

BlackRock

Managing the net-zero transition

The journey to net-zero carbon emissions is unfolding now - and offers extraordinary investment risks and opportunities.

BlackRock
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Introduction



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The transition to decarbonize the world is happening. Whether the goal of net-zero carbon emissions is achievable by 2050 is far from certain. What is clear: Ignoring the transition is no longer an option. Understanding how the journey will unfold in years to come has never been more important for companies and investors alike.

Planning for long-term decarbonization is challenging, especially at a time of convulsions in the energy sector. Booming demand in the powerful restart of economic activity and snarled supply have driven up prices of fossil fuels and their producers. This is happening even as companies, financial institutions, and governments seek to redouble their efforts to accelerate decarbonization to mitigate climate risk. For investors, the resulting picture can be confusing.

Indeed, the path ahead is deeply uncertain and uneven, with different parts of the economy moving at different speeds. The transition will rewire economies, fundamentally reallocating resources. This process will bring value creation—and destruction. Spurred by government, consumer and investor actions, many companies have already started to transform their business models.

A gradual and orderly transition will help mitigate pressure points that could disrupt economic activity and drive up inflation, in our view. This will allow time to make the necessary investments, phase out carbon-intensive activities, redeploy workers, and develop new technologies to power the net-zero economy.

Such a transition is the best macroeconomic outcome, we believe, one that we see translating into a manageable rise in inflation and a net gain for the global economy. Sure, economic outcomes would be even better if there were no climate change. But that's the wrong starting point for comparisons because climate change is real.

A smooth transition, crucially, depends on government policy. The risk to growth is that the current global drive to engineer an orderly transition loses momentum. As each year passes without translating commitments into sufficient action, the transition path becomes steeper and more disruptive. This increases the risk of stranded workers, communities and assets, higher inflation and economic disruption amid an eventual rush to decarbonize.

Companies and investors must choose an approach to manage the transition. All will need to *navigate* it by taking a view on how it will unfold, and overhaul operations and portfolios accordingly. Some will actively *drive* the transition with new investment or the financing to enable it. And within that, some will focus on *inventing* the new technologies needed to fully decarbonize. We see this creating extraordinary investment opportunities in years to come.

The transition won't happen overnight, and the world will need to pass through shades of brown to reach shades of green, as [Larry Fink's 2022 letter](#) to CEOs points out. Whether navigating, driving or inventing, companies and investors need a map to plot their journey. We aim to build out this map throughout the year, with more insights on the speed and shape of the transition to come.

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Summary

- **Climate risk is investment risk – and will be determined by how the transition to a net-zero economy unfolds.** On top of physical climate risks, companies and asset owners must now grapple with the transition. Economies will be reshaped as carbon emissions are cut. The transition will involve a massive reallocation of resources. Supply and demand will shift, with mismatches along the way. Value will be created and destroyed across companies.
- **The transition is happening, and companies and investors need to have view on how it's evolving.** Companies must decide how to revamp their business models, where to invest and what operations to phase out. Asset owners must decide where to put capital to work, and how to use their shareholder votes to try to guard their long-term economic interests.
- **Companies and investors are faced with great uncertainty.** The transition is underway, but its future speed and shape are deeply uncertain. The outcome will be determined by an intricate interplay of evolving societal preferences, company strategies, capital allocation, new technologies and government policies.
- **The energy sector faces the starkest and most acute challenge.** Its transition has so far been lopsided, with extra investment in renewables failing to keep pace with reduced capex in fossil fuels. This mismatch has contributed to energy price spikes in the economic restart, giving a glimpse of what a disorderly transition could look like. The outlook for renewables is bright, and we see a need for lower-carbon fossil fuels to meet global energy demands during the transition.
- **The transition's value creation and destruction is being priced.** We expected two years ago that a tectonic shift toward sustainability would trigger a great repricing of assets across the board. This is why we incorporated climate change in our return and risk assumptions. We now have evidence of this repricing (page 8), and believe most of it is yet to come.
- **The path of transition will shape the macro environment.** A gradual, orderly transition, supported by private capital and public aid for emerging markets, should allow for a relatively smooth reallocation of resources and moderate price increases. A sudden, disorderly transition raises the risk of supply-demand mismatches, inflation spikes and growth disruptions.
- **The popular notion that tackling climate change comes at a net economic cost is wrong, in our view.** Will the transition hurt growth? Will it trigger more inflation? Compared with the past, yes. But the rear-view mirror is irrelevant for what's ahead, we believe. Climate change is real. An orderly transition should boost growth and mitigate inflation versus no climate action or an eventual rush to decarbonize, in our view.
- **Our bottom line: Companies and investors cannot ignore the transition.** It's similar to how they had no choice but to deal with China's economic rise and the tech revolution. All companies and investors must *navigate* the way economies are being re-wired by taking a view on how the transition will shape their operations or investments. Some may choose to *drive* the transition via thematic or impact investments or *invent* the net-zero world by funding new technologies.

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Rewiring the global economy

A massive reallocation of resources lies at the heart of the transition to a net-zero world. We lay out the key drivers powering the transition and show how the interplay between decision makers results in macro and market changes.

An economic rewiring

The transition is fundamentally a rewiring of economies, with similarly transformative effects as the integration of China into the world’s trading system or the tech revolution. We see three drivers of this:

- **Societal preferences:** Consumer and investor preferences for greener services, products and assets.
- **Technology:** Capital costs of incumbent and new technologies; evolution of energy prices; innovations.
- **Policy:** Climate-specific policies; broader energy, industrial, infrastructure and land use policies.

Companies and asset owners must make decisions about how to respond to these drivers. Companies must decide how to alter business models, where to invest and what operations to phase out. Asset owners and managers must decide how to put capital to work and use their shareholder votes with the aim to guard their or their clients’ long-term interests.

