

# 1 Carbon dioxide emissions continue to grow despite emerging climate policies

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18 *A failure to recognise the factors behind continued emissions growth could limit the world's ability to*  
19 *shift to a pathway consistent with 1.5°C or 2°C of global warming. Continued support for low-carbon*  
20 *technologies need to be combined with policies directed at phasing out the use of fossil fuels.*

21 Global fossil CO<sub>2</sub> emissions grew at 1% per year in the 1990's, accelerated to 2.9% per year in the  
22 2000's, but have returned to a slower growth rate of 0.9% per year since 2010 with a more  
23 pronounced slowdown from 2014 to 2016. Despite modest declines in emissions in the United States  
24 and the European Union over the last decade, the growth in emissions in China, India, and most  
25 developing countries have dominated global emission trends over the last 20 years. The Global  
26 Carbon Budget projection<sup>1</sup> suggests global fossil CO<sub>2</sub> emissions will grow 0.5% (range –0.4% to 1.4%)  
27 in 2019, with emissions projected to decline in the US and the EU28, but projected to increase in  
28 China, India, and the Rest of the World (Figure 1a).

29 While a focus on countries and regions is important, a focus on type of fossil fuels and key emitting  
30 sectors is particularly relevant for monitoring changes and implementing adequate mitigation  
31 policies. Globally, and over the last decade (2009-2018), 42% of fossil CO<sub>2</sub> emissions were from coal,  
32 34% from oil, 19% from natural gas, and the remaining 5% from cement and other smaller sources  
33 (Figure 1b). In 2019, CO<sub>2</sub> emissions from coal are projected to decline 1.1% with substantial drops in  
34 emissions from coal use in the US (–13%) and the EU28 (–10%) and weak growth in China and India  
35 due to economic and weather anomalies. Oil is projected to grow 0.9% in 2019 and natural gas 2.5%,  
36 both in line with growth over the last decade.

37 At the most aggregated level, over the last decade, 45% of fossil CO<sub>2</sub> emissions come from the energy  
38 sector, dominated by electricity and heat production. Industry sectors, such as metals production,  
39 chemicals, and manufacturing, cover 22% of global emissions. Land transport combined with national  
40 shipping and aviation contribute 20% of global emissions, while international shipping and aviation  
41 add another 3.7%. The remaining 10% is from buildings, agriculture, fishing, and other sectors not  
42 elsewhere covered (e.g., military). In the following, we detail key changes in fossil CO<sub>2</sub> emissions  
43 across these sectors for the different fossil fuels: coal, oil, and gas.

44 *Coal is still king, but losing power*

45 The changes in global emissions have primarily been driven by changes in coal use, while growth in  
46 the use of oil and gas continued unabated since 1980 following the oil crises in the 1970s (Figure 2a).  
47 Many analysts have speculated that coal use may have peaked. The decline in coal use in  
48 Organisation for Economic Co-operation and Development (OECD) countries is clear, with a 25%  
49 decline in the last decade. Growth in coal use in non-OECD countries has remained strong but is  
50 heavily influenced by China. A global peak in coal use is highly dependent on the pathway in China,  
51 which now accounts for 50% of global coal use. While changes in the structure of China's economy  
52 may have contributed to a recent decline in coal use<sup>2</sup>, Chinese emissions are rising again and it is too  
53 early to proclaim a coal peak in China or globally<sup>1</sup>.

54 The dramatic shifts in coal use have occurred in different sectors (Figure 2). The largest share of  
55 global coal use is for electricity & heat (around 67%), followed by industry such as metals, chemicals,  
56 and manufacturing (27%). The levelling off global coal use in the 1990s resulted largely from the  
57 collapse of the Soviet Union<sup>3</sup> but was partially offset by strong growth in electricity and industry in  
58 China and India. The recent modest decline in global coal use has primarily occurred due to  
59 continued declines in coal power in the US and European Union and a slowdown in coal power  
60 growth in China, combined with a slowdown in the growth in industrial production in China. The  
61 declines in electricity generation likely represent a more systematic structural change with electricity  
62 generation from coal being replaced by non-fossil energy sources or with natural gas. The recent  
63 decline in coal use by industry may represent the effects of economic headwinds in China, as there  
64 are very few technologies to guarantee declines in the hard-to-mitigate industrial sectors<sup>4</sup>.

