How the World Is Tracking Against Its Climate Goals—and the Implications for Economies and Markets

The world is still a long way from hitting its emissions targets, but the process of decarbonization is underway, and climate policies in major economies have a large and growing impact on spending, capital flows, and portfolios.

AUGUST 15, 2023

KAREN KARNIOL-TAMBOUR
DANIEL HOCHMAN
JEREMY NG
LORENZO PINASCO

BRIDGEWATER

While much of the world has agreed in principle on an aggregate climate goal, achieving this goal is extremely difficult. The US, Europe, Japan, and many other countries/regions (though not all, with China and India as key outliers) have signed on to reach net zero emissions by 2050, which is what scientific consensus agrees is needed to limit global temperature increases to 1.5°C above pre-industrial levels. Past energy transitions took many decades to accomplish, and external estimates are that roughly $3 trillion per year will have to be invested to make the requisite progress. In the short term, countries will need to mobilize significant resources to deploy proven technologies (e.g., wind, solar, electric vehicles) to reshape their energy systems, while in the long term, more nascent technologies will need to be developed and scaled (e.g., green hydrogen, carbon capture).

In the developed world economies where most investors are concentrated, government policy has provided substantial public resources to incentivize both a short- and long-term transition to a net zero economy. This creates a meaningful shift in incentives for a large part of the global economy, impacting a sizable share of investor portfolios. In the US and Europe, the energy transition is underway to a significant degree: emissions are falling rapidly, with more to come if these economies intend to meet their emissions targets. This is being accelerated by government policy to incentivize the transition (e.g., the Inflation Reduction Act (IRA) in the US, carbon pricing and the proposed Green Deal Industrial Plan in Europe), changing the trade-offs that economic participants are facing. The transformation of the largest economies in which investors are concentrated is creating meaningful transition-related impacts across the 11 emissions-intensive sectors that make up roughly 30% of public equity market capitalization.

Despite the resources many governments are committing toward reducing emissions, the world is still a long way from hitting its 2030 emissions targets, let alone making the progress necessary to reach net zero by 2050. As a summary perspective, below we show how emissions are distributed globally: while the US and Europe are making substantial emissions reductions, this is still short of what is needed for a global 1.5°C scenario, while other large emitters like China, India, and Russia are likely to see their emissions remain flat or even increase through 2030, in excess of what would be justified under either cost-effectiveness or an evaluation of their historical emissions, technological capacity, and population. While there is likely to be a range of outcomes around countries' precise emissions trajectories, we are already seeing significant changes in markets where most investors are concentrated, such as the United States and Europe (where climate policy is already impacting capital flows and investment decisions), with more to come globally if countries intend to hit the commitments laid out in their nationally determined contributions (NDCs) under the Paris Agreement.

	Emissions Share (% Global)	% Reduction Needed by 2030 (Relative to 2020)	% Committed in NDCs (Relative to 2020)	% Based on Current Policies (Relative to 2020)	NZ Target Year
China	30%	-39%	2%	Approx 0%	2060
United States	13%	-43%	-32%	Approx -15%	2050
Europe	7%	-43%	-32%	Approx -15%	2050
India	7%	12%	44%	Approx +35%	2070
Russia	4%	-47%	17%	Approx +10%	2060
Japan	2%	-52%	-29%	Approx -20%	2050
Brazil	2%	-22%	-12%	Approx +5%	2050
Canada	1%	-49%	-35%	Approx -5%	2050
Australia	1%	-47%	-29%	Approx -15%	2050
Rest of World	**32%**	-	-	-	-

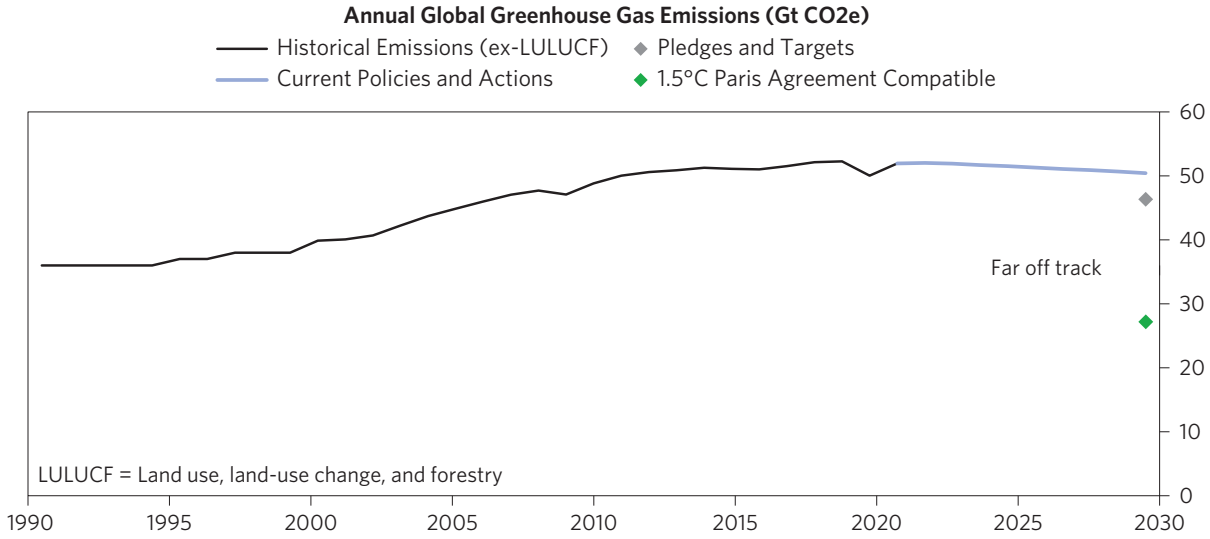
China, the US, and Europe need to cut emissions meaningfully, but China's targets and policies are lagging

