.









Definitions:

High Warming	**4.9 °C**	NDCs	**2.3 °C**	Net Zero 2050	**1.4 °C**
Current Policies	**3.0 °C**	Below 2°C	**1.8 °C**	Low Demand	**1.1 °C**
Fragmented World	**2.4 °C**	Delayed Transition	**1.7 °C**		

Figure 4: Projected emissions of multiple global industries in various transition scenarios to 2050, demonstrating the decarbonisation potential in more ambitious policy scenarios.

Source: Risilience Intelligent Futures Scenario Model (IFSM v2.0) derived from NGFS Phase IV scenarios.

Most cost-effective measures

Understanding cost can also help businesses to surface the value. Visualising the costs associated with transitioning a business towards net zero helps business leaders to:

- Identify the low-hanging fruit and deal with that swiftly
- Capture a pan-business view of where to prioritise resources
- Balance the short, mid and long-term pressures of cost versus value and opportunity

Companies commonly deploy marginal abatement cost curves (MACCs) to assess the relative cost of different emissions-reduction options. This captures the net-present cost of an initiative, in terms of both capital and operational expenditure, over the lifetime of the asset. A MACC sets out decarbonisation options in ascending order of cost, quantifying the cost per tonne of carbon dioxide abated (y-axis) and abatement potential (x-axis).

MACCs are often used to evaluate operational emissions but less frequently used to assess Scope 3 emissions. This is largely due to data scarcity and the difficulty of estimating costs associated with decarbonisation actions within the supply chain, although, as discussed above, this information is increasingly being shared openly in the interest of companies' Scope 3 decarbonisation targets.

MACCs follow a common pattern, whereby a sizeable amount of the abatement potential (x-axis) can be achieved by several relatively low-cost or cost-saving measures but then the curve steepens with diminishing marginal gains at higher and higher cost. Moving from left to right represents longer payback periods.

Figure 5 shows a marginal abatement cost curve for a fictional company's agricultural supply chain emissions. Typically, a MACC would show the full lifetime costs and full-life emissions for different initiatives. In this example, we adapt the MACC to only show emission reductions in 2030, with corresponding marginal-abatement costs in 2030.

By doing this, moving from left to right, the MACC shows the most cost-effective initiatives to achieve the emission-reduction target in 2030. The 2030 emission-reduction target is represented by the vertical red line on the MACC. This shows that everything to the left of the red line offers an opportunity to reduce emissions to achieve the 2030 target, in the most cost-effective way.

