Table TS.1: Signs of Progress and Continuing Challenges

Signs of progress	Continuing challenges
Emissions trends	
The rate of global GHG emissions growth has slowed in recent years, from 2.1% per year between 2000 and 2009, to 1.3% per year in between 2010 and 2019. (TS.3) {2.2}	**GHG emissions have continued to grow at high absolute rates**. Emissions increased by 8.9 $GtCO_2eq$ from 2000-2009 and by 6.5 $GtCO_2eq$ 2010-2019, reaching 59 $GtCO_2eq$ in 2019. (TS.3) {2.2}
At least 24 countries have reduced both territorial carbon dioxide (CO_2) and GHG emissions and consumption-based CO_2 emissions in absolute terms for at least 10 years, including consumption-based CO_2 emissions. Of these, six are Western and Northern European countries that started reducing in the 1970s, six are former Eastern Bloc countries with consistent reductions since the 1990s, and 12 more have reduced since the mid-2000s. Some have done so at rapid sustained CO_2 reduction rates of 4% per year. (TS.3) {2.2}	**The combined emissions reductions of these 24 countries were outweighed by rapid emissions growth elsewhere**, particularly among developing countries that have grown from a much lower base of per capita emissions. Uncertainties in emissions levels and changes over time prevents a precise assessment of reductions in some cases. The per capita emissions of developed countries remain high, particularly in Australia, Canada, and the United States. {2.2}
Lockdown policies in response to COVID-19 led to an estimated global drop of 5.8% in CO_2 emissions in 2020 relative to 2019. Energy demand reduction occurred across sectors, except in residential buildings due to teleworking and homeschooling. The transport sector was particularly impacted and international aviation emissions declined by 45%. (Box TS.1) {2.2}	**Atmospheric CO_2 concentrations continued to rise in 2020 and emissions have already rebounded as lockdown policies are eased.** Economic recovery packages currently include support for fossil fuel industries. (Box TS.1; Box TS.8)
Sectors	
Multiple low-carbon electricity generation and storage technologies have made rapid progress: costs have reduced, deployment has scaled up, and performance has improved. These include solar photovoltaics (PV), onshore and offshore wind, and batteries. In many contexts solar PV and onshore wind power are now competitive with fossil-based generation. (TS.3) {2.5, 6.3}	**Although deployment is increasing rapidly, low-carbon electricity generation deployment levels and rates are currently insufficient to meet stringent climate goals.** The combined market share of solar PV and wind generation technologies are still below 10%. Global low-carbon electricity generation will have to reach 100% by 2050, which is challenged by the continuous global increase in electricity demand. The contribution of biomass has absolute limits. (TS.5, 2.5)
The rate of emissions growth from coal slowed since 2010 as coal power plants were retired in the United States and Europe, fewer new plants were added in China,	**Global coal emissions may not have peaked yet**, and a few countries and international development banks continue to fund and develop new coal capacity,

Signs of progress	Continuing challenges
and a large number of planned global plants were scrapped or converted to co-firing with biomass. (TS.3) {2.7, 6.3}	especially abroad. The lifetime emissions of current fossil-based energy infrastructures may already exceed the remaining carbon budget for keeping warming below 1.5°C. (TS.3) {2.2; 2.7, 6.7}
Deforestation has declined since 2010 and net forest cover increased. Government initiatives and international moratoria were successful in reducing deforestation in the Amazon between 2004 and 2015, while regrowth and regeneration occurred in Europe, Eurasia and North America. (TS.5.6.1) {7.3.1}	**The long-term maintenance of low deforestation rates is challenging.** Deforestation in the Amazon has risen again over the past four years. Other parts of the world also face steady, or rapidly increasing, deforestation. {7.3.1}
Electrification of public transport services is demonstrated as a feasible, scalable and affordable mitigation option to decarbonise mass transportation. Electric vehicles (e-vehicles) **are the fastest growing segment of the automobile industry, having achieved double-digit market share by 2020 in many countries.** When charged with low-carbon electricity, these vehicles can significantly reduce emissions. {10.4}	**Transport emissions have remained roughly constant, growing at an average of 2% per annum between 2010-2019** due to the persistence of high travel demand, heavier vehicles, low efficiencies, and car-centric development. The full decarbonisation of e-vehicles requires that they are charged with zero-carbon electricity, and that car production, shipping, aviation and supply chains are decarbonized. (TS.3) {2.4}
There has been a significant global transition from coal and biomass use in buildings towards modern energy carriers and efficient conversion technologies. This led to efficiency improvements and some emissions reductions in developed countries, as well as significant gains in health and well-being outcomes in developing regions. Nearly Zero Energy (NZE) Buildings or low-energy Buildings are achievable in all regions and climate zones for both new and existing buildings. {9.3; 9.8}	**There is a significant lock-in risk in all regions given the long lifespans of buildings and the low ambition of building policies.** This is the case for both existing buildings in developed countries, and also for new buildings in developing countries that are also challenged by the lack of technical capacity and effective governance. Emissions reductions in developed countries have been outweighed by the increase in population growth, floor area per capita and the demand for electricity and heat. {9.9; 9.3}
The decarbonisation of most industrial processes has been demonstrated using technologies that include electricity and hydrogen for energy and feedstocks, carbon capture and utilisation technologies, and innovation in circular material flows. (TS.5.5) {11.2}	**Industry emissions continue to increase, driven by a strong global demand for basic materials.** Without reductions in material demand growth and a very rapid scale-up of low-carbon innovations, the long lifetimes of industrial capital stock risks locking-in emissions for decades to come. (TS.5.5) {11.2}
Policies and investment	