Source: Climate Action Tracker

How the World Is Tracking Against Its Climate Goals

Scientific consensus agrees that net zero emissions by 2050 will be needed to limit global temperature increases to 1.5°C above pre-industrial levels. While it's hard to assess what will happen over the next 25+ years, many of the necessary changes take time to play out and require front-loading investments to lay the groundwork for future emissions reductions (e.g., funding for more nascent technologies with high emissions reduction potentials) and reducing cumulative emissions (which is what matters for global temperature rises more so than point-in-time emissions).

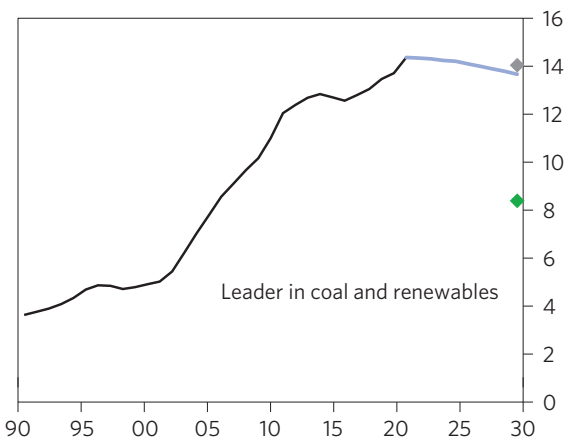
We can understand sovereign emissions in terms of **what reductions are needed for net zero, what countries are committing to by 2030, and what they are likely to achieve given their current policies and actions**. To keep the world on track for net zero, global emissions need to decline significantly by 2030 (as indicated by the green dot in the chart below). Countries around the world have set targets to reduce their emissions (as indicated by the gray dot in the chart below)—although this is still far from what is needed—which we can compare against estimates of forward-looking emissions from organizations such as the Climate Action Tracker and triangulate against reports from international organizations such as the International Monetary Fund (IMF). While the precise impact of government policies and actions on emissions is hard to assess—and will depend on a host of factors such as implementation, take-up by companies and individuals, and the evolving political climate—the directional synthesis is clear: **under current policies and actions, global emissions will flatten out by 2030, bucking the decades-long increasing trend, but will still not come close to the pledges and targets that countries have made, let alone what is compatible with a 1.5°C scenario**. The Climate Action Tracker estimates global temperatures to rise between 2.6°C and 2.9°C above pre-industrial levels, which would result in significant physical risks playing out over the next few decades that would have a very real impact on economies and growth.



Below, we show the Climate Action Tracker's allocation of how much emissions are expected to fall in China, the US, and Europe—which together account for more than 50% of global emissions—relative to what is needed for each country or region. Allocation to each country considers factors such as cost-effectiveness of reducing emissions in addition to their historical emissions, technological capacity, and population. While many countries plan to do more in the coming years (as reflected in ambitious pledges and targets around emissions), the basic picture is clear: **large reductions are necessary for each of these major economies**, especially since there are a host of lower-income countries where significant reductions would be inconsistent with continuing to grow standards of living.

China—the world's largest emitter—is not on track to reduce its emissions in the near term. Its stated ambitions are for its emissions to peak before 2030, i.e., they will likely continue to increase in the short term before declining. This is despite the country's meaningful leadership in green technologies, including the manufacturing of solar energy and EVs. However, while China is adding more renewables to its power generation base than any other nation, it is doing so alongside expanding the highest-emitting energy sources like coal, reflecting its need to back up a still-inconsistent renewables generation base to ensure energy security and prevent future energy crises like the one experienced in 2021. China continues to subsidize and depend on coal, which still represents 60% of its total energy mix (using EVs, for example, does not reduce emissions as much if the electricity to make and operate them is coming from coal). According to the IMF's latest Article IV report, "Further efforts will be needed to help close the global mitigation ambition gap...[and] future provisions should be made for reducing the role of coal as the baseload power." Finally, while China has a carbon pricing scheme, it does not meaningfully discourage emissions given that carbon is trading at less than $10 per tonne and the scheme allocates free allowances generously.