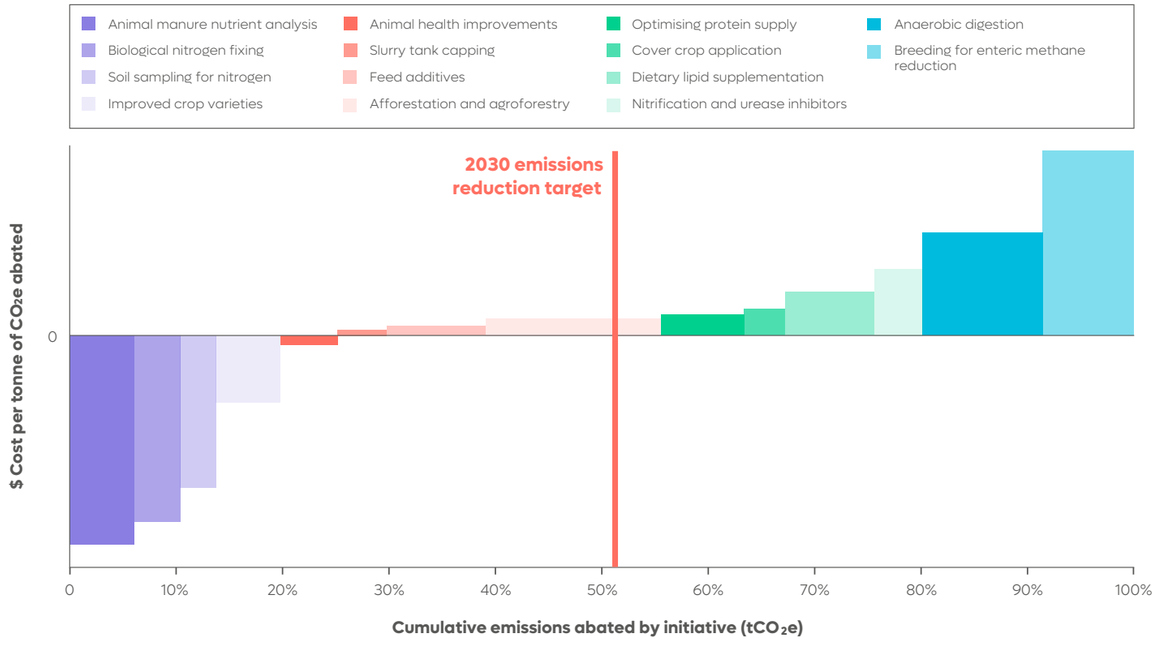


Figure 5: Marginal abatement cost curve (MACC) for decarbonisation initiatives in agricultural supply chain

Depending on the level of sophistication in the cost-modelling, this process may not recognise the longer benefits and cost-reductions afforded to technologies with steep but uncertain cost-reduction potential. Such costs may also not include the inherent climate-related risks and the avoided risks.[10] In this example there are a number of initiatives on the left side of the MACC which have negative costs – i.e. they reduce a company's operating costs. In this figure, the red target line delineates a company's 2030 target, demonstrating that all initiatives to the left of the line must be enacted to reach the target reduction most cost-effectively.

[10] Including climate-related risks would raise the $/tCO$_2$ (y-axis) for different initiatives, while including any savings from avoiding climate-related risks, would lower costs. This would have the effect of reducing the net-cost of investment and therefore reduce $/tCO$_2$ of decarbonisation initiatives.

It is likely that companies have already picked off much of the low-hanging fruit – energy efficiency measures, for example, save a company money and have a negative marginal-abatement cost. To meet aspirational decarbonisation, companies must consider measures with lesser GHG returns per dollar. This means the MACC can often present an alarming picture, suggesting that meeting their decarbonisation targets is not financially viable, according to usual capital budgeting practices.

Despite the potentially steep costs of deep decarbonisation, MACCs are an invaluable tool for optimising a company's transition plan. They can be used to look across different business units and regions, to weigh up where across the business emissions can be removed most efficiently. For example, a MACC can show the relative value of reducing Scope 1 and 2 emissions across different functions, such as a real-estate portfolio versus a transportation fleet, facilitating the definition of more granular, function-specific targets.

Further, MACCs enable companies to make trade-offs and balance short-term financial pressure with long-term sustainability goals. They allow firms to identify quick wins that reduce emissions at low or negative cost and use these savings to offset more capital-intensive decarbonisation measures.

In principle, the MACC methodology enables a company to prioritise initiatives, ensuring that maximum emissions are reduced by the cheapest options. The company selects to implement the measures from left to right until the target is achieved.

In practice there are many constraints on implementing the initiatives. These constraints need to be recognised in the design of the initiative programme. A refinement to the MACC process incorporates these constraints by considering a hierarchy of emissions reduction:

1. Maximum potential – total emissions that can be abated through low-carbon initiatives.

2. Technically feasible – total emissions that might be reduced, bounded by constraints imposed by external factors, for example the potential to reduce emissions from diesel trucks by switching to electric vehicles, with the constraints being that the electric-charging infrastructure needs to exist in the areas where this would operate for the initiative to be technically feasible.

3. Economically viable – cost effective, relative to other expenditure priorities and internal financial rules or investment-hurdle rates.

This hierarchy of initiatives applies to different timescales and for individual geographies. Some initiatives will become technically feasible in future timescales, and in certain locations but not others. This enables realistic net-zero plans to be created and appropriately costed.

Figure 6 illustrates an analysis of the future charging infrastructure availability for heavy-duty electric trucks. This demonstrates the importance for accounting for the technical feasibility of decarbonisation actions, in this case in order to plan for the phase in of electric trucks.

It is also possible to optimise spending by synchronising decarbonisation actions with internal business cycles, such as the rates of asset replacements and write-downs. Low-carbon innovation and technology improvement vary greatly between technologies and systems, from high-frequency incremental improvements, such as solar photovoltaics, to slower but greater breakthroughs, for example, green hydrogen production and direct-air capture. Assessing the cadence of internal cycles and aligning these with the external technology landscape will be essential for companies seeking to optimise investments.