We see this interaction between companies and asset owners shaping the transition – and transforming businesses and portfolios. See the graphic below.

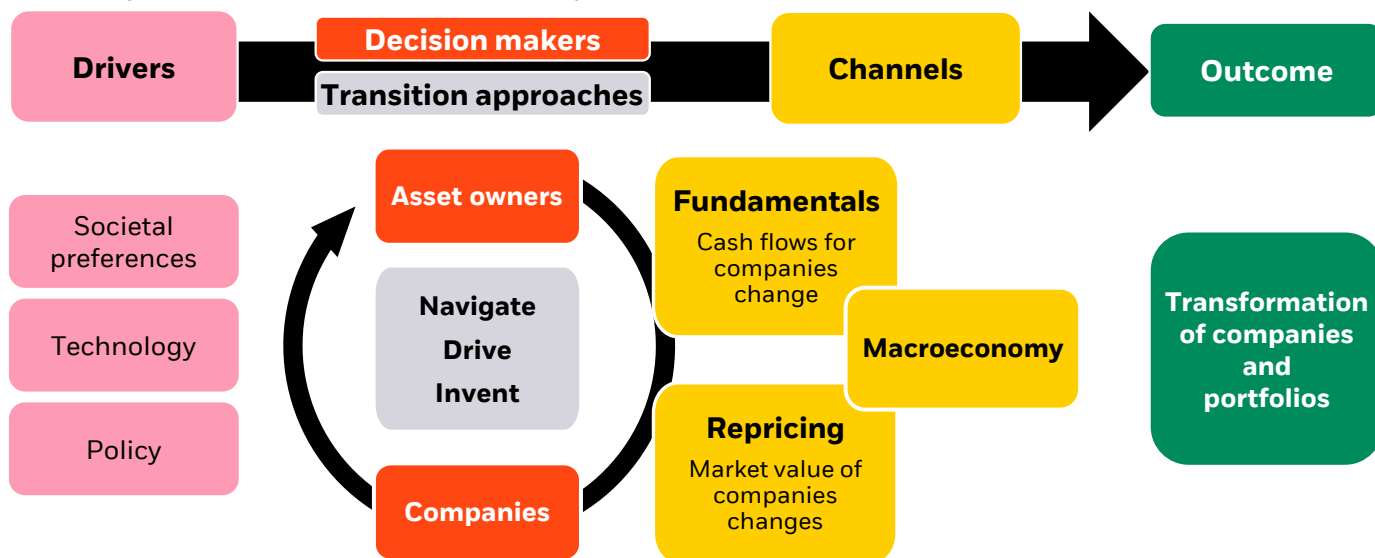
The result? A rewired economy. Supply and demand will shift, not always in tandem. Capital will be created and redeployed. The reallocation of resources will ultimately be huge, we believe. An example: The world would need to cut global emissions in half by 2030 to achieve net zero by mid-century, according to the [2021 Intergovernmental Panel for Climate Change report](#). That’s a 7% annual reduction, we calculate, the type of decline the world only managed in 2020 by freezing much of the global economy when the pandemic hit.

At least one out of 50 employees worldwide will move sectors by 2050 as part of this reallocation, according to the International Monetary Fund’s [2020 outlook](#). And that’s before taking into account those who will move *within* sectors as some companies thrive and others become challenged. We expect this reallocation to create and destroy company cashflows (page 7), reprice assets (page 8), and reshape the macroeconomy (page 9).

This is a tough adjustment to manage. We see a risk that resources and demand become misaligned through the transition. Companies and investors need to manage this macro risk on top of the other changes triggered by the transition’s drivers (pages 10–14).

Transition in action

BlackRock guide to the net-zero transition, February 2022



The transition is powered by three main **change agents**: shifting societal preferences, new technologies and evolving climate policies. Key **decision makers** – companies and asset owners – position themselves for the changes, further shaping the transition. They can use three **transition approaches**: all must *navigate* or adapt to it; some will help *drive* it through decarbonization investments or *invent* it by creating or funding new technologies. We see three main **channels** on how these approaches shape the transition further: changes in company fundamentals, in asset prices and in the economy at large. What is the potential **outcome**? A transformation of both the corporate landscape and investor portfolios.

Source: BlackRock Investment Institute, Feb. 1, 2022. Notes: For illustrative purposes only. Subject to change without notice.

The transition in action

Companies are revamping business models, and we see a repricing of assets across the board. A smooth transition should boost growth and mitigate inflation; a disorderly one heralds price spikes and growth disruptions.

Drivers in motion

The key drivers of the transition are in motion, with expanding climate policies and regulations, rapid technological advancements and fast-changing societal attitudes. Some may think the transition is evolving too fast; others may see progress as too slow. That's besides the point for investors, in our view. What matters is that the transition is happening and will shape cashflows, risks and capital costs for years to come. As a result, it's crucial companies and asset owners form a judgement on how the transition will further unfold, and reposition their businesses and portfolios accordingly.

They need to do this now, we believe, not at some faraway point in the future. The transition is gaining momentum. There's been a sea change in how countries, companies and financial institutions view climate change in just a few years. Countries representing nearly 90% of the world economy now have net-zero commitments, while about half of major companies and financial institutions do. See the chart at the top right. They are increasingly turning pledges into concrete targets. For example, the number of companies setting specific greenhouse gas reduction targets has accelerated.

The transition is transforming the key energy sector. Renewables generation and electric vehicles are fast gaining market share, and hydrogen projects to decarbonize carbon-intensive industries are mushrooming (page 12).

