

In collaboration with
Boston Consulting Group



Winning in Green Markets: Scaling Products for a Net Zero World

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Foreword



Antonia Gawel
Head, Climate Action,
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Current headwinds for climate action. Companies and consumers are being buffeted by a number of challenges today – inflation and a looming recession, the energy crisis in Europe and heightened food risks. Society must not, however, allow these near-term problems to distract us from moving with urgency on the growing threat posed by a warming world. Climate action remains insufficient today. Current projections hold that emissions will rise nearly 11% by 2030 versus 2010, far from the 43% decline that is needed to limit warming to 1.5°C. Although adaptation and resilience were at the top of the COP27 agenda, with some progress being made through the establishment of a loss and damage fund, only a fraction of nationally determined contributions were updated. As United Nations secretary general Antonio Guterres stated plainly: “We are on a highway to climate hell with our foot still on the accelerator”.

The role and opportunity for corporate climate action becomes primary. For roughly two decades, governments called upon the private sector to engage on climate. But that dynamic has shifted. Corporate leaders are increasingly urging governments to act while moving on their own to take action that will preserve our economies and livelihoods alike. US Special Presidential Envoy for Climate John Kerry has spoken frequently of the critical private sector role, noting: “I believe the private sector has the ability to win this battle for us”. Early movers in various sectors have started to find a market for their green products. They understand how decarbonization commitments made by consumer-facing corporations and evolving government policy will drive green demand. This World Economic Forum and Boston Consulting



Patrick Herhold
Managing Director and
Partner, Center for Climate
and Sustainability, Boston
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Group report explicitly takes a business perspective on how to find, create and shape those green markets.

Winning in green markets. While sustainability still often comes at a cost today, green leaders can thrive, nonetheless. A critical element of successful go-to-market strategies is collaboration. Leaders understand that partnership is the new leadership. Companies can work with suppliers to secure and develop supply, often sharing the costs across the value chain. They can partner with customers to design and bring new green products to market and engage with government to drive the right enabling environment. They can even work with competitors to scale the critical supply, demand, transparency and infrastructure needed for green markets to materialize.

The findings of this report are based on quantitative and qualitative evidence from across the private and public sectors. The analysis is based on company sustainability commitments, announced green technology costs, as well as survey responses from over 65 companies and interviews with more than 20 sustainability leaders across various sectors and geographies.

We remain in the decade of urgent delivery. The benefits of action are clear, and the costs of inaction pose a threat to humanity and to biodiversity more broadly. Decisive corporate action has become an imperative and an opportunity to not only lead in a growing market but to also create, shape and scale the green markets that will transform our economy and protect our planet.

Executive summary

Green market leaders can thrive by taking an early market position. This decade, large-scale green markets will become a reality. Even though costs for early adopters are higher, they will likely find a market. As demand for green materials is projected to outpace supply, leaders in developing a green offering and go-to-market look poised to benefit.

- **Some green technologies have managed to reach cost parity during the last decade. Many others, especially in industry, still need to scale.** While many green technologies have already achieved market parity in many parts of the world, others, particularly in the industrial sector, still come at a cost premium of 50% or more. As these new technologies scale with continued government support, declining cost premiums will open up opportunities to pioneer green markets. Sectors like renewables and electric vehicles have proven that leaders can thrive by investing far before cost parity is achieved. This now needs to happen everywhere.
- **Willingness to pay a “green premium” is growing.** Green markets for upstream players are poised for robust growth. Most often, downstream companies are the driver, as they seek to deliver on sustainability commitments and meet long-term consumer trends. Early movers in upstream parts of key value chains are already capturing price premiums on green products. Early downstream movers are finding the consumers already paying more for sustainability, up to 7% and growing. This helps bring down technology costs while government policy is still catching up.
- **This decade, demand for several green materials could outpace supply. This is an opportunity.** Despite the outlook of significantly increasing demand in green markets, suppliers in many sectors are not addressing it at the required pace. Across most major value chains, the market share of downstream players with science-based value chain decarbonization commitments far surpasses the share of upstream players who would need to supply green materials to achieve these commitments. In some cases, this market share gap is more than 20 percentage points. As a result, green markets for materials like plastics, chemicals, aluminium, glass, concrete and steel will likely be short. Downstream companies will need to rethink procurement to strategically

secure and develop supply. Upstream companies who move into this market have great potential to find demand, potentially with premium prices relative to the more mature parts of their portfolio.

- **To win in green markets, companies should rethink their go-to-market approach.** First, companies should design a “green” target portfolio that serves tomorrow’s net-zero demand. Second, they will need to shape the value proposition of products within this portfolio; beyond emissions and other sustainability dimensions such as water, air and biodiversity, this may entail additional benefits around health, usability and other aspects. Third, companies should identify the most promising target segments and engage early adopters, often through partnerships. Fourth, companies need to create a green pricing strategy based on product, customer and desired outcomes. Fifth, companies should develop their green market environment and unlock scaling barriers with their suppliers, customers, peers and regulators. Finally, to fully deliver in green markets, companies will generally need to transform internally with new capabilities, measures and incentives, and internal collaborations across business functions.
- **Pioneering green markets is a bet, but it will likely pay off.** For decades upstream players in industries like steel, base chemicals and logistics have operated in commoditized, liquid buyers’ markets, competing mainly on cost and price. Phenomena like scarcity, value-based pricing and other characteristics of supplier markets have largely been unknown. Suddenly, an enormous untapped market could be willing to buy (and pay for) more sustainable products. Investing in this market is a bet and will require a mindset shift, but early movers can find new sources of demand and value capture. On the other hand, those that wait for demand to materialize before investing might ultimately be too late. Companies in downstream markets who want to avoid overpaying for their decarbonization targets should start changing their procurement process to consider carbon, proactively look for partnerships and be willing to make longer-term sourcing commitments. This decade is when large-scale green markets become a reality. It is up to early movers to shape them in their – and everyone’s – favour.

1

Sustainability isn't free – yet

Today, many low-carbon product alternatives still come at a cost premium, but early movers can secure leadership before cost parity.

Today, most non-fossil alternatives come at a cost premium

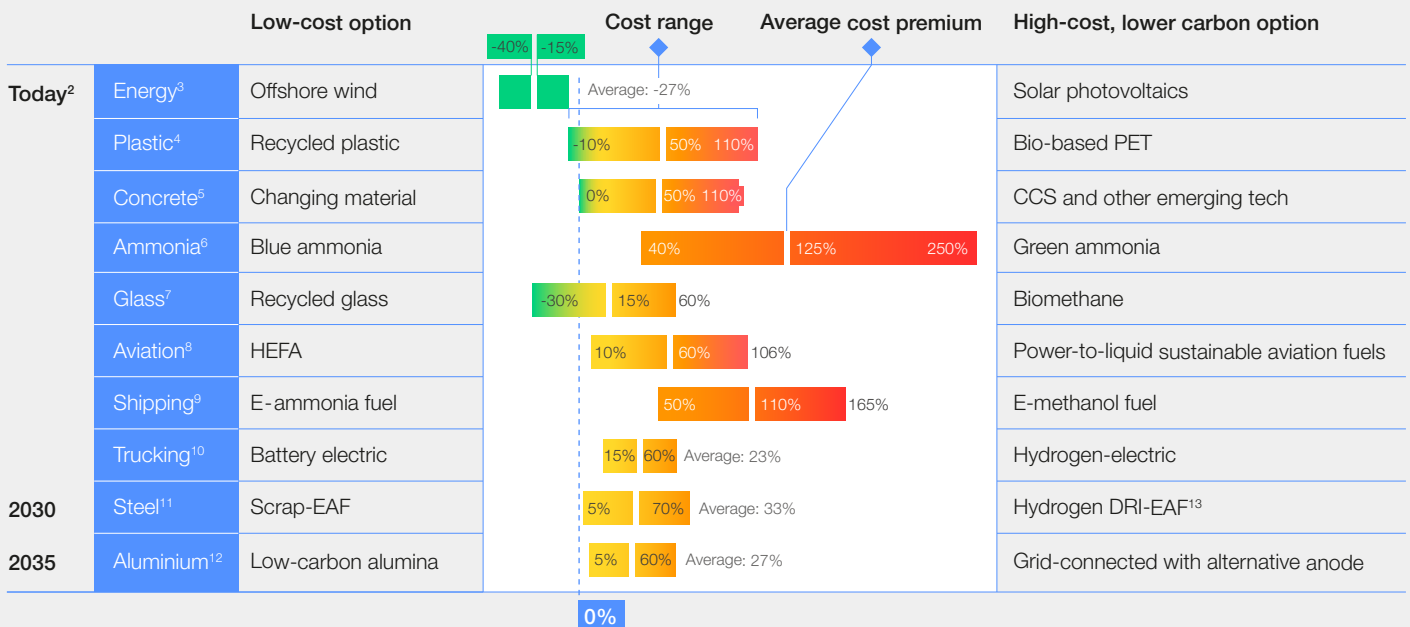
To realize the ambitions set out in the Paris accord, a massive technology shift is needed across all economic sectors. Non-fossil solutions already exist to mitigate most global emissions.¹ However, for many non-fossil materials, products and processes, costs are higher than their fossil counterparts in the current- and medium-term, particularly in industrial sectors. This is because some solutions, for example, cement produced with carbon capture and storage (CCS), are either structurally more expensive, still early in their learning curves, or both. In particular, the green raw materials or logistics

services that are required in almost all global value chains remain much more expensive than the status quo.

Consider green technologies to decarbonize aviation. Air transport with 100% hydrotreated esters and fatty acids (HEFA) biofuels is expected to increase the cost per tonne-kilometre by roughly 8% while reducing emissions by 50% to 90%.² Meanwhile, a fully net zero fuel like power-to-kerosene, which is in the pre-industrial phase and not yet scaled, would increase fares by a factor of almost 2. Other green materials and services face a similar challenge (see Figure 1).

FIGURE 1 Many non-fossil alternatives still come at a cost premium

Green cost premiums for selected low-emission materials and services
(percentage increase vs fossil)¹



Notes: 1 Numbers are rounded to nearest 5%, and individual projects may be outside the given ranges based on unique regional and financing situations; 2 2020-22; High premium = highest cost technology in unfavourable geography, low premium = lowest cost technology in favourable geography; 3 2022, includes residential, commercial and utility and considers mean of unsubsidized levelized cost of energy (LCOE) values; 4 2022, considers regular PET baseline, low technology considers recycled polypropylene; 5 2020; 6 2020; 7 2022; 8 2022, power to liquid (PtL) = power to kerosene, middle range for PtL; 9 2022; 10 2022; 11 2030, considers blast furnace-basic oxygen furnace (BF-BOF) baseline and mix 80% DRI, 20% scrap; 12 2035, considers coal-based smelters baseline; 13 Direct reduced iron-electric arc furnace.

