ESG

Net Zero Economy Index 2023

Bending the curve: can climate ambition and reality still converge?

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pwc

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Foreword

This year's Net Zero Economy Index provides a stark illustration of the growing divergence between the global ambition to tackle climate change and the reality of current progress. The world achieved a decarbonisation rate of just 2.5% in 2022, which means a year-on-year decarbonisation rate of 17.2% is now required until 2050 to limit average global warming to 1.5°C above pre-industrial levels. To put this into perspective, since 2000, no G20 country has achieved a decarbonisation rate of more than 11% in a single year.[1]

The synthesis report of the UNFCCC's[2] Global Stocktake's technical dialogue published in September 2023 emphasises the likelihood of society overshooting 1.5°C without immediate and significant action. Specifically, it highlights that collective commitments to date indicate a global temperature increase of 2.4-2.6°C, with the possibility of reaching 1.7-2.1°C, "when taking into account the full implementation of long-term net zero targets".[3] The IPCC's 2023 Summary for Policymakers report gives a sobering account of the likely impacts of global average temperatures reaching these levels.[4]

This stark reality check on progress must not reopen the door to a lower ambition target. The increasing severity and frequency of extreme weather events is already being experienced across all continents under current warming levels of 1.1°C. It has been widely documented that the costs of inaction on climate mitigation and adaptation will far outweigh the cost of taking urgent action to transform energy systems. It is therefore essential that policymakers, businesses and communities accelerate efforts to fight to prevent every fraction of a degree of warming, while simultaneously scaling-up action on adaptation to protect economies and livelihoods.

[1] The UK's decarbonisation rate in 2014 was 10.9%.
[2] The secretariat to the United Nations Framework Convention on Climate Change (UNFCCC) is the UN entity tasked with supporting the global response to the threat of climate change. The Convention entered into force in 1994 and has now been ratified by 198 countries; the UNFCCC is the parent treaty of the 2015 Paris Agreement.
[3] UNFCCC (2023) Technical dialogue of the first global stocktake. Synthesis report by the co-facilitators on the technical dialogue
[4] Intergovernmental Panel on Climate Change (2023) Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the IPCC

A fundamental shift in the pace and scale of action is required. By transitioning their energy mix away from fossil fuels and improving energy efficiency, nations can rapidly decouple economic growth from emissions and close the ambition gap that persists between implemented policies and announced pledges. However, while increasing and decarbonising the electricity supply will help address a significant part of this demand, it alone will not be enough. Holistic transition of the entire energy system is needed if we are to bridge the gap between where we are now and what is needed to achieve a net zero transition.[5] 80% of primary energy demand is still driven by direct consumption of hydrocarbons (in particular fossil fuels such as oil, gas and coal), by industry, manufacturing, space heating, transport and logistics. The accelerated action we are seeing on deployment of renewable energy will need to be met by concurrent progress with other forms of green energy such as hydrogen, biofuels, and a revolution in infrastructure as well as demand management. Furthermore, while energy consumption accounts for approximately three quarters of greenhouse gas emissions, progress to decarbonise the industries which drive the remaining quarter - agriculture, land use change, waste, and industrial processes - must not be neglected if we are to limit warming to 1.5°C.

Alongside these findings, there are green shoots of something more encouraging. Our analysis also reveals that last year saw a surge in renewable energy deployment, which, alongside the thousands of businesses and financial institutions currently setting net zero targets, and the COP28 Presidency's action plan for renewable energy capacity to triple by 2030, highlights the growing potential for an accelerated and market-led transition in the years ahead. Solar and wind power in particular now offer the lowest cost power generation options in many regions. Government support for green industries is also reaching a meaningful scale. The pace setters include the historic $370 billion Inflation Reduction Act from the US and a similarly targeted Green Industrial Plan by the EU.

We see further evidence of a momentum shift in net zero-related market activity. According to PwC's State of Climate Tech analysis, the number of climate technology start-ups has increased fivefold since 2010;[6] and whilst early stage venture investment has slowed over the past 18 months, the total global investment in low-carbon energy technology passed $1 trillion for the first time in 2022.[7] Climate investments are fast developing as a new asset class that is reallocating global capital into clean and renewable energy supply, modern and efficient industry, buildings, construction materials and even nature-based and mechanical carbon removal technologies. The pace of decarbonisation required means innovation must now play a critical role, particularly to accelerate reductions in hard to abate sectors, and create the breakthroughs that address transition barriers such as cost and achieving a just transition.

There is no longer a question whether an urgent transition to a net zero economy is necessary, but this might be our last year to answer whether we will act fast enough. This year can be the one that unlocks the full power and scale of business, the capital markets and competition to accelerate emission reductions, spur breakthrough innovation, and stimulate mass behavioural change. But we still need careful diplomacy to align countries, and strengthened policy to give the markets the long term clarity they need to invest at scale. We therefore encourage organisations to explore our index data and see what it means for you and the countries where you operate. We also recommend you use the analysis in your boardroom conversations, and with suppliers, to drive faster, deeper action.