Annual GHG Emissions - China (Gt CO2e)



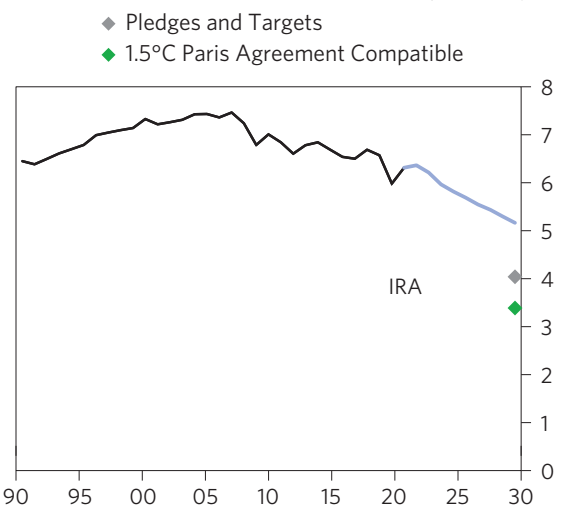
Source: Climate Action Tracker

Key Climate Policies

- Fledgling emissions trading scheme covering ~2,000 companies in power sector (10% of global emissions)
- $72 billion in subsidies for EVs until 2027
- Development of carbon capture and green hydrogen, targeting 100,000 to 200,000 tonnes by 2025
- However, continued increase of coal consumption (125 GW of capacity in pipeline)

The United States is on track for significant declines in emissions. Its targets are ambitious—a 50% cut in the level of emissions in 2030 (versus 2005 levels)—and the policies are mostly in place to back that up, though more action will be needed to fully get there. The IRA has been described by the IMF as "a substantial step forward" toward the US's 2030 target, although more still needs to be done. Specifically, clean electricity tax credits for consumers, utilities, and states under the IRA are expected to be a meaningful accelerant of the US's share of clean energy generation by 2030, and the US is also subsidizing EV purchases and targeting 50% EV sales by 2030, as well as earlier-stage technologies such as green hydrogen and carbon capture. Overall, the US has seen a boom in green-tech investment since the IRA's announcement a year ago—we give some examples of this later in this piece—as the take-up rate for many of these subsidies has been higher than initially anticipated. Finally, carbon pricing is employed regionally in some states across the country (notably, California's carbon trading scheme and the Regional Greenhouse Gas Initiative, which encompasses 11 northeastern states). The current administration is also tackling emissions through regulation; for example, the EPA's proposed (not implemented) power plant regulation would phase out most unabated coal and gas generation in 2030-35.

Annual GHG Emissions - United States (Gt CO2e)



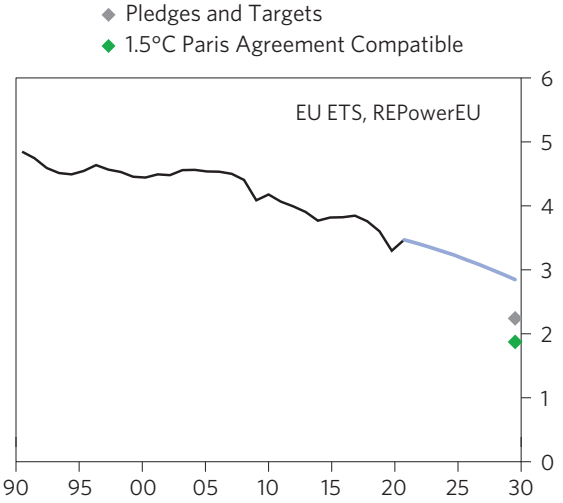
Source: Climate Action Tracker

Key Climate Policies

- Estimated $160 billion in clean electricity tax credits for consumers, utilities, and states to switch to renewables
- Estimated $40 billion in grants and loans for green transport and infrastructure, including for sustainable aviation fuel
- Production tax credits for manufacturing set per unit of output in solar, wind, batteries, and other components
- $7,500 subsidy for qualifying EVs
- Stricter regulation of emissions from fossil power plants

Europe has already seen significant declines in emissions, and they are expected to continue. Its targets are ambitious—a 55% cut in the level of emissions in 2030 (versus 1990 levels)—and the policies are mostly in place to back that up, though some more action will be needed to fully get there. Europe's climate strategy to date has been more focused on carbon pricing, but the upcoming Net Zero Industry Act is expected to add a more substantial "carrot" to its climate policy "stick" and help unify country-level policies that diverge in terms of their subsidies to green technology, regulation and permitting, etc. The EU's Emissions Trading System (ETS) is the world's largest cap-and-trade system and covers around 36% of the bloc's total greenhouse gas emissions across electricity and heat generation, energy-intensive industrial sectors like steel producers, and, increasingly, transportation and buildings. While the scheme has been an important contributor to the EU's decarbonization over the last decade, the EU has more recently started to adopt subsidy-based programs in part as a response to similar measures in the US (particularly the IRA). REPowerEU (launched in the wake of the Russia-Ukraine conflict) increased investment in renewables as a means of increasing energy independence, while Fit for 55 included consumer-directed subsidies for EVs. Additionally, the European Commission has significantly loosened state aid rules for climate and energy projects until the end of 2025 and proposed the $270 billion Green Deal Industrial Plan, which is expected to streamline permitting and project approval processes for clean energy sectors via the Net Zero Industry Act and includes significant subsidies for green energy and climate technologies that will help to support the EU's goal of a 55% reduction in emissions by 2030 (relative to 1990) and 42.5% renewable share by 2030.