#### 65 *Oil shows resilient growth*

66 Global oil use has grown almost unimpeded for several decades (Figure 2b), with the main  
67 disruptions occurring during the oil crises<sup>3</sup> in 1973 and 1979. The oil crises primarily hit oil use in  
68 OECD countries, but more so in sectors where oil was used inefficiently (electricity and industry) with  
69 limited effects in transport (Figure 2b). Global oil use is dominated by land transport, representing  
70 50% of emissions from oil use and growing at 1.9% per year (104MtCO<sub>2</sub> per year) in the last decade.  
71 Oil use in OECD countries declined after the global financial crisis in 2009 but has since begun to rise  
72 again, making current oil use similar to the levels in 2009. Oil use in non-OECD countries continues to  
73 grow strongly, despite a slowdown in the growth rate in the last few years. National and  
74 international aviation represent around 8% of the emissions from oil use and is growing at around 3%  
75 per year (25MtCO<sub>2</sub> per year) in the last decade. Other sectors (industry, power, other) are flat at the  
76 global level, with declines in OECD countries offset by increases in non-OECD countries.

77 While aviation is receiving increased public attention, the continued growth in emissions from land  
78 transport are far more significant in aggregate terms and is the main driver of CO<sub>2</sub> emissions from oil  
79 globally. The deployment of electric vehicles is promising, but demand for transport services is  
80 growing more rapidly. In many markets, electric vehicles are adding to demand and not replacing  
81 existing vehicles, therefore having minimal effect on oil use. If electrical grids are not decarbonised  
82 fast enough, then the addition of electric vehicles may partly shift emissions from transport to the  
83 energy sector. Oil is generally an inefficient energy source outside of transport, suggesting there are  
84 many opportunities to reduce oil use in the power sector and industry.

#### 85 *Natural gas is only a temporary fix*

86 CO<sub>2</sub> emissions from natural gas use have been growing steadily and almost uninterrupted for over  
87 half a century, and they are currently the fastest growing fossil fuel (Figure 2b). Natural gas has  
88 contributed to the largest increase in global fossil CO<sub>2</sub> emissions in recent times, accounting for  
89 around 35% of the growth in the last decade and 50% in the last few years. Natural gas use is

90 growing strongly in most countries, with the 44% of gas use in electricity and heat growing the most  
91 rapidly globally. OECD countries generally have more diverse usage of gas, with significant gas use in  
92 industry, energy, and buildings. Non-OECD gas use is more concentrated in the electricity sector.

93 Natural gas has been portrayed as a bridge fuel from coal power to non-fossil power generation  
94 because it emits about 40% less CO<sub>2</sub> than coal per unit of energy and can therefore reduce emissions  
95 if gas substitutes coal in electricity generation. While natural gas can help begin decarbonisation in  
96 electricity generation, it still emits CO<sub>2</sub> and natural gas use without Carbon Capture and Storage (CCS)  
97 needs to be phased out not long after it displaces coal use. In some instances, natural gas could lead  
98 to worse outcomes for the climate than coal depending on methane leakage rates<sup>5</sup>. Natural gas is  
99 also an attractive alternative in industrial, commercial, and residential applications, but without CCS,  
100 the emissions still contribute significantly to global warming.

101 While natural gas may be necessary to aid a transition from coal to non-fossil energy in some  
102 national circumstances, expanded natural gas use without CCS could limit the ability to meet  
103 ambitious climate targets. The rapidly growing global Liquefied Natural Gas (LNG) market will support  
104 the expansion and reach of natural gas in the coming decades, while plans to develop CCS that could  
105 limit the climate impacts of natural gas still lagging at the small-scale demonstration stage.

