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Is Paris possible?

The Low Carbon Economy Index 2017

Tracking the progress G20 countries have made to decarbonise their economies. #LCEI

pwc

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Is Paris possible?

Not at this rate

In 2016, global GDP growth was 3.1% but emissions showed signs of stabilising, growing by only 0.4%. This means carbon intensity – emissions per dollar of GDP – fell by 2.6% in 2016. Carbon intensity has fallen at approximately this rate since 2014 – a clear step change from the historical rate. While the recent decarbonisation rate is nearly double the average since 2000, it falls just short of the 3% average decarbonisation rate required to achieve the national targets pledged in the 2015 Paris Agreement.

More importantly, this rate is less than half of the 6.3% decarbonisation rate needed to limit global warming to well below two degrees – the main objective of the Paris Agreement.

Some countries are leading the pack

There are signs that some countries are sustaining a low carbon transition. The leaders in our Index – UK, China, Mexico and Australia – all reduced emissions while growing their economies. In the UK and China this is particularly driven by policies to reduce coal consumption.

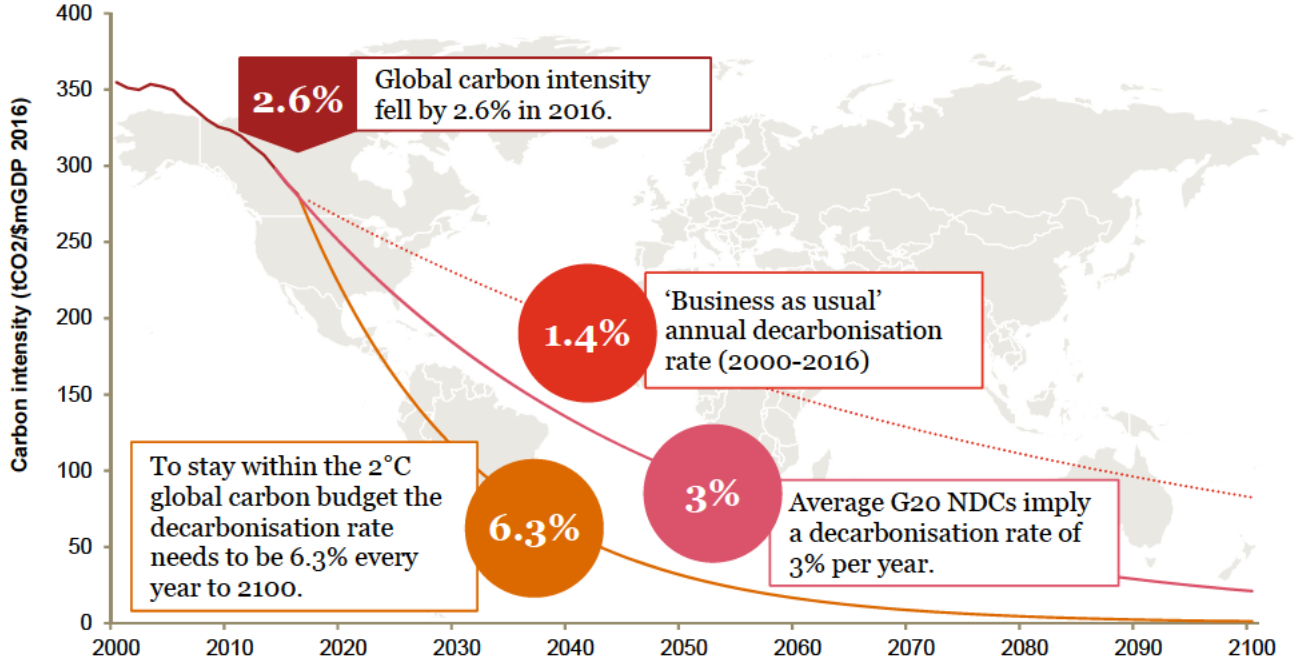
But progress is inconsistent

Although countries such as the UK and China substantially reduced their use of coal, this was offset by increases in coal demand in India, Indonesia and Turkey. As a result, coal consumption, which provides one third of the world's energy, fell modestly by 1.4%. Demand for gas and oil both continued to grow by 1.8% in 2016. Solar and wind output grew at 30.0% and 15.9% respectively last year, but these still only account for a small share of the global energy system.