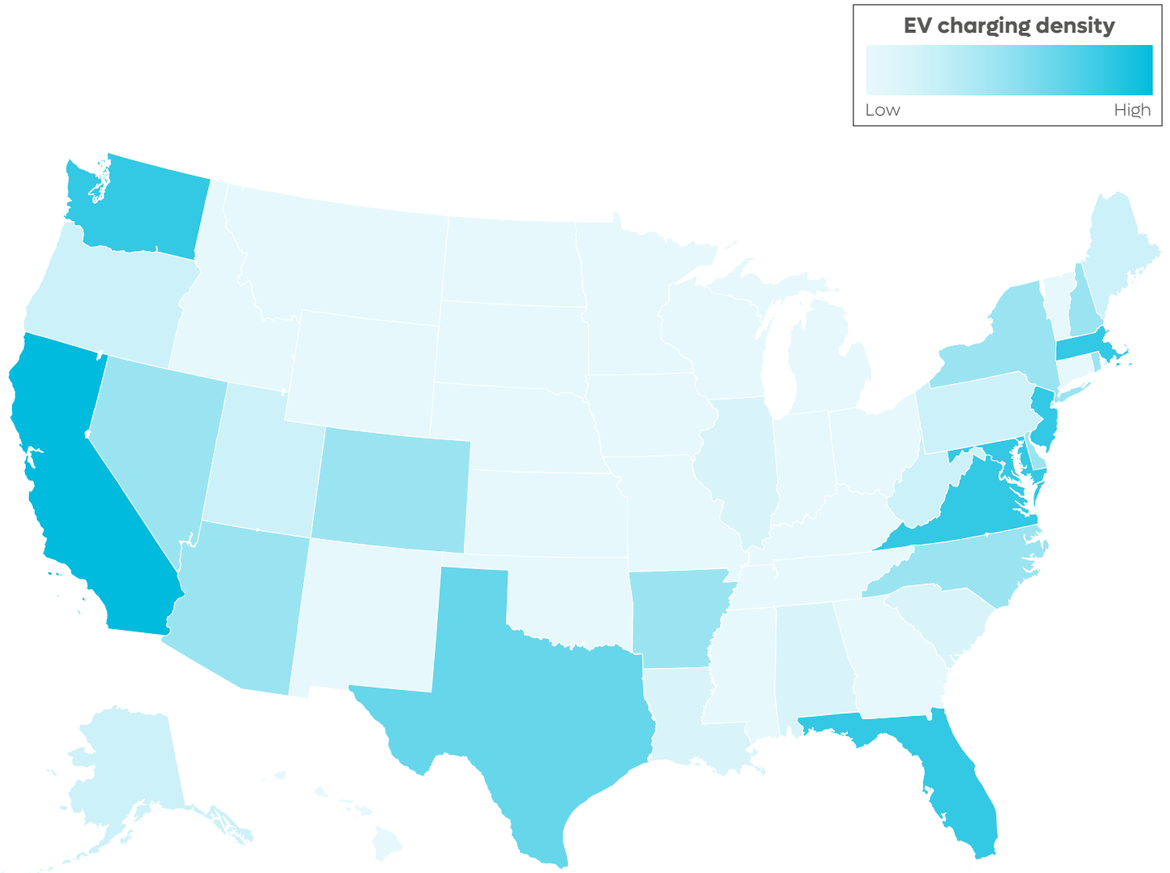


Figure 6: Risilience 2030 forecast of heavy-duty electric vehicle charging infrastructure by US state. To ensure that decarbonisation of land transport is technically feasible, forecasts of where charging infrastructure will be available enables planning for electrification of heavy-duty trucks.

The investment calculus

Decarbonisation requires serious finance. Organisations can really reap the benefits of connecting their financial and transition plans as a unified business strategy.

Companies recognise that carbon emissions need to be decoupled from growth – i.e. the business growth objectives must be met alongside the need to reduce emissions. Simply put, the emissions intensity of the business – carbon generated per dollar of revenue – needs to reduce, over time.

Meeting the decarbonisation targets that companies have set implies committing significant expenditure. Some view spending on sustainability as discretionary, to meet corporate social responsibility expectations – actions that have benefits on the planet and the company's reputation but may not necessarily generate a business return.

Many companies have difficulties linking their decarbonisation programme to the financial benefits that will accrue, and the magnitude of investment required may not be considered financially viable according to usual capital budgeting practices. Such thinking potentially limits the level of investment companies might be willing to commit.

