



Net Zero Economy Index 2021

Code Red To Go Green

Tracking the progress G20 countries have made to reduce energy-related CO₂ emissions and decarbonise their economies



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Foreword

Code red for humanity

The Intergovernmental Panel on Climate Change (IPCC) in their latest report issued a stark warning that there is more than a 50% chance that we will reach 1.5°C warming within the next two decades if emissions continue at their current rates. With every fraction of a degree of warming, the negative impacts of climate change increase exponentially and we move closer to breaching critical tipping points in the climate system. Even with the deployment of stringent emissions reductions measures, we have already locked in somewhere between 0.8-1.2°C of warming by mid-century. But there is hope. Scientists stress there is a narrow window to keep warming to 1.5°C and avoid catastrophic climate change if concerted action is taken now to halve global emissions by 2030 and reach net zero emissions by no later than 2050.

Largest ever mobilisation of state and non-state actors committing to net zero; but emissions gap remains

Over the last year, the private and public sectors moved to enhance ambition to act on climate change, with over two-thirds of global GDP now covered by a net zero target. But climate ambition is still falling short. Estimates for projected end of century warming vary depending on how ambition is defined and measured (e.g. some use Nationally Determined Contributions (NDCs) plus other announced policies and targets to estimate overall ambition), however, all projections point to a greater than 2°C temperature rise above pre-industrial levels by 2100. From these estimates, it is clear that current ambition is nowhere near enough to keep global warming to 2°C let alone 1.5°C. The UN Climate Summit – COP26 – in Glasgow this November has the herculean task of accelerating climate action to put us on a 1.5°C pathway.

This report estimates the rate of global decarbonisation needed to deliver a 1.5°C aligned net zero world by 2050. The analysis compares the current rates of decarbonisation of G20 member states – representing 80% of global GDP and around 75% of global emissions – against what the science tells us is required. The report also examines some of the recent climate policy announcements of the G20 and considers the potential for these to accelerate rates of decarbonisation and their implications for business.

The Net Zero Economy Index tracks the decarbonisation of energy-related CO₂ emissions worldwide. The analysis is underpinned by the bp Statistical Review of World Energy, which provides carbon emissions based on the consumption of oil, gas and coal for combustion-related activities. The analysis does not consider emissions from other sectors or other types of greenhouse gases (e.g. methane), and does not account for any carbon that is sequestered. As a result, it cannot be compared directly with national emissions inventories.



COVID-19 and climate change have exposed the systemic vulnerabilities of our economies and societies. As we tackle both threats concurrently, now is the moment to take deliberate, concerted, and timely action to build a cleaner, greener, fairer, healthier, more resilient global society. We have less than a decade to halve global emissions and put us on a net zero by mid-century trajectory.

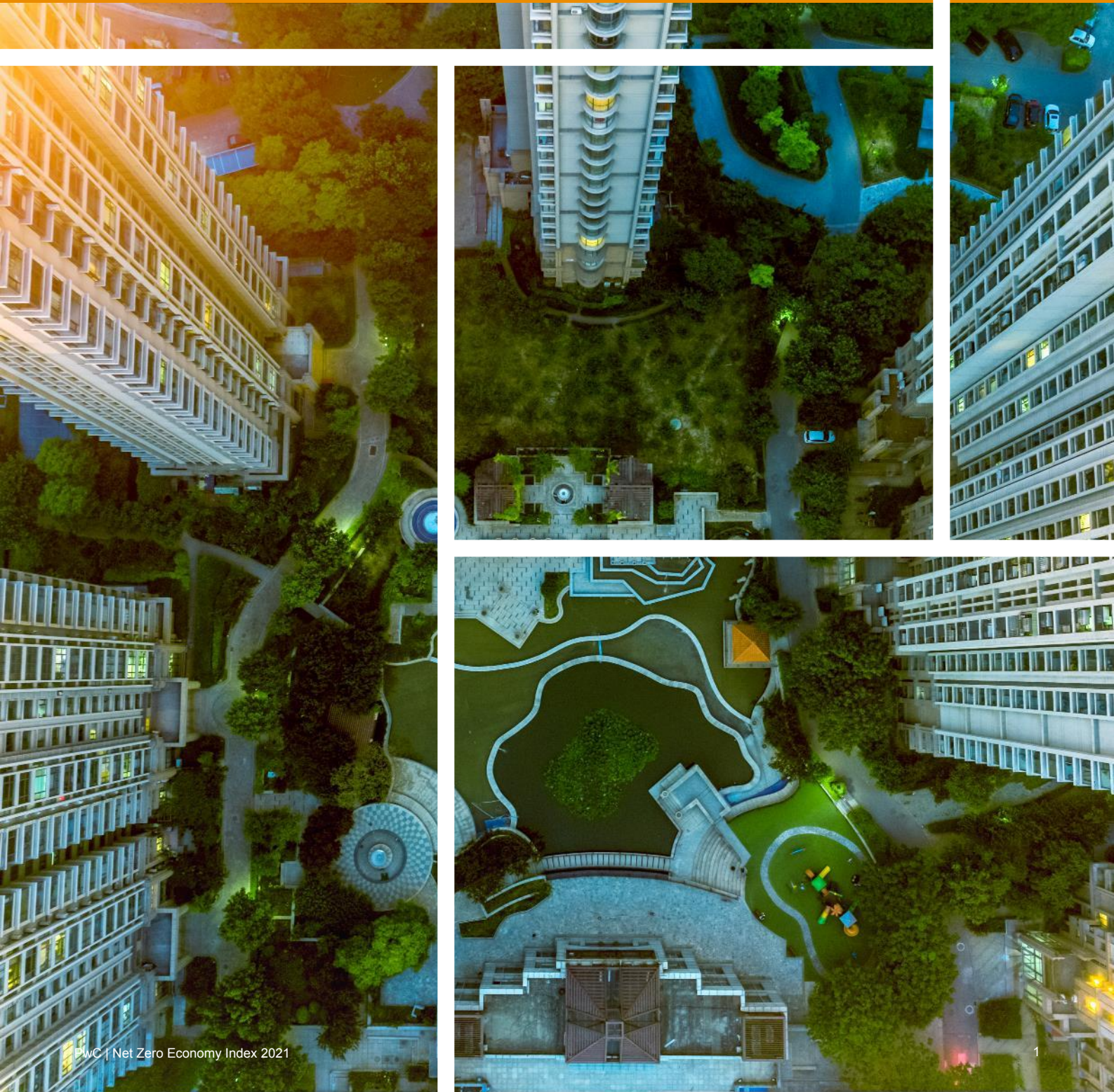
Ian P. Milborrow
PwC Sustainability and Climate Change
Partner



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The Global Picture



Global rate of decarbonisation needs to increase five-fold to keep 1.5°C within reach

The decarbonisation challenge gets progressively harder

In 2020 the rate of global decarbonisation – the reduction in carbon intensity or energy-related CO₂ emissions per dollar of GDP – was 2.5%. This rate represents a slight improvement from last year's rate of 2.4%, but is significantly lower than the annual global rate of decarbonisation of 12.9% now required to achieve the 1.5°C goal.

The average annual global rate of decarbonisation required to achieve the Paris Agreement goals is growing year on year. The rate required now is higher than the 11.7% set out in last year's report and more than eight times faster than the global average over the course of the 21st century.

