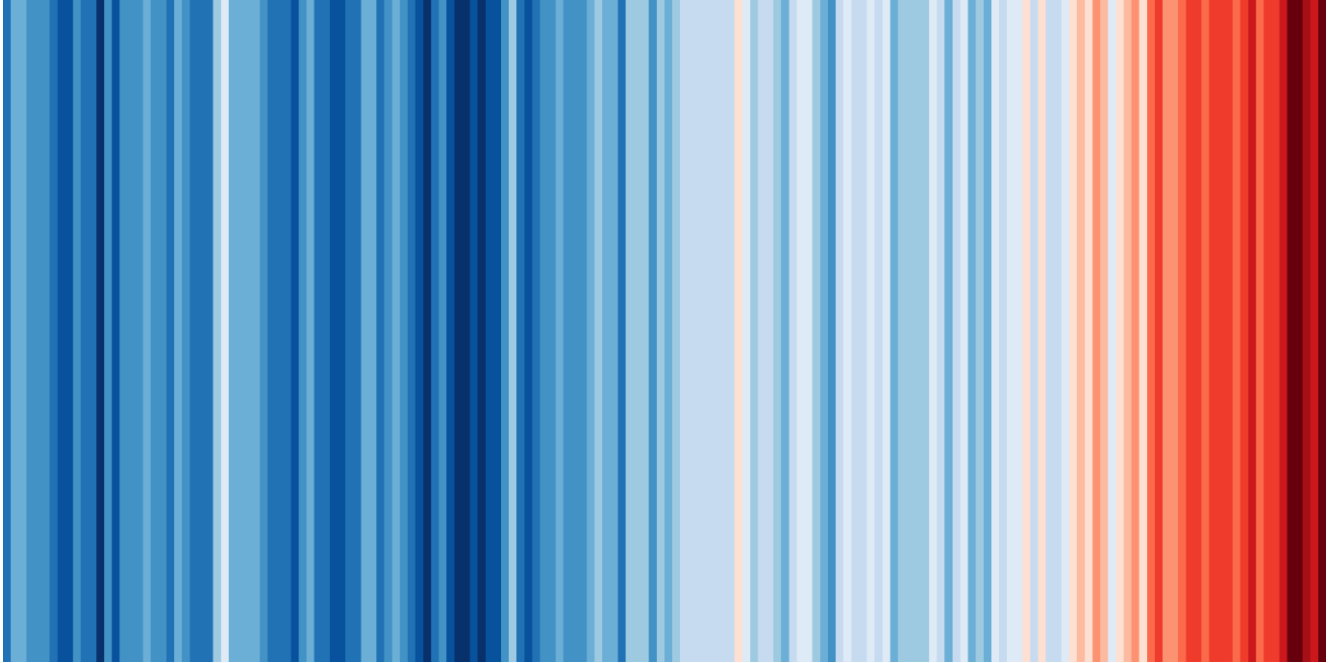


## Implications of climate science for financial markets

*Synthesis of the UN Intergovernmental Panel on Climate Change's Global Warming of 1.5°C special report for financial policymakers*



The IPCC's special report demonstrates that the risks for natural and human systems are significantly lower at 1.5 than 2°C of global warming. Limiting warming to 1.5°C means less extreme weather, lower sea-level rises and hundreds of millions less people exposed to climate-related risks.

Current policies, however, set a course well beyond this and towards over 3°C of warming by 2100, which would have huge impacts on global GDP. At the present rate of emissions there are just 10 years of the carbon budget left to limit

warming to 1.5°C. Those 10 years, instead, need to see the halving of global emissions, before coming down to zero by 2050, to meet the ambitions of Paris Agreement.

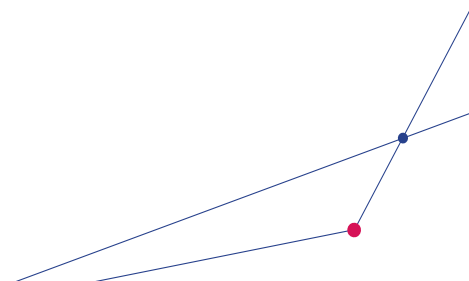
Meeting the ambitions of 1.5°C will require large and consistent investment to ensure the socio-economic transformations. The benefits of this transformation, though, are huge, environmentally, socially and economically.