Yes we can still have hope of a convergence of action with ambition, but we risk doing too little, too late.

Emma Cox
Partner, Global Climate Leader, PwC UK

Dan Dowling
Partner, Sustainability, PwC UK

[5] PwC (2023) Bridging the gaps: Setting the stage for an orderly energy-system transition
[6] PwC analysis on Pitchbook data
[7] Bloomberg NEF (2023) Energy Transition Investment Trends.

Our 2023 analysis and findings

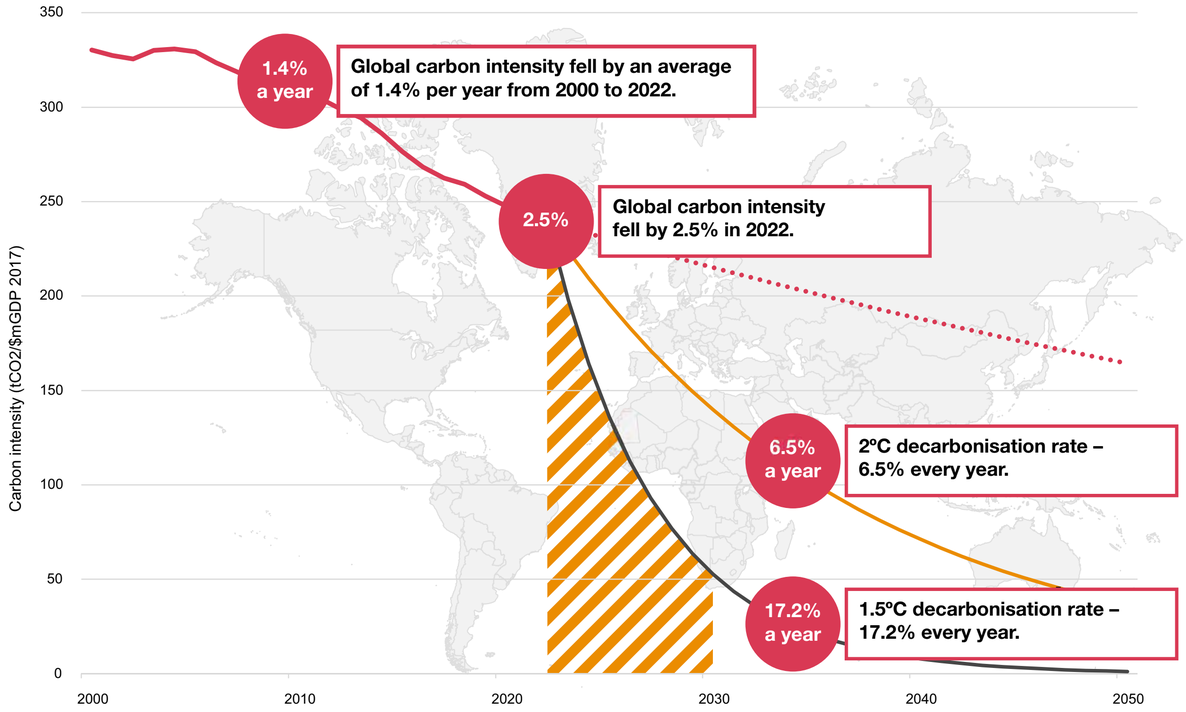
To limit warming to 1.5°C, annual decarbonisation rates need to increase sevenfold to 17.2%

An average year-on-year global decarbonisation rate of 17.2% is required from now until 2050, up from 15.2% in last year's analysis, if we are to limit warming to 1.5°C. This pace of change is seven times faster than the global average achieved in 2022 (2.5%), and 12 times faster than the global annual average decarbonisation rate since 2000 (1.4%). For context, not one of the G20 member states – who collectively account for around 85% of global energy-related emissions – achieved more than an 8% (Turkey achieved 7.4%) reduction in carbon intensity in 2022.

Absolute levels of carbon intensity vary across countries, given that nations are at different stages of development and have contrasting socio-economic bases. In 2022, 240 tonnes of CO_2 was emitted for every million dollars of GDP generated worldwide, ranging from an average of 175 tonnes in the G7 to 312 tonnes in the E7[8]. This is a notable reduction (20%) from the 299 tonnes of CO_2 emitted globally for every million dollars of GDP in 2012. Across the same time period, GDP globally has risen by 34%, while the respective increases in energy consumption and emissions have been slower (14% and 7% respectively).

