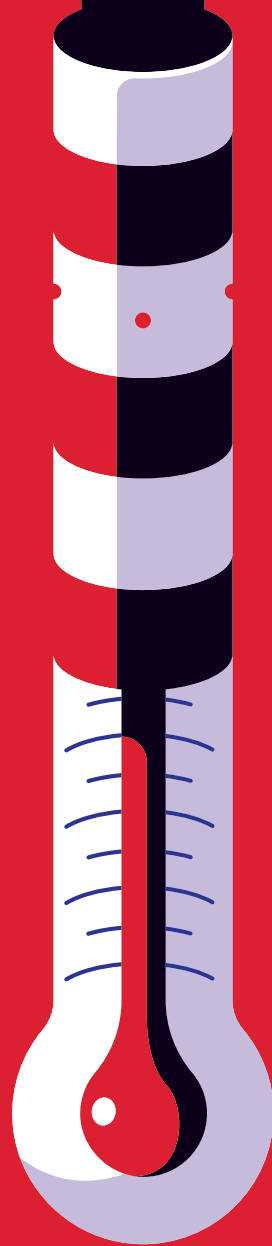


The Heat Is On

A world of climate promises
not yet delivered

Executive Summary



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**A world of climate promises
not yet delivered**

Executive Summary

Emissions Gap Report 2021

Executive summary

Introduction

This twelfth edition of the United Nations Environment Programme (UNEP) Emissions Gap Report comes during a year of constant reminders that climate change is not in the distant future. Extreme weather events around the world – including flooding, droughts, wildfires, hurricanes and heatwaves – have continuously hit the news headlines. Thousands of people have been killed or displaced and economic losses are measured in the trillions. Bearing witness to the increasingly clear signs of climate change, the Intergovernmental Panel on Climate Change (IPCC) published the first report in its Sixth Assessment cycle addressing the “Physical Science Basis” in August 2021. Dubbed a “code red for humanity” by the United Nations Secretary-General, the IPCC report documents in far greater detail and with higher certainty than previous assessments how climate change and extreme events can be attributed to the build-up of anthropogenic greenhouse gas (GHG) emissions in the atmosphere. There is a fifty-fifty chance that global warming will exceed 1.5°C in the next two decades, and unless there are immediate, rapid and large-scale reductions in GHG emissions, limiting warming to 1.5°C or even 2°C by the end of the century will be beyond reach.

Building on the new evidence from the IPCC, the twenty-sixth United Nations Climate Change Conference of the Parties (COP26) is charged with the growing urgency of accelerating global ambition and action on both mitigation and adaptation. This year, the spotlight is on the new and updated nationally determined contributions (NDCs) that countries were requested to submit in advance of COP26. As the September 2021 version of the NDC Synthesis Report published by the United Nations Framework Convention on Climate Change (UNFCCC) illustrates, the new and updated NDCs are insufficient to achieve the temperature goal of the Paris Agreement.

This Emissions Gap Report confirms the findings of the UNFCCC report. It expands the assessment to consider announced mitigation pledges for 2030 in addition to the new and updated NDCs. The report shows that new or

updated NDCs and announced pledges for 2030 have only limited impact on global emissions and the emissions gap in 2030, reducing projected 2030 emissions by only 7.5 per cent, compared with previous unconditional NDCs, whereas 30 per cent is needed to limit warming to 2°C and 55 per cent is needed for 1.5°C. If continued throughout this century, they would result in warming of 2.7°C. The achievement of the net-zero pledges that an increasing number of countries are committing to would improve the situation, limiting warming to about 2.2°C by the end of the century. However, the 2030 commitments do not yet set G20 members (accounting for close to 80 per cent of GHG emissions) on a clear path towards net zero.

Moreover, G20 members as a group do not have policies in place to achieve even the NDCs, much less net zero. Turning to some of the opportunities for bridging the emissions gap and getting on track to net zero, the report assesses the extent to which COVID-19 fiscal recovery measures are used to accelerate a green transition. It examines the scope for reducing emissions from methane, the second-most-important GHG in terms of current anthropogenic climate forcing, to bridge the gap and get on track to net zero. Finally, the report looks into a key negotiation issue for COP26: reaching agreement on how to move forward with article 6 of the Paris Agreement dealing with cooperative approaches and market mechanisms. A large number of countries have included the use of market mechanisms in their NDC implementation plans and are waiting for the modalities to be agreed. At the same time, the use of markets and offsets in meeting net-zero emission goals is often unclear.