Driving sectoral transition

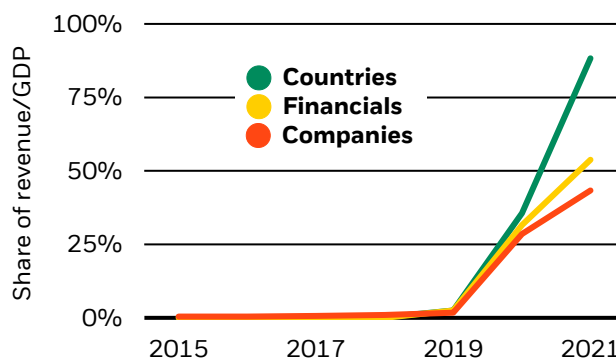
Examples of key transition drivers by sector, 2022

Sector	Transition drivers
Oil & gas	<ul style="list-style-type: none"> Changing demand and prices Carbon costs
Electric utilities	<ul style="list-style-type: none"> Power demand Policy incentives for renewables
Airlines	<ul style="list-style-type: none"> Global carbon costs Shift to other transport modes
Road & rail	<ul style="list-style-type: none"> Oil price and demand by segment Capital costs of new vehicles
Marine shipping	<ul style="list-style-type: none"> Cost of alternative fuels
Steel	<ul style="list-style-type: none"> Carbon capture and storage Furnace retrofit costs
Metals & mining	<ul style="list-style-type: none"> Demand for batteries, equipment

Source: BlackRock Investment Institute, Feb. 1, 2022. Notes: These are illustrative examples of what we view as key drivers by sector of the net-zero transition. They should not be seen as exhaustive nor construed as investment advice.

The times they are a-changin'

Share of net-zero pledges by key players, 2015-2021



Source: BlackRock Investment Institute, with data from [Net Zero Tracker consortium](#), Feb 1, 2022. Notes: The chart shows the progress of country, financial institution and company net zero commitments. Companies and financial commitments are shown as a share of revenue, country commitments as a share of GDP. Countries include the 197 members of the United Nations Climate Change secretariat. Companies are the 2,000 largest publicly traded companies tracked by Net Zero Tracker, and financials are a subset of this group.

The transition is ultimately about the replacing or retrofitting the physical assets that power the modern economy – power plants, steel mills, buildings, cars, ships and planes – and these are capital-intensive assets. For a company making or operating such assets, reallocating the required cashflow is no trivial matter.

How is this playing out across the corporate landscape? We see the largest effects and risks in the utilities, energy and energy-intensive industrial sectors. Changing production costs, including possible CO₂ taxes, and demand are reshaping cash flows and terminal values.

We see the transition driving financial risk in sectors and regions at different speeds. Why? The changes in cost and demand affect sectors differently due to differences between policy, pricing power and the cost of eliminating a unit of carbon. Climate policies can target specific sectors, so the impact varies greatly. Some sectors can more easily pass on increased input costs. And the availability and cost of low-carbon technologies vary by sector. The table on the left shows examples of key drivers for selected sectors that investors need to form a view on.

The result: Decarbonization is taking place across different sectors and regions at different rates. For example, the IEA expects the electric utilities sector to change most quickly in an orderly transition. It sees light vehicles next, with heavy transport (shipping, aviation) and industry (steel, cement) moving more slowly. These different speeds are driven by the relative cost of decarbonization in each sector. The slower sectors need innovation to make net zero possible.

Our bottom line: Policy, technology and societal preferences are driving changes in company fundamentals at different speeds in different sectors.

Assets are repricing

The transition’s complex interplay between companies and asset owners is not just changing company fundamentals; it’s also causing changes in valuations. We theorized two years ago that this would happen – and we now have evidence that it is.

We posited in 2020 that there was a tectonic shift toward sustainable assets underway as investors increasingly embrace sustainability – and made this the cornerstone of our sustainability framework for portfolio construction. This theory built on the notion that financial markets don’t immediately price in slow-moving trends such as the impact of an aging population. We believed the transition would create a similar phenomenon. Capital and investments would increasingly flow to more sustainable assets and away from less sustainable ones.

We argued that this would cause a repricing over time as we believed markets would get ahead of the actual transition to a greener world. We put theory to practice with the launch of our climate-aware capital market assumptions (CMAs) in February 2021, or our long-term expectations of risk and return across asset classes.

The new CMAs incorporated the effects of a sustainability-driven repricing of assets, along with the changes in the macro backdrop and corporate fundamentals linked to the transition. The result: We see the transition driving a relative return advantage for sectors such as tech and healthcare over other sectors such as energy, all else equal.

Our view went against the popular notion that there was no return advantage to be had from the green transition. Critics claimed sustainability should already be in the price if markets are efficient, making expected returns from sustainable investments lower than those of less-sustainable assets. Since then, there’s been an acceleration of investment flows into sustainable funds. We believe this supports our original theory – and our latest work shows the repricing is actually playing out.

Our new analysis goes beyond the common approach of measuring correlations between climate emissions and valuation measures. Our method accounts for the myriad other factors that influence returns, such as news on fundamentals, common risk exposures and risk premia. This way, we can directly measure the repricing via changes in the cost of capital – the compensation investors require to hold a stock – that can be explained by the transition. We proxy the exposure of companies to the transition by measuring a company’s carbon-emission intensity, or CO₂ emissions, as a share of its enterprise value. The higher its CO₂ intensity, the more a company or sector is exposed.

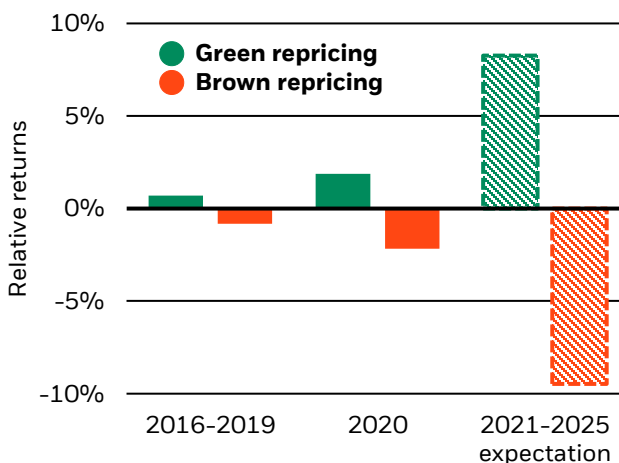
What did we find? Relatively green sectors such as IT and brown ones such as utilities experienced a positive and negative repricing in 2020, respectively. See the middle bars in the chart below. Our analysis shows this effect is new as it was negligible in the period 2016–2019 (the left bars). We also find the repricing is taking place not just *between* sectors but also *within* them.