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***'Climate change is the great existential challenge of our times.'***

*Christine Lagarde, President of the European Central Bank and former Managing Director of the IMF*

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Meeting the challenge and setting the economy on the path towards a 1.5°C world is estimated to provide by 2030:

- Direct economic gain of \$26 trillion;
- 65 million new low-carbon jobs; and
- Over 700,000 fewer premature deaths from air pollution.

What the market now needs are the strong signals to guarantee a fast and smooth transition.

The Paris Agreement has been ratified by 187 countries and sets the global objective of limiting global warming above pre-industrial levels to 'well below 2°C' and 'pursuing efforts to limit the temperature increase to 1.5°C.'<sup>1</sup> In light of this, the Intergovernmental Panel on Climate Change (IPCC) published a special report in 2018 that drew together the latest research on the climatic, environmental and societal impacts of 1.5°C and 2°C so as to more thoroughly assess the implications of global warming.<sup>2</sup>

### The importance of half a degree

Though the impacts of global warming vary according to a complex host of factors, the climate-related risks for natural and human systems are significantly lower at 1.5 than 2°C.

Climate models show that 1.5 rather than 2°C would mean:

- Less extreme heat in most regions, smaller increases in frequency and intensity of heavy precipitation in several regions, and lesser probabilities of drought in some regions;
- Sea level rise by the end of century 0.1m lower, meaning that 10 million fewer people exposed to related risks; and
- Halving the area of land that would undergo an overhaul of their precious ecosystems, which is expected to be 13% of all land at 2°C.

<sup>1</sup> United Nations (2015), Paris Agreement. Accessed online: [https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch\\_XXVII-7-d.pdf](https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch_XXVII-7-d.pdf)

<sup>2</sup> IPCC (2018), Global Warming of 1.5°C - An IPCC Special Report. Accessed online: <https://www.ipcc.ch/sr15/>

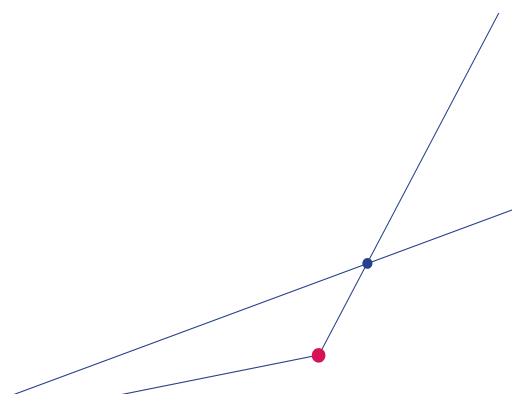
Restricting global warming to 1.5°C instead of 2°C also reduces the chance of reaching potentially irreversible thresholds, such as melting of the permafrost or collapse of the Greenland ice sheets. These "tipping points" could induce cycles of ever-increasing temperatures and compounding impacts for people and planet.

Societally, limiting warming to 1.5 instead of 2°C is estimated to:

- Reduce the number of people both exposed to climate-related risks and susceptible to poverty by up to several hundred million;
- Lower the proportion of the world population subjected to climate change-induced water stress by 50%;
- Result in smaller net reductions in yields of key crops such as maize, rice and wheat; and
- Limit the expected increase in risks from vector-borne diseases like malaria and dengue fever, which currently cause more than 700,000 deaths annually.<sup>3</sup>

Significantly, the special report lowers the temperature of warming when the world will face high levels of risk of "global aggregate impacts", such as global monetary damage, global-scale degradation and loss of ecosystems and biodiversity. Previously, high levels of risk of global aggregate impacts were expected at 3.6°C, now that it is between 1.5 and 2.5°C of warming.