Paris is only possible with accelerated action

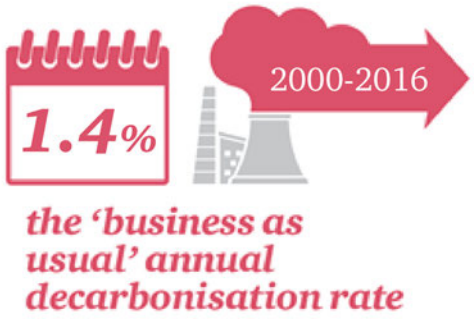
In future we project global average economic growth of 2.1%, so carbon emissions need to fall by over 4% every year on average to hit the two degrees target. The considerable gaps between current progress, the Paris Agreement's national targets and the global two degrees goal highlight the risks to business and society.

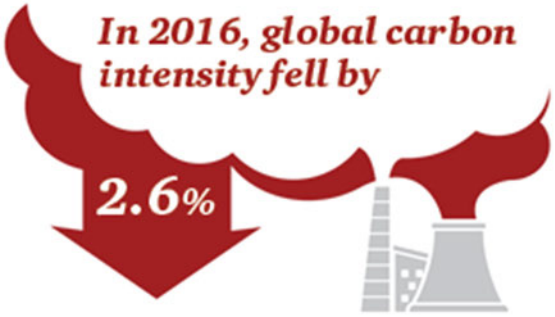
Figure 1:
Low Carbon Economy Index 2017: Transition pathways

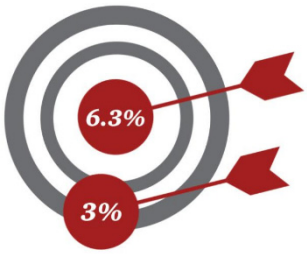


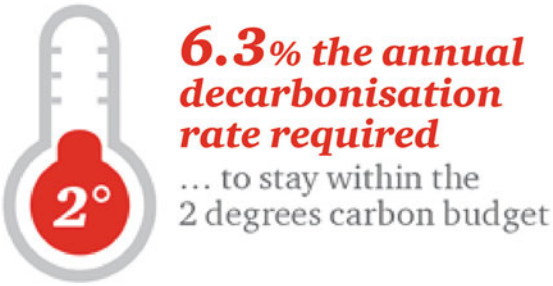
***Sources**: BP, Energy Information Agency, World Bank, IMF, UNFCCC, National Government Agencies, PwC data and analysis.*

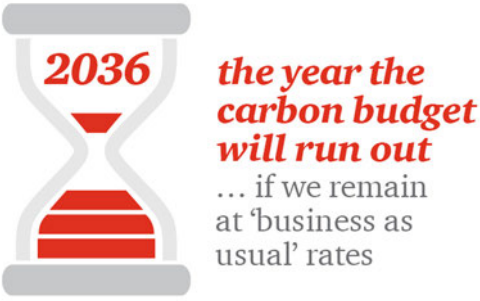
***Notes**: GDP is measured on a purchasing power parity (PPP) basis. The NDC pathway is an estimate of the decarbonisation rate needed to achieve the targets released by G20 countries. NDCs only cover the period to 2030, we extrapolate the trend in decarbonisation needed to meet the targets to 2100 for comparison.*


2000-2016
1.4%
the 'business as usual' annual decarbonisation rate


In 2016, global carbon intensity fell by
2.6%


6.3%
3%
Decarbonisation rate needed for 2°C
vs. National targets set in Paris


2°
6.3% the annual decarbonisation rate required
… to stay within the 2 degrees carbon budget


2036
the year the carbon budget will run out
… if we remain at 'business as usual' rates


3.1%
global GDP growth in 2016

The Index

Our Low Carbon Economy Index tracks the rate of the low carbon transition in each of the G20 economies and compares this with their national targets.

Top performers in 2016 are the UK and China, who reduced their carbon intensities by 7.7% and 6.5%. Both exceeded their NDC targets and the annual global decarbonisation rate required to limit warming to two degrees. However, these countries are the exceptions rather than the rule – the rest of the G20 didn't do so well.