Is there a sustainable bubble building? Not yet, in our view. We find that the cumulative repricing so far is only a fraction of sector repricings such as the 1998–2002 dot-com bubble and 2007–2008 financial crisis. In fact, we expect more repricing in the next four years, based on factors such as investor preferences for greener assets and historical changes in risk premia for similar long-run transitions such as demographics (the chart’s right bars).

Our bottom line: The great repricing of sustainable assets we anticipated is actually happening now, and we believe it has room to run.

Green repricing: It’s happening

Relative returns of green vs. brown sectors, 2016–2025



Past performance is no guarantee of current or future results. Forward looking estimates may not come to pass.

Sources: BlackRock Investment Institute, with data from the Center for Research on Security Prices, Feb. 1, 2022. Notes: To estimate climate-driven repricing, we attribute historic returns to two drivers: cashflow news and discount rate (DR) news. We then identify the DR news associated with climate change using carbon emission intensity (CEI) as a proxy. To isolate the DR component of returns, we apply the standard decomposition formula of Campbell (1991) using a standard factor model of expected returns (which embed well-known predictors such as value, momentum, and quality). Attribution to climate scores is then given by forecasting regressions of DR news on a measure of CEI. Sector returns are MSCI US Sector index- weighted averages of stock-level returns. Green represents the technology sector, the most “green” in our work, whereas the utilities sector is the most “brown” in the repricing. The 2016–2019 bars represent the total repricing over this period; and the 2021–2025 expectation is the cumulative repricing we expect over that period. The estimate is highly uncertain and is based on factors including risk premia effects in other long-run transitions such as demographic trends, market pricing of green bonds, and investor survey data on how much return they would be willing to give up to for more sustainable assets. See [Sustainability: the tectonic shift transforming investing](#) of February 2020 for details.

Macro impact

The huge reallocation of resources in the transition will transform the macro environment. Will it hurt growth? Will it be inflationary? Compared with the past, yes. But we believe the rear-view mirror is irrelevant for what's ahead. Climate change is here – and an orderly transition should boost growth and mitigate inflation versus all alternatives, in our view.

Overall production costs will likely increase as the world shifts away from carbon-intensive energy sources. We see this happening whether the shift is prompted by carbon taxes, regulations or consumers simply choosing to pay more to avoid climate damages.

The extra production costs could reach as much as \$160 USD per ton of carbon emissions by 2030, according to the [Network for Greening the Financial System from June 2021](#). The U.S. emits about 240 tons of carbon per \$1 USD million of expenditure. Result: Consumer prices could rise by as much as 4% by the early 2030s if all additional cost ends up there, we estimate. A smooth transition would add about 0.4 percentage points to inflation a year as a result. It could be lower if renewables become even more competitive over time. If the shift happens faster – compressing price rises into a shorter timeframe – the inflation impact could be much bigger, we believe.

The inflationary impact of net-zero will be supplemented by the transition's resource re-allocation as demand and supply shift across companies and sectors. This is an underappreciated factor detailed in our [January 2022 Macro and market perspectives](#).

We see a risk of resources becoming misaligned, particularly if the transition is rapid and disorderly. 2021 gave a glimpse of what that could look like. In the powerful economic restart from pandemic-driven shutdowns, demand moved toward spending on goods, from services. Supply couldn't adapt quickly enough. The result: bottlenecks, disruption and high inflation, even though economies had yet to fully recover overall.

Monetary policy cannot magically make this sort of supply-driven inflation go away. Trying to stabilize this sort of supply-driven inflation would require destroying demand to squeeze wages and prices. There is no way of avoiding macro volatility, in our view: the price is either higher inflation or destroyed growth.

We believe the most effective way to contain inflation and maintain growth is to ensure the transition is gradual. Supply and demand would keep pace, and necessary investment would have time to take place. A disorderly transition, by contrast, raises the risk of supply-demand mismatches, inflation spikes, growth disruptions, and stranded workers, communities and assets.

Increasing energy prices and a re-allocation of resources are the consequences of tackling climate change. They will impose costs on economies relative to the past. But we cannot go back to the past – and it is pointless to make comparisons with it. Yes, the outlook would be better if climate change didn't exist. The problem: Climate change is real.

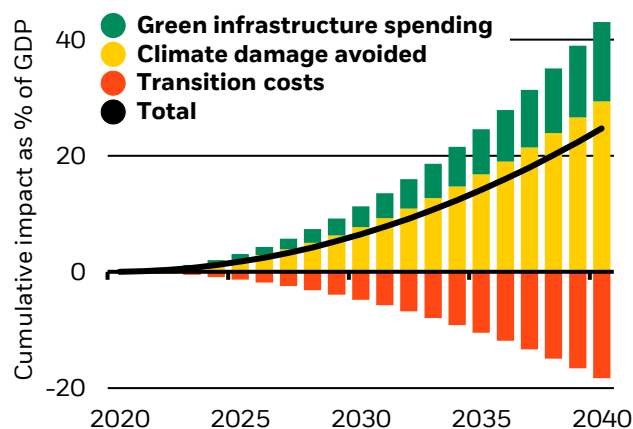
From here, the only possible alternative to the net-zero transition is to allow temperatures to rise to levels that cause devastating damage. Today's damage from extreme weather events is only a small fraction of the likely economic disruption in the world we are tracking toward under current policies, in our view. This could even include famine, mass migration and resource wars.