Annual GHG Emissions - Europe (Gt CO2e)

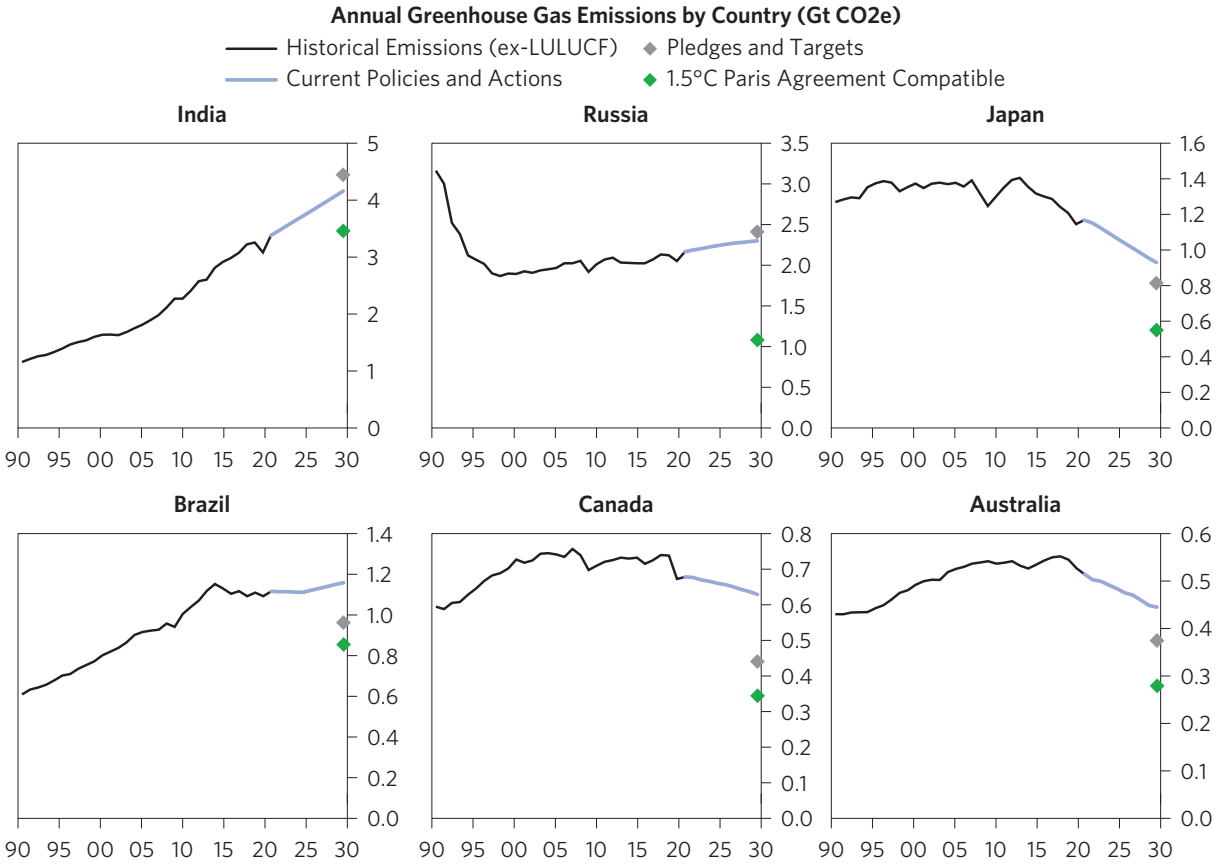


Source: Climate Action Tracker

Key Climate Policies

- Emissions Trading System (ETS) running since 2005; most recent phase launched in 2021 with stricter quotas
- Targets to increase share to 42.5% by 2030
- Consumer-directed subsidies for EVs
- Proposed $270 billion Green Deal Industrial Plan, including subsidies for green energy and climate technologies

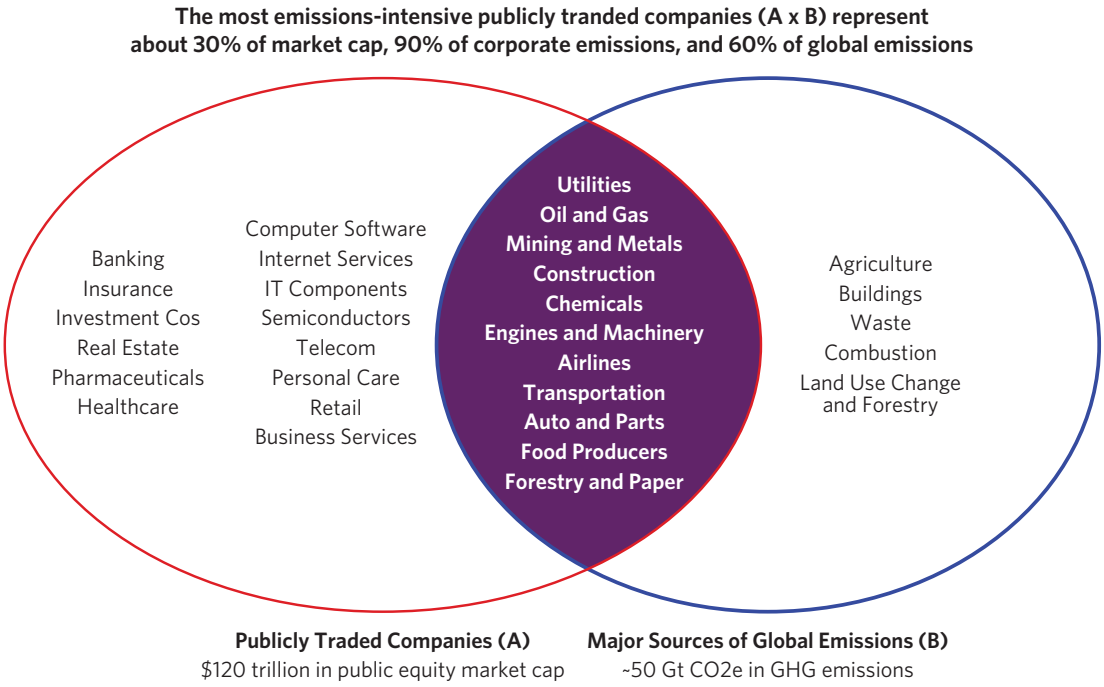
Beyond these three economies, we have also seen similar policies in other large developed markets where investors are likely to have significant portfolio exposure (e.g., Japan, Australia), while policies in other countries remain further away from what is needed in a 1.5°C scenario (e.g., Canada, Russia). Each country also faces its own range of challenges in reducing emissions from fossil fuel energy sources such as oil (Canada), natural gas (Australia), and coal (India), or other significant areas such as livestock (New Zealand) and land use/deforestation (Brazil).