The IPCC's 2030 target to reduce emissions by 43% is fast approaching. Our analysis, which factors in projected increases in GDP to give carbon intensity (CO_2/GDP), shows that nations must work even harder to meet this figure, with a 78% reduction in carbon intensity required within seven years.

Figure 1: Net Zero Economy Index 2023



[8] **G7** countries include Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. The **E7** country group refers to Brazil, China, India, Indonesia, Mexico, Russia and Turkey.

Our metrics

The table below sets out key metrics used in this report. For further details, see our metrics and methodology section at the end of this report.

Carbon intensity

The primary purpose of the Net Zero Economy Index is to calculate national and global **carbon intensity (CO_2/GDP)**, and track the rate of change needed by 2050 to limit average global warming to 1.5°C.

To do this, we use the IPCC carbon budget to calculate how much emissions need to be reduced in the future, and divide this by the projected increase in GDP. This allows us to see the amount emissions must reduce to maintain projected GDP growth, providing insight to the scale of efforts required to decouple emissions from economic growth.

Fuel factor

The **fuel factor (CO_2/energy** measures how much CO_2 is emitted per unit of energy consumed. Put simply, how green the energy consumption is.

It indicates a country's shift in energy mix towards renewable energy sources and can reflect movements away from the most highly emitting fossil fuels (such as coal). For each fossil fuel type, a differing amount of CO_2 will be released per unit of energy consumed. For each unit of energy consumed from a renewable source, emissions will be reduced to negligible, or zero, therefore reducing the fuel factor towards zero.

Energy intensity

Energy intensity (energy/GDP) measures the energy consumed per unit of GDP generated. It shows how much energy is needed to generate a given amount of GDP.

Energy intensity is impacted by factors including: energy efficiency, in the form of energy efficiency policies or technological advances enabling efficiency; energy pricing mechanisms; shifts in regional population and demographics; changes in the composition of an economic sector's output; maximising economic output per unit spend on energy usage; investment in new, more efficient technology and infrastructure; and climatic influences on energy usage.

Decarbonisation rates have largely returned to pre-pandemic levels

The COVID-19 pandemic's impact on the global economy and energy consumption created an artificially low level of emissions in 2020. The lifting of pandemic restrictions in 2021 gave way to a much needed resurgence in economic activity, but also a rebound in emissions. This primarily occurred in 2021, and did not exceed the decline in emissions in 2020. In net terms, this means the world still managed to decarbonise from 2019 to 2021, despite two years of erratic data.

The 2022 data shows a return to levels of economic growth and emissions reduction similar to those experienced pre-pandemic. When comparing 2022 carbon intensity with pre-pandemic levels in 2019, we see a global decarbonisation rate of 1.8% per year. This suggests that while decarbonisation has occurred over the COVID period, there is a considerable way to go to meet the rates required to limit warming to 1.5°C above pre-industrial levels.

"15 of the G20 have managed to reduce their carbon intensity from the COVID-19-induced emissions low of 2020...

while five of the G20 have seen a sustained increase in carbon intensity since the initial dip caused by COVID-19."[9]

[9] For full results, please see the table at the end of our report: 'G20 performance across our key metrics'.

Decarbonisation trajectories are progressing at different rates between G7 and E7 economies

Decarbonisation rates across the world have returned to levels consistent with those achieved before the COVID-19 pandemic. The average global reduction in carbon intensity in 2022 was 2.5%, a marked improvement on 0.5% in 2021. While this is the fourth highest reduction since 2001, it is approximately seven times slower than the rate of decarbonisation required to limit warming to 1.5°C. Furthermore, it matches the average change in carbon intensity for 2014-2019, which was also a 2.4% reduction, suggesting progress has not accelerated from the pre-pandemic trend.

By assessing the average annual decarbonisation rate achieved in different economies from 2019 to 2022 (which removes the effects of the sharp decrease in emissions and their subsequent rebound on decarbonisation rates), we can compare progress in 2022 to decarbonisation rates in recent years. The G7 achieved a 1.2% reduction in carbon intensity in 2022, compared to the annual average of 2.3% achieved since 2019; highlighting the limited progress of G7 nations in 2022. By contrast, E7 nations achieved a 2.8% decarbonisation rate in 2022, relative to a 1.7% annualised decrease since 2019.

1.2% decrease

G7 change in carbon intensity in 2022
(vs. a 2.3% average annual decarbonisation. rate for G7 nations over COVID period (2019-2022)

2.8% decrease

E7 change in carbon intensity in 2022
(vs. 1.7% average annual decarbonisation rate for E7 nations over COVID period (2019-2022).