The avoidance of such climate-related damages and green infrastructure spending far outweigh transition costs, we estimate. All in all, an orderly transition should result in a 25% net gain in global growth by 2040, we believe, compared with doing nothing or a disruptive transition. See the chart below.

Our bottom line: An orderly transition to a net-zero world results in lower inflation, higher economic growth and more financial stability than other scenarios.

Transition results in net economic gain

Estimated cumulative GDP impact of transition, 2020-40



Forward looking estimates may not come to pass. Sources: BlackRock Investment Institute, Banque de France, International Energy Agency, OECD, Feb 1, 2022. Notes: The bars show the overall estimated impact of three factors – avoidance of climate damages (positive), green infrastructure spending (positive) and costs associated with the transition (negative). The black line shows the estimated net impact. Our estimates of the impact under a climate-aware scenario are based on expected changes in energy consumption including composition, relative carbon and renewables pricing and on potential losses due to global warming. Energy consumption is estimated as a function of GDP and the relative price of energy per the Banque de France's working paper no. 759 titled the [Long-term growth impact of climate change and policies](#). GDP losses from global warming are calibrated on analysis of [Impact Assessment Models](#) per W. Nordhaus and A.Moffat (2017). We assume green infrastructure spending programs of 1% of GDP gradually phased out over the next 10 years.

The transition in practice

The transition's path is deeply uncertain, making it crucial to manage its risks and opportunities. We show how companies and investors can navigate, drive and invent the transition, zooming in on the energy sector.



Navigate



Drive



Invent

Navigating transition uncertainty

There is huge uncertainty about how the transition’s drivers will evolve from here. Government commitments to reach net zero are now nearly universal, yet they are not enough to deliver net zero by 2050. Already enacted policies are even further behind, creating an “implementation gap” between current policies and pledges and an “ambition gap” between pledges and the goals of the [COP 21 Paris Agreement](#).

The question is whether governments will actually close these gaps. Could they even backtrack? New elections could bring new approaches. A focus on the short term could start to crowd out climate considerations. The answers to these questions are crucial to the transition’s path, or how fast and smoothly carbon emissions are reduced to net zero.

The stylized charts below show the two key measures: speed and shape. Transition speed (left chart) describes how quickly the economy reaches net zero. Various policy paths give a wide range of outcomes for how fast CO₂ emissions can be cut, as the left chart shows. Transition shape (right chart) describes how smooth the path will be, or how orderly. The shape ranges from smooth to abrupt amid an eventual rush to decarbonize.

The speed and shape of the transition are likely to power risk and returns in coming years, so companies and investors need to *navigate* this. To do so, they must develop informed views about the evolution of climate policy, societal preferences and technological innovation; the size and timing of mismatches in supply and demand between and within sectors; and the timeframe and shape of the key energy transition (pages 12-13).

How should companies and asset owners go about this? First, they need data, models, analytics and tools at a granular level as they become available. Navigation requires an increasingly precise map over time. Second, companies and asset owners need to act on the views they have developed with the help of these new insights.

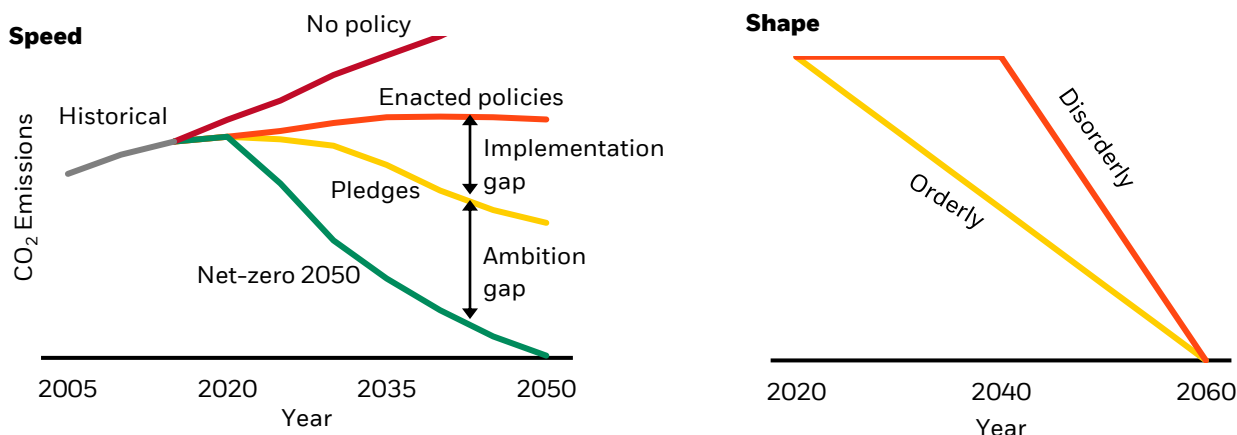
Companies are overhauling their business models, choosing where to invest and what operations to phase out. Industry leaders are focusing on core competencies geared toward the transition or are diversifying into growth businesses of the net-zero future.

Many asset owners are navigating the transition through security selection strategies that aim to manage the value creation and destruction from these shifts. Two principal navigation approaches have been used at scale: removing companies or sectors viewed as not aligned with the transition (screening), and over- or underweighting companies based on static, backward-looking Environmental, Social and Governance (ESG) metrics.

We think asset owners can do more to effectively navigate the transition. First, investors can measure transition readiness with forward-looking indicators, like emissions targets or other data sources that give insight into how issuers are progressing along several ESG dimensions and positioning themselves for the future. Second, stewardship—corporate engagement and the use of shareholder votes—can help make sure portfolio companies properly manage transition risks. And third, ESG integration—using transition metrics throughout the investment process—can help ensure that even portfolios without a climate focus are managing their transition risk.