Source: Climate Action Tracker

How the Energy Transition Underway in the US, Europe, and Other Large Economies Is Flowing Through to Portfolios

As we have discussed previously, for investors with exposure to global public equities, around 30% of their portfolios are likely to be in sectors highly exposed to climate policy through the provision of climate solutions (many of which still incur high emissions as part of the production process) or through companies with high operational emissions (although, in some cases, with realistic possibilities of improvement). The chart below shows the intersection of public equity market sectors and major sources of global emissions.

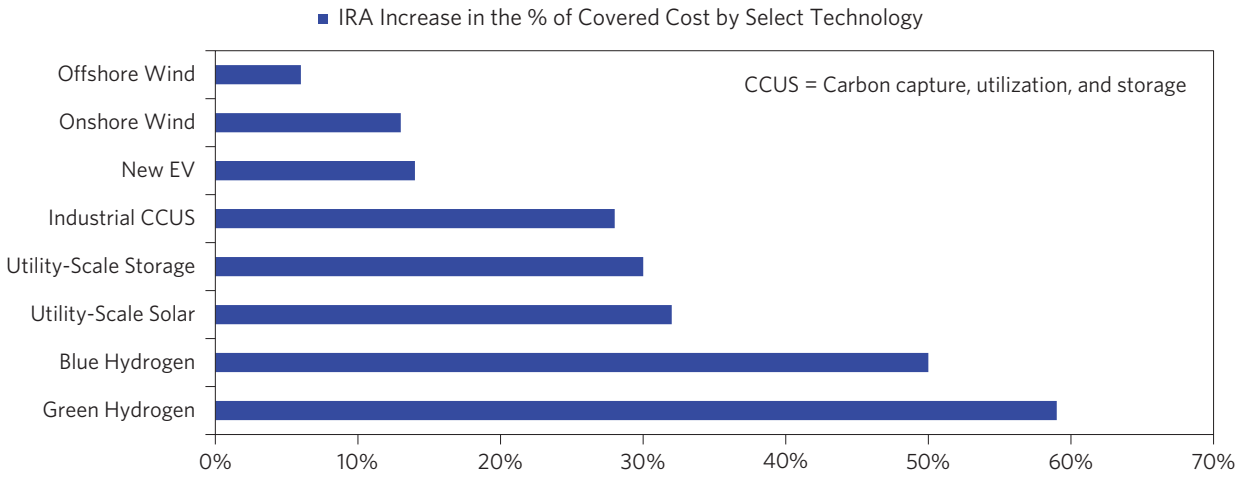


For high-emitting companies in these sectors, climate policies can create clear incentives to reduce their emissions, either by rewarding actions that reduce emissions or penalizing emissions-intensive processes—sometimes with differences across geographies. For example, a utility in the US can access tax credits for clean energy generation, while in Europe utilities need to pay a carbon price for most of their emissions. Other sectors such as autos face relatively similar incentive schemes across the US and Europe, with subsidies for the transition from internal combustion engine (ICE) vehicles to EVs. Some of these structural changes arising from climate policy can be a big deal: for example, many companies in these sectors have high operational emissions, which would significantly affect their profitability under a global carbon price scenario unless they are able to pass enough of their cost increases to their customers or invest in abatement technology to reduce their emissions going forward. Conversely, while the green revenue share in many of these sectors is relatively low today, there is the potential for subsidies to accelerate a brown-to-green transition in areas such as EVs, green buildings, or renewable energy.