Rebound not reduction through the pandemic

In the year where the global economy was heavily impacted by the COVID-19 pandemic, energy demand fell by 4.3%, leading to a reduction in energy-related emissions of 5.6% (from 2019 levels) and consequently a fall in total global emissions. There was a notable 4.6% reduction in coal consumption and 9.3% reduction in oil consumption in comparison to 2019.

Whilst the impact of COVID-19 continues to be felt across the world, many countries have lifted restrictions. Consequently, we are seeing a much needed resurgence in economic activity, but with this we are also seeing a rebound in emissions. The growth in emissions during 2021 has been driven by an increase in demand for coal in electricity generation in particular. Global energy demand is set to increase by 4.6% in 2021, led by emerging markets and developing economies.

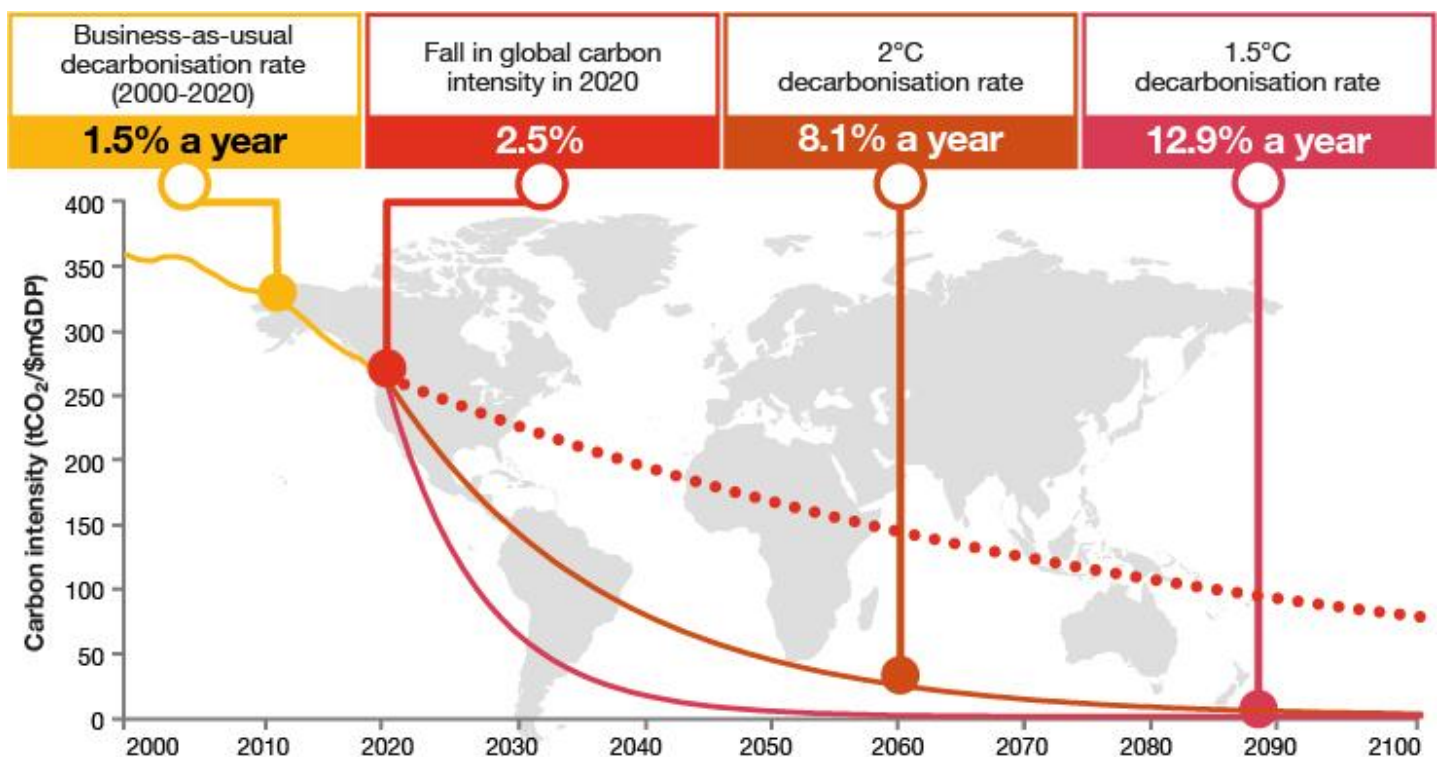


Figure 1: Net Zero Economy Index 2021

Global carbon budgets refer to the global estimated budget of fossil fuel emissions taken from the IPCC Special Report on Global Warming of 1.5°C. A series of assumptions underpin these carbon budgets, including the likelihood and uncertainties of staying within the temperature limits, and the use of carbon dioxide removal (CDR) technologies.

Sources: bp, World Bank, OECD, IPCC, PwC data and analytics.

Note: GDP is measured on a purchasing power parity (PPP) basis.

The Index 2021



Progress on decarbonisation varies across the G20

Key findings from our Net Zero Economy Index

The PwC Net Zero Economy Index tracks the rate of decarbonisation worldwide, with a focus on the G20, across energy-related CO₂ emissions. Mexico and Indonesia recorded the highest rates of decarbonisation at 12.4% and 10.6% respectively. This was largely driven by a reduction in energy-related emissions due to economic restrictions imposed in response to the pandemic. These results are expected to be an isolated occurrence rather than evidence of a longer-term trend as economic activity resumes, given that both countries have announced plans to invest in fossil fuel production in 2021.

Reductions in carbon intensity are insufficient across the G20

Despite the double digit rates of decarbonisation delivered in Mexico and Indonesia, none of the G20 are achieving the 12.9% average rate of decarbonisation required to limit warming to 1.5°C. Indeed, average decarbonisation rates have only narrowly improved since the adoption of the Paris Agreement in 2015.

The G20 needs to rapidly accelerate its rate of decarbonisation to put itself on a 1.5°C trajectory. This will require a complete transformation of energy systems, industries, economies and societies. Rates of decarbonisation will necessarily vary across the G20 as countries are at different stages of development and have very different socio-economic bases; however all need to commit and pursue greater ambition to bend the global emissions trajectory in this decisive decade.

Country	Change in carbon intensity 2019-20	Annual average change in carbon intensity 2000-2020	Annual average change in carbon intensity 2016-2020 (post-Paris Agreement)	Change in energy-related emissions 2019-20	Real GDP growth (PPP) 2019-20	Carbon intensity (tCO ₂ /\$m GDP) 2020
World	-2.5%	-1.5%	-2.3%	-5.6%	-3.3%	262
G7	-5.7%	-2.4%	-3.3%	-10.5%	-5.1%	202
E7	-0.8%	-1.6%	-2.4%	-2.2%	-1.5%	337
China	-1.0%	-2.8%	-3.6%	1.3%	2.3%	434
US	-7.2%	-2.8%	-3.6%	-10.4%	-3.5%	236
EU	-6.3%	-2.5%	-4.2%	-12.1%	-6.2%	140
India	1.6%	-1.4%	-1.2%	-6.5%	-8.0%	274
Japan	-3.5%	-1.5%	-3.0%	-8.2%	-4.8%	221
Germany	-5.7%	-2.6%	-5.3%	-10.3%	-4.9%	147
Russia	-4.0%	-2.7%	-1.9%	-6.8%	-3.0%	389
Indonesia	-10.6%	-1.5%	-1.1%	-12.5%	-2.1%	171
Brazil	-1.9%	-0.5%	-1.9%	-5.9%	-4.1%	145
France	-6.1%	-2.7%	-3.7%	-13.7%	-8.1%	95
UK	-6.5%	-3.9%	-4.9%	-15.7%	-9.8%	112
Italy	-3.8%	-1.9%	-2.3%	-12.3%	-8.9%	125
Mexico	-12.4%	-1.4%	-5.5%	-19.6%	-8.2%	154
Turkey	-5.8%	-1.6%	-3.3%	-4.1%	1.8%	162
Korea	-6.0%	-1.7%	-3.0%	-6.9%	-1.0%	341
Canada	-4.4%	-2.2%	-2.0%	-9.5%	-5.4%	321
Saudi Arabia	2.9%	1.0%	-0.6%	-1.3%	-4.1%	432
Australia	-6.9%	-2.5%	-3.7%	-7.2%	-0.3%	279
Argentina	2.8%	-0.3%	-1.4%	-7.4%	-9.9%	178
South Africa	0.9%	-1.4%	-1.1%	-6.1%	-7.0%	574