Carbon intensity: Making simultaneous progress on energy efficiency and the global fuel mix

Reducing carbon intensity can support growth through action on energy transition policy and economy-wide efficiency. We have analysed two drivers of carbon intensity:

The IPCC's 2030 target to reduce emissions by 43% is fast approaching. Our analysis, which factors in projected increases in GDP to give carbon intensity (CO_2/GDP), shows that nations need to work even harder to meet this figure, with a 78% reduction in carbon intensity now required in under seven years.

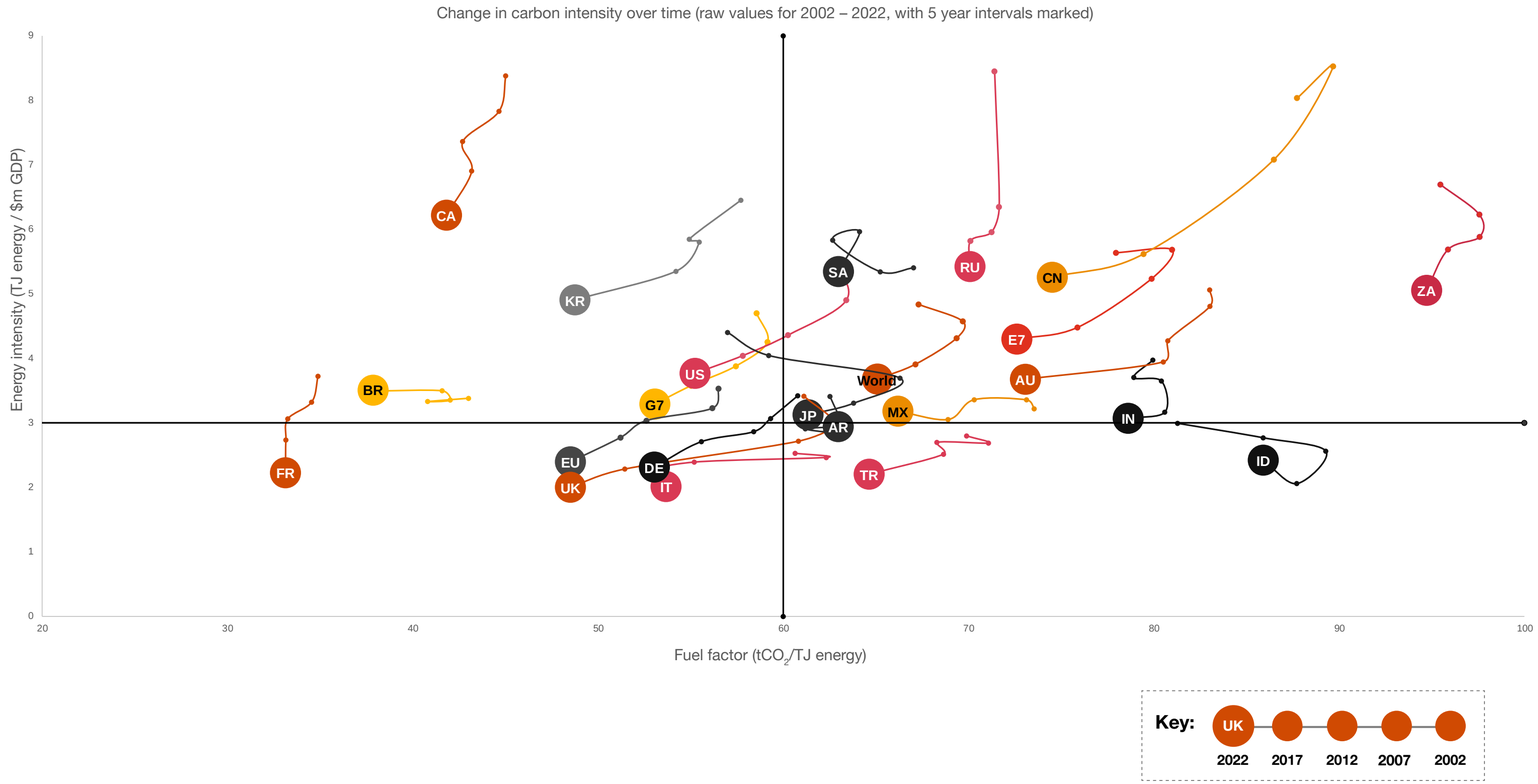
01 The carbon content of the national energy mix (fuel factor: CO_2/energy).

02 The amount of energy consumed per unit of economic output (energy intensity: energy/GDP).

The graph to the right uses the relationship between these drivers to show the decarbonisation positions of every G20 member state, and highlights the challenges to be overcome to deliver greater emissions reductions.

Over time, countries need to shift towards the bottom-left quadrant as they reduce the share of fossil fuels within their energy mix (moving left) and reduce the energy intensity of their economies (moving down). Countries already in this quadrant are those with the lowest carbon intensities in our Index - but even they have a long way to go in reducing their fossil fuel dependence. Countries in the top right quadrant are those with the highest carbon intensities in our index.