Examples of Policy Disincentives and Incentives in Emissions-Intensive Sectors

	% Mkt Cap	Examples of Policy Disincentives	% of Market Cap with High Operational Carbon Intensity	% of Mkt Cap on Clear and Credible Decarb Pathway	Examples of Policy Incentives	% of Mkt Cap with High Green Revenue Share
Oil	6.8%	**Disincentives on operational emissions, but has technological obstacles (e.g., carbon capture).** Free allowances in EU ETS gradually being removed. Regulation to reduce methane leakage in CAN, USA, AUS.	77%	0%	**Incentives to make advancements in carbon capture.** Tax credits under the IRA; carbon capture a priority area in AUS technology road map.	0%
Engines and Machinery	3.7%	Wide range of operational emissions depending on specific products. Large Scope 3 impact, especially in heavy industry and power/electricity-related segments.	2%	47%	**Incentives to expand production of renewable energy technology (e.g., solar panels, wind turbines).** Investment and production credits for green-energy segments in USA; $3 bln fund in AUS to support renewables manufacturing.	8%
Utilities	3.1%	**Disincentives on operational emissions.** Covered by EU ETS and more early-stage carbon pricing systems in USA, CHN, etc.	70%	21%	**Incentives to shift to clean energy (e.g., wind, solar).** Tax credits in USA amounting to $160 bln+ over 10 years; price stability measures in GBR.	16%
Auto and Parts	2.8%	Low operational emissions. Large Scope 3 impact, some tightening of fuel-economy standards, and zero emissions mandates for new sales in 10-15 years (EUR, GBR, CAN).	7%	41%	**Incentives to transition to EVs.** Consumer subsidies across USA ($7,500 per EV, plus battery subsidies), EUR (similar levels, with variation between countries), and CHN ($70 bln over four years).	22%
Chemicals	2.7%	**Disincentives on operational emissions, but has technological obstacles (e.g., clean hydrogen).** Free allowances in EU ETS gradually being removed.	56%	42%	**Incentives to transition to clean hydrogen.** Subsidies of up to $3 per kg credit in USA; $50 bln+ over 15 years in subsidies in JPN to support new demand sources (e.g., hydrogen-based fuels).	1%
Mining and Metals	2.6%	**Disincentives on operational emissions.** Free allowances in EU ETS gradually being removed, along with carbon border tax to prevent leakage.	65%	11%	Limited direct policy. Trade restrictions on "dirty" steel and aluminum in USA and EUR.	0%
Transportation	2.0%	**Disincentives on operational emissions.** Slated to be added to the EU ETS in the coming years. International Maritime Organization regulations to lower shipping emissions intensity.	58%	24%	Limited direct policy. Revenues from EU ETS may be redirected to marine decarbonization projects.	28%
Food Producers	2.0%	Low operational emissions. Large Scope 3 impact that tends to fall outside carbon pricing schemes, but discussion in NZL to incorporate it.	13%	41%	Limited direct policy. Farm to Fork strategy in EUR on sustainable agriculture, grants supporting investment in plant-based foods in CAN.	1%
Construction	1.9%	**Disincentives on operational emissions, but has technological obstacles (e.g., green cement).** Free allowances in EU ETS gradually being removed; ban on heavy industrial projects in polluted regions of CHN.	24%	54%	**Incentives to support construction of green buildings.** Around $70 bln in grants and loans to upgrade buildings and transmission in US IRA.	2%
Airlines	0.5%	**Disincentives on operational emissions, but has technological obstacles (e.g., sustainable fuels).** Slated to be added to the EU ETS in the coming years; short-haul flights banned in FRA and NLD.	68%	1%	**Incentives to make technological advancements in sustainable aviation fuels.** Minimal tax credits as technology is still in early stages.	0%
Forestry and Paper	0.4%	Not included in most carbon pricing schemes, but need to decrease operational emissions. Ban on products with evidence of large-scale deforestation in GBR.	51%	31%	Limited direct policy. Some activities eligible for credits under CAN's GHG offset system.	0%
		Most sectors have high operational emissions today, and forward-looking improvements are unlikely to be uniformly distributed (with leaders and laggards)			**Green segments in most sectors relatively small today,but subsidies could help to accelerate the transition**	