Sources: US Department of Energy's Solar Energy Technologies Office (SETO); Science Direct; Environmental Investigation Agency (EIA); International Renewable Energy Agency (IRENA); S&P; Rabobank; Mission Possible Partnership (MPP); International Energy Agency (IEA); PR Newswire; GOV.UK, Global Maritime Forum; Methanol Institute; BCG analysis

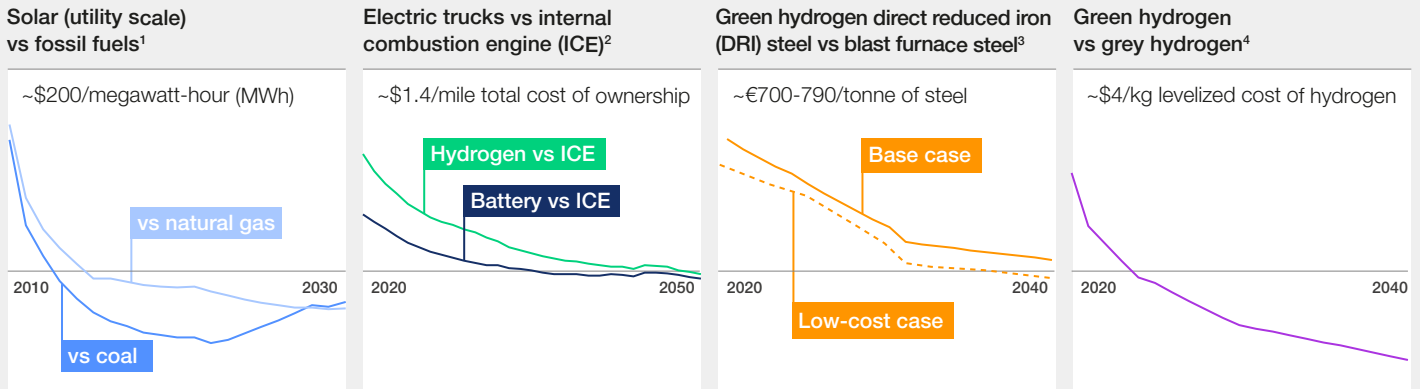
Cost premiums are projected to decline over time

As green technologies scale, their cost disadvantage is projected to decline. In the US, for example, solar has reached cost parity with both coal and natural gas. Meanwhile, the total cost of

ownership (TCO) of both commercial battery and hydrogen electric vehicles is expected to drop below internal combustion engines within the first half of this century. In Europe, green steel may reach cost parity as early as next decade, in large part due to the rapid projected decrease in the cost of green hydrogen (see Figure 2).

FIGURE 2 With scale, cost premiums will decline or disappear

Cost premium for green vs grey alternative(s) in specific areas



Notes: **1** US view, includes residential, commercial and utility; natural gas-fired combined cycle plants; considers mean of unsubsidized LCOE values; **2** US view, TCO (total cost of ownership) for the expected adoption scenario, long-haul segment from the MPP report on transport; IRA impacting cost viability shifting cost parity ahead of 2030; **3** EU view, considers base and low-cost scenario – ranges based on on-site electrolysis setup with LCOE energy cost excluding grid and other tariffs, compression or transport costs for hydrogen; **4** EU view, green hydrogen cost vs steam methane reforming (SMR) hydrogen cost.

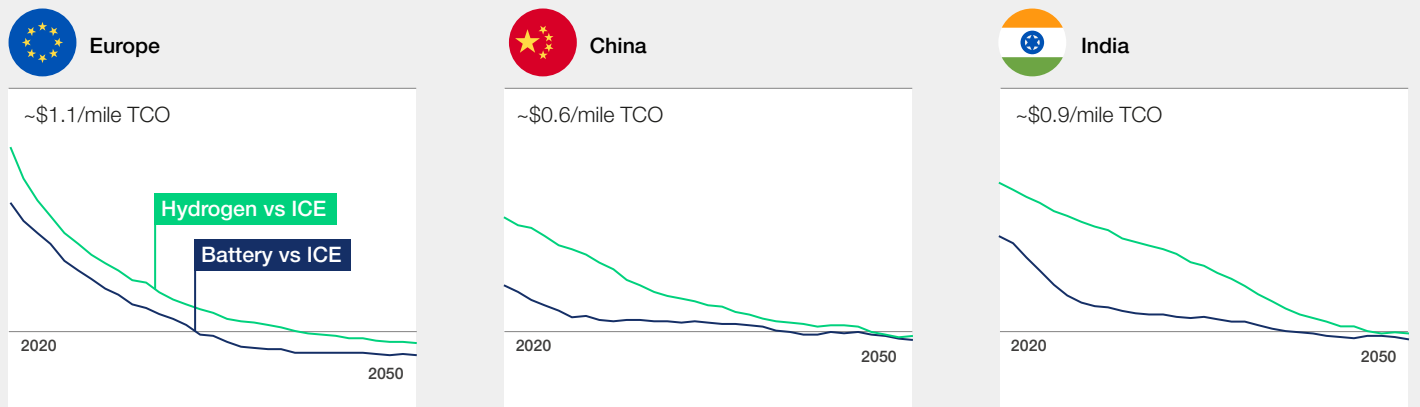
Sources: SETO; Lazard; Science Direct; EIA, IRENA; MPP; IEA; Bloomberg; BCG analysis

The exact timing of cost parity can be a function of geographic location. For example, TCO parity for commercial battery electric vehicles in the US is currently expected in 2036.³ It will likely be achieved

earlier in Europe but is expected later in China and India, but regardless of location, the overall trend is the same: cost premiums are declining rapidly (see Figure 3).⁴

FIGURE 3 Cost premiums are set to decline across geographies

Cost parity across regions for electric trucks vs ICE



Note: TCO for the expected adoption scenario, long-haul segment from the MPP report on transport.

Sources: MPP; IEA; IRENA; Bloomberg; BCG analysis

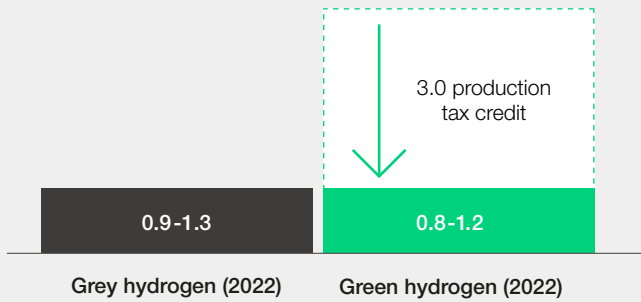
Governments can accelerate this dynamic with policies that either support green technologies or penalize grey (fossil-fuel-based) options. In the US, for example, the Inflation Reduction Act (IRA) will significantly reduce the cost of hydrogen and many other green technologies. Meanwhile, the EU's

Emission Trading Scheme (ETS) and its planned Carbon Border Adjustment Mechanism (CBAM) are increasing the cost of fossil technologies to make their green counterparts more competitive (see Figure 4).

FIGURE 4 Government action is reducing green premiums today

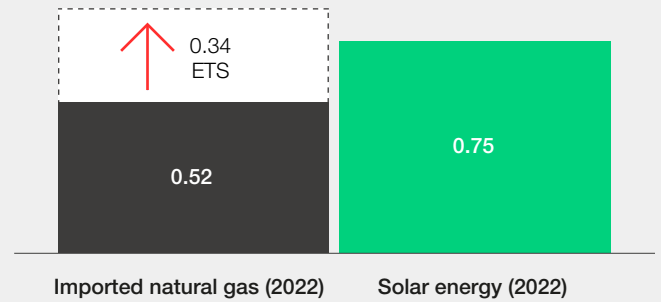
Example: Inflation Reduction Act (US), reducing the cost of green

Levelized cost of hydrogen in the US 2022 \$/kg, US, production cost^{1,2}



Example: EU Emissions Trading Scheme (ETS), increasing the cost of grey

Cost of imported natural gas in EU 2022 €/MWh, EU, import cost³



Notes: 1 Excluding infrastructure costs for storage and delivery to end consumers; 2 Dotted section reflects pricing uncertainty regarding natural gas (lower limit \$2/British thermal unit (MMBTU), upper limit \$5/MMBTU) and electricity. Starts at \$0.4/kg of hydrogen for 60-75% GHG reduction vs grey hydrogen, goes up to \$0.75/kg hydrogen for 75-85% GHG reduction; 3 Natural gas costs (\$54/MWh) for 10 tonnes of imports at 0.41 CO₂/tonne. ETS current price: 72 €/tonne of CO₂ emitted. Energy sector not benefitting from EU ETS allowances before the import.

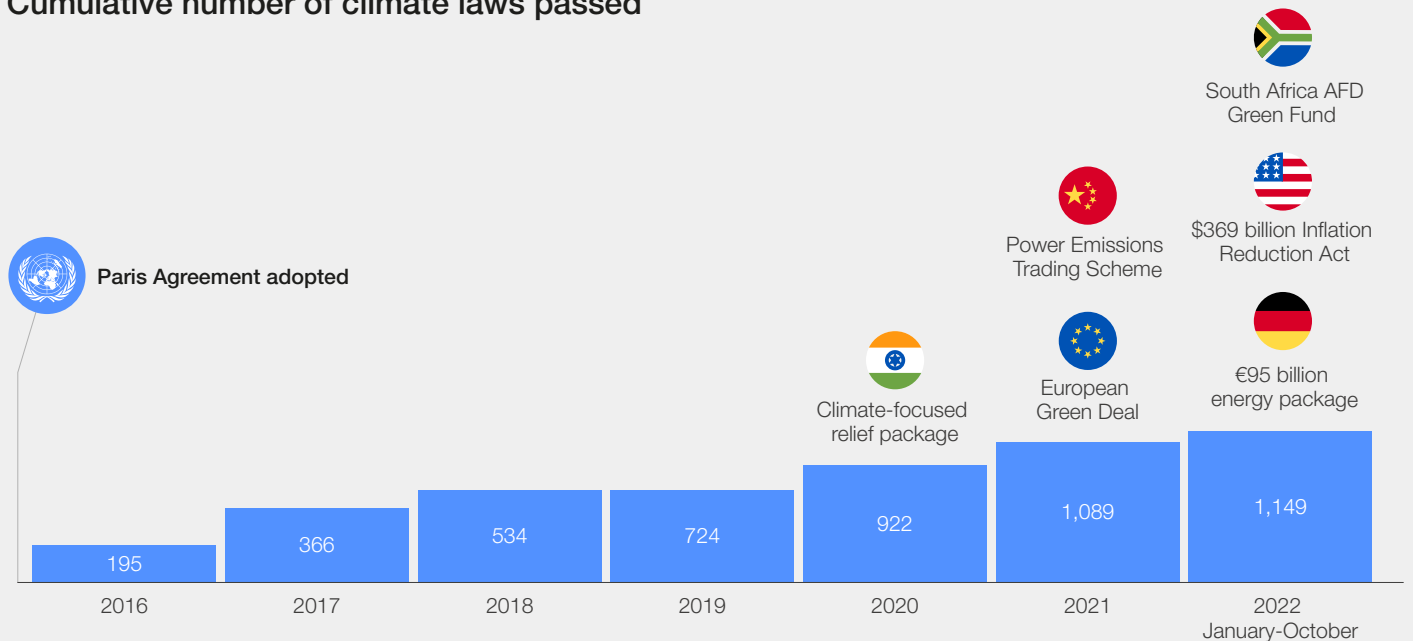
Sources: European Commission; BCG analysis

As noted in the Forum's 2022 report [Winning the Race to Net Zero: The CEO Guide to Climate Advantage](#), the impact of these interventions is

consistently underestimated. In past years, climate legislation has only ever gotten more ambitious across the globe (see Figure 5).