Table 1: Net Zero Economy Index 2021 – G20 performance across energy-related CO₂.

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 CO₂ emissions only and do not include other greenhouse gases including non-CO₂ energy-related emissions. At the time of publication only 2018 national inventory GHG emission data is available: https://di.unfccc.int/time_series.

The change in carbon intensity figures reflect the movement of both country level GDP and energy-related CO₂ emissions, and so it is possible for carbon intensity to increase overall if the size of the economy falls faster than the rate of emissions reductions. This was the case in India, South Africa, Argentina, and Saudi Arabia.

G7: Canada, France, Germany, Italy, Japan, the United Kingdom and the United States. E7: China, India, Brazil, Mexico, Russia, Indonesia and Turkey.

The Call to Action



COP26 needs to raise government ambition further

Our analysis reaffirms that all governments need to significantly increase their climate ambition if the world is to achieve the rates of decarbonisation required to limit warming to 1.5°C. Under the Paris Agreement, governments are required to submit enhanced climate commitments, known as Nationally Determined Contributions (NDCs), every five years. The delayed COP26 is the first real test of whether this ambition 'ratchet' mechanism can introduce the necessary momentum to spur meaningful decarbonisation.

Around 90 governments have submitted revised NDCs, but not all have increased their level of ambition. Current submitted NDCs, alongside legally binding net zero commitments, are estimated to result in 2.4°C of warming by the end of the century.

Given its share of GDP and emissions, the actions of the G20 will determine whether global goals are achieved or not. Strengthened 2030 climate targets and net zero pledges that have been announced by some G20 countries (but have not yet been formalised in NDCs or binding net zero targets) would lower estimated warming to 2.1°C by the end of the century if fully implemented. Whilst this is an important step in the right direction it still falls short of the ambition needed to meet the Paris Agreement 1.5°C temperature goal. If G20 member states alone were to submit and fully implement NDCs compatible with 1.5°C and net zero by mid-century, that would limit warming to 1.7°C by the end of the century.

Currently four countries within the G20 are yet to submit revised NDCs – China, India, Turkey, and Saudi Arabia. Others have submitted targets that are the same as, or even weaker than, their previous goals, including Mexico, Brazil and Australia.

The overarching aim of the forthcoming climate summit in Glasgow – COP26 – is to mobilise stronger and more ambitious climate action from governments to keep the 1.5°C Paris Agreement goal within reach. This will require a significant strengthening of climate commitments from all countries, and especially from the G20, as without concerted action from this group the chances of limiting warming to 2°C, let alone 1.5°C, will all but disappear.

NDCs signal the strength and urgency with which governments are responding to the climate emergency and pursuing the transition to a net zero world. However, governments also need to reform and enact the necessary policies to set a clear long term strategy for achieving these emissions reductions, whilst ensuring they are delivering a fair and equitable transition for all. And just as consumer pressure impacts on businesses, so does the pressure of the electorate on governments. As shown in a recent [UK study](#), citizens are increasingly supportive of strong climate action. Governments will need to balance the demands of their citizens to do more on climate change with the needs of those who will be impacted the most.



Short term shock versus long term ambition

The journey towards long term goals will inevitably include short term shocks that governments will need to navigate. In 2020, the pandemic exposed systemic vulnerabilities across our economies and societies, and invariably required governments to take immediate and necessary action to limit the potential impact. In [last year's NZEI report](#) we asked if 2020 would be an inflection point that provides the opportunity for businesses and governments to reset and invest for the long-term goal of net zero emissions. Here we consider the stimulus packages of some G20 member states and their implications for the transition to net zero.

Some stimulus packages have included innovative measures to support a greener recovery

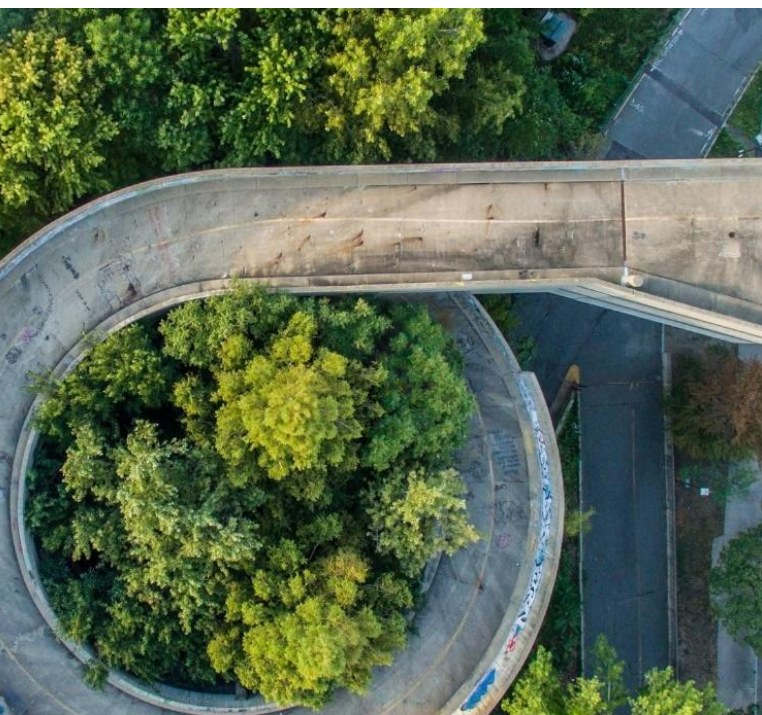
COVID-19 is one of the biggest challenges governments have faced and the unprecedented levels of spending that have ensued are testament to the pandemic's reach across every sector of society and the economy worldwide. While governments have necessarily prioritised protecting economies, jobs and livelihoods alongside health, their recovery spending presented a unique opportunity to also spur the transition to net zero and build the resilience of society and economies to prevailing systemic shocks and vulnerabilities.