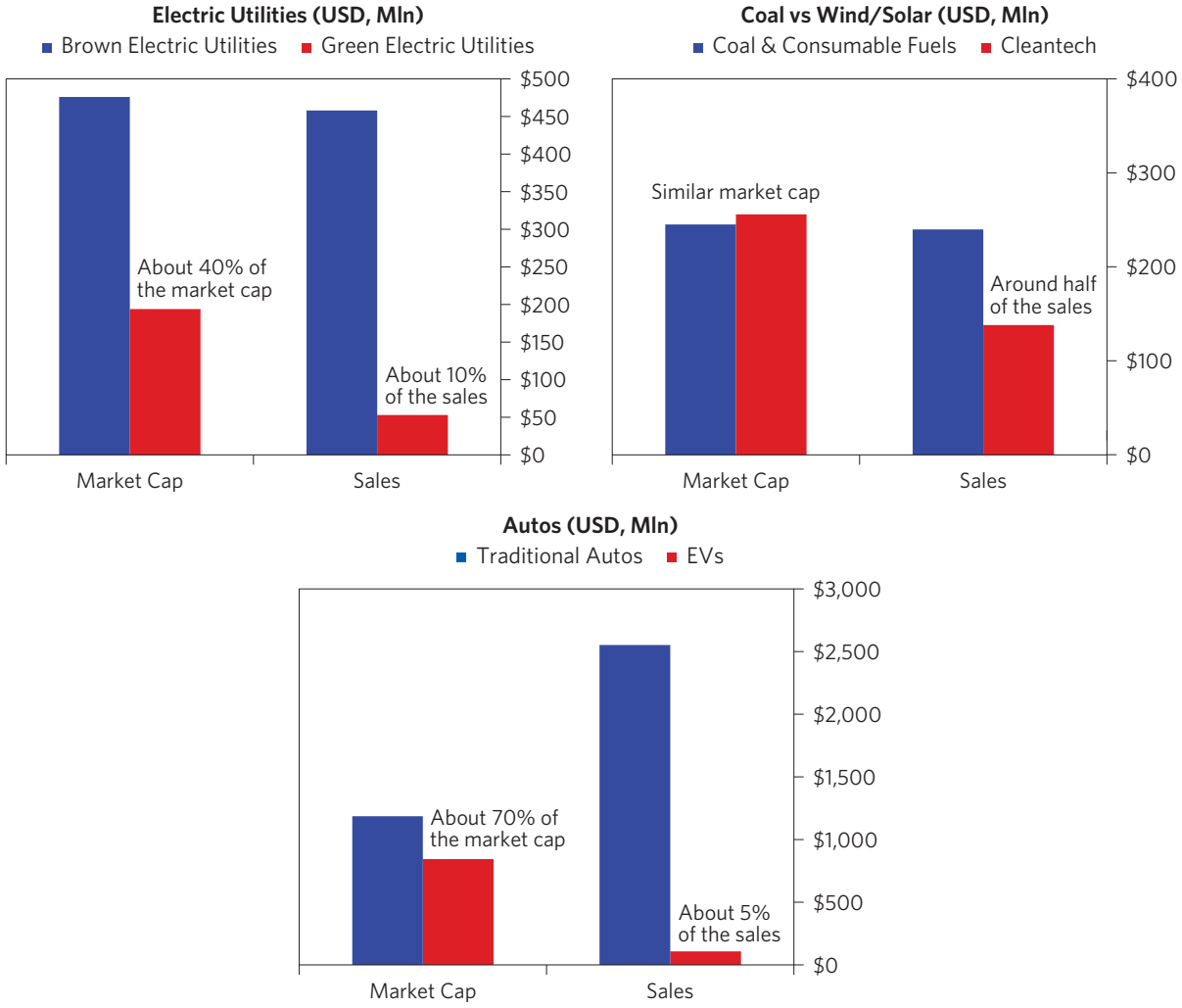
While differences across jurisdictions matter—for cross-border FDI, subsidies in the US could attract investment from European firms—and there is significant "competition" to shape the global landscape (e.g., Europe catching up to the subsidy approach after the IRA and examining a carbon border tax to prevent companies from circumventing its carbon pricing), the broader picture is of a shift in the incentives across the large developed world economies where investors are concentrated to support the energy transition and reduce emissions. **In many of the critical sectors, these policies can be transformative**: for example, wind and solar generation are already cost-competitive with natural gas, while IRA tax credits for emerging technologies like blue/green hydrogen are expected to cover over 50% of the expected cost and could make production cheaper than less sustainable alternatives like gray hydrogen (which is made from fossil fuels) well before 2030. High-emitting companies can subsequently use these cheaper technologies to accelerate their own decarbonization (e.g., decreasing the cost to switch over to renewable energy, or transition their vehicle fleets to EVs and potentially hydrogen fuel-cell vehicles).



As shown in the table below, we are already seeing companies respond to the changing incentives from climate policies through their investments, earnings guidance, and forward commitments. Companies can change both *what they do and how they do it*—which products they will sell (e.g., EVs or ICE vehicles) and how they will produce them (e.g., hydrogen produced with unabated natural gas or with carbon-free electrolysis, powered by renewable energy). In a very direct way, a larger number of investments consistent with transitioning to net zero will become viable as a result of these government policies. And while climate policies are one of many factors that companies are weighing, they have, in some cases, already changed corporate plans in a way that will materially affect how the transition actually plays out. Below, we show a few corporate announcements on how climate policies such as the IRA have impacted their business strategies.

Sector	Company	Impact
Utilities	NextEra Energy	"**With an opportunity set of $20 billion of capital investment requiring more than 15 gigawatts of new renewables**, NextEra Energy Resources is well positioned to be the green hydrogen partner of choice, potentially creating new earnings opportunities toward the end of the decade."
Auto and Parts	Ford	"**We expect the US Inflation Reduction Act to have a wide range of positive impacts for both our customers and for Ford**...From '23 to '26, we estimate a combined available tax credit for Ford and our battery partners could total more than $7 billion with large step-up in annual credits in '27 as our JV battery plants ramp up to full production."
Chemicals	Linde	"**We continue to make good progress on the $50 billion of clean energy opportunities**, of which I expect $9 billion to $10 billion to be decided in the next few years."
Semiconductors	First Solar	"**Since the announcement of the Inflation Reduction Act approximately one year ago, we have committed over $2.8 billion in capital investments into the United States** across our existing Ohio manufacturing facilities, a new manufacturing plant in Alabama, a new research and development center in Ohio, and, most recently, our fifth US factory announced today."
Diversified Industrial	General Electric	"**We serve many of North America's largest [clean energy] developers, and the IRA incentives are helping grow orders significantly this year**...Looking ahead, we're raising our full-year Renewables revenue growth forecast to high-single digits, and we're expecting some sequential profit improvement in the second half, driven by Onshore Wind and Grid."
Engines and Machinery	Enphase	"Starting in the second quarter of 2023, **we are adding manufacturing capacity in the United States due to the global demand for our products as well as the incentives related to the Inflation Reduction Act (IRA)**, which will bring our total global quarterly capacity to more than 10.0 million microinverters as we exit 2023."
Engines and Machinery	Dover Corporation	"Demand trends remain robust in [climate and sustainability technologies, such as] heat exchanges and CO2 refrigeration systems **driven by global investments in sustainability**."