FIGURE 5 Government green action expected to continue increasing

Cumulative number of climate laws passed



Sources: Grantham Research Institute on Climate Change and the Environment; LSE; Climate-laws.org; BCG analysis

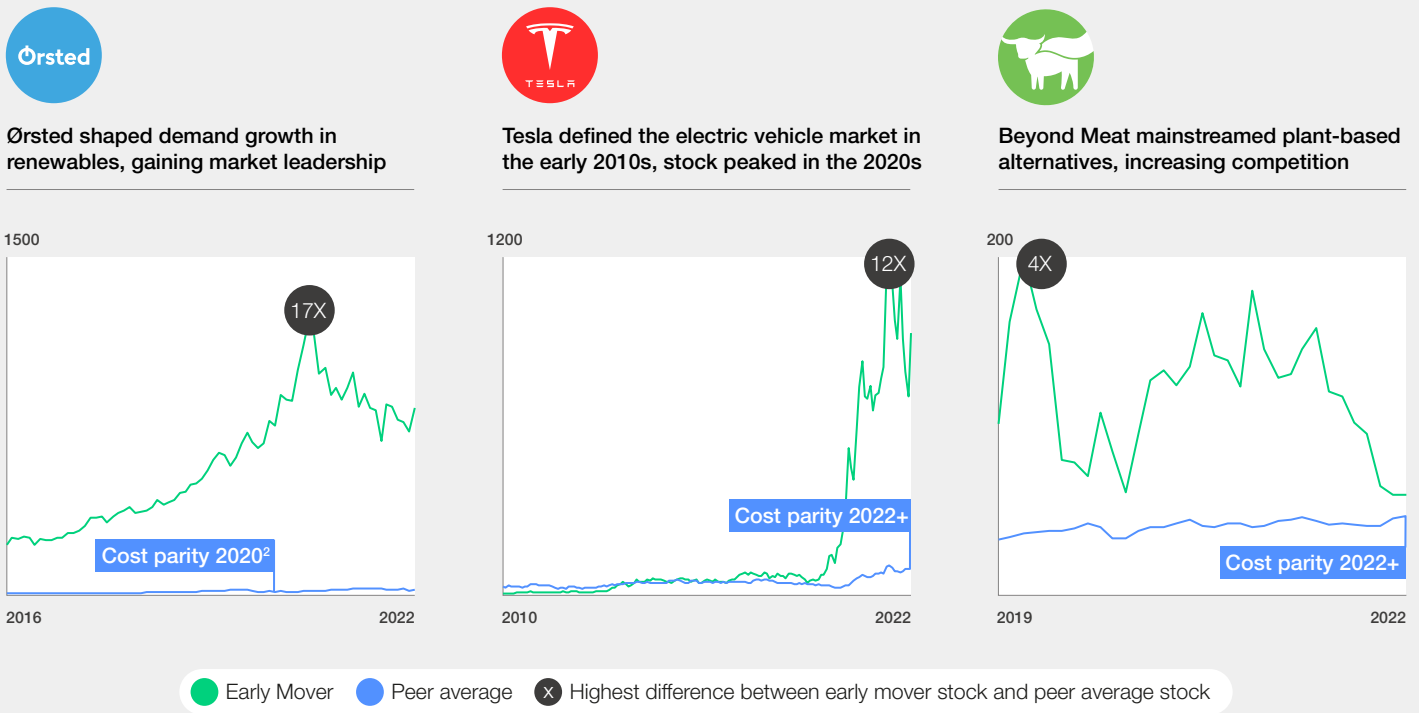
Early movers can create value before cost parity is achieved

While they wait for cost parity, early movers need to find a way to offset higher costs and transform the “green cost premium” into a “green revenue premium”. This means translating emissions

reductions into a business advantage. Several companies have done this successfully. In energy, automotive and food, respectively, Ørsted, Tesla and Beyond Meat were each able to realize lasting first-mover advantage by creating a compelling green offer before cost parity was achieved (see Figure 6).

FIGURE 6 **Early movers can find attractive markets before cost parity**

Stock prices (\$), early movers vs peers



Notes: Selection of early movers based on sustainability commitments, innovative approach and market share to relative category, annual reports and brand recognition; 1 Average of stock prices of peers listed by Capital IQ based on 2021 revenues; 2 Cost parity in Northwest Europe, debate between 2019 and 2020; 3 TCO of passenger battery electric vehicles (BEVs) vs ICE across regions and car models in the US; 4 Energy costs comparison includes non-renewables (nuclear, coal, combined heat and power (CHP), combined cycle gas turbine (CCGT) vs renewables (photo voltaic (PV), onshore wind, solar thermal) in December 2016; 5 Costs of production per kg of meat; 6 Costs of production of polylactic acid (PLA) (corn-based) and regular plastic.

Sources: Bloomberg; Capital IQ; Companies’ annual reports and press releases; Good Food Institute (GFI); Science Direct; BCG analysis



During the journey it pays off to be brave ... you can't calculate everything to the last digit and only then make a decision.

Andrea Fuder, Member of the Executive Board and Chief Purchasing Officer, Volvo

In some cases, companies absorb the costs to get access to a promising, fast-growing market. In others, they pass the costs along to early-adopter consumers willing to pay a green premium.

There is good reason to believe the same will happen in green material markets. In the 2021 report [Net Zero Challenge: The Supply Chain Opportunity](#), it was shown that the significant cost disadvantage in upstream materials and

services significantly dilutes as materials are moved through the value chain. For example, by 2030, a €30,000 mid-sized car made entirely out of net zero materials should only cost around €600 more. It was therefore argued that the emergence of net zero products and green markets is a significant opportunity – and that there is a segment in the market where a green premium will be paid. This now must be proven in every major industry segment, at scale.

2

Green markets already exist

A growing number of consumers and companies are paying extra for sustainable products. Early movers can find demand.

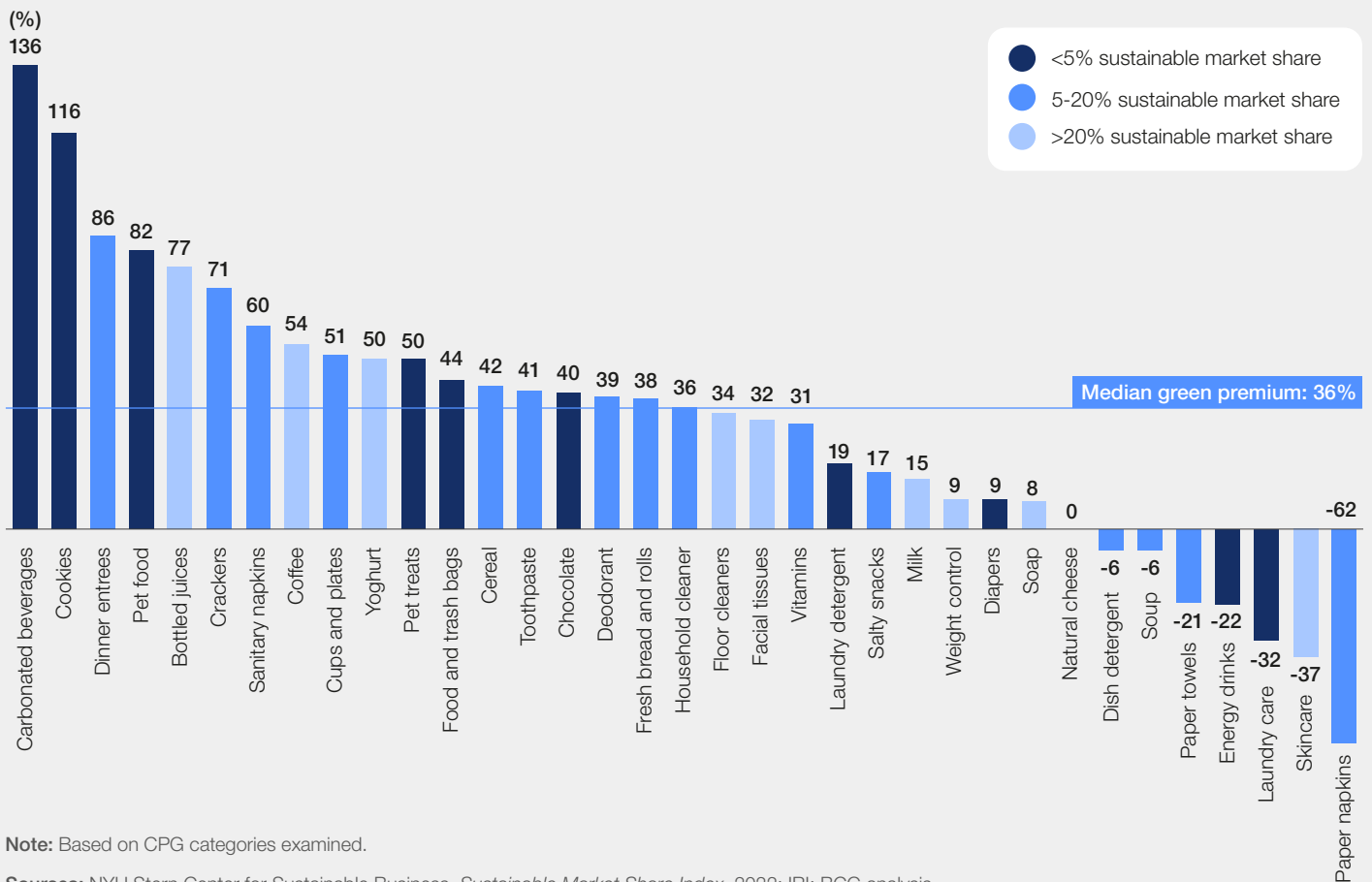
Consumer demand and willingness to pay for green are growing

Green consumption is an often-cited example of the “intention-action gap” in consumer research. Consumers claim they are willing to pay more for sustainable products but don’t necessarily back this up with actual purchase decisions. Nonetheless, companies can realize sizeable premiums for more sustainable products for a small but growing segment of consumers.

New York University Leonard N. Stern School of Business (NYU Stern) research on spending behaviour in the US consumer packaged goods sector, for example, showed that in 27 out of 36 categories analysed, consumers of sustainability-marketed products are paying a premium today. The median across categories achieved more than 35% higher prices – for often meaningful market share (see Figure 7).

FIGURE 7 Some consumers already paying more for sustainability

Price premium/discount for sustainability-marketed products in consumer packaged goods (CPGs), US (2021) (%)



Note: Based on CPG categories examined.

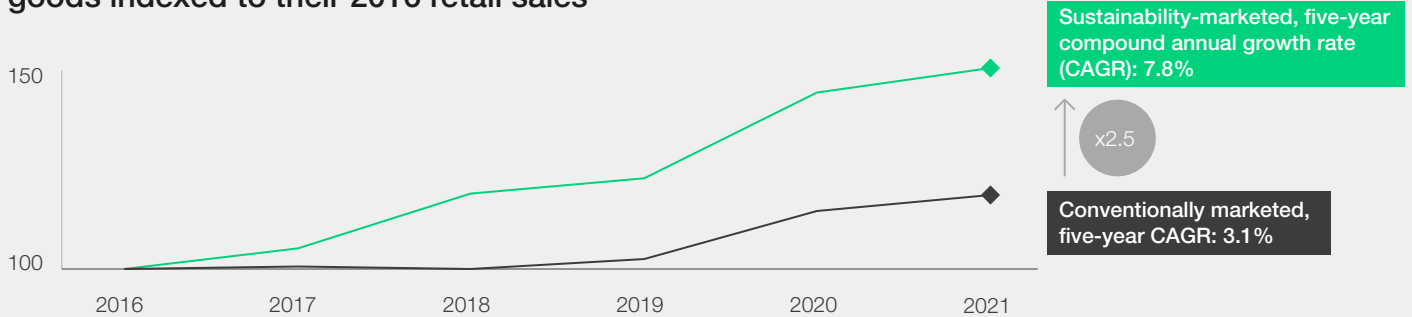
Sources: NYU Stern Center for Sustainable Business, *Sustainable Market Share Index*, 2022; IRI; BCG analysis

And in most categories, the share of consumers paying extra for sustainability is growing faster than the market. Between 2016 and 2021, the combined

sales of sustainability-marketed consumer packaged goods grew at 2.5 times the rate of conventionally marketed products (see Figure 8).

FIGURE 8 “Sustainable” consumer products are outgrowing the market

Sustainability- and conventionally-marketed consumer packaged goods indexed to their 2016 retail sales



Note: Based on 36 CPG categories examined. Base year 2015 = 100. Total market CAGR: 3.7%.