According to a [recent report](#), 28% of the \$17.2 trillion of fiscal policies spending announced by the largest 30 economies in 2020/21 went to environmentally relevant stimulus. This included energy efficiency measures such as retrofitting housing, energy infrastructure, [low-carbon energy and heating solutions](#), and e-mobility, particularly electric vehicles. Such investments can provide a short term boost to the economy whilst also delivering new jobs, greater energy access, economic growth, and emissions reductions over the longer term. Examples of green stimulus measures include:

- Canada's "[Healthy Environment and Healthy Economy Plan](#)" – their first national infrastructure assessment to aid in planning towards a net zero future.
- UK's "[Ten Point Plan for a Green Industrial Revolution](#)" - £12bn of investment focussed on energy, transport and EVs.
- South Korea's "[New Plan](#)" – including objectives to facilitate a low-carbon and decentralised energy supply using advanced smart meters and reducing the reliance of island regions on diesel-powered generators.
- The EU's 'Connecting Europe Facility' – dedicated nearly €1 billion of its stimulus package to [ten major energy infrastructure projects](#) across the continent.
- [France](#), [Germany](#) and [Turkey](#) have all included measures to cut emissions in the automotive sectors.

However, several countries also continue to invest in fossil fuels and carbon-intensive industries

Almost half of the G20's [financial support](#) for the energy sector (representing some \$296 billion) was allocated to support the continued production and consumption of fossil fuels over the same period. [15 of the G20's stimulus packages are reported to have a net negative environmental impact](#) by supporting carbon-intensive industries without associated conditions to deliver emissions reductions over time, or investing in new unabated fossil fuel production and strategies reliant on [increased coal consumption](#). Whilst some subsidies are necessary to ensure energy access for the most vulnerable groups across society and to deliver a just transition, it is widely held that the failure to eliminate fossil fuel subsidies is holding back progress at a time when rapid emissions cuts are urgently required.



Converting climate pledges into action

Policy breakthroughs are essential across all sectors of the economy, with effective implementation, clear milestones and accountability

Governments have a pivotal role to play in creating the enabling environment for the transition to net zero through policy and regulatory reform and investment. National targets need to be underpinned by policies that will deliver change at the pace and scale required. These policies will vary by nation, depending on the socio-political and economic context, but need to set the regulatory environment that businesses and individuals operate within, and encourage capital to be deployed to the right places. This requires clear overarching strategy and ambition, long-dated policy mechanisms and the removal of fiscal or other disincentives.

Table 2 outlines some of the key climate policies and commitments of the G20. It is not an exhaustive list, but these are beacons that signify positive change, as explained below:

- A significant step to helping achieve net zero by 2050 is the phasing out of coal from a nation's energy mix. This is a central milestone to achieving net zero by 2050 and reducing energy-related emissions according to the IEA, with a need to end the approval for development of any new unabated coal plants from this year onwards. Coal phase out is a contested issue, with some G20 countries pushing for phase out by 2025, whereas for others it continues to be a major part of their power sector energy mix and wider energy plans. For these states, ensuring a just transition in tandem with coal phase out will be key.
- Economic levers are another method by which a nation can reach net zero. Carbon pricing is widely agreed by economists to be the most effective way for a country to reduce their emissions. The IMF estimates that setting fossil fuel prices that reflect their true cost – which is currently not the case – would cut global CO₂ emissions by over a third. Over half of the G20 nations have a form of carbon pricing in place at the national level, be this a carbon tax or an emissions trading scheme (ETS), and other countries are likely to follow suit. Notably, China's National ETS became operational earlier this year. It is estimated that 21.5% of global emissions are currently covered by carbon pricing initiatives implemented or scheduled to be implemented. There is an expectation that carbon pricing will be increasingly used to deliver carbon reductions, with this ultimately flowing down to businesses.

- Transport comprises 24% of global GHG emissions, making the mass-market adoption of alternative fuel vehicles a key focus area for economies around the world. The transition to electric vehicles (EVs) is a key policy focus of many of the G20 nations, with targets set on the proportion of EVs on the roads, the development of EV infrastructure, or the phase out of internal combustion engine (ICE) vehicles, often using a combination of policy instruments.
- Renewable energy targets, backed up by policy enablers to catalyse investment, are crucial to decarbonising economies. Whilst grid-based renewables have advanced significantly over the past 20 years, governments are now focused on advanced energy storage solutions and the hydrogen economy.

In addition to having sufficient visibility of the regulatory landscape, businesses and investors also need to understand the specific risks and opportunities presented by the climate challenge. The Task Force on Climate-related Financial Disclosures (TCFD) offers such a framework. Whilst originally conceived as a voluntary initiative, the approach has gained widespread acceptance and is now mandatory in certain countries such as the UK. Most recently, it was adopted by the G7 and other countries are expected to follow this lead at the forthcoming meeting of the G20 and at COP26.

TCFD serves to better align the disclosure of climate information with more mainstream business risk disclosures, providing signals that should facilitate more efficient pricing of business risks and better deployment of capital towards decarbonisation efforts. It is, therefore, a highly important step in shaping market maturity around climate change with implications for both business and society.



Selected climate policies of the G20

Country	Updated NDCs ^a	Net zero (NZ) commitment ^b	Phase out of coal ^c	Carbon pricing ^d	Electric vehicle (EV) target ^e
China		2060 [†]		✓	✓ [§]
US	✓	✓ [†]			✓
EU	✓	✓		✓	✓
India					✓ [§]
Japan	✓	✓		✓	✓ [§]
Germany	✓	2045	2038	✓	✓ [§]
Russia	✓*				✓
Indonesia	✓*	2060 [†]	2055 [‡]		✓
Brazil	✓*	✓ [†]			
France	✓	✓	2022	✓	✓ [§]
UK	✓	✓	2024	✓	✓ [§]
Italy	✓	✓ [†]	2025	✓	✓
Mexico	✓*			✓	
Turkey		2053 [†]			
Korea	✓*	✓		✓	✓
Canada	✓	✓	2030	✓	✓ [§]
Saudi Arabia			n/a		
Australia	✓*				
Argentina	✓	✓ [†]		✓	
South Africa	✓	✓ [†]		✓	

Table 2: Selected climate policies of the G20.

The data in this table is accurate as of 30th September 2021. This does not mean the data coverage goes up to and includes 30th September 2021 in all cases due to the availability of data on certain categories in the table or from certain nations in the G20. NDC data is correct as of 12th October 2021.

The methodology adopted focuses on a selection of policy areas, with primary focus on decarbonisation of the energy system. We acknowledge that there are other policy measures such as strategies for ecosystems/forests, energy efficiency, and renewables, etc. that will also make a positive contribution to tackling climate change.

^a **Updated NDCs:** Nations that have either updated their first NDC, or submitted a second NDC. Nations denoted with a “✓*” submitted an updated submission, but did not increase their ambition from their first submission. In order to increase the ambition of NDCs over time, parties were asked to submit their next round of NDCs (either new or updated NDCs) by 2020, and every five years from then onwards. Sources: [UNFCCC](#), [Climate Action Tracker](#)

^b **Net zero (NZ) commitment:** NZ commitment enshrined in law, target is for 2050 unless otherwise stated, any nation denoted with a “✓[†]” has a net zero target that is either proposed legislation or is currently in a policy document. Sources: [Energy & Climate Intelligence Unit](#), [Visual Capitalist](#)

^c **Phase out of coal:** Commitment to phase out coal consumption in the energy sector. Indonesia’s (‡) state-owned utility says it will phase out coal-fired power plants by 2055, at the same time as building new coal-fired power plants with an operating life until 2065. All data is based on the Europe Beyond Coal report and the Government of Canada website and is supplemented by subsequent announcements where further data is available up to 30th September 2021. Saudi Arabia (n/a) is denoted as such due to coal not playing a significant role in its energy mix. Sources: [Europe Beyond Coal](#), [Government of Canada](#)