Table 1:
Low Carbon Economy Index 2017 – country summary

Country	Change in carbon intensity 2015–16	Paris target annual change in carbon intensity 2015–2030	Annual average change in carbon intensity 2000–2016	Change in energy related emissions 2015-2016	Real GDP growth (PPP) 2015-2016	Carbon intensity (tCO2/$m GDP) 2016
World	-2.6%	-3.0%	-1.4%	0.4%	3.1%	281
G7	-2.9%	-3.6%	-2.2%	-1.4%	1.5%	237
E7	-4.2%	-1.7%	-1.6%	0.5%	4.9%	337
UK	-7.7%	-3.2%	-3.7%	-6.0%	1.8%	142
China	-6.5%	-3.4%	-2.7%	-0.2%	6.7%	431
Mexico	-4.6%	-2.4%	-0.7%	-2.4%	2.3%	197
Australia	-3.8%	-4.5%	-2.0%	-1.2%	2.8%	339
Brazil	-3.8%	-2.9%	0.1%	-7.2%	-3.6%	156
US	-3.4%	-3.9%	-2.5%	-1.8%	1.6%	284
Japan	-2.4%	-4.2%	-1.0%	-1.5%	1.0%	228
Canada	-2.1%	-4.5%	-1.9%	-0.7%	1.5%	344
Russia	-1.7%	0.7%	-3.1%	-2.0%	-0.2%	443
EU	-1.7%	-3.2%	-2.3%	0.2%	1.9%	170
India	-1.6%	-1.9%	-1.7%	5.4%	7.1%	261
Korea	-1.0%	-4.3%	-1.3%	1.8%	2.8%	409
Germany	-0.6%	-3.2%	-1.9%	1.3%	1.9%	188
Italy	-0.4%	-3.2%	-1.9%	0.5%	0.9%	143
Saudi Arabia	0.2%	0.7%	1.4%	1.9%	1.7%	397
France	0.4%	-3.2%	-2.4%	1.6%	1.2%	118
South Africa	0.7%	-2.7%	-1.8%	1.0%	0.3%	555
Turkey	2.5%	1.9%	-1.4%	5.4%	2.9%	179
Argentina	2.7%	-1.6%	0.0%	0.4%	-2.3%	215
Indonesia	3.4%	-3.9%	-1.1%	8.5%	5.0%	171

Key: Top 5 in Index | Bottom 5 in Index

Sources: *BP, Energy Information Agency, World Bank, IMF, UNFCCC, National Government Agencies, PwC data and analysis*

Notes: *The UK, Germany, France and Italy all have the EU's required decarbonisation rate for the Paris target, since they are all subsumed under the same NDC.*

Figures 2 and 3 show the historic and projected changes in carbon intensity of major economies if they achieve their national targets. Table 2 shows the targets submitted by each of the G20 countries. Most G20 countries' targets will require a step change in effort to reduce their carbon intensity.

Figure 2:

Developed economies NDCs

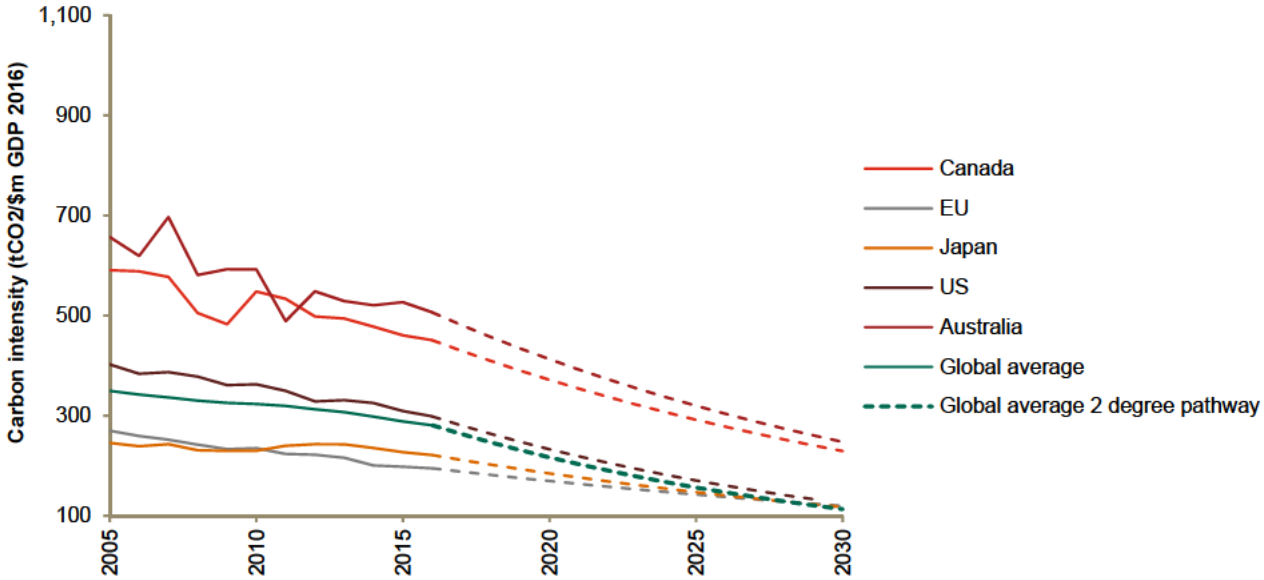
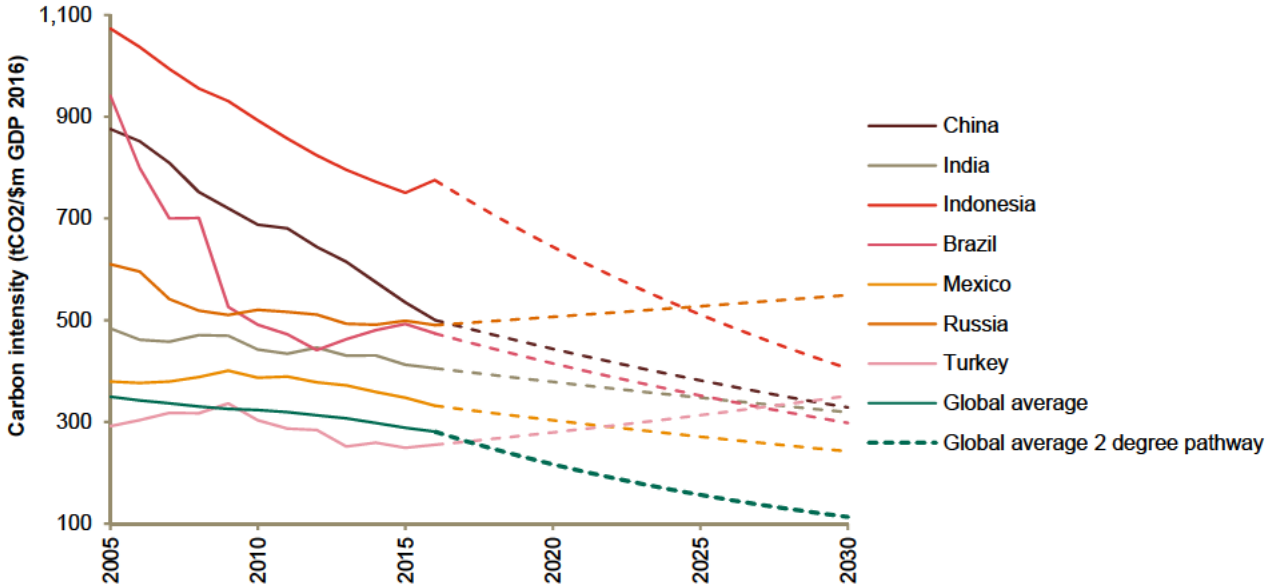


Figure 3:

Emerging economies NDCs



***Note:** The green dotted line indicates the transition that global average carbon intensity needs make between 2015 and 2030 to be on a 2°C pathway.*