Sources: NYU Stern Center for Sustainable Business, Sustainable Market Share Index, 2022; BCG analysis

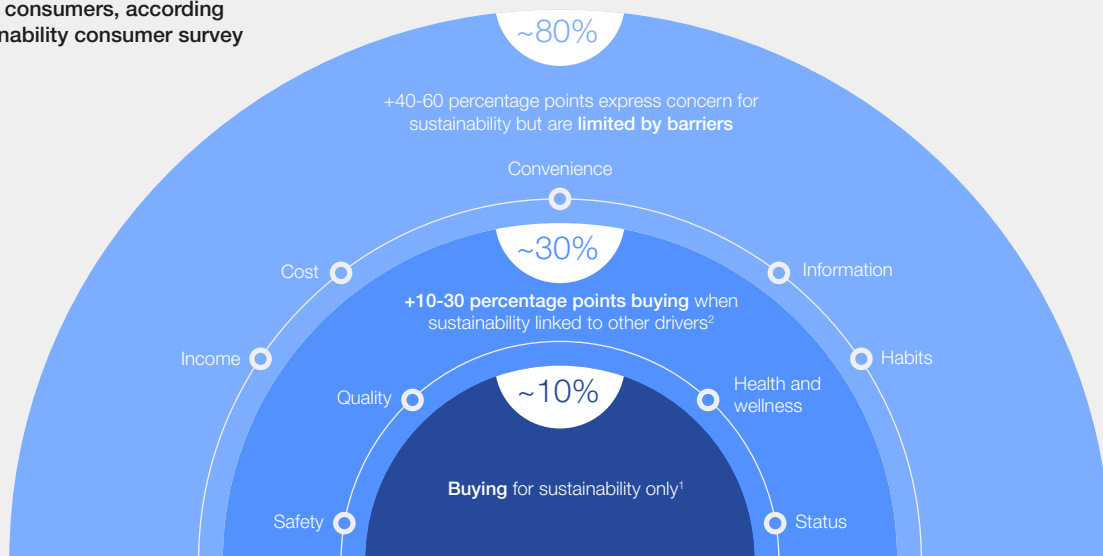
There are many signs of substantial potential for sustainable goods. A June 2022 BCG sustainability consumer survey highlighted that while less than 10% of consumers purchase on sustainability just to “save the planet”, the number of consumers in any given category that would make sustainable choices increases roughly 2-4 times (to 20-43% of consumers) when sustainability is linked to other benefits such as health, safety and quality. The number that would make sustainable choices increases yet another 2-4 times (to roughly 80%)

when barriers such as convenience, information and cost are addressed (see Figure 9).

As companies increasingly link green benefits to other decision-making drivers and eliminate those friction points, they are unlocking a segment of consumers that has not purchased green products in the past. Ultimately, they are turning what was once an intention-action gap into an intention-action opportunity.

FIGURE 9 The untapped market for sustainable products is larger than it appears

Percentage of consumers, according to BCG sustainability consumer survey



Notes: 1 Includes shoppers often/very often purchasing sustainably and considering themselves as sustainable; 2 Includes shoppers that sometimes buy sustainably; 3 Includes non-buyers that would be willing to pay a more than 5% premium at parity of other benefits.

Sources: BCG sustainability consumer survey, 2022; BCG analysis



“ For early movers in particular, there is an untapped and growing market willing to pay for green products.

Demand for green inputs grows – fueled by net zero commitments

Based on the consumer trends outlined above, combined with increasing government action and pressures to act from employees, investors and other stakeholders, companies can build a compelling business case for action. For early movers in particular, there is an untapped and growing market willing to pay for green products. In many cases, green price premiums already surpass the medium-term cost increases of full value-chain decarbonization. As consumer-facing companies accelerate their development of green options, this will, in turn, spark growing demand for low-carbon alternatives upstream.

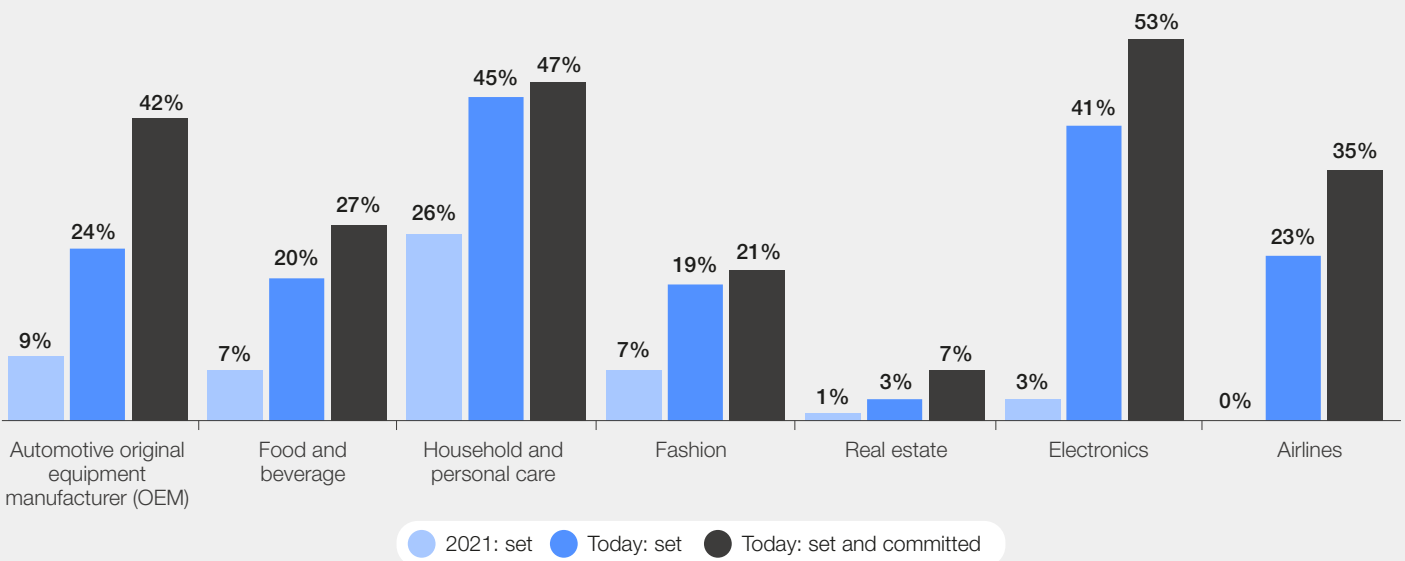
As of November 2022, 1,957 companies had set certified science-based emissions reduction

targets, and a further 2,103 had committed to set them,⁵ reflecting a significant increase in many sectors. For most consumer-facing companies, this means ambitious reductions to scope 3 emissions throughout the entire value chain.

For example, in the global automotive industry, the combined market share of companies with Science Based Targets initiative- (SBTi) verified scope 3 reduction targets increased from 9% to 24% between the end of 2021 and November 2022 alone. Adding companies that have committed to (but not yet verified) a scope 3 target, and those that have set upstream green procurement targets via the First Movers Coalition, this figure increases to 42%, almost half of the industry by sales (see Figure 10).

FIGURE 10 Supply chain decarbonization commitments are growing quickly

Market share of companies with upstream scope 3 sustainability commitments in different sectors (% by revenue, 2021)



Notes: Approximately \$24 trillion revenues (~30% global gross domestic product (GDP)) covered with science-based targets; Data as of November 2022, cumulative view, includes companies committed and with targets set.

Source: SBTi; BCG analysis

As companies translate these commitments into action, “green premium” markets are beginning to emerge. Players in different sectors have begun

introducing low-carbon materials and services to the market – and are capturing price premiums for them (see Figure 11).

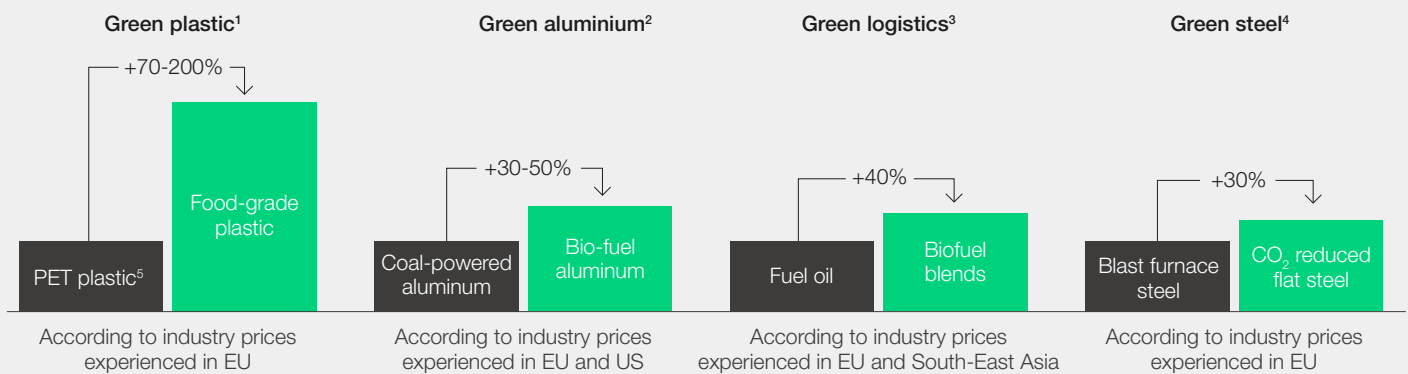


A successful adoption of next-generation sustainable technology requires immense collaboration across the value chain. Leaders along every part of the value chain are responsible for driving this change, including the additional short-term costs. These front-runners will consequently benefit from priority access to risk-mitigating sustainable technology and the social value of sustainability leadership.

Lisa Ekstrand, Vice-President and Head of Sustainability, Vestas

FIGURE 11 First green upstream products with a price premium

Price premiums (%) observed in Q3 2022



Notes: 1 Based on industry trends and expert interviews (2020-2025); 2 Platts and from Metal Bulletin; 3 Observed premia for biofuel blends with both fatty acid methyl ester (FAME) and hydrotreated vegetable oil (HVO), in a 30% and 10% blend vs bunker fuel oil from Rotterdam and Singapore; 4 Comparison for flat steel, CO₂ reduced ~50% of scope 1, 2 and 3 emissions; 5 Polyethylene terephthalate.

Source: BCG analysis

Even companies that feel unable or unwilling to fully pass on increasing base material costs to consumers seem willing to pay green premiums on purchased materials and services. A recent survey of 81 members of the Forum’s CEO Climate Leaders Alliance found that while almost half were already paying a green premium for at least one input, most of them were not passing this on (see Figure 12). Reasons cited for absorbing higher costs included: the costs were seen as an investment in overall sustainability goals; there

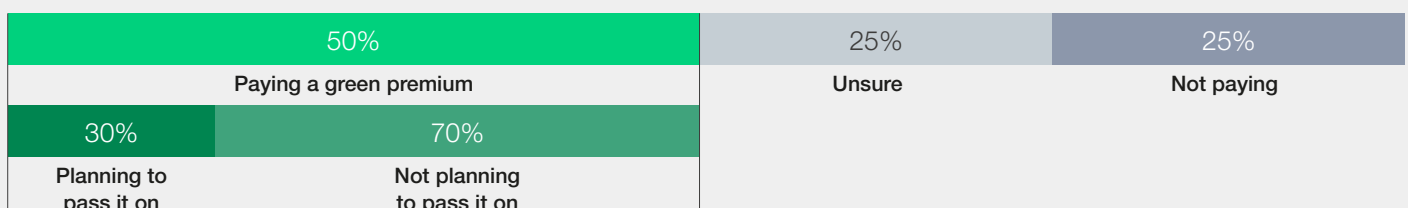
was a perceived need to secure access to inputs that were critical to capturing or expanding share in a promising new market, or the company was hedging against future climate legislation.