<sup>3</sup> World Health Organization (2017), Vector-borne diseases. Accessed online: <https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases>



## Pathways to 1.5°C

The IPCC's special report offers four emissions pathways and system transitions that are consistent with limiting global warming to 1.5°C.<sup>4</sup> In each pathway, net anthropogenic CO<sub>2</sub> emissions decline by 45% from 2010 levels by 2030, reaching net zero by around 2050, which is around 20 years earlier than required to limit warming to 2°C. The 1.5°C pathways project that CO<sub>2</sub> emissions from industry are to be between 65-90% lower in 2050 compared with 2010, with each pathway employing to varying degrees of CO<sub>2</sub> removal.

Restricting global warming to 1.5°C will require rapid and far-reaching transitions in energy, land, infrastructure and industrial systems. The special report emphasises that these transformations are unprecedented in terms of scale, but not with regard to speed. Not acting with the scale or speed

necessary will result in overshooting 1.5°C, which could “lock in” the impacts and risks of higher temperatures on the long-term even if efforts to remove carbon are undertaken in the future.

## Where we stand today

In 2019, global carbon emissions from fossil fuels rose to a record high, a 0.6% increase on the previous year, which itself saw a 2.1% rise on the previous year.<sup>5</sup> At this rate of carbon emission, there are around just 10 years left in the carbon budget to limit warming to 1.5°C.<sup>6</sup>

Carbon Action Tracker have estimated that the current set of global pledges and targets around carbon emissions will result in 3°C of warming by the end of the century, a temperature unprecedented for millions of year.<sup>7</sup> Current policies, meanwhile, are estimated to mean 3.3°C warming by 2100, which poses even greater risks to society, the environment and surpassing “tipping points” (Figure 1).

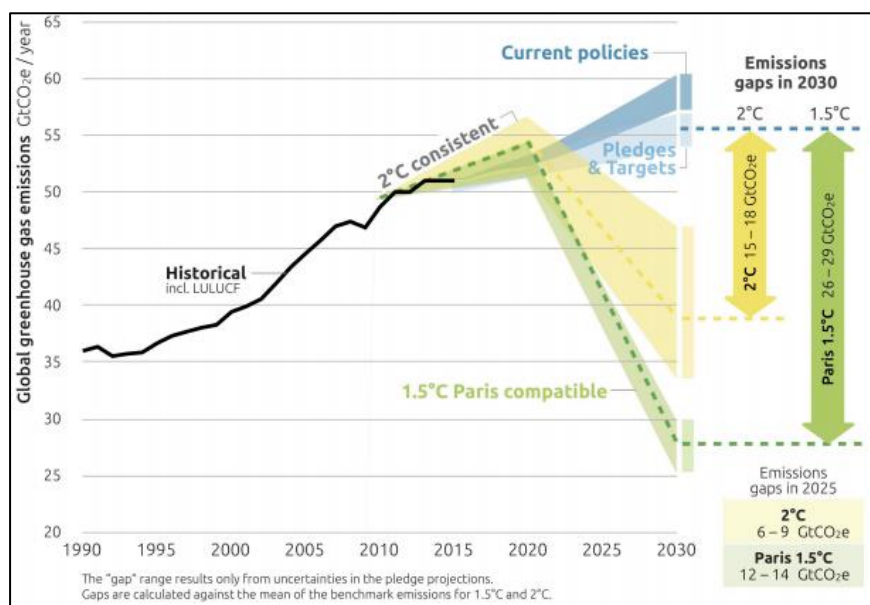


Figure 1: Global emissions pathways based on Climate Action Tracker analysis compared with 1.5°C and 2°C pathways from IPCC. Source: Climate Action Tracker

<sup>4</sup> IPCC (2018), Global Warming of 1.5°C - An IPCC Special Report.

<sup>5</sup> Friedlingstein, P., et al (2019), Carbon Budget 2019. Accessed online: <https://essd.copernicus.org/articles/11/1783/2019/>

<sup>6</sup> IPCC (2018), Global Warming of 1.5°C - An IPCC Special Report.