#### 106 *Shift focus to fossil fuels*

107 The continued growth in global fossil CO<sub>2</sub> emissions is taking place despite growing public and policy  
108 attention, five cycles of the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports,  
109 and almost 30 years of international climate negotiations. While some climate policies have fallen  
110 into place, leading to rapid progress in the deployment of clean energy technologies in the last  
111 decade, few policies are in place to phase out fossil fuel technologies in parallel, and CO<sub>2</sub> emissions  
112 continue to grow globally. Even following the apparent policy breakthrough leading to the Paris  
113 Agreement in 2015, it is likely that global fossil CO<sub>2</sub> emissions will have grown over 4% through to the  
114 end of 2019. Current national policies still put the world on a pathway of increasing greenhouse gas  
115 emissions through to 2030<sup>6</sup>.

116 The continued growth in fossil fuel use and associated CO<sub>2</sub> emissions is happening despite significant  
117 progress in low carbon technologies<sup>7</sup> and progress in some countries in reducing energy use<sup>8</sup>. Growth  
118 in energy use and emissions is dominated by developing countries, as they strive to close the large  
119 disparity between per capita energy use compared to developed countries<sup>9</sup>. This suggests current  
120 policies are either not enough to effect global emissions, are slow to have a detectable effect, or  
121 simply fail to directly address the root cause of the problem: phase out CO<sub>2</sub> emissions from the use of  
122 fossil fuels<sup>10</sup>. The rapid growth in solar and wind will help reduce the use of coal in power generation,  
123 but current policies to phase out coal use are focussed in countries with old coal fleets<sup>11,12</sup>. Natural  
124 gas may displace some coal in power generation, but it at best only offers a short-term solution, as  
125 once coal is displaced CO<sub>2</sub> emissions continue at an albeit lower rate. The rapid growth in electric  
126 vehicles has been insufficient to alter global oil use, as the growth in transport demand far outpaces  
127 the deployment of electric vehicles. Very little attention has been placed on the difficult-to-mitigate  
128 sectors<sup>4</sup>, such as industry, aviation and shipping, and a complete decarbonisation of electricity  
129 generation.