^d **Carbon pricing:** Either a carbon tax or emissions trading scheme (ETS) in place at the national level. Carbon pricing is a mechanism to put a financial value to the emission of greenhouse gases. There are two main methods of doing this; an ETS, where emissions can be traded to meet emissions targets, and carbon taxes which directly set a price for carbon by quantifying a tax rate for greenhouse gas emissions. Italy does not have its own carbon pricing scheme, but is included in the EU ETS. Source: [World Bank](#)

^e **Electric vehicle (EV) target:** An EV target relates to a national-level ambition targeting the amount of EV stock, the proportion of EV sales in the country by a given year, the proportion of EV vehicles on the road by a given year, and/or the phase out of internal combustion engine (ICE) vehicles. The aims included in this analysis include legislative measures, targets as part of legislation, ambitions, and government proposals. Nations denoted with an “✓[§]” are signatories of EV30@30. All data is based on the IEA’s ‘Global EV Policy Explorer’ report and is supplemented by subsequent announcements where further data is available up to 30th September 2021. Source: [IEA](#)

Private sector focus on net zero shifts from ambition to execution

To close the decarbonisation and emissions gap we need all actors in the economy to raise their game. Businesses and investors have the resources, innovation capacity, and wide-reach needed to decarbonise at speed and at scale. The private sector is responding to the direction of travel set by governments; with companies and institutions increasingly pursuing more aggressive emissions reductions.

The race to net zero is on

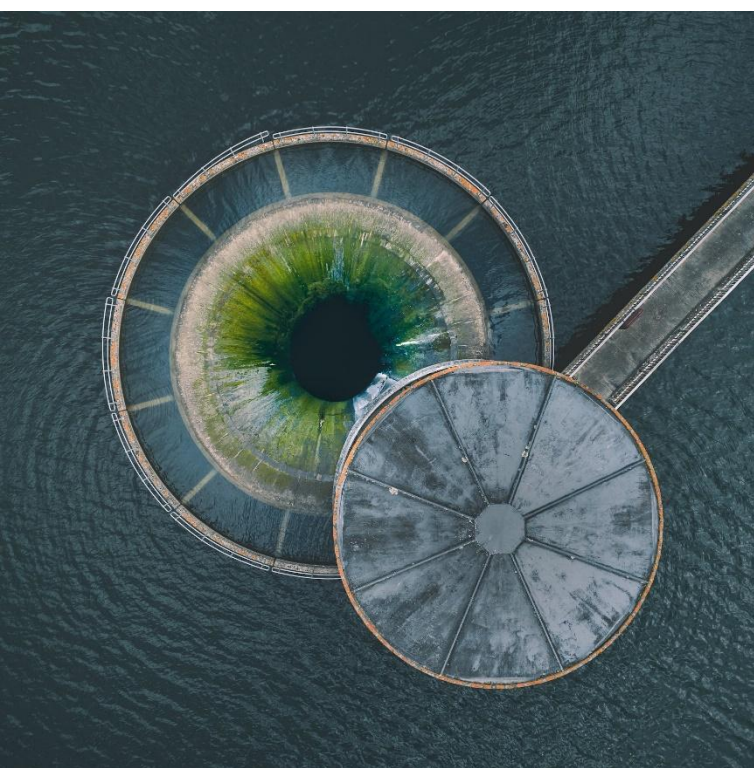
We have seen an unprecedented number of net zero commitments by the private sector in the last 18 months. Over 3,000 businesses are now part of the [Race To Zero](#) Campaign, joining 733 cities, 31 regions, 173 of the biggest investors, and 622 Higher Education Institutions. Alongside 120 countries, they form the [largest ever alliance](#) committed to achieving net zero emissions by 2050 at the latest, collectively making up [nearly 25% global CO₂ emissions and over 50% GDP](#). More than 1,500 companies have set science-based targets aligned with 1.5°C through the [Science-based Targets Initiative](#); and financial institutions are starting to align their investment portfolios with net zero by 2050. The [Net Zero Asset Managers Initiative](#) has over 120 signatories with \$43 trillion in assets, while the [Glasgow Financial Alliance for Net Zero](#) has brought together over 250 firms representing in excess of \$88 trillion in assets under management to accelerate the net zero transition.

A critical mass of businesses are committing to net zero

Over half the sectors that make up the global economy have committed to halve their emissions within the next decade and achieve near-term emissions reduction targets. In each of these sectors, at least 20% of the major companies by revenue are aligning around sector-specific 2030 goals – in line with delivering net-zero emissions by 2050 (Figure 2). This means sufficient momentum has been generated among a critical mass of key actors, enabling them to break away from the business-as-usual path and together deliver breakthrough climate outcomes at pace. We are already seeing the race to decarbonise in action across the automobile industry, for example, with manufacturers competing against one another to be the first to phase out sales of ICE vehicles. The level of ambition and actions taken by individual businesses as part of these sectoral shifts will also have a ripple effect across supply chains, ultimately extending the reach of impact, and encouraging others to act.

Greater public-private sector collaboration will be key

Halving emissions this decade and delivering net zero by the middle of the century will require collaboration between sectors and across industries. Indeed businesses are calling on governments, especially those of the [G7](#) and [G20](#), to set “bold and courageous commitments, policies and actions” to accelerate the transition and stimulate further action from the private sector, emphasising that public-private collaboration is vital and welcoming transformative policy change. Examples of such collaborations include The [LEAF Coalition](#) launched by the UK, US and Norway with a number of private sector partnerships including Amazon, Unilever and PwC, which is mobilizing at least \$1 billion in financing to protect tropical forests; the Cleaner Skies for Tomorrow Coalition supporting the transition of the aviation sector to sustainable aviation fuels; and The Rockefeller Foundation’s collaboration with the African Development Bank, CDC Group (the UK’s development finance institution), European Investment Bank, International Energy Agency, International Renewable Energy Agency (IRENA), UNDP and USAID to improve energy access for 1 billion people from developing countries.