Speed and shape key

Illustrative net-zero transition scenarios and stylized transition shape, 2022



Source: BlackRock Investment Institute, Feb. 1, 2022. Notes: The diagrams above serve as a general summary and should not be seen exhaustive nor construed as investment advice. The left chart describes how quickly the economy reaches net zero. The implementation gap is the difference between current policies and pledges; the ambition gap is the difference between pledges and the goals of the COP 21 Paris Agreement. For illustrative purposes only.

Navigation in the energy sector

The energy and utilities sectors face perhaps the starkest challenges in navigating the transition. These sectors have long had the difficulty of trying to plan for long-term capital assets in an uncertain policy and resources landscape. The drivers powering the entire net-zero transition are magnified in this space:

- **Technology:** Rapid technological change, driving uncertainty in future production costs and demand.
- **Preferences:** Shifting consumer demand for energy and investor preferences for greener assets.
- **Policy:** A highly uncertain and fast-evolving environment, with great regional differences.

First, technological advances have upended the long-term outlook for energy demand. The role of renewables in global electricity generation jumped to 29% in 2020, from 27% in 2019, according to the [IEA's 2021 renewable review](#). The price of renewables has dropped to levels near or below fossil fuel-based generation in most regions, also helped by sharply rising fossil fuel prices. This means renewables are driving almost all new power capacity growth now, even as they face headwinds from the surge in the prices of commodities, from copper and aluminium to silicon.

Electric vehicles (EV) are becoming mainstream and are showing early signs of eating into oil demand, supported by a range of government policies, voluntary automaker pledges and consumer preferences. EV's total global market share rose above 7% in 2021, according to [BloombergNEF](#), driven by large growth in China. The adoption of EVs is set to spread from passenger vehicles to commercial zero-emission vehicles.

And there is optimism about the role of hydrogen to decarbonize energy-intensive sectors. Seventeen countries have developed hydrogen strategies, with 20 more on the way, according to the IEA's [Global Hydrogen Review 2021](#). Hydrogen currently is made nearly exclusively from fossil fuels, but projects for carbon capture and storage and electrolyzers (the equipment to make hydrogen from electricity) are experiencing fast growth. The IEA has identified nearly 400 green hydrogen projects in development. The recent U.S. infrastructure bill devoted \$8 billion to the U.S. Department of Energy for a regional clean hydrogen hub. At the same time, emissions-free hydrogen is currently expensive, and government policy and incentives for it are needed to move beyond demonstration and reach scale, in our view.

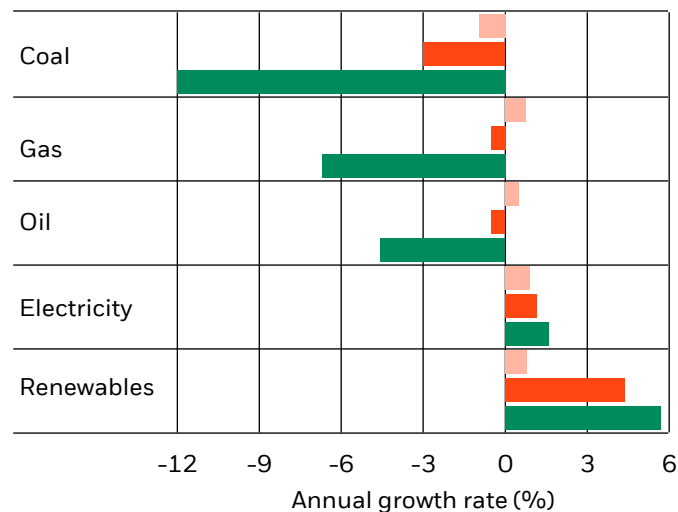
Second, consumer and investor preferences are changing, as shown in consumer markets for EVs, electric heat pumps and LED lighting. Investor-driven shifts toward sustainable investing are also driving repricing (page 8). We see many of these shifts accelerating, creating uncertain future demand for energy and changing the cost of capital for traditional energy and renewables.

Third, and most importantly, the policy landscape is fast evolving and highly uncertain. Consider how the huge ambition and implementation gaps between governments' climate goals, pledges and actual policies affect the energy sector. If the world wants to achieve net-zero emissions by 2050, the use of coal, gas and oil needs to decline at a much faster clip than it would under current policies or pledges. See the green bars versus the red and pink ones in the chart below. Renewables offer the mirror image: They need to clock up much higher growth than they are currently tracking.

Government policy is instrumental in enabling a smooth transition, in our view. As each year passes without translating commitments into sufficient action, the transition path becomes steeper and more disruptive.

An energy mismatch

Energy growth needed vs. policies and pledges by 2050



● Current policies ● Pledges ● Net zero 2050

Sources: BlackRock Investment Institute and IEA, Feb. 1, 2022. Notes: The chart shows estimated growth changes in energy consumption by source under different scenarios outlined in the [IEA World Energy Outlook 2021](#). Current policies represent the changes resulting from stated policies. The pledges scenario shows changes if governments implement pledged changes to consumption. The IEA's net-zero scenario shows the estimated change needed to achieve net-zero carbon emissions by 2050.