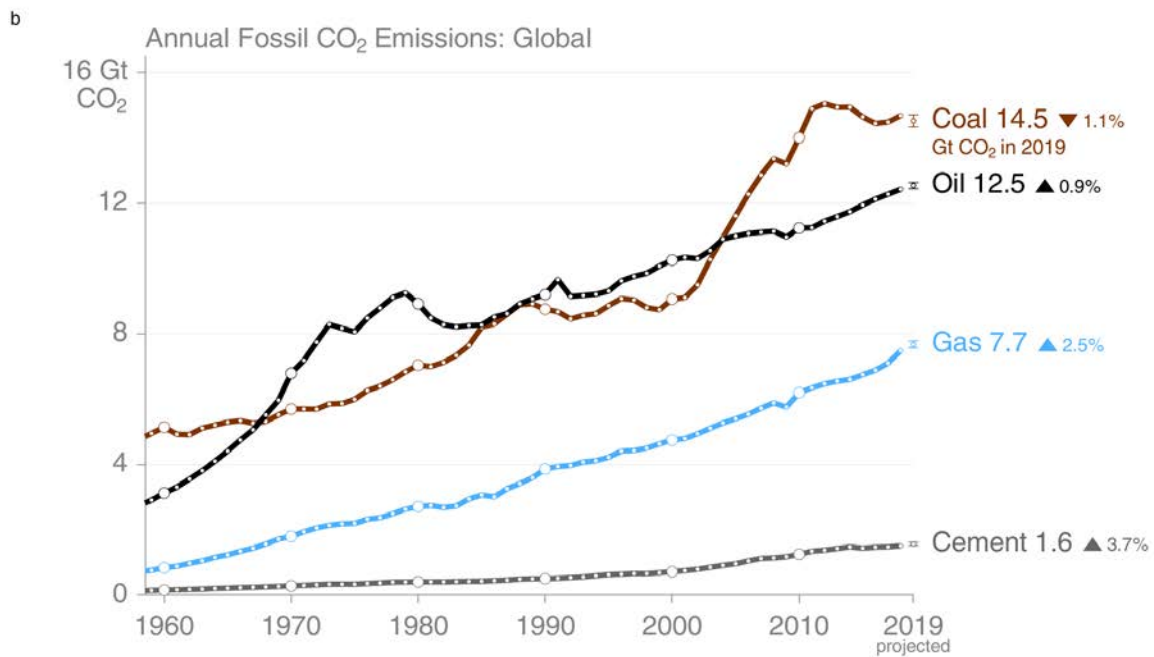
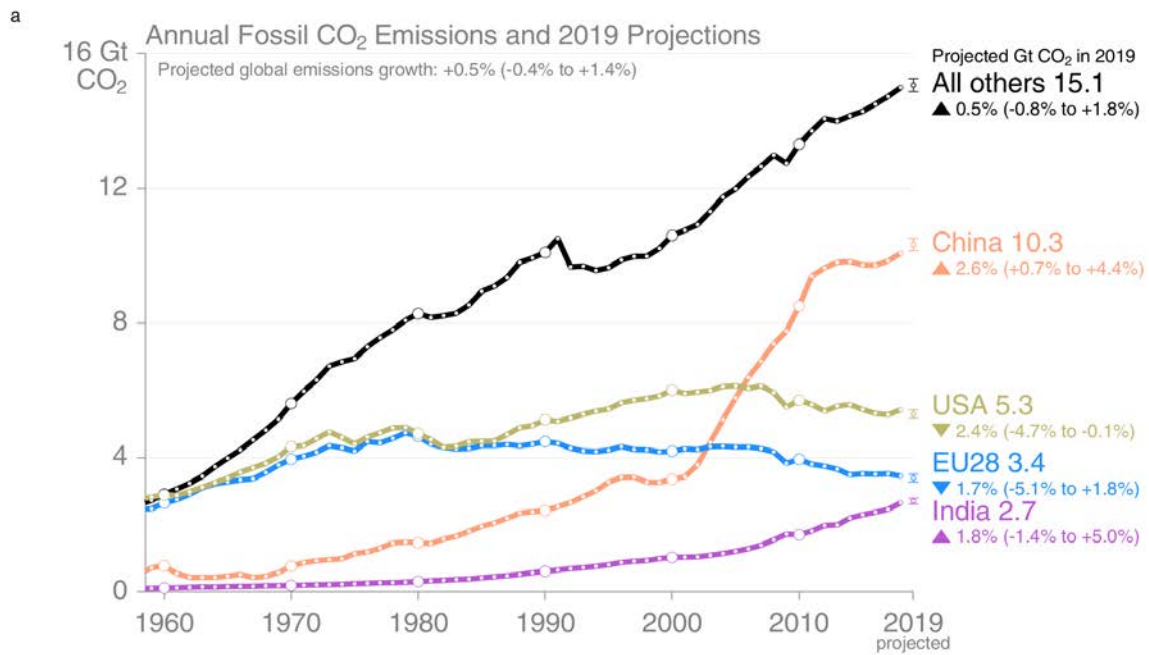
130 The failure to mitigate global emissions, despite positive progress on so many aspects of climate  
131 policy, suggests the full bag of policy options are not being effectively deployed. Most policies tend  
132 to focus on supporting low-carbon alternatives, such as solar, wind, or electric vehicles, but these  
133 technologies often add to existing demand and therefore do not significantly displace fossil fuel  
134 use<sup>13</sup>. Public policies need to place far more attention on directly cutting back the use of fossil fuels

135 or remove their emissions through CCS, particularly the phasing out of coal power plants<sup>14</sup> and  
136 conventional vehicles, well before they reach their productive end-of-life.