Today, companies are often early in the process of moving from setting climate targets to taking actions such as paying green premiums for materials and services. As more companies make this shift, a product carbon footprint (PCF) will become an increasingly important procurement KPI.

FIGURE 12 Companies starting to pay green premiums

Companies paying green costs and securing price premiums (%)

According to the Forum’s Alliance of CEO Climate Leaders member survey, 2022



Source: Net Zero Tracker; Alliance of CEO Climate Leaders member survey, 2022; SBTi; BCG analysis

3

Navigating an era of sustainability scarcity

Many low-carbon materials and services will likely be in short supply. Downstream and upstream players must navigate scarcity.

“ There is a notable gap between the commitment of downstream players to decarbonize their upstream value chains and the commitment of upstream players to provide the low-carbon materials.

Several macro trends are making green markets more attractive. The energy crisis will ultimately accelerate the green transition, starting in Europe. Consumers worldwide are increasingly environmentally conscious. Companies are setting commitments to tackle upstream scope 3 emissions and, more recently, translating their pledges into action. Governments are also taking action to advance the green transition, albeit not rapidly enough to limit warming to 1.5°C. This includes transparency initiatives such as labelling, green incentives, carbon pricing, direct investments, restrictions on the sale and use of grey infrastructure, and green public procurement.⁶

A decade of sustainability scarcity

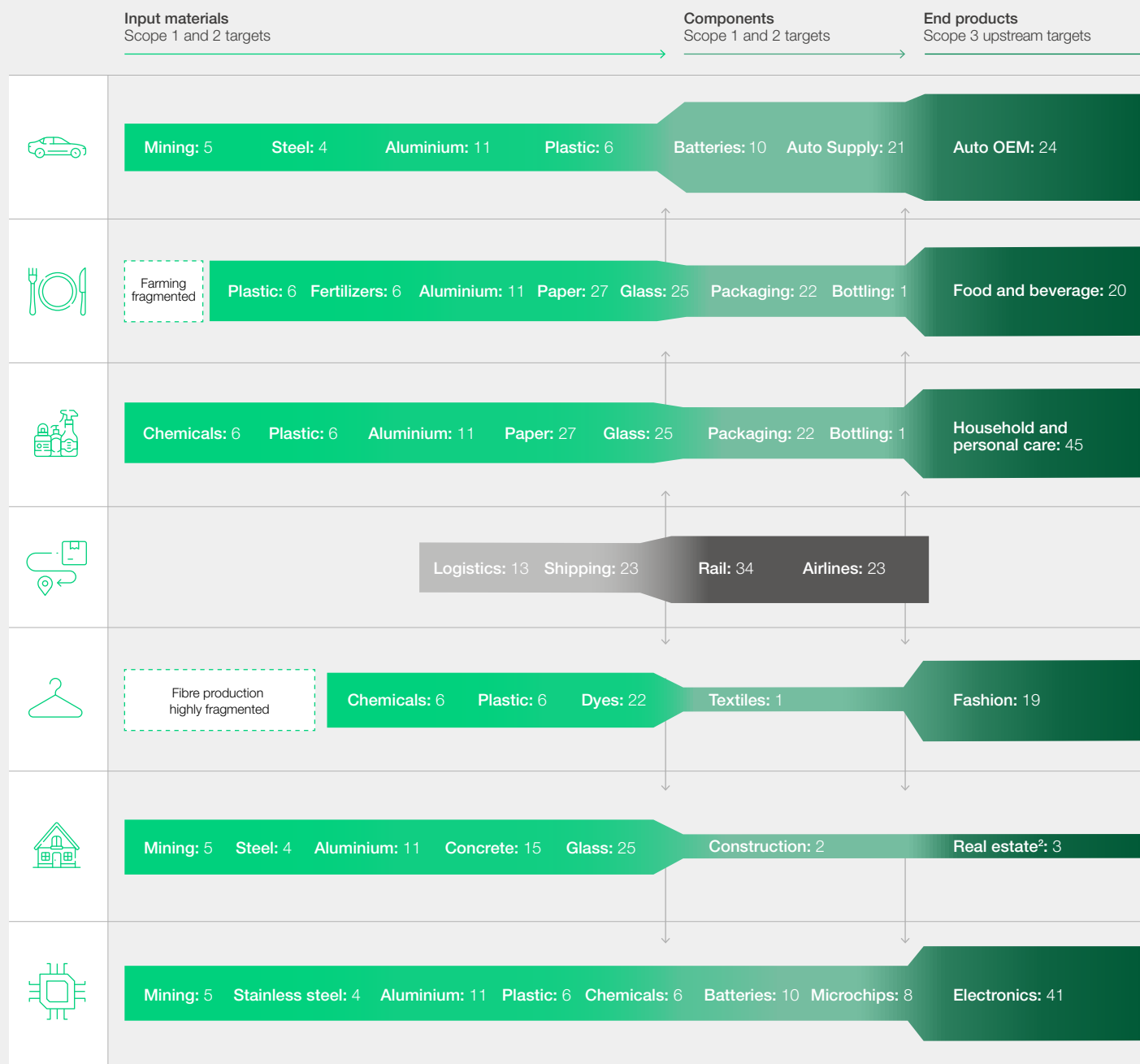
Together, these trends create substantial demand for green materials, but on the supply side, many players are not responding at the pace needed. There is a notable gap between the commitment of

downstream players to decarbonize their upstream value chains and the commitment of upstream players to provide the low-carbon materials required to meet these targets.

Consider the value chain for the household and personal care sector. Downstream players with SBTi-aligned scope 3 targets already hold around 45% of the industry market share. However, in industries such as plastic and aluminium, which provide materials for the household and personal care value chain, companies representing, respectively, just 6% and 11% of the market share have made similar commitments for their own emissions. This divergence in commitment level creates a major scarcity risk for green materials. Unaddressed, this could leave downstream players scrambling to lock up not only limited supplies of green materials and logistics but also green fuels, renewable power, new energy minerals and other goods (see Figure 13).



Market share (%) with CO₂e¹ targets SBTi and First Movers Coalition targets, by revenue, 2021



Note: 1 CO₂ equivalent; 2 Real estate and construction.

Source: S&P; Market reports; Company annual reports; BCG analysis

Scarcity will be different across sectors, as will players' ability to secure a green premium

Green materials supplies are just coming online in most categories, creating scarcity for almost all those inputs right now. True non-fossil steel, for example, is currently only available from a single pilot plant in Sweden, whose product has sold out

for years. The supply of non-fossil chemicals and plastics is still marginal. Green logistics alternatives are only beginning to emerge. Cement producers are only in the planning stages for carbon capture and storage (CCS) projects to decarbonize their product. The list goes on. As a result, true early movers in any of these categories – if they do it right – should be in a strong position to find a market.

“ By far, the highest scarcity risk for 2030 is currently projected to be in green plastics and chemicals.

In the medium term, the picture is less clear. Analysing the current public decarbonization targets of players across several major value chains, the supply and demand dynamics for several green materials and services have been estimated based on three major inputs:

1. **Scope 3 targets** of downstream players through 2030.
2. **Relative attractiveness** of different green materials to meet these commitments, based on emissions share, impact on end-product costs and technological readiness.
3. **Supply capacity commitments** to come online through 2030.

While precise projections are difficult to make and uncertainties are significant, the analysis indicates where sustainability scarcity is likely to be most severe, given current supply capacity announcements. By far, the highest scarcity risk for 2030 is currently projected to be in green plastics and chemicals. In both sectors, substantial demand

can be expected from consumer-packaged goods and other sectors, but upstream players currently plan limited production capacity for non-fossil and decarbonized alternatives. Contrast this with green steel, which is currently scarce, but many producers, especially in Europe, have announced plans to bring significant production capacities online within this decade. As a result, the risk of scarcity for green steel in 2030 is materially lower (but might still exist regionally) (see Figure 14).

In logistics, the dynamic is the most difficult to predict. On the one hand, players such as DHL have made very ambitious decarbonization commitments⁷ and the upcoming electrification of trucking will help satisfy demand this decade. On the other hand, low-carbon solutions for longer-range heavy-duty trucks are still immature, and green fuels for shipping or aviation are scarce. This scarcity might increase if logistics customers, unable to find low-carbon materials such as green plastics, seek to reach their scope 3 commitments by other means. In that case, many customers may look to green logistics as a larger-than-expected contributor to their scope 3 targets.

“

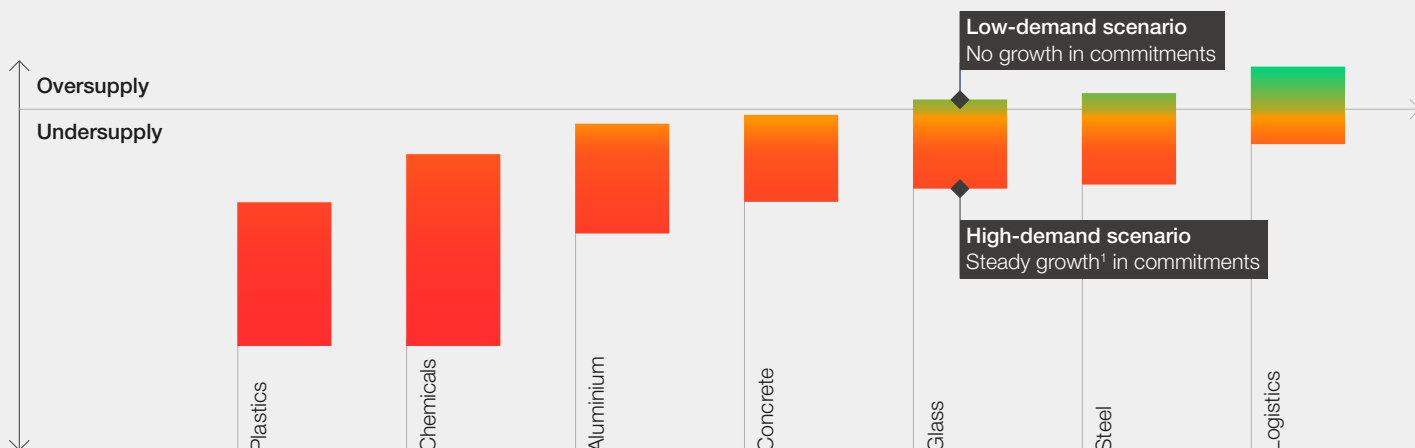
We believe that significant market demand for low-carbon logistics will materialize this decade. This is why DHL has set very ambitious emission reduction targets and why we are developing low- or net zero emission alternatives for customers along our entire logistics portfolio.

Carsten Luetzenkirchen, Senior Vice-President, Commercial Operations, DHL Customer Solutions and Innovation



Directional estimate of supply scarcity risk:

Gap between estimated demand and planned capacity in 2030 according to decarbonization commitments and announced capacity to 2030, as of October 2022



Notes: Commitments intended as upstream commitments; **1** Based on 2030 growth in commitments by sector, assumes continued decline in gap to 100% of revenue covered by upstream commitments (80% for auto OEM, 59% for food and beverage, 76% for households and PC, 46% for fashion, 20% for real estate and 100% for electronics). Green demand considered at different commitment levels up until 2030, defined as current SBTi commitments and assuming linear growth as per the 2021-2022 period. Green capacity considered at 2030 figure over global capacity in the same period.

Source: Company announcements; News reports; BCG analysis

“ Downstream players need to clearly signal intent and engage in downstream partnerships to alleviate the scarcity risk.

These results highlight how important it will be for upstream and downstream companies alike to stake out an early position in green markets. Downstream players need to clearly signal intent and engage in downstream partnerships to alleviate the scarcity risk. Upstream players should see the growing demand as an opportunity and invest in closing the gap. Demonstrating commitment to building capacity should also unlock further demand and lead to partnerships with downstream customers who are currently still on the fence about scope 3 commitments.