And this landscape, in turn, is getting priced into the markets. As a simple cut, we show the market cap of green companies (which takes into account some expectations around the future) compared to their current revenue shares. Green companies tend to face a higher valuation than their brown counterparts. For example, even though EV companies represent around 5% of global sales, they comprise over half of market cap versus traditional automakers, with Tesla being a big part of that. And electric utilities with a high share of clean energy generation have almost half the market value of their carbon-intensive counterparts, despite having one-tenth of the sales.



Important Disclosures and Other Information

This research paper is prepared by and is the property of Bridgewater Associates, LP and is circulated for informational and educational purposes only. There is no consideration given to the specific investment needs, objectives, or tolerances of any of the recipients. Additionally, Bridgewater's actual investment positions may, and often will, vary from its conclusions discussed herein based on any number of factors, such as client investment restrictions, portfolio rebalancing and transactions costs, among others. Recipients should consult their own advisors, including tax advisors, before making any investment decision. This material is for informational and educational purposes only and is not an offer to sell or the solicitation of an offer to buy the securities or other instruments mentioned. Any such offering will be made pursuant to a definitive offering memorandum. This material does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual investors which are necessary considerations before making any investment decision. Investors should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, where appropriate, seek professional advice, including legal, tax, accounting, investment, or other advice.

The information provided herein is not intended to provide a sufficient basis on which to make an investment decision and investment decisions should not be based on simulated, hypothetical, or illustrative information that have inherent limitations. Unlike an actual performance record simulated or hypothetical results do not represent actual trading or the actual costs of management and may have under or overcompensated for the impact of certain market risk factors. Bridgewater makes no representation that any account will or is likely to achieve returns similar to those shown. The price and value of the investments referred to in this research and the income therefrom may fluctuate. Every investment involves risk and in volatile or uncertain market conditions, significant variations in the value or return on that investment may occur. Investments in hedge funds are complex, speculative and carry a high degree of risk, including the risk of a complete loss of an investor's entire investment. Past performance is not a guide to future performance, future returns are not guaranteed, and a complete loss of original capital may occur. Certain transactions, including those involving leverage, futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Fluctuations in exchange rates could have material adverse effects on the value or price of, or income derived from, certain investments.

Bridgewater research utilizes data and information from public, private, and internal sources, including data from actual Bridgewater trades. Sources include Climate Action Tracker, BCA, Bloomberg Finance L.P., Bond Radar, Candeal, Calderwood, CBRE, Inc., CEIC Data Company Ltd., Clarus Financial Technology, Conference Board of Canada, Consensus Economics Inc., Corelogic, Inc., Cornerstone Macro, Dealogic, DTCC Data Repository, Ecoanalitica, Empirical Research Partners, Entis (Axioma Qontigo), EPFR Global, ESG Book, Eurasia Group, Evercore ISI, FactSet Research Systems, The Financial Times Limited, FINRA, GaveKal Research Ltd., Global Financial Data, Inc., Harvard Business Review, Haver Analytics, Inc., Institutional Shareholder Services (ISS), The Investment Funds Institute of Canada, ICE Data, ICE Derived Data (UK), Investment Company Institute, International Institute of Finance, JP Morgan, JSTA Advisors, MarketAxess, Medley Global Advisors, Metals Focus Ltd, Moody's ESG Solutions, MSCI, Inc., National Bureau of Economic Research, Organisation for Economic Cooperation and Development, Pensions & Investments Research Center, Refinitiv, Rhodium Group, RP Data, Rubinson Research, Rystad Energy, S&P Global Market Intelligence, Sentix Gmbh, Shanghai Wind Information, Sustainalytics, Swaps Monitor, Totem Macro, Tradeweb, United Nations, US Department of Commerce, Verisk Maplecroft, Visible Alpha, Wells Bay, Wind Financial Information LLC, Wood Mackenzie Limited, World Bureau of Metal Statistics, World Economic Forum, YieldBook. While we consider information from external sources to be reliable, we do not assume responsibility for its accuracy.

This information is not directed at or intended for distribution to or use by any person or entity located in any jurisdiction where such distribution, publication, availability, or use would be contrary to applicable law or regulation, or which would subject Bridgewater to any registration or licensing requirements within such jurisdiction. No part of this material may be (i) copied, photocopied, or duplicated in any form by any means or (ii) redistributed without the prior written consent of Bridgewater® Associates, LP.

The views expressed herein are solely those of Bridgewater as of the date of this report and are subject to change without notice. Bridgewater may have a significant financial interest in one or more of the positions and/or securities or derivatives discussed. Those responsible for preparing this report receive compensation based upon various factors, including, among other things, the quality of their work and firm revenues.