Figure 2: Change in carbon intensity over time (raw values for 2002 - 2022, with 5 year intervals marked)



Energy intensity

The decline in global energy intensity by an average of 1.4% per year over the past 20 years shows the world is gradually decoupling economic growth from energy consumption. This is a positive sign that means economies can grow without proportionately increasing energy consumption. The trend is largely attributed to modernisation and advancements in energy efficiency, driven by policy initiatives, cost control and industry competition. This highlights the importance of both regulatory frameworks and market dynamics in shaping the energy landscape.

According to the IEA Net Zero by 2050 scenario, global energy intensity in 2030 and 2050 needs to fall by about 35% and 62% - to 2.973 TJ/million US$ and 1.716 TJ/million US$, respectively - compared to 2020, while serving a larger economy and population[10] (it has fallen by nearly 15% since 2012). This corresponds to a 4.2% and 3.2% average annual reduction between 2020-2030 and 2020-2050, respectively. Although there has been a modest increase in the rate of reducing energy intensity, with the 2022 rate (2.2%) being the fourth highest since 2000, this needs to nearly double to align with the targets of the IEA.

To improve energy efficiency, industries, businesses, and households must adopt best practices and technologies that optimise energy use. These could involve retrofitting buildings with energy-efficient lighting, the installation of solar panels and the use of management systems to monitor and reduce energy consumption. Behavioural changes, on the other hand, highlight the role of individuals in this transition. Every decision, from the thermostat setting in our homes to our mode of transport influences energy intensity.

However, to deliver on these ambitious targets we need both a reduction in energy consumption and also a focus on how energy is sourced and used to power our economies - this is the focus of the fuel factor metric in our analysis.

[10] International Energy Agency (2021) Net Zero by 2050: A Roadmap for the Global Energy Sector.

The global fuel mix and renewable energy

The fuel factor metric calculates the emissions released per unit of energy consumed. It not only gauges the carbon intensity of energy consumption but also reflects the balance between fossil fuels and renewables in the energy mix. Since 2012, the 15% reduction in global energy intensity has far exceeded the fuel factor's reduction of just 6.2%. In 2022 alone, while energy intensity saw a reduction of 2.2%, the fuel factor's reduction was just 0.3%.

Our analysis shows that last year witnessed a remarkable surge in renewable energy adoption, with solar energy experiencing its highest recorded growth at 24.4% and wind energy increasing by 13.1%. Renewable energy also accounted for 83% of all new power capacity added globally in 2022[11]. The significant growth of renewables is primarily concentrated in specific countries and regions, with Asia, the USA, and Europe at the forefront. Almost half of all new capacity in 2022 was added in Asia, with China being the largest contributor[12]. This uptake in renewable energy has been attributed to supportive policies and significant reductions in the cost of solar and wind technologies. The IPCC has noted a decrease of up to 85% in the costs of solar and wind energy and batteries since 2010 and estimates that mitigation options costing $100 per tonne of CO_2e or less can reduce greenhouse gas emissions by at least half of the 2019 values by 2030[13].

However, last year's positive progress on renewables was overshadowed by a proportional growth in fossil fuel usage. In response to the supply shock resulting from the Russia-Ukraine conflict, several countries temporarily turned to coal to bolster energy supplies. This led to the second highest coal consumption in the 15 year history of our report's analysis and an increase in the fuel factor for half of the G20 countries. As a result, renewables have only managed to increase their share in the total energy mix by 0.5% in 2022. Despite the increase in coal consumption, there was no sign of a surge in coal investment in export-driven coal projects.[14]

Further geopolitical effects of the conflict on national energy consumption can be observed in our analysis, most prominently in European energy mix changes. Although the EU made significant progress in improving its energy intensity in 2022 (a 6.8% reduction), its fuel factor increased by 2.8% over the same period. This suggests that the observed 13.5% reduction in gas usage in 2022, was not compensated for in a substantive way by renewable sources. Although solar and wind energy saw large relative increases in usage, these were offset by large decreases in nuclear and hydroelectricity. Due to the large proportion of fossil fules in the EU's fuel mix, the marginal relative increases in oil and coal consumption were enough to result in an increase in its fuel factor.

[11] IRENA (2023) Renewable capacity statistics 2023.
[12] IRENA (2023) Renewable capacity statistics 2023.
[13] IPCC (2023). Climate Change 2023 Synthesis Report.
[14] International Energy Agency (2022) Coal 2022

The business imperative to take action

The opportunity for businesses

Estimates still vary over the exact cost of achieving the transition to net zero emissions. While the IEA estimates the required annual investment in the energy sector will need to more than triple by 2030, to around $4 trillion per year[15], IRENA suggests that annual investments in energy transition technologies must more than quadruple from their current level ($1.3 trillion in 2022) to over $5 trillion per year. In cumulative terms, research from the UN High-Level Climate Action Champions in 2021 argues $125 trillion of climate investment is needed by 2050 to meet net zero[16].