Shades of brown to go green

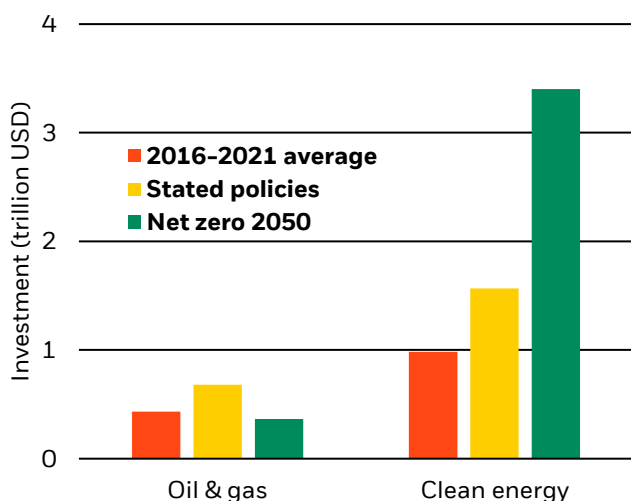
Navigating the energy sector is tough as even relatively small changes can prove very disruptive. The powerful economic restart from the Covid-19 shock in 2021 exposed mismatches in supply and demand, providing a glimpse of what a disorderly transition could look like. The fragility in power markets was exposed by a mix of geopolitical factors and weather-related supply disruptions of renewables and coal just as European inventories were low. The result: surging energy prices.

This has driven sharp gains in shares of traditional energy companies over the past year, whereas clean power stocks lagged. This doesn't say anything about the speed of the transition or the future shape of the economy, in our view. It's only natural that energy stocks would rally at a time the economy restarted from its pandemic-induced slumber. It's impossible today to kickstart activity without fossil fuels, we believe, as the economy has not been rewired yet. The rewiring will take time, and there will be periods when the traditional energy sector can benefit from mismatches in supply and demand. These periods should not be seen as being counter to the transition, in our view, but part of it.

Transition risk is about mismatches in resources. Indeed, the energy market's underlying issue is a mismatch in investments. Capex in fossil fuels has slowed to levels consistent with a net-zero future, but investment in renewables has lagged. See the chart below.

Energy investment needed

Annual energy capex needs, actual vs. estimates



Forward looking estimates may not come to pass. Sources: BlackRock Investment Institute, with data from IEA, Feb. 1, 2022. Notes: The chart shows historical and estimated capex needs by energy sector under different policy paths. See the [IEA World Energy Outlook 2021](#) report for details.

Uncertainty is at play here. If governments enact policies to meet their commitments, fossil fuel companies face the risk of stranded assets. If governments don't deliver on those commitments, clean energy firms and companies seeking to transform their business face the risk of seeing their investments go to waste.

The result of this uncertainty? Underinvestment across the board. This means energy markets are sensitive to shocks. And governments for now may find themselves – for political reasons – supporting fossil fuel use in tight energy markets to mitigate the hit to consumer budgets.

The uncertainty about policy and other transition drivers need not be paralyzing. Sitting out the sector altogether risks missing out on an investment opportunity, in our view. Companies and asset owners can navigate the sector's transition by following three trends we see as robust against policy uncertainty:

- **Exponential growth in renewables:** The outlook for renewables is bright even under currently enacted policies. Renewables supply will likely jump under all feasible transition speeds, in our view. We see the sector's cost of capital further decreasing due to changing investor preferences, regardless of policy support.
- **Continued oil and gas capex:** Investment in fossil fuel and energy-intensive sectors will be needed to enable the transition, in our view, even in ambitious scenarios to reach net zero by 2050. Case in point: The IEA's net-zero 2050 scenario envisions \$360 billion per year of ongoing capex in oil and gas fields this decade to meet demand in the transition. These fuels are needed to reduce (dirtier) coal usage and require capex during the transition's early stages after years of under-investment. We see potential opportunities in oil and gas companies with solid transition plans.
- **A place for gas:** We believe natural gas will play an important role in the transition given its lower carbon intensity compared with other fossil fuels. Gas remains controversial because it contributes to global methane emissions. Its longer-term role is unclear as renewables and battery storage costs keep dropping. We see potential opportunities to invest in low-cost assets with relatively low-greenhouse gas emissions that could be retrofitted to new fuels like hydrogen.

Our bottom line: A smooth transition to a net-zero world requires the world to go from shades of brown to shades of green. Making no investment choice at all risks missing out on a core part of the transition.

Driving and inventing net zero

Some companies and investors want to go beyond navigating the transition to *drive* it forward or even help *invent* it. They help shape the transition by accelerating its advance or by enabling future progress. The latter is critical because many sectors do not yet have viable, cost-competitive technology to get to net zero. Some of these technologies are only at the prototype phase; others have yet to be invented. We see this chance to invent the net-zero world as an extraordinary investment opportunity.

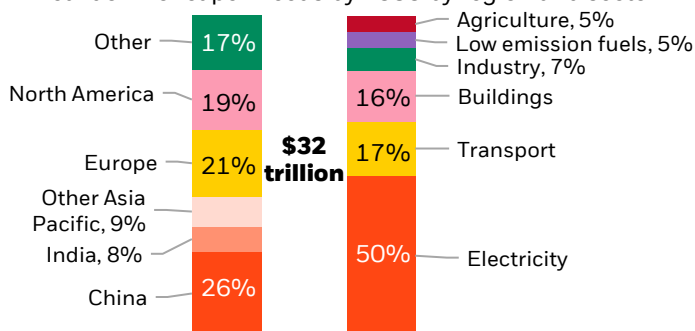
For companies, to drive the transition means proactively revamping business models and to invent it can take the form of funneling R&D toward new technologies. A utility might phase out a coal-fired power plant and invest in grid-scale battery technology. A steel producer might replace traditional blast furnaces with electric arc furnaces. An automaker might commit to an all-electric vehicle platform and devote R&D toward that goal.

For investors, to drive means mean identifying opportunities in companies making these changes. Investing in early-stage technologies is about helping invent the net zero economy. Dialogue between companies and investors on transition plans and capital needs is crucial to delivering the capital to the right places at the right time, in our view. This goes beyond channeling capital to companies with green business models, we believe, and includes funding carbon-intensive companies leading decarbonization within their industries. Withholding capital or divesting from these firms is counterproductive to the transition, in our view.