In fact, expenditure on decarbonisation can be justified using appropriate and systematic financial principles to demonstrate the return-on-investment. As discussed, tools such as MACCs can demonstrate the return in terms of GHG reduction and can help to optimise the cheapest path to a company's decarbonisation target. However, the total MACC may still present an alarming picture if it shows that meeting a target is only possible at huge expense.

This investment burden can be reframed if the externalities of climate-related risks and opportunities are properly accounted for. Increased costs from carbon taxes, regulatory burdens, litigation risks, higher costs of capital, loss of customer market share and technology penalties threaten material losses.[11] 'Tail risks', the potential for extreme events and combinations of bad outcomes, can be significantly greater than the expected or best estimates of loss in given scenarios.

Many organisations take a risk-adjusted view by stress testing their projected financial performance as part of their routine planning and assurance exercises. This includes assessing impacts on future cash flows, impairment testing of fixed and intangible assets, and goodwill. This means that risks are represented in the baseline financial plan, and so companies are not overestimating their future bottom line because they've ignored key factors that might diminish it. This "Climate Value at Risk" is a critical metric to quantify.

With this robust baseline projection of the business, a company can effectively demonstrate the benefits of mitigation through decarbonisation. Decarbonisation can generate a significant return in reducing downside risk, and improve profitability and growth in the long run. These effects can be quantified. The reductions in emissions results in a reduced risk, which can be quantified as a reduction in Climate Value at Risk. This demonstrates the financial value of the decarbonisation plan on payback horizons aligned with investor expectations.

Risilience has found that decarbonisation action aligned with net zero can reduce the risk to five-year earnings value by more than half. This protected value can be added into the cost-benefit equations for decarbonisation, and a risk-adjusted marginal abatement cost shows the net financial impact of mitigation action. The plan is likely to have additional benefits in strategic repositioning of the company and non-financial value in the societal contribution to global reduction in GHG emissions. Intangibles and goodwill from these societal benefits adds further justification for the plan.

[11] Even if all these risks and regulatory burdens are taken into account, externalities attributable to the business may still exist. It is therefore likely, that even after a business has accounted for the financial impacts on the business, the full costs to the environment and to society may not been captured and therefore any acts of mitigation or adaptation may still not include the full cost of externalities caused by the business.

Risk reduction is a compelling motivator but this process can also identify major upsides related to the opportunities that climate change presents. A good sustainability programme can also have major positive benefits on a range of stakeholders, including attracting sustainable consumers and discerning business-to-business customers; retaining and motivating internal talent; and opening favoured access to green capital. Novel products and services may generate new revenue lines, and improved efficiencies in the business model can shape merger and acquisition activities and spark innovation.

Translating the plan into action

Investment in decarbonisation is no longer an option for business. Tough questions must be answered surrounding that investment and how to approach the difficult balancing act required when financing your transition plan.

Climate change adaptation is a disruptive economic process – companies that are early adopters will secure better deals with suppliers and transition quicker, leaving their competitors behind. Upside potential can be captured in the financial models when justifying the investment needed.

But how much should a company invest in its decarbonisation? How can the targets be achieved without over-investing or failing to invest enough to meet the targets? What should the priorities be? The GHG footprint of the business shows where emissions are largest to prioritise effort to reduce them. The plan typically consists of large numbers of initiatives that are required across many business activities and geographical regions. The first step is to gather data and information on the current and potential initiatives, mapping them to the targets, and to optimise them across the business as a whole.

Ultimately all activities need to be decarbonised to achieve 'net-zero' emissions, and, although the expensive-to-abate processes may not be among the initial priorities, they need to be included at some point in the future.

SBTi standards allow around ten per cent of emissions to be offset, so typically most organisations plan to achieve reductions of around 90 per cent, with expensive-to-abate activities being the candidate initiatives for the offset programme. Offset programmes themselves have challenges, risk and reputational implications, so need to be well-managed to form an integral part of the strategy.

Initiatives are funded from a combination of operating expenses (OpEx) and capital expenditures (CapEx). Some of these can be identified as a distinct and incremental decarbonisation budget, others are an integral part of operating and managing business-as-usual. The timing of capital expenditures needs careful management. The replacement of a heavy-emitting plant and equipment with low-emissions equivalents is an obvious requirement but if this occurs before the amortised lifespan of the plant, the write-down on the balance sheet may be painful. If the substitution can be phased with the natural replacement cycle, the costs of the initiative can be made much more manageable and balance sheet costs reduced. New regulation is the most likely cause of premature and costly PPE replacement, so anticipating when these potential regulatory pressures are likely to come into force is an important part of the plan.