Table 2:
NDC targets for G20 countries

Country	Target description
South Africa	Emissions in a range between 398 and 614 MtCO2e by 2025-30
Mexico	22% reduction against baseline scenario by 2030
Korea	37% reduction against baseline scenario by 2030
Canada	30% reduction against 2005 absolute emissions by 2030
Japan	26% reduction against 2013 absolute emissions by 2030
Australia	26% to 28% reduction against 2005 absolute emissions by 2030
US	26% to 28% reduction against 2005 absolute emissions by 2025
India	33% to 35% reduction against 2005 carbon intensity by 2030
China	60% to 65% reduction against 2005 carbon intensity by 2030
EU	40% reduction against 1990 absolute emissions by 2030
Brazil	37% reduction against 2005 absolute emissions by 2025 and indicative 43% against 2005 by 2030
Russia	25% to 30% reduction against 1990 absolute emissions by 2030
Indonesia	41% reduction against business as usual emissions by 2030
Turkey	21% reduction against business as usual scenario by 2030
Saudi Arabia	130 MtCO2e reduction on annual dynamic baseline by 2030

UK leading the low carbon revolution

The UK is strongly outperforming its peers in the G20, achieving a decarbonisation rate of 7.7% that places it at the top of this year's LCEI. This is almost three times the global average of 2.6%.

Emissions fell 6% in 2016 while GDP grew modestly at 1.8%. The emissions reduction is mainly attributed to a decrease in total energy consumption and a continued transition from coal to gas.

Despite higher demand for heating as a result of cooler temperatures in 2016, total energy consumption fell by 2% as a result of efficiency improvements.

More importantly for carbon reduction, however, were the plans to close all coal power stations by 2025. Three major coal plants shut down in 2016. Deep mined coal production in the UK dropped from 2,784,000 tonnes in 2015 to 22,000 tonnes in 2016, as the last deep coal mine in the UK closed in December 2015. Low global gas prices meant that the gap in power demand is served by gas; gas imports increased by 7% and domestic production by 2%.

Output of renewable electricity generation was mixed in 2016. Solar generation increased by 36% in 2016 and exceeded coal generation between April – September 2016, but hydro and wind power fell, due to low rainfall and wind speeds respectively.

The UK also leads the G20 in having the highest average decarbonisation rate since 2000. The carbon intensity of the UK has fallen this century by 3.7% a year on average, the highest of the G20 countries. Whilst impressive, the British transition away from coal is almost complete. To maintain its position as a climate leader, the UK will need to tackle other emission sources, in particularly in heating and transport.

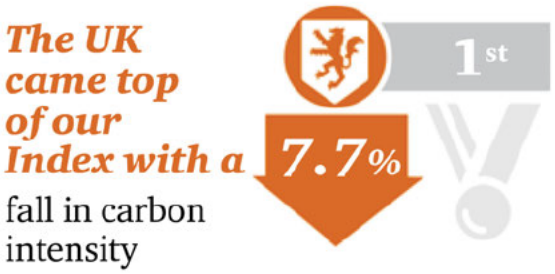
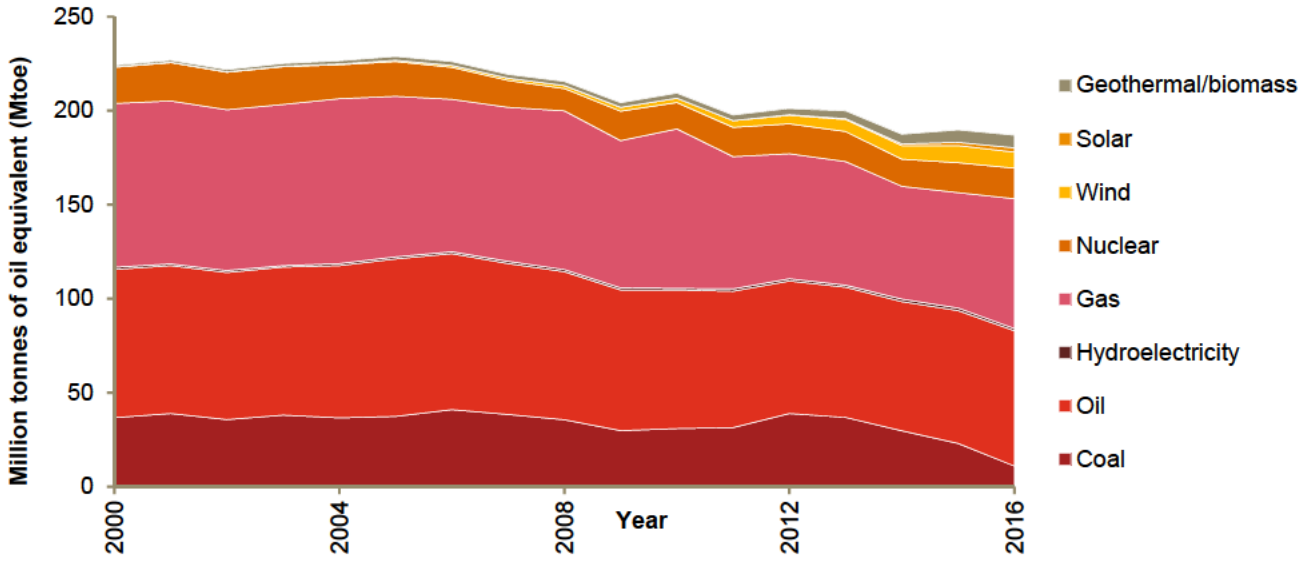