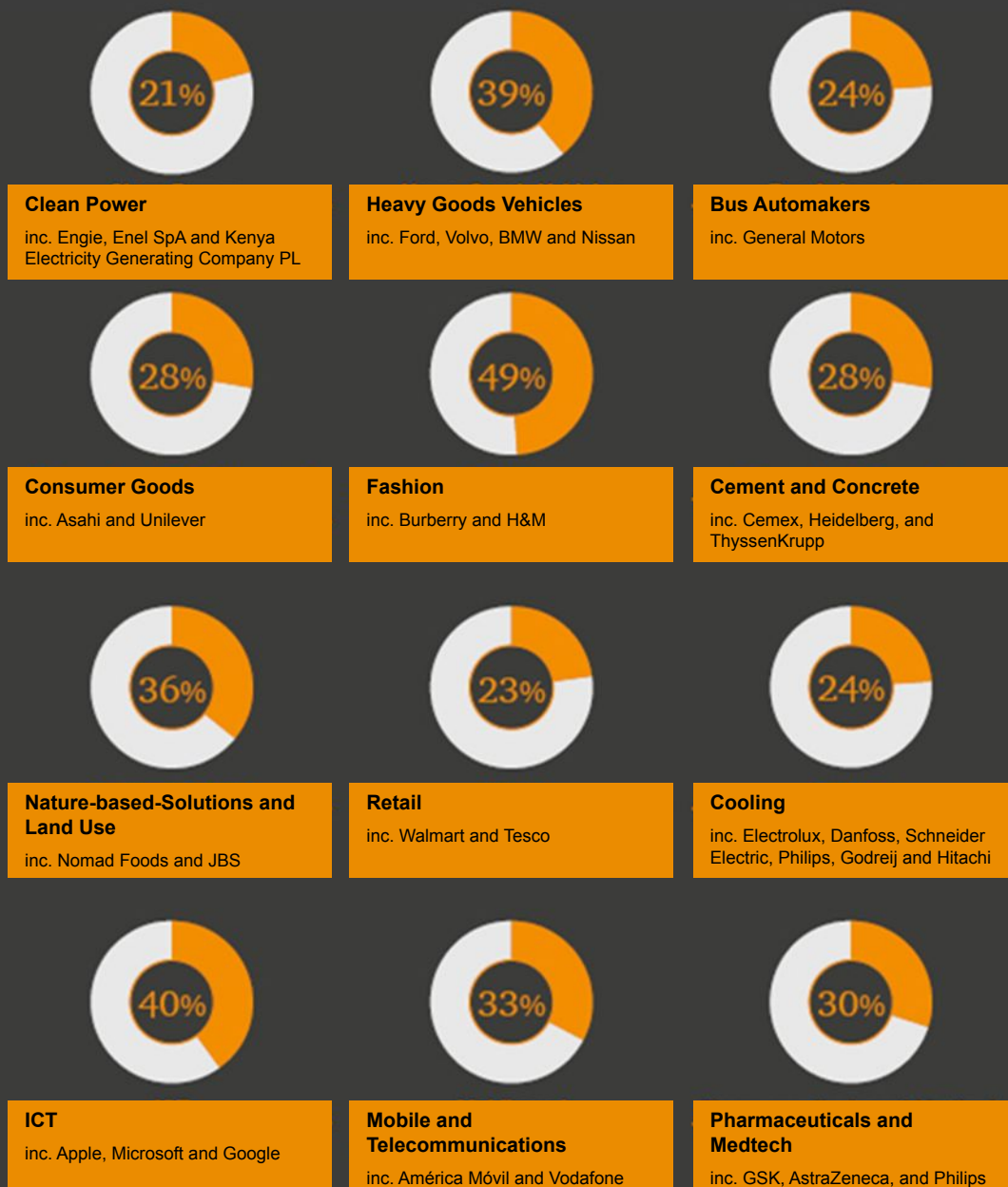
Race to Zero sector breakthroughs

Figure 2: Race to Zero sector breakthroughs.

The data in this graphic is accurate as of 20th September 2021. Data source is [Race to Zero](#).

Stated percentages represent major industry actors by total industry revenue who have joined the Race to Zero campaign, with the following additional notes:

- The major heavy goods vehicles manufacturers included in the 'Heavy Goods Vehicles' statistic (39%) have also committed to 100% zero emission sales by 2040 (via RouteZero).
- The major bus automakers included in the 'Bus Automakers' statistic (24%) have also committed to 100% zero emission bus sales by 2030 (via RouteZero).
- The major food suppliers included in the 'Nature-based-Solutions and Land Use' statistic (28%) have also committed to implement deforestation free supply chains as part of the transition to halting land conversion, as well as to fully adopt regenerative agriculture and land restoration practices by 2030.



Time for all businesses to commit, plan and act

Although there is a huge uptick in momentum across the private sector, not all businesses are on board yet, and progress needs to happen at a much more accelerated pace. All businesses need to respond – and quickly – if we are to halve emissions before the end of this decade. We have less than two business cycles left to deliver the necessary changes.

The pressure for businesses to act will continue to intensify. This pressure will not only come from the global regulatory environment – where we can expect mandatory climate reporting to cover more sectors and issues, and market instruments like carbon pricing and trading to be deployed more widely – but also pressure from across value chains, investors and increasingly climate-aware consumers. The business case for transformation is proven: the net zero transition provides an opportunity to pivot business to create sustainable value. The organisations that get it right will not just thrive today – they will be resilient well into the future. Leading businesses of the future will act with purpose and deliver a broad set of value outcomes to customers, employees and shareholders.

This means understanding and managing business risks associated with climate change, and moving with the tide of new opportunities. Climate technology is fast becoming a standout investment opportunity. [PwC's State of Climate Tech report \(2020\)](#) finds that annual venture capital funding has increased by more than 3750% over the 7-year period 2013-2019. Major firms have pledged billions of dollars to climate technology, including Amazon's \$2 billion 'Climate Pledge Fund', Microsoft's \$1 billion 'Climate Innovation Fund', and Unilever's €1 billion 'Climate & Nature Fund'. Investment in energy solutions, such as batteries for energy storage, micro-mobility, and carbon capture, utilisation, and storage (CCUS) are all reaching record levels and will continue to grow. All of this, and more, signals a wave of new business opportunities, and the creation of new green jobs and skills that will enable the world to make a just transition to net zero. [Estimates](#) suggest that around 20 million new green jobs could be created worldwide.

Making such fundamental changes is big and complex. But fortunately, this is not all new ground. Some businesses have been leading the way and there is a lot to learn and build on as we move forward.

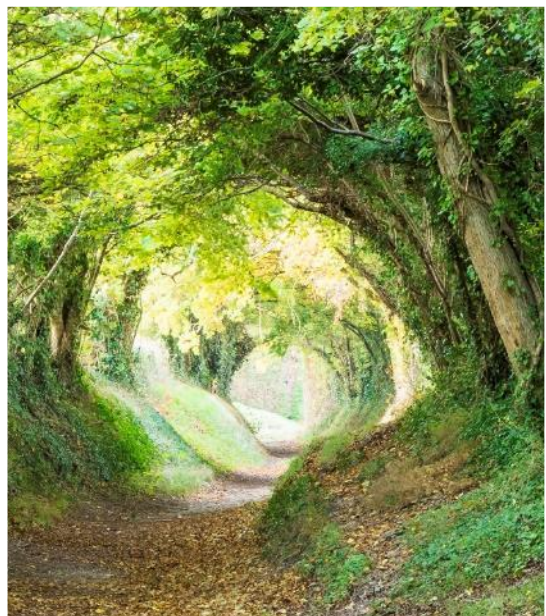
[The PwC Building Blocks for Net Zero Transformation](#) report, commissioned by Microsoft, provides a practical guide for functional heads across a business to embed the necessary actions to achieve net zero business transformation. These include:

- Setting a science-based target to achieve net zero emissions across the value chain by no later than 2050;
- Embedding net zero emissions within the broader company strategy;
- Assessing and disclosing climate-related risks and opportunities in alignment with the TCFD;
- Investing in reskilling and upskilling employees to deliver a just transition;
- Considering the impacts associated with carbon pricing, trading and taxes, including carbon border adjustment taxes;
- Investing in R&D and innovation in new technologies to help to deliver net zero.

There are also a number of initiatives that can support companies. The World Business Council for Sustainable Development (WBCSD) is supporting companies from all sectors to stay within the 1.5°C safe operating space as part of its [SOS 1.5 initiative](#), for example. This initiative provides support for companies to match their climate ambition with robust strategy and implementation guidance for net zero systems transformation. The [Mission Possible Partnership](#) is an alliance of private and public partners focused on accelerating decarbonisation across the entire value chain of the world's highest-emitting industries and mobility sectors.