Transition planning is underpinned by a coherent greenhouse-gas inventory, which highlights where emissions must be reduced. Currently, many companies lack the granularity in their GHG footprint to understand where or how to reduce emissions. Carbon accounting methods still rely heavily on average data, which is too coarse to recognise the year-on-year emissions reductions that a company makes in reality. Companies that focus on improving their data are able to use it to focus their activities and investments most effectively.

Achieving operational buy-in is critical to successfully implementing the decarbonisation programme. Risilience takes an enterprise approach to working with an organisation beyond the sustainability or finance team leading the initiative – understanding who the key internal stakeholders are and working with each business unit or functional department to engage, empower and encourage them in their role for operationalising the sustainability plan. Typical functional activities in an organisation with important roles in implementing the plan may include treasury or finance, procurement and supplier management, facilities management, packaging, strategy, and compliance, in addition to sustainability and risk departments, and individual product or regional business units.

Some companies have found it helpful to embed incentives and financial management tools to ensure that these initiatives are aligned across the organisation, including having internal or shadow-carbon prices to reflect financial costs to the business.

Many businesses have chosen to implement an internal initiative fund, typically a research and development or ideas-encouragement tool, with a pot of money to fund otherwise non-budgeted initiatives, to explore pilot projects or seed innovation.

Ultimately the investment costs of initiatives and the total decarbonisation plan need to be subjected to the same hurdle rates or return-on-investment that the business uses for other investment decisions. The challenge is that returns from business transformation are likely to occur over a longer timescale than typically sought by executives and investors. Financial valuation tools, cost of capital and discount rates can be applied if they take a strategic approach to return on capital over the period that sustainability programmes will generate their returns.

Conclusion: sustainable growth in the green economy

Climate change is transformational to the economy; it will disrupt business-as-usual and redefine the terms of success for many industries. Companies that address it early will thrive, while others will find their competitors have used the disruption to gain advantage.

However, to optimise shareholder value and ensure this evolution is financially viable, businesses should take care to neither under- nor over-invest in their transition plan. Companies that are perceived to have over-invested in sustainability have come under pressure from investors seeking short-term gains with little appetite for longer term paybacks. Businesses that are perceived to be under-investing in sustainability are penalised by receiving poor ESG ratings and being shunned by green investors.

The transition plan is a multi-year change programme that involves evolving business processes as well as diverting operating costs and capital expenditure. To strike the right balance and optimise both the timing and magnitude of decarbonisation efforts, firms should apply the same decision criteria they use for any other investments.

It is critical that financial plans factor in the externalities of climate change – particularly the risks and opportunities presented by a low-carbon economy – to first understand the business-as-usual outlook. This baseline should be integrated into cost-benefit tools to assess the risk-adjusted abatement cost, as well as demonstrate the wider range of upsides, such as reputational, market and credit-rating benefits.

This provides a holistic return-on-investment, and various metrics, such as the risk-adjusted cost of capital, can express a truer view of the financial costs and benefits that will result from decarbonisation.

With growing regulatory requirements to publish comprehensive transition plans, there is urgency for companies to draw up a plan quickly. However, this is a deeply involved process akin to redefining a business model. This requires engagement across numerous operational and strategic functions of the business, to assemble the data and actions that are both technically feasible and economically viable. Sustainability teams must speak the same language as the finance office to demonstrate that a transition plan enables a company to pursue profitable sustainability.

FINANCING NET ZERO

Integrating financial and transition planning

At Risilience, our mission is to help global businesses transition to the net-positive economy. Our award-winning platform and advisory services drive actionable Sustainability Intelligence, connecting climate and nature, to deliver better disclosures, better risk insights and better transition strategy.

Our technology enables you to quantify the financial impact of climate-and-nature-related risks and opportunities to make better business decisions that lead to better business outcomes.

We developed our environmental frameworks in partnership with the University of Cambridge Centre for Risk Studies to enable you to deliver credible and rigorous sustainability disclosures, and transition plans, on your journey to net positive.

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Intelligently driving sustainability