This transformational level of investment will clearly have significant impact on and implications for businesses. For investors, this offers an opportunity in the form of long-term returns from providing the capital to finance the transition to net zero. Sectors with high emissions, however, may face significant short-and medium-term costs from the need to invest in energy efficient technologies and processes that facilitate decarbonisation. In the longer-term, however, the adoption of innovative energy efficient technologies - such as advanced manufacturing processes, intelligent energy management systems, and renewable energy integration - can also offer substantial cost savings. In the UK, for example, the Climate Change Committee[17] estimates that the net operating savings of reducing carbon intensities across all sectors between 2020 and 2050 will offset approximately 75% of the costs of transitioning to net zero.[18] This excludes transfers between the private and public sectors, so does not include factors such as government subsidies.

The role of business in driving the net zero transition at a macroeconomic scale

A challenge facing companies' decarbonisation efforts is access to low carbon energy, required to reduce emissions from purchased energy (Scope 2)[19], and the emissions of their supply chain (Scope 3). Current renewable energy planning and permitting practices are, however, typically lengthy as they require multi-level government involvement, energy market reforms, land use and zoning complexities, public and community engagement and cultural considerations, on top of inherent financing and technical preparations.

Companies' net zero ambitions are consequently reliant on government efforts to streamline the processes for scaling renewable energy sources and developing grids' renewables capacities. For many companies, policy advocacy is a crucial step in aligning companies' functions with the delivery of net zero targets. In June 2023, a call to action for all non-state actors to align their advocacy, policy and engagement with science-based targets was issued by the UN Climate Change High Level Champions at London Climate Action Week.

By acting quickly and boldly, businesses will not only demonstrate their commitment to emissions reduction, but can also position themselves to thrive in an era where good climate change practice increasingly makes good business sense. This is because taking action on net zero brings benefits beyond curbing energy costs. It allows organisations to tap into growth opportunities from rising demand for low-carbon goods, services and technologies, and manage the risks caused by the impacts of climate change and nature loss. Perhaps most influential, the emphasis businesses place on decarbonisation is a profound signaller of purpose. People are at the heart of business success, and an organisation with a galvanised, purpose-driven workforce is best placed for sustained positive outcomes.

[15] International Energy Agency (2021) Net Zero by 2050: A Roadmap for the Global Energy Sector.
[16] UNFCCC Climate Champions (2021) What's the cost of net zero?

[17] An independent, statutory body established to advise the UK and devolved governments on emissions targets and to report to Parliament on progress made in reducing greenhouse gas emissions and preparing for and adapting to the impacts of climate change.
[18] Office for Budget Responsibility (2021) Fiscal risks report.

[19] **Scope 1** emissions are direct, onsite emissions from owned or controlled sites and assets. **Scope 2** emissions are indirect emissions from the consumption of electricity and purchased energy. **Scope 3** emissions are all other indirect upstream and downstream emissions in the value chain of the entity.

Our metrics and methodology

The Net Zero Economy Index tracks the decarbonisation of energy-related CO_2 emissions worldwide. The analysis is underpinned the Energy Institute's **Statistical Review of World Energy**, which reflects energy consumption per fuel type per country and CO_2 emissions based on the consumption of oil, gas and coal. Emissions are calculated by using consumption data and applying Default CO_2 Emission Factors for Combustion from the list of IPCC emission factors. Non-combustion activities, such as the use of oil products and natural gas in the petrochemicals industry, or oil used in the production of bitumen for road construction, are not included in the analysis. Estimates of the proportion of non-combusted fossil fuels are subtracted from the total consumption of fossil fuels before applying the relevant emission factors.

The analysis does not consider emissions from other sectors (e.g. Agriculture, Forestry and Other Land Use). Data for methane emissions associated with fossil fuel production, transportation and distribution from the IEA are included in the Energy Institute's **Statistical Review of World Energy** and in our analysis. Carbon emissions are included from natural gas flaring and from industrial processes (which refer only to non-energy CO_2 emissions from cement production). No carbon sequestration is accounted for in the Net Zero Economy Index analysis. As a result, this data cannot be compared directly with national emissions inventories.