Making the transition to a more environmentally and socially responsible world is now an urgent business imperative. Working alongside governments, and providing the mandate and impetus for them to go further and faster, is vital if we are to keep warming to 1.5°C and avoid catastrophic climate change. By taking firm and decisive action now to halve global emissions by 2030 and reach net zero emissions by no later than 2050, we have a chance to succeed.

Methodology



Methodology

The Net Zero Economy Index tracks the decarbonisation of energy-related CO₂ emissions worldwide. The analysis is underpinned by the bp Statistical Review of World Energy, which reflects carbon emissions based on the consumption of oil, gas and coal for combustion-related activities. The analysis does not consider emissions from other sectors (e.g. AFOLU) or from any other greenhouse gases, and does not allow for any carbon that is sequestered. As a result, this data cannot be compared directly with national emissions inventories.

The purpose of our model is to calculate carbon intensity (tCO₂/\$m GDP) for different countries and the world, and the rate of carbon intensity change needed in the future to limit warming to 1.5°C and 2°C by 2100.

The countries the study focuses on are individual G20 economies, as well as world totals. The G20 is also 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).

For GDP data, the study draws on World Bank historical data. For long-term GDP projections the study draws on the latest version of PwC's 'World in 2050' model. This was last published in February 2017 and details and a methodology summary can be found here: <http://www.pwc.com/world2050>. In 2021 we used near-term economic forecasts from the OECD to account for the impact of the COVID-19 pandemic on GDP in 2021 and 2022.

For emissions, the study considers energy-related CO₂ emissions drawn from the bp Statistical Review (2021). We use the Intergovernmental Panel on Climate Change global estimated carbon budget data on fossil fuel emissions taken from the IPCC Special Report on Global Warming of 1.5°C, to estimate the energy-related CO₂ emissions associated with limiting warming to 1.5°C and 2°C by 2100.