As in previous years, the 2021 Emissions Gap Report has been guided by an experienced steering committee and prepared by an international team of leading scientists, assessing all available information, including that published in the context of the IPCC reports, as well as in other recent scientific literature. The assessment process has been transparent and participatory. The assessment methodology and preliminary findings were made available to the governments of the countries specifically mentioned in the report to give them an opportunity to comment on the findings.

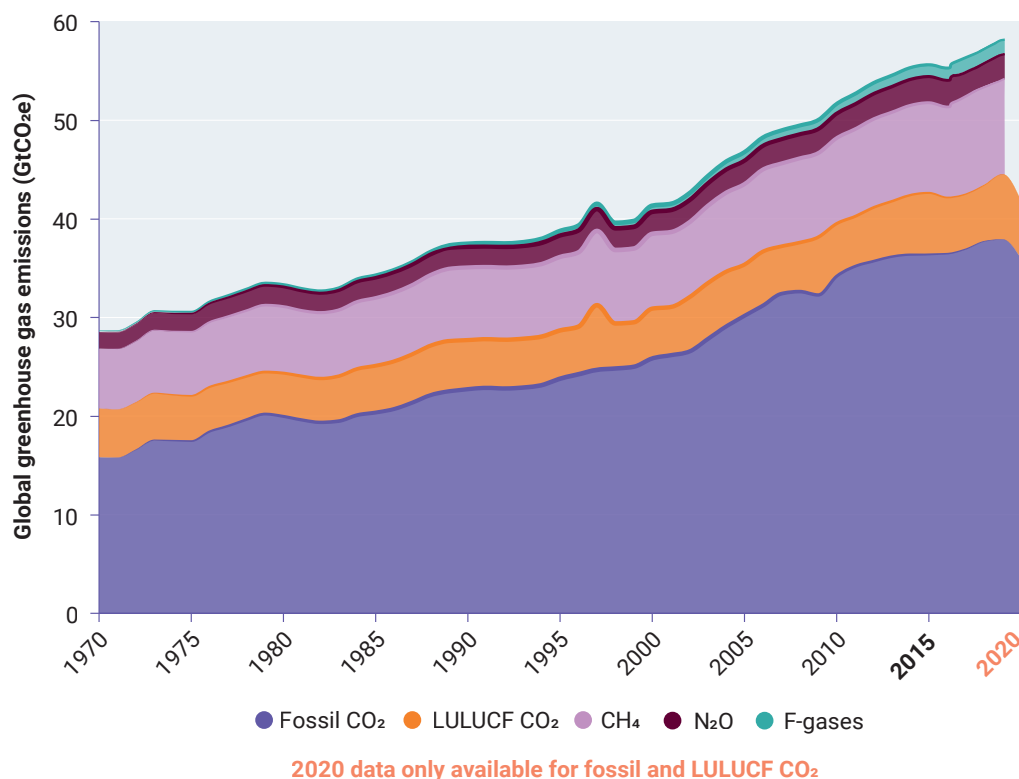
1. Following an unprecedented drop of 5.4 per cent in 2020, global carbon dioxide emissions are bouncing back to pre-COVID levels, and concentrations of GHGs in the atmosphere continue to rise.

- ▶ The COVID-19 pandemic led to an unprecedented 5.4 per cent drop in global fossil carbon dioxide (CO₂) emissions in 2020 (figure ES.1). Data are not yet available for all GHG emissions in 2020, but the drop in total global GHG emissions is anticipated to be smaller than the drop in fossil CO₂ emissions.
- ▶ A strong rebound in emissions is expected in 2021. Preliminary estimates suggest fossil energy

CO₂ emissions could grow by 4.8 per cent in 2021 (excluding cement), and global emissions in 2021 are expected to be only slightly lower than the record level of 2019.