<sup>7</sup> Climate Action Tracker (2018), Warming Projections Global Update.

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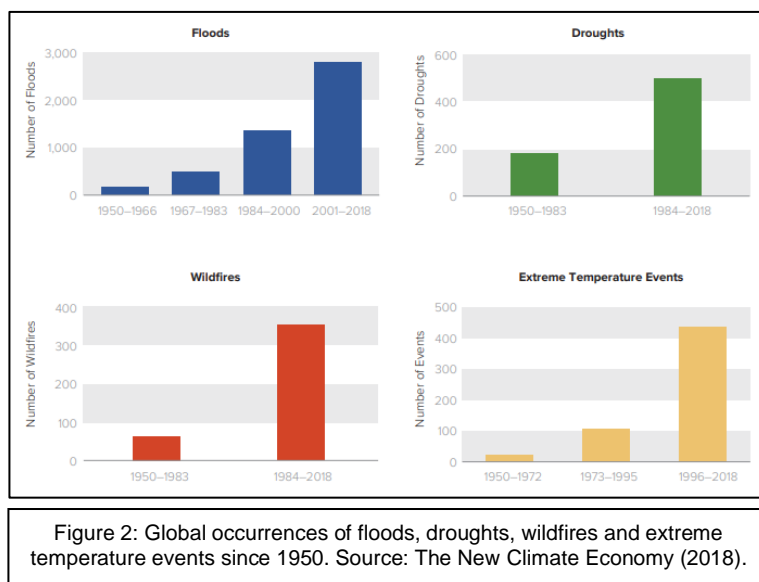
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With current level of 1°C, the world, its populations and economies, are already feeling the impacts of climate change (Figure 2). Scientists are progressively attributing extreme weather events, such as the Cape Town water crisis and Western Europe’s 2019 heatwave, to global warming.<sup>8,9</sup> Extreme weather events such as these are increasingly costing insurers, with 2017 being the second costliest year ever for natural disasters with \$330 billion in losses.<sup>10</sup> CDP’s analysis of the disclosures of 215 of the world’s 500 largest companies found \$970 billion was at risk to climate change. Over half of these risks were reported as likely, very likely or virtually certain and likely materialize in the short- to medium-term, i.e. around five years or earlier.<sup>11</sup> Indeed, 2019 saw what was dubbed the first “climate change bankruptcy,” with PG&E insolvent following the

financial impacts and potential liabilities from the Californian wildfires of 2017 and 2018.<sup>12</sup>

### The economics of 1.5°C

Limiting global warming to 1.5°C entails transforming many of aspects of how our socio-economic systems are organised, which will require large and consistent investment from public and private sources. For example, the IPCC in their special report estimate that average annual investment required to transform the energy system for a 1.5°C world would be around \$2.4 trillion, which equates to around 2.5% of the world GDP.<sup>13</sup> Relative, though, the IMF has estimated that global fossil fuel subsidies stood at \$5.2 trillion in 2017.<sup>14</sup>



<sup>8</sup> Otto, F.E.L., et al (2018), Likelihood of Cape Town water crisis tripled by climate change. Accessed online: <https://www.worldweatherattribution.org/the-role-of-climate-change-in-the-2015-2017-drought-in-the-western-cape-of-south-africa/>

<sup>9</sup> Vautard, R., et al (2019), Human contribution to the record-breaking July 2019 heat wave in Western Europe. Accessed online: <https://www.worldweatherattribution.org/wp-content/uploads/July2019heatwave.pdf>

<sup>10</sup> Munich RE (2018), Hurricanes cause record losses in 2017 – The year in figures. Accessed online: <https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/natural-disasters/2017-year-in-figures.html>

<sup>11</sup> CDP (2019), Major risk or rosy opportunity: Are companies ready for climate change? Accessed online: [https://6fefcbb86e61af1b2fc4-](https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/004/588/original/CDP_Climate_Change_report_2019.pdf?1562321876)

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<sup>12</sup> Kolhatkar, S. (2019), The PG&E Bankruptcy and the Coming Climate-Related Business Failures. Accessed online: <https://www.newyorker.com/business/currency/the-pg-and-e-bankruptcy-and-the-coming-climate-related-business-failures>

<sup>13</sup> IPCC (2018), Global Warming of 1.5°C - An IPCC Special Report.