All these changes require massive amounts of capital from investors and the public sector. Reaching net zero by 2050 would require USD \$125 trillion flowing into low-carbon energy supply (primarily electric power) and demand (transport, buildings and industrial equipment), according to the [Glasgow Financial Alliance for Net Zero](#).

Wanted: Net-zero investment

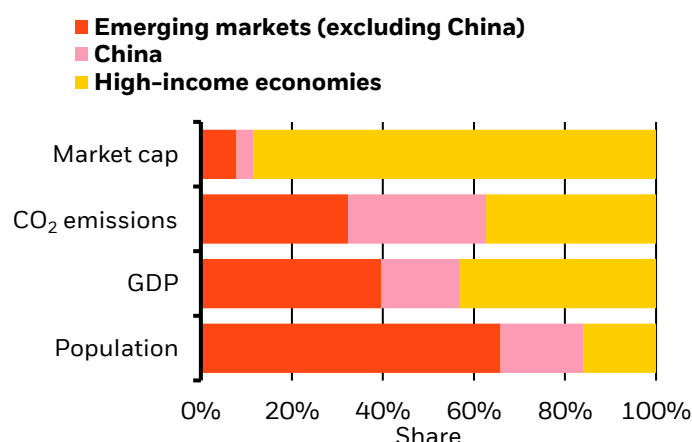
Breakdown of capex needs by 2030 by region and sector



Sources: BlackRock Investment Institute and the Glasgow Financial Alliance for Net Zero, Feb. 1, 2022. Note: The charts show the estimated capex needed across regions and economic sectors by 2030 to be on track for achieving net-zero emissions by 2050, according to [Glasgow Financial Alliance for Net Zero](#).

Mismatched resources

Distribution of global resources, pollution and assets



Sources: BlackRock Investment Institute, IMF, World Bank, MSCI, using data from Haver Analytics and Refinitiv DataStream, February 2022. Note: The chart shows the shares in different concepts of EMs (excluding China), China and high-income economies (i.e. rest of the world). EMs are those classified as low and middle-income countries by the World Bank. For market cap, this is the share of each group/country in total world stock market capitalization measured by the MSCI world stock market capitalization, as of 4 October 2021. For CO₂ emissions, this is the share of each group in total world CO₂ emissions in 2018 (latest data point). For GDP this is the share of each group in world GDP measured using purchasing power parity exchange rates, as of 2019 (before the Covid shock). For population, it is the share of each group in world population in 2020.

A quarter of this capex, or USD \$32 trillion, is needed by 2030. See the chart below left. We see a large investment opportunity here – if governments do their part. Public investment will be needed to de-risk private capital, especially in emerging markets (EMs). Climate change is a global problem. Without a successful transition to net zero everywhere, climate risk is unmanageable anywhere. The problem: EMs have too little capital to address growing populations and CO₂ emissions, as the chart above shows. We estimate EMs will need at least USD \$1 trillion per year to achieve net-zero emissions by 2050 – more than six times current investment. See [Financing the EM transition](#) from October 2021.

Our bottom line: The transition is happening, and we believe companies and investors need to have view on how it's evolving. A gradual and orderly transition will help mitigate pressure points that could disrupt economic activity and drive up inflation. This will allow time to make the necessary investments, phase out carbon-intensive activities, redeploy workers, and develop new technologies to power the net-zero economy. Such a transition is the best macroeconomic outcome, we believe, one that we see translating into a manageable rise in inflation and a net gain for the global economy. All companies and investors must *navigate* the way economies are being re-wired by taking a view on how the transition will shape their operations or investments. Some may choose to *drive* the transition via thematic or impact investments or *invent* the net-zero world by funding new technologies.

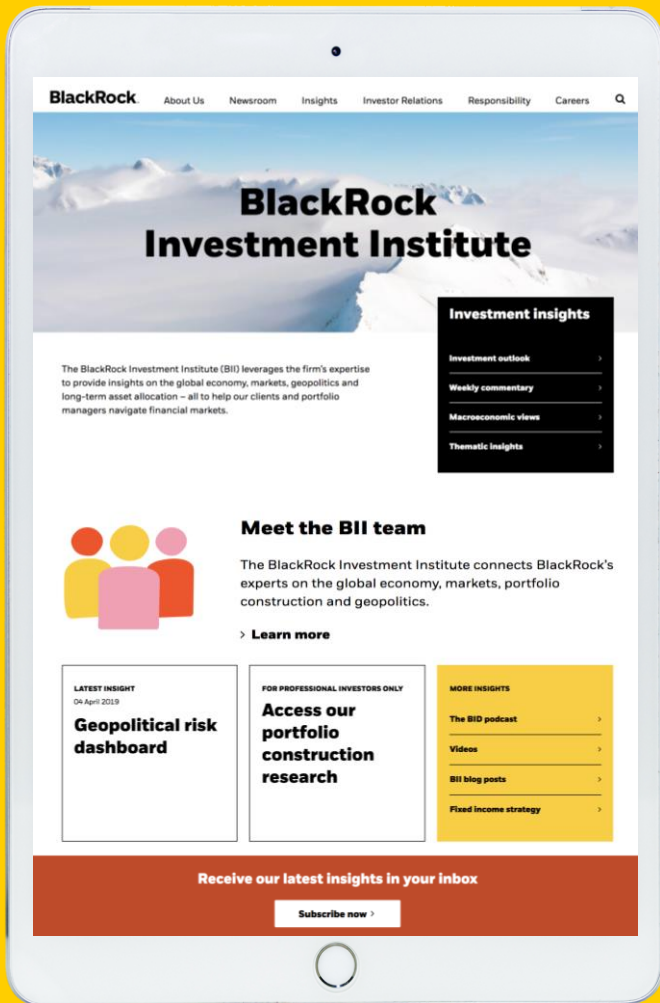
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