Downstream players need to commit to securing supply

Looming scarcity poses a challenge for all downstream companies aiming to decarbonize. Early movers have a better chance to secure supply of a scarce good and will likely be able to achieve their scope 3 commitments at a lower cost. This will require a shift in the procurement mindset of downstream companies. In many cases, it will mean integrating short-term cost and performance optimization with longer-term commitments and supplier partnerships. Suppliers that have been operating in cost-pressured commodity markets for decades will be hesitant to make decarbonization investments without knowing if they will pay off. Closing the gap will require showing upstream players that this demand is real so they have the confidence to invest in green product lines. Suppliers need clear signals of intent and willingness to pay or – even better – an engagement in longer-term offtake and decarbonization partnerships.

In many cases, companies will have to prioritize with whom they engage in such partnerships – and where they focus their decarbonization dollars. As with any partnership, companies should consider the calibre of the company and their commitment to the work. Beyond that, there are three main factors to consider for upstream decarbonization:

1. The share of input on their end-to-end emissions footprint.
2. The degree to which green supply of an input can achieve scale.
3. The impact that “buying green” would have on overall costs.

Across these last two factors, in particular, companies should watch policy and regulatory developments that will create mandates and help draw down the green premium. These government interventions may shift where spending is most effective. In many cases, companies make forward-looking investments based on expected policy and regulatory momentum.

Active efforts to develop low-carbon suppliers should be focused on all inputs that address a high share of emissions. Within this category, scalable solutions that have the lowest cost impact will get the most attention, but companies need to work simultaneously with suppliers on other solutions to ensure that low-carbon alternatives are available in the future. Beyond this category, companies should provide decarbonization incentives to suppliers they think can reduce emissions inexpensively,

for example, through clear and transparent procurement criteria. For green inputs that have a high impact on costs but not emissions, a “wait and learn” approach might suffice while other sectors are driving scale (see Figure 15).

Leaders are already demonstrating how to green their supply chain. To regenerate nature and reduce emissions, Unilever launched “The Unilever Sustainable Agriculture Code” in 2010.⁸ The code, among other things,⁹ outlines criteria Unilever uses to assess how their suppliers are progressing on

sustainability. While the code had significant reach, it has not been enough to solve all the sustainability challenges that Unilever hoped to address. Seeing a need for deeper collaboration, in 2021 Unilever complemented the code with “Unilever Regenerative Agriculture Principles” to inspire its own business, its suppliers and its peers and form the basis for regenerative programmes in the company’s supply chain. Today, Unilever provides financial, technical and social support to help farmers and smallholders implement regenerative agriculture farming practices.¹⁰

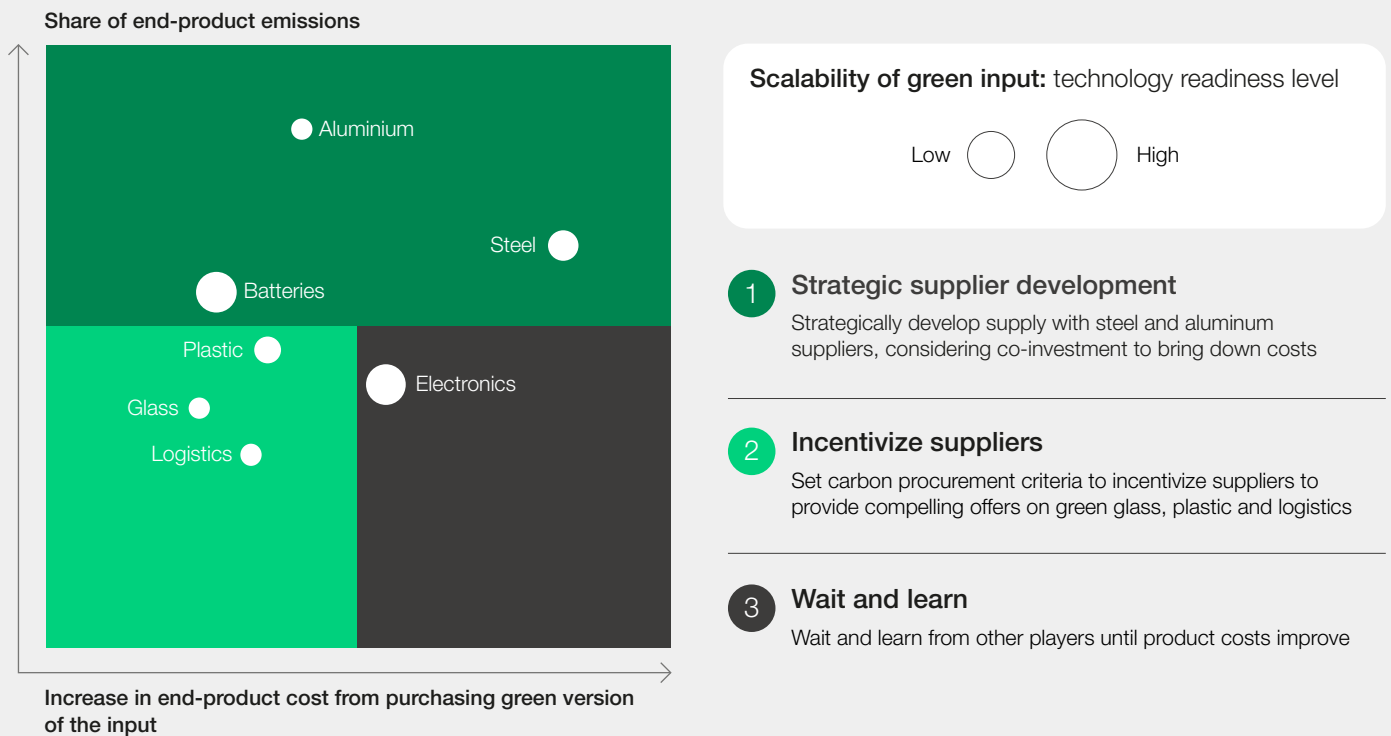


We have worked with our procurement team to start building in sustainability as a factor. Making sure it’s clear to our suppliers that for the right green offer we are willing to pay a fair premium. It’s a culture shift for suppliers to develop green products.

Nicolas Clerget, Director, Net Zero Strategy, Heineken

FIGURE 15 Three general strategies for supply chain decarbonization – automotive example

Example: Automotive



Scalability of green input: technology readiness level

Low High

- 1 Strategic supplier development**
Strategically develop supply with steel and aluminum suppliers, considering co-investment to bring down costs
- 2 Incentivize suppliers**
Set carbon procurement criteria to incentivize suppliers to provide compelling offers on green glass, plastic and logistics
- 3 Wait and learn**
Wait and learn from other players until product costs improve

Sources: S&P; Rabobank; MPP; Concrete; IEA; Argus Media; PR Newswire; GOV.UK; Net-Zero Aviation; Global Maritime Forum; Methanol Institute; NASA; Science Direct; Company interviews; BCG analysis

Upstream, early movers have a larger opportunity than many realize

Suppliers of low-carbon materials that move quickly to sell into an undersupplied market will be best able to secure a premium and gain an advantage in navigating the previously uncharted territory of selling a non-commoditized product. There is a large shortfall between upstream and downstream commitments to green offerings, which creates an untapped market of customers

– be they private or public – looking for green supply. In some cases, as with household and personal care, this shortfall is more than 20 percentage points in terms of the market share held by companies with commitments. To capture this market, upstream companies need to accelerate their green transformation and build a compelling go-to-market strategy for green products. This will require a mindset shift but can unlock new sources of competitive advantage for first movers.

4

The “green go-to-market”: how to commercialize sustainability

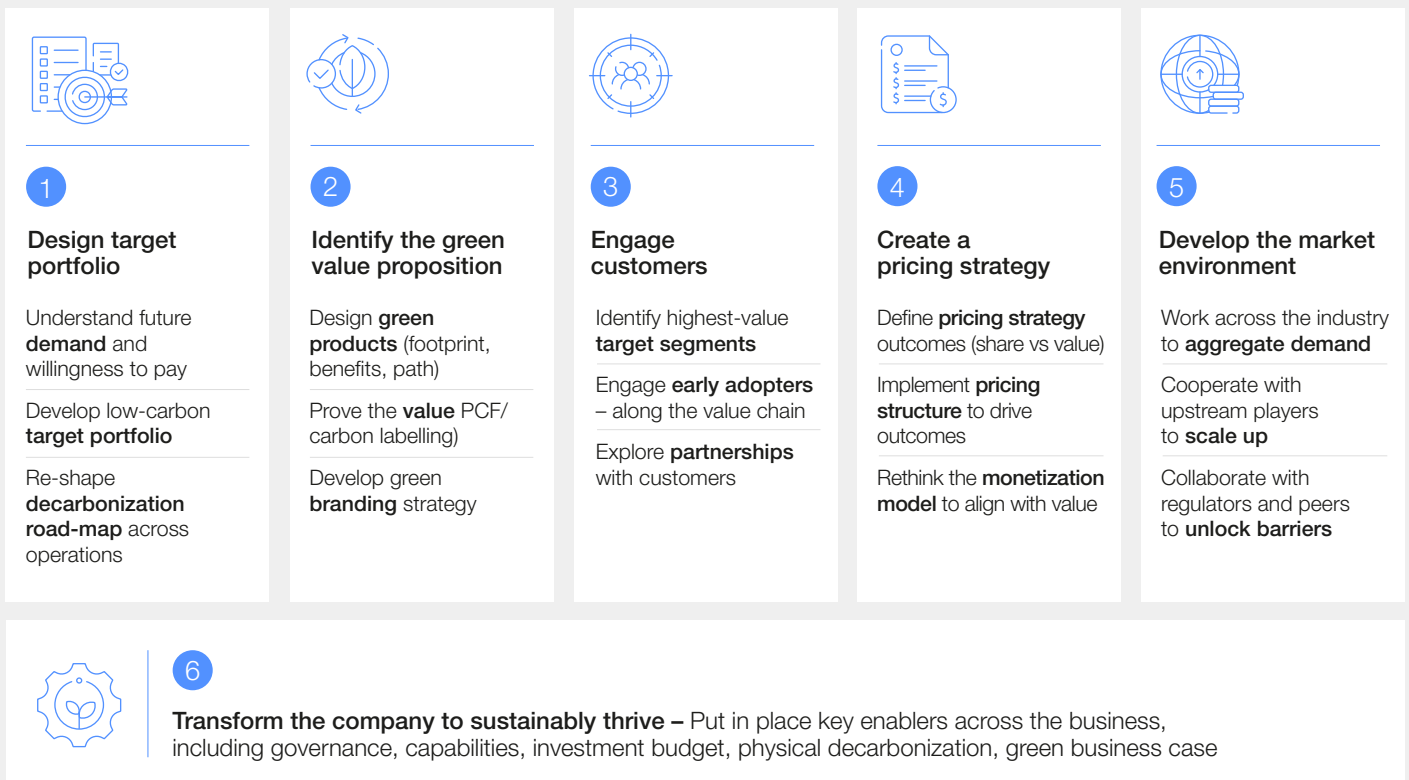
To win in green markets, companies need to revamp their go-to-market approach, which demands new thinking in pricing and partnerships.

An increasing number of companies are making ambitious decarbonization commitments. So far, however, few have a clear strategy for turning this ambition into customer value. Upstream companies struggle to shape a de-commoditized market. Downstream players still struggle to develop “net zero” products that would be compelling to consumers.