Figure 4:

UK's energy mix 2000-16



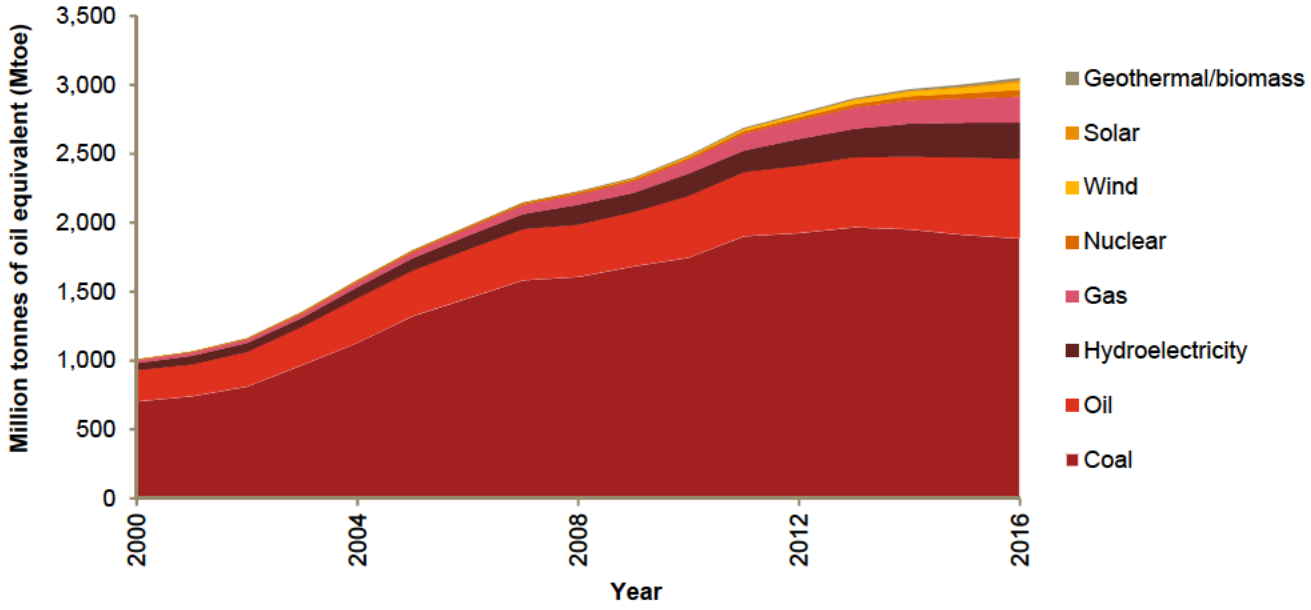
China: Tackling coal consumption

China has maintained its position as one of the top performers of the Index. This is the result of reductions in coal use and structural changes in the economy. As the world's largest energy consumer, China accounts for 50% of global coal consumption. In 2016, coal consumption in China fell by 1.4% or 26 Mtoe (million tonnes of oil equivalent). That is equivalent to the entire energy consumption for Portugal in 2016.

China's energy policies have shifted in recent years. Its new energy and environmental policies, as part of the 'war on pollution', halted construction of coal fired power stations between 2016 and 2020 and has supported renewables. China maintained its lead in installing the most renewable energy power capacity and overtook the US as the world's largest consumer of renewables. Solar generation increased by 72% and wind by 22%.