Signs of progress	Continuing challenges
The Paris Agreement established a new global policy architecture to meet stringent climate goals, while avoiding many areas of deadlock that had arisen in trying to extend the Kyoto Protocol**.** (TS 6.3)	**Current national pledges under the Paris Agreement[3] are insufficient to limit warming to 1.5°C with no or limited overshoot, and would require an abrupt acceleration of mitigation efforts after 2030 to *likely* limit warming to 2°C.** (TS 6.3)
Most wealthy countries, and a growing list of developing countries, have signaled an intention to achieve net zero GHG (or net zero CO_2) emissions by mid-century. National economy-wide GHG emissions targets covered 90% of global emissions in 2020 compared to 49% in 2010. Direct and indirect climate legislation has also steadily increased and this is supported by a growing list of financial investors. (TS.6.2)	**Many net zero targets are ambiguously defined, and the policies needed to achieve them are not yet in place.** Opposition from status quo interests, as well as insufficient low-carbon financial flows, act as barriers to establishing and implementing stringent climate policies covering all sectors. (Box TS.6) {13.4}
The global coverage of mandatory policies – pricing and regulation – has increased, and sectoral coverage of mitigation policies has expanded. Emission trading and carbon taxes now cover over 20% of global CO_2 emissions (TS 6). Allowance prices as of April 1, 2021 ranged from just over USD1 to USD50, covering between 9 and 80% of a jurisdiction's emissions {13.6.3}. Many countries have introduced sectoral regulations that block new investment in fossil fuel technologies.	**There is incomplete global policy coverage of non-CO_2 gases, CO_2 from industrial processes, and emissions outside the energy sector**. Few of the world's carbon prices are at a level consistent with various estimates of the carbon price needed to limit warming to 2°C or 1.5°C {13.6}
There has been a marked increase in civic and private engagement with climate governance. This includes business measures to limit emissions, invest in reforestation and develop carbon-neutral value chains such as using wood for construction. There is an upsurge in climate activism, and growing engagement of groups such as labour unions {1.3.3, 5.2.3}. The media coverage of climate change has also grown steadily across platforms and has generally become more accurate over time. (TS 6.2)	**There is no conclusive evidence that an increase in engagement results in overall pro-mitigation outcomes**. A broad group of actors influence how climate governance develop over time, including a range of civic organisations, encompassing both pro-and anti-climate action groups. Accurate transference of the climate science has been undermined significantly by climate change counter-movements, in both legacy and new/social media environments through misinformation. (TS 6.2)

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FOOTNOTE [3] Current NDCs refer to nationally determined contributions submitted to the UNFCCC, as well as publicly announced but not yet submitted mitigation pledges with sufficient detail on targets, reflected in studies published up to 11 October 2021. Revised NDCs submitted or announced after 11 October 2021 are not included. Intended nationally determined contributions (INDCs) were converted to NDCs as countries ratified the Paris Agreement. Original INDCs and NDCs refer to those submitted to the UNFCCC in 2015 and 2016