To commercialize sustainability, companies must revisit their go-to-market approach with five

interlinked actions. They need to: 1) design a new green target portfolio, 2) develop a differentiating value proposition for green products, 3) engage the most promising potential customers, 4) design a value-adding pricing strategy, and 5) shape a supportive market environment by partnering with suppliers and customers and collaborating with peers and regulators (see Figure 16).

FIGURE 16 Green go-to-market: how to commercialize sustainability



Source: Interviews with climate-leading chief executive officers and their teams and experts in Q3 and 4 of 2022, BCG analysis

Designing a green target portfolio

All leaders in green markets need to develop a vision of their product portfolio for a net-zero world. The first step is to develop a compelling green portfolio that can serve the customer demand of tomorrow. Many companies stumble at this point.

To succeed here, companies first need to gauge **future green demand and willingness to pay** in their sector. With moving decarbonization targets and no established low-carbon market, customers' needs today will likely not provide enough insight. Upstream players also need to understand how their target customers' scope 3 decarbonization ambitions will impact demand for low-carbon base materials in the medium term – and then plan production accordingly. Downstream organizations should judge whether demand for net-zero versions of their products could be mobilized once the products exist – in many cases, it will. Both should understand how current trends, policy and regulatory environment, commitments and preference shifts will likely shape demand going forward.

Based on this perspective of where the market will be, companies should design a **low-carbon target portfolio**. Today, many companies start investing in emission reductions and then try to commercialize the outcome. Instead, they should prioritize low-carbon product development in areas where expected demand and willingness to pay will be largest. Put simply, it might be easier to commercialize 30% of the product portfolio with net-zero emissions than the full product portfolio with 30% lower emissions.

Doing this will also mean that companies need to **reshape their decarbonization roadmaps**. Instead of prioritizing emission reduction levers based on cost and trying to find the least-cost pathway to achieving their emissions targets, companies should instead prioritize based on value. For upstream players, this will mean immediately implementing higher-cost “deep decarbonization” levers (which bring high emissions reductions) if this enables them to make more appealing customer offerings. For downstream players, it means strategically engaging suppliers to avoid the sustainability scarcity trap.

Shaping green value propositions

To maximize value from their low-carbon portfolio and unlock maximum demand for a green offering, companies must develop the right value proposition—ideally, together with their customers.

The first question companies must answer is how to **design their green products** that meet core customer needs to drive both growth and environmental impact. Should they aim to bring a truly net-zero product to market, or is a low-carbon option sufficient to unlock demand? Will customers accept a “mass balance” approach, where emission reduction impacts are allocated to just a percentage of product output or only products from physically non-fossil processes?¹¹ What other sustainability components will be critical, such as water usage, biodiversity, waste and recycling? Which additional benefits apart from sustainability should the product provide – such as improving convenience, extending product lifecycle and making it easier to repair?¹² The answer to these questions may well evolve. For example, some customers may initially be willing to pay for broader decarbonization of operations but demand actual decarbonization at the product level over time.

Companies need to figure out a way of **proving value**. Upstream players will only be able to commercialize a low-carbon offering if it actually brings down their customers' scope 3 emissions. End-consumer companies with a true net-zero product have to find a way to get through the greenwashing noise that less sincere alternatives create. This will require doubling down on emissions transparency, developing the ability to provide a PCF for all major products¹³ and providing certifications for emission reductions achieved (CERs). Carbon labelling has proven to be a major differentiator for companies that introduced it, ideally linked to emerging standards.

With the introduction of a green product line, companies need to think about a **green branding strategy**. Will green products be marketed as a separate product line? Will this be under the heritage brand or separately given perceptions and barriers (real or perceived) about the heritage brand? Can upstream players differentiate by developing a brand promise that carries over into consumer products (much like Intel has achieved with its processors)?

Steelmaker ArcelorMittal is an example of a company that has taken a portfolio approach to this challenge. It has developed a vision for a low-carbon target portfolio that balances interim products that decarbonize based on physical and mass-balance approaches (such as its XCarb™ umbrella brand for reduced, low- and zero-carbon steelmaking), with its long-term investments in developing truly non-fossil steel at the product level.

“ The first step is to develop a compelling green portfolio that can serve the customer demand of tomorrow. Many companies stumble at this point.



Engaging with customers on green products

For upstream players in traditional commodity markets, selling green products will require different, unfamiliar engagement with customers. While green markets are not yet established, they should aim to focus their go-to-market efforts where they have the most potential. They may need to engage in partnerships that go beyond typical buyer and seller relationships.¹⁴

Companies first need to **identify the highest-value target segments** in their customer base, because not all segments have equal ambitions to bring down scope 3 emissions. The same upstream product will have different relative decarbonization

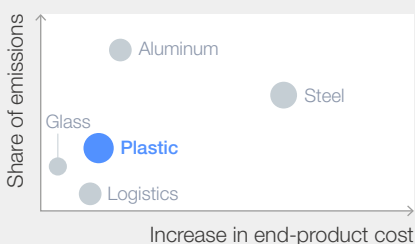
value in different sectors. For example, green plastic might be a priority for household and personal care. It is less critical, however, for the automotive sector, where it accounts for a relatively small share of product emissions (see Figure 17). In prioritizing sectors, companies should aim to answer three main questions:

1. In which sector do companies have the highest decarbonization ambitions?
2. Where does the product/service make up the largest emissions share?
3. How competitive are emission reduction investments in the product vs alternatives?

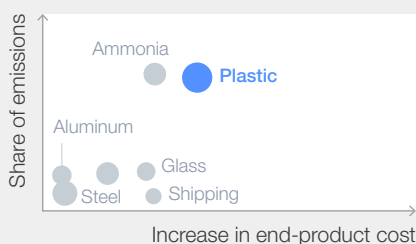
FIGURE 17 Relevance of green input varies by sector

High-level preference of upstream decarbonization levers across downstream players. Example: Plastic

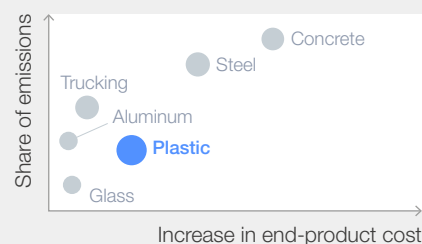
Automotive



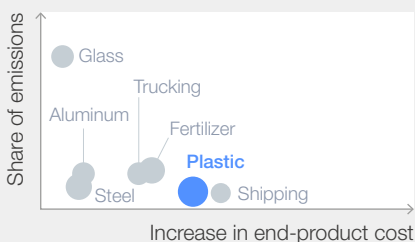
Household and PC¹



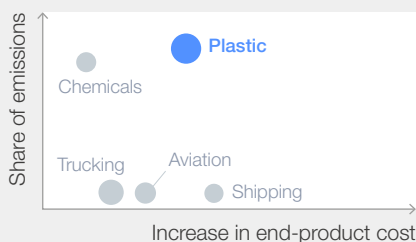
Real estate²



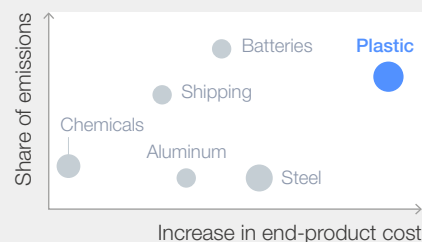
Food and beverage³



Fashion⁴



Electronics



Notes: 1 Assuming the same packaging and transit breakdown as ammonia 30% of chemicals; 2 Enterprise, contractor's margins are under threat by rising material costs; 3 BCG industry experience for food and beverage packaging cost estimates, assuming all metal packaging aluminium in food and beverage industry and 15% of farm emissions from ammonia; 4 Assuming ammonia 30% of dyes.

Sources: Bank of America Global Research; Journal of Food Science; United States Department of Agriculture (USDA); Science Magazine; Purnaa; Battery University; BCG analysis

In plastics, for example, this could lead to:

1. **Co-developing and investing** in products alongside specific customers in household and personal care or fashion, where green ambition and potential demand are high and where plastic is a competitive and important decarbonization lever.
2. **Working to develop more competitive products** with customers in the food and beverage sector, which has strong green ambition and potential demand, but other green products, such as glass or agriculture inputs, may be more attractive.
3. **Deprioritizing customers** in construction and automotive where long-term demand is not as high, and abatement cost competitiveness with alternatives, such as steel and aluminium are lower.

With a clear perspective on the most promising target markets, companies should seek to **engage**

early adopters along the value chain. Which customers have strong ambitions to decarbonize and high long-term potential demand? Where is government intervention most likely to create a pull for green materials? In some cases, early adopters might sit further downstream and require a different channel approach.

To translate customer ambition into actual buying behaviour in the early stages of market development, companies will need to **explore partnerships with customers.** Early manufacturers of low-carbon steel have co-shaped longer-term arrangements with their first customers – a “win-win” that de-risked their investments and created early supply security for their customers. Heating, ventilation, air conditioning and refrigeration company Trane Technologies is working with customers such as Walmart and Loblaws to test its new electric refrigerated trailers, using the data collected to further innovate and develop the production scale needed to help their customers decarbonize their supply chains.



Innovating and collaborating with customers enables even more sustainable product use as we continue to decarbonize our full value chain. Scaling low-carbon materials like steel, across the industrial sector and in many other key market sectors, will play a critical role in our collective goal for a net-zero future.

Scott Tew, Vice-President, Sustainability, Trane Technologies

In many cases, these types of partnerships will have to be aligned outside traditional sales channels. In some cases, they might involve more than two companies. When Maersk set out to pioneer green logistics, it partnered with green fuel providers, vessel engine manufacturers and early offtakers like H&M. Another example is a chemical player producing a material that could make non-fossil plastic bottles, which would have a better chance of successful commercialization if it partnered with producers of other necessary components and decarbonization-focused plastic bottle customers, rather than just waiting for market demand to emerge.

Creating a green pricing strategy

Alongside a green value proposition and new customer engagement models, companies need to develop strategies for pricing their green portfolio products. This is a new challenge for companies used to selling in relatively undifferentiated commodity markets.

First, companies need to define their desired **pricing strategy outcomes.** To develop an effective pricing strategy for a new green offering, companies must begin by setting clear objectives, for example, expanding their market share, recovering decarbonization costs or capturing a scarcity premium. Value chain position and market context can help inform this. Downstream companies have the greatest opportunity to realize excess margins if they can secure a premium positioning for their

green products. Whether upstream players can realize a price beyond “cost-plus” depends on market scarcity and their ability to produce low-carbon materials below market cost. Companies can also choose to price “ahead of the curve” to gain a share of new technology and realize an early-mover advantage on scale benefits.

Next, companies should seek to **implement a pricing structure to drive these outcomes.**

Companies have various pricing structures they can consider. A simple cost-plus structure may be most effective if they are focused on cost recovery. If they prioritize expanding market share, they may accept a margin hit or introduce pricing by outcome, for example, by accepting a discount for co-branding partnerships in exchange for brand recognition. In undersupplied markets, players seeking to maximize margins can opt for auction- or value-based pricing.

Independent of this, companies should **rethink their monetization model** to align with value. For many green product launches, traditional “make and sell” monetization models will still apply, with the buyer taking ownership of the green product as they do with the grey product. Where a new product launch requires large capital investment, co-investment can be considered. In other settings, circular business models are gaining traction as companies consider the full life cycle emissions of a product. In recent years, this has given rise to an increasing number of subscription and pay-as-you-go schemes (see Figure 18).¹⁵

“ To translate customer ambition into actual buying behaviour in the early stages of market development, companies will need to explore partnerships with customers.