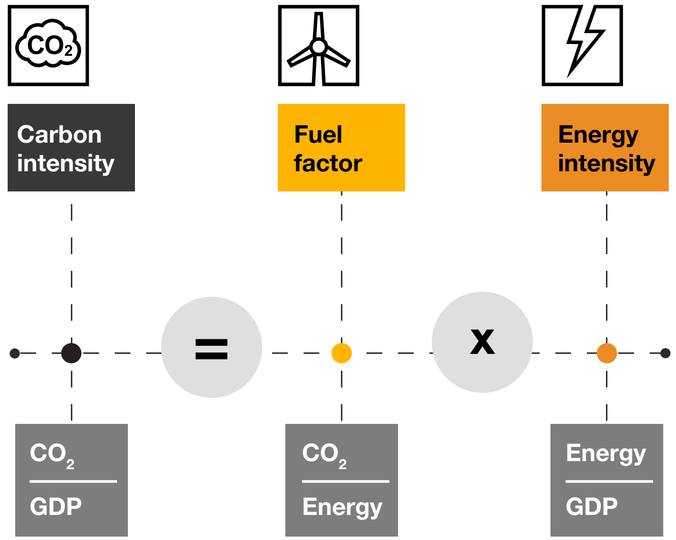
We use the IPCC global estimated carbon budget data on fossil fuel emissions taken from the IPCC Special Report on Global Warming of 1.5°C (SR15), to estimate the energy-related CO_2 emissions associated with limiting warming to 1.5°C and 2°C by 2100. We have elected to not use the updated global carbon budget from the IPCC's **Sixth Assessment Report** (AR6), as it is similar to the total budget attained from SR15 and AR6 does not provide interim emissions targets for specific years between the present-day and 2100, which are used in the model underpinning this analysis.

For GDP data, our analysis draws on the World Bank historical data. For long-term GDP projections, our analysis draws on two different banks of OECD forecast data. The first dataset assesses 2022 and 2023, accounting for the impacts of current world events such as COVID-19, which was updated in June 2022. The second dataset consists of 2024-2060 forecast data, updated in October 2021. World GDP projections for 2061-2100 have been updated based on PwC analysis (decreasing by 0.1% from last year's forecast growth rate).

The countries our analysis focuses on are individual G20 economies, as well as focusing on world totals. The G20 is portioned into 3 blocks: G7 economies (US, Japan, Germany, UK, France, Italy, Canada), E7 economies which covers the BRICs (Brazil, Russia, India and China), and Indonesia, Mexico and Turkey and other G20 (Australia, Korea, EU, South Africa, Saudi Arabia, Argentina).

The primary purpose of our model is to calculate national and global **carbon intensity** (CO_2/GDP), and the rate of carbon intensity change needed by 2050 to limit warming to 1.5°C above pre-industrial levels. We use the IPCC carbon budget to calculate the required quantity of emissions reductions in the future, and then divide this by the projected increase in global GDP, providing us a required rate of carbon intensity reduction to limit warming to 1.5°C. This allows us to see the amount emissions must reduce to maintain projected GDP growth, providing insight to the scale of efforts required to decouple emissions from economic growth.

Carbon intensity is the product of two factors that are explored separately, allowing for greater insights in our analysis.



The **fuel factor** (CO_2/energy) measures how much CO_2 is emitted per unit of energy consumed. It serves as a performance indicator for a country's shift in energy mix towards renewable energy sources, and can reflect movements away from the most highly emitting fossil fuels (such as coal). For a given unit of energy consumed, different fossil fuels will release differing amounts of CO_2 emissions. For a given unit of energy consumed from a renewable source, emissions will be reduced to negligible, or zero, thus reducing the fuel factor toward zero.

Energy intensity (energy/GDP) measures the amount of energy consumed per unit of GDP generated. It illustrates how much energy is required to generate a given amount of GDP. Energy intensity serves as a performance indicator for a country for factors including: energy efficiency, in the form of energy efficiency policies or technological advances enabling efficiency; energy pricing mechanisms; shifts in regional population and demographics; changes in the composition of an economic sector's output; maximising economic output per unit spend on energy usage; investment in new, more efficient technology and infrastructure; and climatic influences on energy usage.

To calculate the required percentage reduction in global fuel factor to maintain the world's course for a 1.5°C world, we use the IEA's values for percentage reduction of energy intensity presented in their Net Zero Emissions by 2050 Scenario (NZE) in the IEA's World Energy Outlook 2021. The scenario projects a 4.2% reduction in energy intensity year-on-year to 2030, followed by an annual reduction rate of 2.7% from 2030 to 2050. We divide the raw values of carbon intensity from our analysis by the raw values of global energy intensity we calculate using the IEA's NZE to calculate the necessary reduction in fuel factor.

Using the energy consumption data provided in the Energy Institute's Statistical Review of World Energy we have compared the proportions of different energy sources in the G20's fuel mix with that of the average fuel mix of the world, and observed how these have changed over time as the proportions of fossil fuels and renewables consumed has changed. Changes to the fuel mix affect the fuel factor, as a country increases the proportion of renewable energy in its fuel mix its fuel factor will decrease.