<sup>14</sup> International Monetary Fund (2019), Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates. Accessed online: <https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509>

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***‘...once climate change becomes a defining issue for financial stability, it may already be too late.’***

*Mark Carney, Former Governor of the Bank of England and former Chairman of the Financial Stability Board*

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Not limiting global warming, though, will have significant costs to the global economy. Analysis by the OECD estimated that GDP could be hurt by 10% by 2100 in a business-as-usual scenario.<sup>15</sup> Approximations such as these, though, are based on economic models that underestimate the potential damages from climate change, it has been argued, by failing to include the largest risks and applying high discount rates on future scenarios.<sup>16</sup>

Indeed, these economic models also underplay the enormous benefits of decisive action, economically, socially and environmentally. The investment required to meet the challenges of limiting warming to 1.5°C has been estimated to deliver a direct economic gain of \$26 trillion through to 2030 compared to business-as-usual as well as creating 65 million new low-carbon jobs, with the authors stating that they know they ‘are

grossly under-estimating the benefits of this new growth story.’<sup>17</sup> In the long term, achieving a 1.5°C world would ‘protect lives and livelihoods by avoiding the worst impacts of climate change,’<sup>18</sup> and significantly benefit the ambitions of achieving the Sustainable Development Goals.<sup>19</sup>

The economic and societal transformation required to achieve 1.5°C will produce turbulence for businesses around the world. Companies will face transition risks, but without the transformation they will face greater and greater physical risks from climate change. Investment, both public and private, needs to be accelerated to ensure a 1.5°C world and limit the impacts of climate change. The market needs strong signals to ensure a faster and smoother transition – this is where policy and regulation must be decisive.

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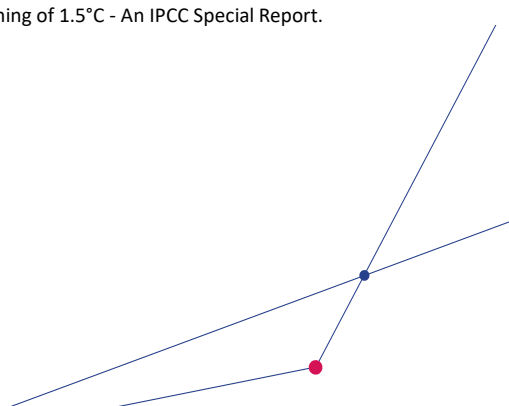
<sup>15</sup> OECD (2015), The Economic consequences of Climate Change. Accessed online: [https://www.oecd-ilibrary.org/environment/the-economic-consequences-of-climate-change\\_9789264235410-en](https://www.oecd-ilibrary.org/environment/the-economic-consequences-of-climate-change_9789264235410-en)

<sup>16</sup> Stern, N. (2016), Economics: Current climate models and grossly misleading. Accessed online: <https://www.nature.com/news/economics-current-climate-models-are-grossly-misleading-1.19416>

<sup>17</sup> The New Climate Economy (2018), Unlocking the Inclusive Growth Story of the 21<sup>st</sup> Century: Accelerating Climate Action in Urgent Times. Accessed online: <https://newclimateeconomy.report/2018/>

<sup>18</sup> Curran, P., et al (2019), Unlocking the strategic economic opportunity of clean and inclusive growth. Accessed online: [https://publications.banque-france.fr/sites/default/files/media/2019/08/27/financial\\_stability\\_review\\_23.pdf](https://publications.banque-france.fr/sites/default/files/media/2019/08/27/financial_stability_review_23.pdf)

<sup>19</sup> IPCC (2018), Global Warming of 1.5°C - An IPCC Special Report.



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