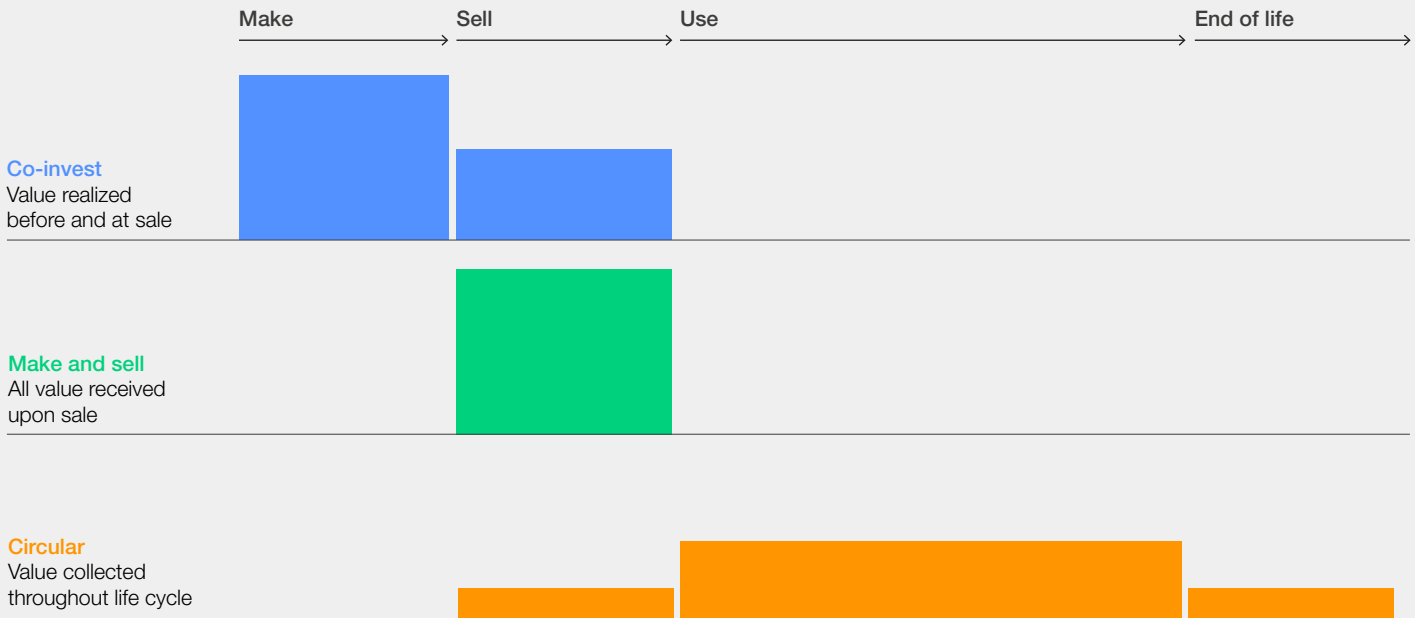


We need partners in all areas of our eco system to make a successful transition to net-zero emissions and this is the decade of action if we want to be successful in our efforts.

Vincent Clerc, Chief Executive Officer, A.P. Moller, Maersk

FIGURE 18 Different approaches to realign monetization model

Potential value captured during product life cycle depends on value chain position and industry dynamics



Source: BCG analysis

Developing green market environment

Green markets are an enormous opportunity for growth but are still in their infancy. As they shape their own green go-to-market strategy, companies should therefore think about how to

rally support across their entire market environment – especially from upstream players, customers, regulators and peers. Such collaboration is critical to accelerating the development of uniform green market standards, green supply and demand, and supportive regulation.



We are big on collaborating with others and learning from others because if you're only working within yourself the knowledge and insights are very limited. Our CEO welcomes open innovation and collaboration with others.

Keiko Shiga, General Manager, Environment Section, Sustainability Department, Sony

Companies should **cooperate with upstream players to scale up** the market. In a market at risk of being short of supply, supporting suppliers and investing in upstream solutions creates the necessary supply to create the net-zero products needed. Collaborations upstream help position companies to be earlier to market with their own green transformation.

Companies should also seek to **work across the industry to aggregate demand**. Initiatives like the First Movers Coalition bring together global businesses on both the supply and demand side across industries such as cement, trucking and aviation to accelerate the supply and demand of green products in these sectors. Similar initiatives exist at the level of individual sectors.



Partnership is the new leadership. If you just leave everyone to function by themselves, nothing will happen with the necessary speed. For entire system solutions to be real, partnerships is the truly powerful way of working. And I can see that everyone's realizing this more and more and more.







Martin Lundstedt, President and Chief Executive Officer, Volvo

Finally, once companies follow bold decarbonization ambitions, they should have a self-interest in **collaborating with regulators and peers to remove barriers**. Taking away barriers such as lack of information, convenience challenges or infrastructure availability helps unlock demand and accelerate the shift to green markets.¹⁶ For example, the more uniform the definition of a

green product is, the easier it is for companies to be confident and transparent about the emission footprint of the materials they buy and the goods they sell. This, in turn, enables a vibrant green market to emerge more quickly. Companies should therefore cooperate to establish such standards, with peers through industry bodies and with regulators (see Figure 19).

FIGURE 19 Develop the market environment with partnerships

Develop the green environment

<p>1 Work across the industry to aggregate demand</p>	 <p>Companies using collective procurement power to create early markets for green technologies across hard-to-abate sectors</p>	 <p>Playing a leading role in two key health sector partnerships: Sustainable Markets Initiative (SMI) Health Systems Task Force to accelerate the transition to net-zero health systems and Energize initiative to reduce supply chain emissions</p>
<p>2 Cooperate with upstream players to scale up</p>	 <p>Invested in RetourMatras to build mattress recycling capacity and help develop new foam based on post-consumer recycled foam, enabling circularity</p>	 <p>Launched the “Unilever Climate Programme” to help suppliers measure, report and reduce their own emissions</p>
<p>3 Collaborate with regulators and peers to unlock barriers</p>	 <p>Signed an agreement to install and operate public charging network for battery electric heavy-duty long-haul trucks in Europe</p>	 <p>ArcelorMittal is engaging with regulators and standard setters to develop a definition for “low emissions steel”</p>

Source: Interviews with climate-leading CEOs and their teams and experts in Q3 and 4 of 2022, BCG

Transforming a company to thrive sustainably

For many companies, succeeding in green markets does not only require a new go-to-market but also a broader transformation and mindset shift across their organization. Emission reduction investments need to be coordinated with go-to-market efforts. Procurement teams need to be trained and

incentivized to procure potentially more expensive green materials, often in longer-term sourcing partnerships. Commodity sales teams need to learn how to brand, price and sell a green “premium” product. All this will require new capabilities, incentives and forms of internal collaboration across different business functions.



We want to be part of changing the course on climate change with action. Our investment and engagement in mattress recycling is one example of how we work together with other stakeholders across society, government and businesses to support the transition to a circular future. Someone's waste is another one's resource and we have the ambition to scale the current solution to more countries and secure that no mattress goes to waste, but rather is reused again and again.

Jesper Brodin, Chief Executive Officer, Ingka Group

Conclusion: Now is the time to create the green markets of the future

This decade will see a massive acceleration in the global net zero transformation. The immediacy, pace and extent of change are still widely underestimated. There is a significant market of consumers willing to buy (and pay for) more sustainable products if their core needs are met with sustainable options that unlock growth and, in some cases, a price premium. In many downstream sectors, companies with science-based emission reduction targets across their entire value chain are close to making up a majority of the market. At the same time, the cost gap for sustainable goods is closing. Government support for the transformation is accelerating – and so is technology innovation. All these factors will create large markets for low-carbon materials, products and services. In many sectors, this market is at risk of being undersupplied, at least in this decade.

For companies in upstream markets, this is an enormous opportunity to escape the commodity trap and realize value from decarbonization. Doing so successfully will require a different go-to-market with new approaches to a “green”

value proposition, pricing, customer engagement and market shaping. Early movers who can commercialize net-zero alternatives first have a strong chance of finding an undersupplied market. For example, early investors in sustainable aviation fuels who struggled to find funding for their projects just a few years ago now find themselves in a market that was predicted to be undersupplied. On the contrary, companies that wait for demand to materialize before investing might be too late.

Companies in downstream markets should prepare for a market in which the supply of sustainable materials is predictably scarce. Overcoming this scarcity will require new forms of upstream partnerships and a longer-term perspective on material sourcing. In this context, early signals matter. Those willing to send them will find themselves paying less to achieve their decarbonization targets.

This decade is when large-scale green markets will become reality. It is up to early movers to shape them to their advantage – and to everyone else’s.

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Endnotes

1. World Economic Forum, *Net-Zero Challenge: The supply chain opportunity*, 2021.
2. The Mission Impossible Partnership, *Making Net-Zero Aviation Possible*, 2022.
3. Note that the recently passed Inflation Reduction Act (IRA) could shift this to as soon as 2030. The recent commitment by the Biden administration to reach 30% zero-emission truck sales nationwide in 2030 and 100% in 2040 might accelerate it even further.
4. Because of limited data on the cost premium, in certain emerging markets it is likely to be valuable to focus more on market dynamics as these markets' share of energy demand and greenhouse gas (GHG) emissions increases.
5. Science Based Targets initiative, *Companies Taking Action Database* [Database], <https://sciencebasedtargets.org/companies-taking-action>.
6. The Mission Possible Partnership (MPP) report on the power of public procurement for construction highlighted that 40-60% of demand for concrete sales come from governments. See: MPP, *Low-carbon Concrete and Construction: A Review of Green Public Procurement Programmes*, 2022.
7. Deutsche Post DHL Group along with scope 1 and 2 reductions has also committed to reduce absolute scope 3 GHG emissions from fuel and energy related activities, upstream transport and distribution and business travel 25% by 2030 from a 2021 base year.
8. Updated in 2017.
9. The code is a collection of best practices related to sustainability in farming that the company uses as the standard it aims to achieve.
10. Smallholder farmers are often characterized through the use of mainly family labour, limited training, lack of formal land tenure and limited access to improved technology. This leaves them vulnerable to poverty and the impacts of climate change. As such, smallholder farmers present a significant opportunity to adapt and introduce the principles of regenerative agriculture.
11. Emissions reductions embodied in the product: the actual embodied emissions of the product are lowered by a stated percentage. Mass-balance approach: The emissions reductions of an entire facility are allocated to only a percentage of the product output, increasing emissions reductions that can be allocated to a customer via certifications.
12. Dell is an example of a company that is trying to design green products that provide additional benefits. They developed Concept Luna, a prototype laptop, to test the current limits of sustainable portable-computing design and to improve its current green value proposition. Dell's development team worked closely with both suppliers and customers to co-design internal components that reduced the carbon footprint of the manufacturing process, while delivering additional benefits to customers such as improved recyclability and reduced repair time and energy consumption.
13. For example, BASF is currently working on an ability to provide an auditable product carbon footprint (PCF) for all its products going forward. This is an ability that many companies will need to develop.
14. Although the primary focus here is on upstream companies it is worth noting that this step is a requirement for both upstream and downstream players. To learn more about downstream consumer segmentation, see: Boston Consulting Group, *Achieving 'Mainstream Green' is Key in Accelerating Transition to a More Sustainable Economy* [Press release], 23 September 2022.
15. For example, Philips' [Lumify with Reacts](#) portable ultrasound service is pay-as-you-go model. Under this flexible subscription service, users can have access to transducers, an app and online environment. The subscription service reduces upfront costs and improves patient access to innovative care.
16. An additional 20 percentage points of consumer demand for sustainability unlocked when friction points were removed per 39,832 respondents in a BCG run sustainability consumer survey in June 2022. See: Sanghi, Kanika, Aparna Bharadwaj, Lauren Taylor, Léa Turquier and Indira Zaveri, "Consumers Are the Key to Taking Green Mainstream", BCG, 12 September 2022, <https://www.bcg.com/publications/2022/consumers-are-the-key-to-taking-sustainable-products-mainstream>.



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