G20 performance across our key metrics

This table presents the data underpinning our analysis and our findings.

Country	Carbon intensity (tCO_2/$m GDP) 2022	Change in carbon intensity 2021-2022	Annual average change in carbon intensity 2000-2022	Fuel factor (tCO_2/TJ) 2022	Change in fuel factor 2021-2022	Annual average change in fuel factor 2000-2022	Energy intensity (TJ/$m GDP) 2022	Change in energy intensity 2021-2022	Annual average change in energy intensity 2000-2022	Change in energy related emissions 2021-2022	Real GDP growth (PPP) 2021-2022
World	240	-2.49%	-1.45%	65.09	-0.34%	-0.13%	3.68	-2.16%	-1.32%	0.77%	3.34%
E7	312	-2.78%	-1.58%	72.61	-0.91%	-0.27%	4.30	-1.89%	-1.31%	0.67%	3.56%
G7	175	-1.19%	-2.18%	53.06	0.33%	-0.45%	3.29	-1.51%	-1.74%	1.04%	2.26%
China	392	-3.65%	-2.78%	74.51	-1.67%	-0.77%	5.26	-2.01%	-2.03%	-0.77%	2.99%
US	208	-0.38%	-2.47%	55.24	-0.98%	-0.60%	3.77	0.61%	-1.88%	1.68%	2.06%
EU	116	-4.14%	-2.51%	48.51	2.84%	-0.68%	2.39	-6.78%	-1.84%	-0.74%	3.54%
India	241	-0.84%	-1.39%	78.62	0.46%	-0.01%	3.07	-1.29%	-1.39%	6.10%	7.00%
Japan	192	-1.25%	-1.23%	61.34	0.33%	0.38%	3.13	-1.58%	-1.60%	-0.24%	1.03%
Russia	380	-4.98%	-2.41%	70.08	1.41%	-0.04%	5.42	-6.30%	-2.37%	-6.95%	-2.07%
Germany	123	-3.02%	-2.42%	53.05	2.56%	-0.63%	2.32	-5.44%	-1.80%	-1.29%	1.79%
Indonesia	208	21.30%	-0.64%	85.90	1.39%	0.25%	2.42	19.63%	-0.89%	27.73%	5.31%
Brazil	132	-6.16%	-0.54%	37.73	-7.43%	-0.48%	3.49	1.38%	-0.06%	-3.44%	2.90%
France	74	-4.22%	-2.69%	33.13	10.09%	-0.26%	2.22	-13.00%	-2.44%	-1.77%	2.56%
UK	97	-3.29%	-3.67%	48.50	-0.93%	-1.07%	2.00	-2.38%	-2.63%	0.68%	4.10%
Turkey	142	-7.44%	-1.63%	64.63	-2.95%	-0.51%	2.20	-4.62%	-1.12%	-2.29%	5.57%
Italy	108	-2.75%	-1.68%	53.67	4.02%	-0.53%	2.01	-6.50%	-1.16%	0.83%	3.67%
Mexico	211	6.94%	-0.35%	66.19	0.91%	-0.38%	3.18	5.97%	0.04%	10.21%	3.06%
Korea	239	-4.37%	-2.26%	48.75	-3.00%	-0.79%	4.91	-1.41%	-1.47%	-1.92%	2.56%
Canada	260	-1.20%	-1.77%	41.82	-0.05%	-0.27%	6.22	-1.15%	-1.50%	2.16%	3.40%
Saudi Arabia	337	-1.48%	0.06%	62.98	0.23%	-0.55%	5.35	-1.71%	0.61%	7.13%	8.74%
Australia	269	-2.17%	-2.15%	73.07	-2.82%	-0.57%	3.68	0.67%	-1.58%	1.37%	3.62%
Argentina	185	-1.78%	-0.35%	62.97	-0.27%	-0.11%	2.94	-1.51%	-0.24%	3.37%	5.24%
South Africa	479	-5.60%	-1.65%	94.73	-0.03%	-0.01%	5.06	-5.58%	-1.65%	-3.67%	2.04%

- Note that countries have been ordered in terms of percentage of global GDP, PPP (current international $).
- Numbers in the table are based on energy-related CO_2 emissions only and do not include other greenhouse gases including non-CO_2 energy-related emissions.

- No carbon sequestration is accounted for in the Net Zero Economy Index analysis. As a result, this data cannot be compared directly with national emissions inventories.

- The changes in carbon intensity figures reflect the movement of both country level GDP and energy-related CO_2 emissions.
- G7: Canada, France, Germany, Italy, Japan, the United Kingdom and the United States. E7: China, India, Brazil, Mexico, Russia, Indonesia and Turkey.

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