However the continued shift in the composition of China's economy also played a role, as China's services sector grew faster (7.8%) than the secondary (6.1%) and primary (3.3%) sectors. These lower carbon services sectors now account for 49% of China's GDP.

Figure 5:
China's energy mix 2000-16



Bracing for disruption

The global average decarbonisation rate is less than half of what is needed. So where does this leave us? The gaps between current progress, the Paris Agreement's national targets and the two degrees global goal indicate the potential for major disruptions:

1. Physical risks

There is increasing evidence that recent extreme weather events could be attributable to climate change. Many of these are projected to increase in severity and frequency. Businesses will need to increase their resilience to protect assets, supply chains, operations and people in anticipation of physical disruptions; and to recover when they occur.

2. Policy risks in low carbon transition

Countries with strong climate ambition are implementing policies to accelerate the low carbon transition. These range from applying a carbon price to setting emissions or efficiency standards for products and buildings. The falling cost of low carbon technology costs allows policymakers to consider options that weren't viable just a few years ago. But for those yet to act, there is the risk of knee-jerk climate policy responses at some point in future. Investors are also now using their voting power to demand that companies disclose how they are managing these emerging policy risks.

3. Market and technology risks

Technology innovation and deployment will determine whether countries can achieve the Paris Agreement's two degrees goal. Emerging technologies and new business models are already disrupting the energy system. These technologies include smart power and heating systems in buildings, autonomous electric vehicles, advanced biofuels and 3D printing. Our *Innovation for the Earth* report highlights the potential of these Fourth Industrial Revolution technologies to disrupt current business models.

Responding to climate risks is a strategic, business priority

Our Low Carbon Economy Index shows the rapid transition that is needed to get to the Paris targets and ultimately to two degrees. This transition presents high probability, high impact risks to the financial performance of companies as well as to the returns expected by their investors and lenders.

Such companies, including financial institutions such as banks, insurers and asset managers/owners, are increasingly expected to identify, understand, manage and report on a range of climate risks and opportunities that will drive the transition to a low-carbon, climate resilient economy. This should allow their stakeholders to better understand and price in these risks and the issue is now firmly on the agenda of financial regulators.

In his speech at Lloyds of London 2015, Mark Carney, Governor of the Bank of England and Chair of the Financial Stability Board (FSB), identified climate change as one of the most material threats to financial stability. As a result, the FSB set up a Task Force on Climate-related Financial Disclosure (TCFD) at the climate summit in Paris. This Task Force provides guidelines for financial disclosure on climate risks. The Task Force is focused on the disclosure of financial impacts arising from climate change, and looks to move reporting beyond carbon footprinting alone. Currently few companies or financial institutions are comprehensively able to disclose the financial impacts of climate change to their business.

Methodology

The low carbon economy index

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 two degrees 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 historic 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.

For emissions, the study considers energy-related carbon emissions drawn from the BP Statistical Review (2017). For biofuels we adjust BP Statistical Review (2017) data from production to consumption using US Energy Information Administration data.

We use Intergovernmental Panel on Climate Change data for the energy related emissions associated with limiting warming to two degrees by 2100.

The national targets

Our analysis of the national targets in this report considers the full national greenhouse gas inventory. Therefore, this analysis includes emissions from industrial process, fugitives (leaks from pipes), land use change and forestry. This is because some countries' targets focus on actions to reduce emissions in those sectors (which are outside our normal energy-based LCEI model). This means that despite the emission intensity numbers not being directly comparable to those in Table 1, the rate of change implied by these NDCs is representative of what is required in Figure 1.

NDC targets were taken from the UNFCCC portal.

Where available national greenhouse gas inventory data was taken from the UNFCCC for 1990 to 2012. This was supplemented with national government department data where gaps existed in UNFCCC data. Where there were still missing years we used the rate of change in energy related emissions from the BP Statistical Review (2017) and applied this to the UNFCCC or national government department data.

Where NDCs mention emissions from Land Use, Land Use Change and Forestry (LULUCF) we assume a net-net approach has been used. If LULUCF is not mentioned in NDCs we assumed it is not included in the target.

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171012-174741-GL-OS