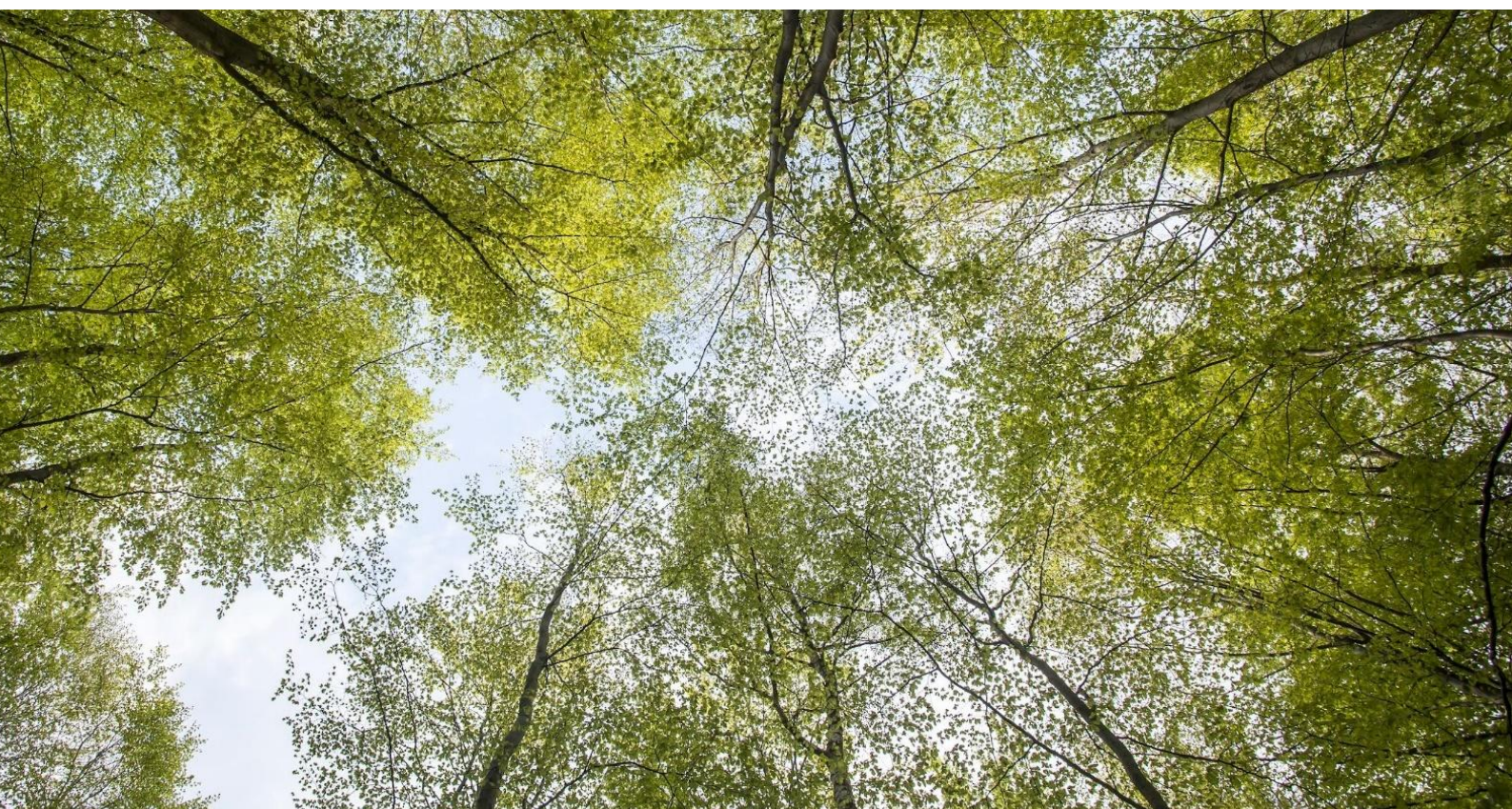


Glossary

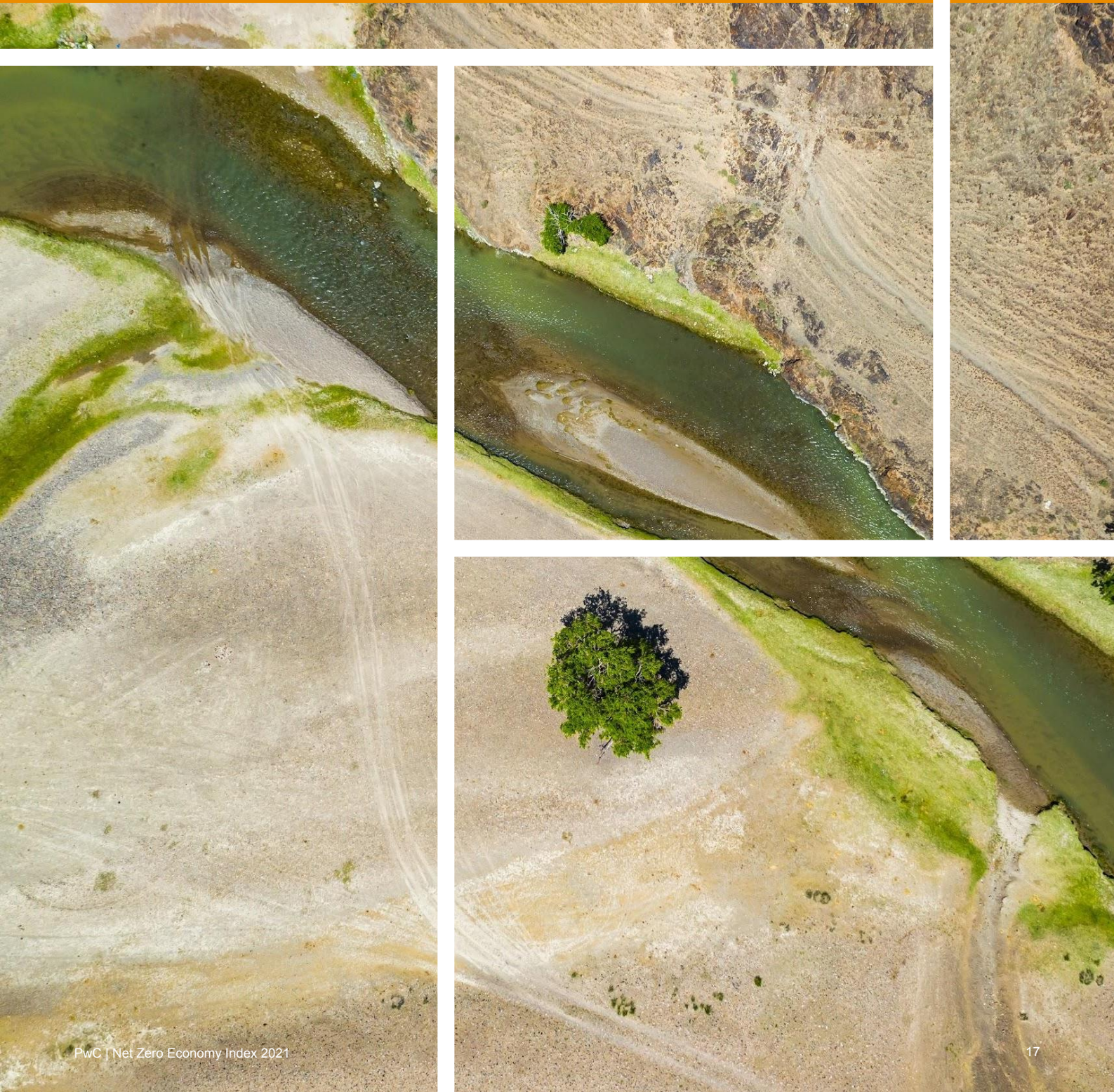
- **AFOLU:** Agriculture, Forestry, and Other Land Use – anthropogenic GHG emissions from two sectors, agriculture and LULUCF.
- **Carbon intensity:** Energy-related CO₂ emissions per dollar of GDP.
- **Carbon leakage:** Businesses transferring production to other countries with more lax emissions constraints, to reduce costs related to climate policies. This can lead to an increase in their total emissions.
- **Carbon pricing:** An instrument to capture the monetary costs of GHG emissions and link them to their sources, usually through placing a price on the carbon dioxide emitted.
- **CCUS:** Carbon capture, utilisation and storage.
- **COP26:** The 197 countries that have ratified the Convention are called 'Parties to the Convention'. The Treaty entered into force in 1994 and the first Conference of the Parties (COP) to the Convention was in 1995. COP has been held every year (excluding 2020) since 1995 in a different country. The COP is the supreme decision-making body of the UNFCCC. COPs are attended by countries engaged in formal climate negotiations, as well as non-state actors e.g. business and civil society. The 26th COP will be held in Glasgow in November 2021.
- **Decarbonisation:** The process of reducing or removing the carbon dioxide output of a country's economy.
- **E7:** The seven countries China, India, Brazil, Mexico, Russia, Indonesia and Turkey grouped together because of their major emerging economies.
- **Emissions trading scheme (ETS):** A government sets a cap across given sectors on the permitted levels of emissions, issuing permits for each unit of emissions allowed under the cap. Firms subject to this cap can then trade permits based on how many they need to cover their emissions, or reduce their emissions to lessen their need to trade permits with other firms.
- **Fossil fuel subsidy:** A government action to lower the cost of fossil fuel energy production, reduce the price paid by energy consumers, or increase the price received by energy producers.
- **G7:** The Group of Seven consists of Canada, France, Germany, Italy, Japan, the UK and the US, along with the EU and is made up of the world's most advanced economies.
- **G20:** An intergovernmental forum consisting of 19 countries and the EU.
- **GHG emissions:** Greenhouse gas emissions are both natural and anthropogenic emissions that contribute to the 'greenhouse effect', such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases.
- **Glasgow Financial Alliance for Net Zero (GFANZ):** It brings together over 250 firms representing in excess of \$88 trillion AUM, providing a forum for leading net zero initiatives from across the financial system to accelerate the transition to a net zero economy by 2050.
- **IPCC:** Intergovernmental Panel on Climate Change – a UN body dedicated to furthering knowledge on human-induced climate change.
- **Just transition:** This aims to ensure that the economic benefits of a transition to a green economy are shared widely, and that those who stand to lose out economically from this transition are supported financially.
- **LEAF Coalition:** The Lowering Emission by Accelerating Forest finance (LEAF) Coalition aims to mobilise \$1 billion to protect tropical forests, making it one of the largest ever public-private efforts of this type.
- **LULUCF:** Land Use, Land Use Change and Forestry – anthropogenic GHG emissions resulting from direct human-induced land use changes such as settlements and commercial uses and forestry activities.

Glossary

- **NDC:** Nationally Determined Contributions – they capture the efforts of a country to reduce national emissions and adapt to the impacts of climate change and are important commitments required under the Paris Agreement.
- **Net zero:** This refers to achieving a balance between the emissions released into the atmosphere and the emissions removed from the atmosphere. When this balance is achieved, or there is a deficit of emissions released into the atmosphere, net zero has been achieved.
- **Net Zero Asset Managers Initiative:** An international group of asset managers committed to supporting the goal of net zero by 2050.
- **OECD:** Organisation for Economic Co-operation and Development – an intergovernmental organisation aiming to stimulate economic growth and world trade.
- **Paris Agreement:** Legally binding international climate change agreement, adopted by 196 countries in December 2015 at COP21, entering into force in November 2016. Its goal is to limit global warming to well below 2°C, preferably to 1.5°C, above pre-industrial levels.
- **Race to Zero:** A global campaign to gain support from businesses, cities, regions, and investors for a zero carbon recovery that prevents future threats and promotes sustainable growth.
- **TCFD:** The Task Force on Climate-related Financial Disclosures was created in 2015 by the Financial Stability Board, with the aim of increasing and improving the reporting of climate-related financial disclosures.
- **Unabated fossil fuel production:** Fossil fuel production without CCUS technology equipment to offset the carbon emissions of the fossil fuel production.
- **UNFCCC:** The United Nations Framework Convention on Climate change is an international treaty that was adopted in 1992 during the ‘Earth Summit’ in Rio de Janeiro. UNFCCC’s aim is to prevent ‘dangerous’ human interference with the climate system.



Authors and Acknowledgements



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Ian P. Milborrow

Partner, Sustainability & Climate Change,
PwC United Kingdom
milborrow.p.ian@pwc.com



Kiran Sura

Assistant Director, Sustainability & Climate Change,
PwC United Kingdom
kiran.sura@pwc.com



Claire Monkhouse

Assistant Director, Sustainability & Climate Change,
PwC United Kingdom
claire.m.monkhouse@pwc.com



Matt Gilbert

Senior Associate, Sustainability & Climate Change,
PwC United Kingdom
matt.gilbert@pwc.com



Josh Huntley

Associate, Sustainability & Climate Change,
PwC United Kingdom
joshua.huntley@pwc.com

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