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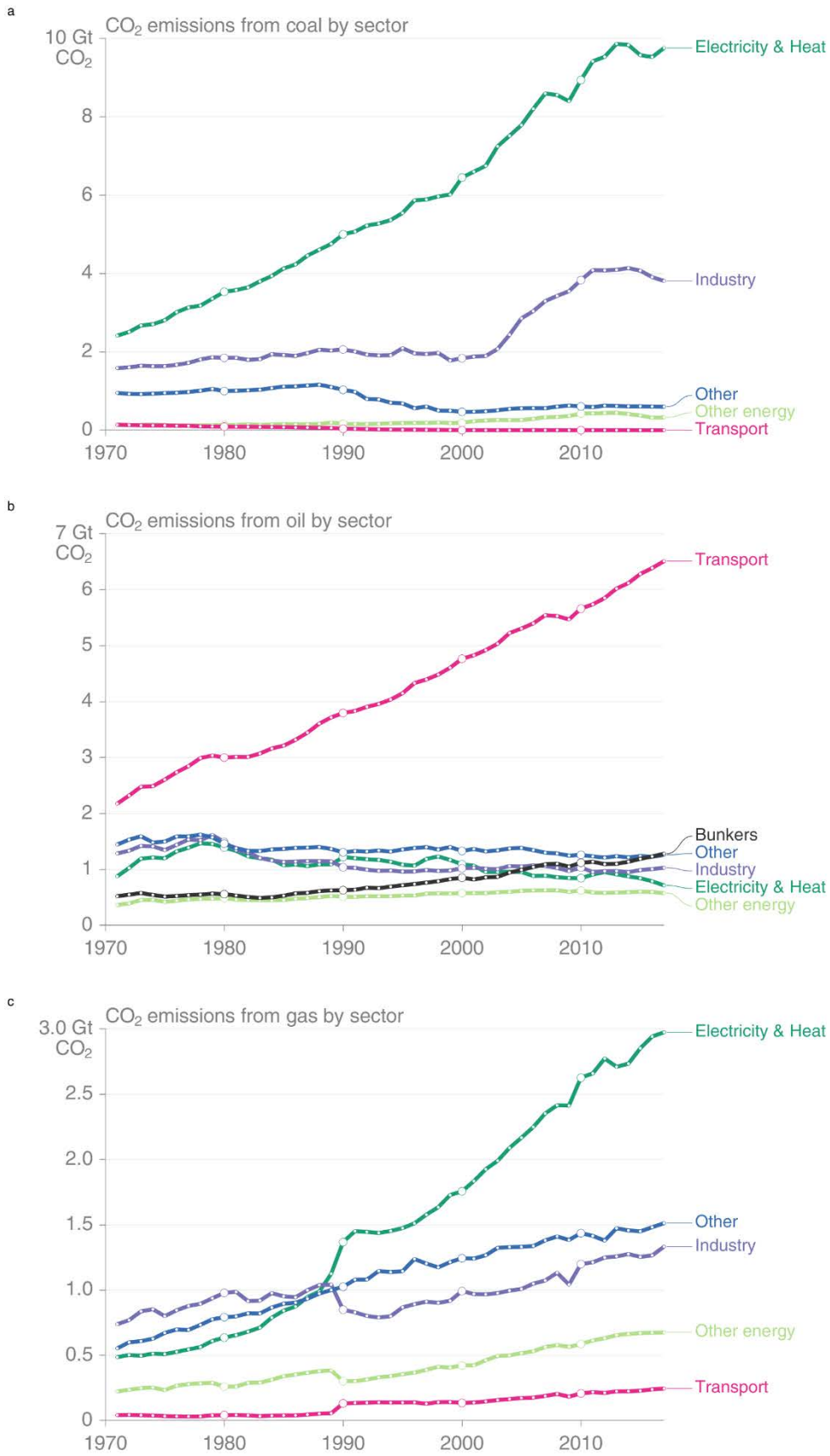
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Figure 1: Global fossil CO<sub>2</sub> emissions showing projections<sup>1</sup> for 2019 for a) regions and b) fossil fuels and cement. The projections for China, USA, EU28, and India in 2019 are based on monthly data available at the time of submission, while all others are projected based on economic data. The projections are done separately for coal, oil, gas, and cement in each region. The Indian projection is based on the Indian financial year, April 2019 to March 2020. Both China and India exhibit higher uncertainty than usual because of unusual economic (China and India) and monsoon (India) events.



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Figure 2: CO<sub>2</sub> emissions from different fossil fuels by sector. Bunkers are emissions from international aviation and shipping. Source: IEA<sup>15</sup> based on detailed data on energy demand and IPCC Guidelines.

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