- ▶ Despite the large decline in CO₂ emissions in 2020, the concentration of CO₂ in the atmosphere grew by around 2.3 parts per million, in line with recent trends. It is unlikely that the reductions in emissions in 2020 will be detectable in the atmospheric growth rate, as the natural variability of around one part per million is far greater than the effect of a 5.4 per cent reduction in CO₂ emissions in a single year. Solving the climate problem requires rapid and sustained reductions in emissions.

Figure ES.1. Global greenhouse gas emissions from all sources, 1970–2020

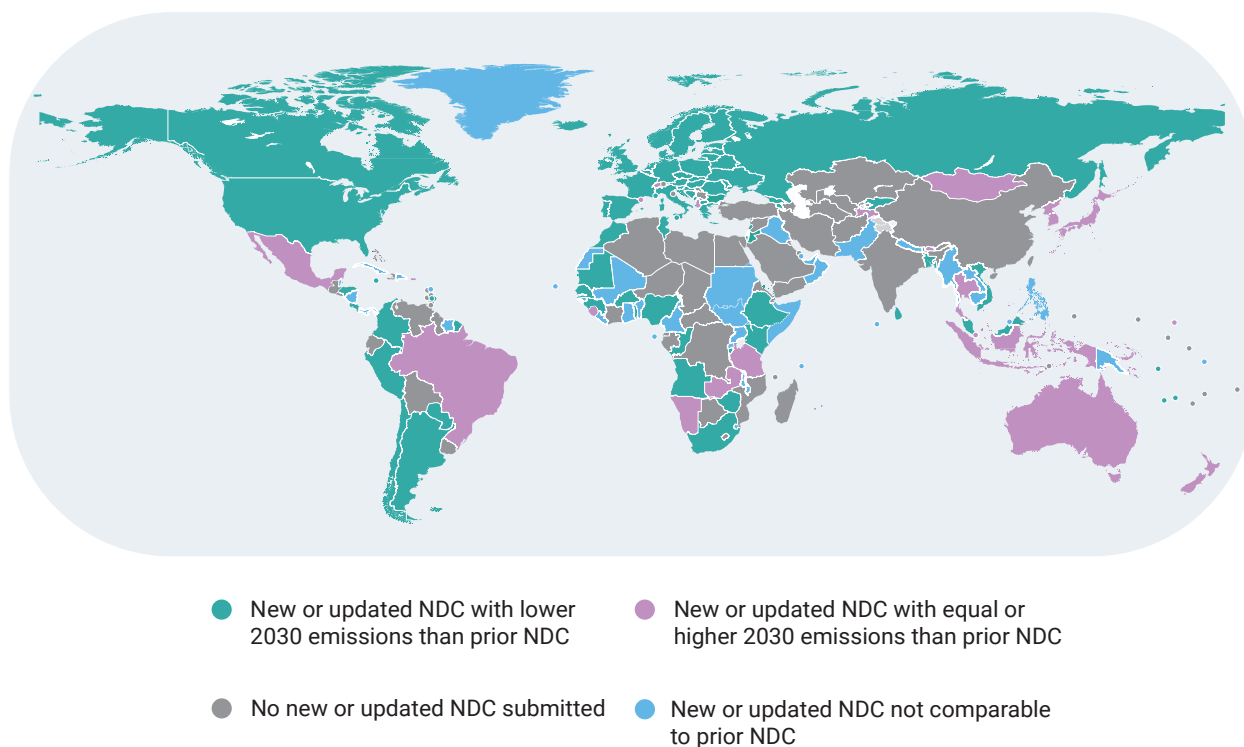


2. New mitigation pledges for 2030 show some progress, but their aggregate effect on global emissions is insufficient.

- ▶ As at 30 September 2021, 120 countries (121 parties, including the European Union and its 27 member states) representing just over half of global GHG emissions, have communicated new or updated NDCs. This year's assessment considers the new or updated NDCs communicated to the UNFCCC as well as announcements of new mitigation pledges for 2030 by China, Japan and the Republic of Korea not submitted as NDCs by 30 September.

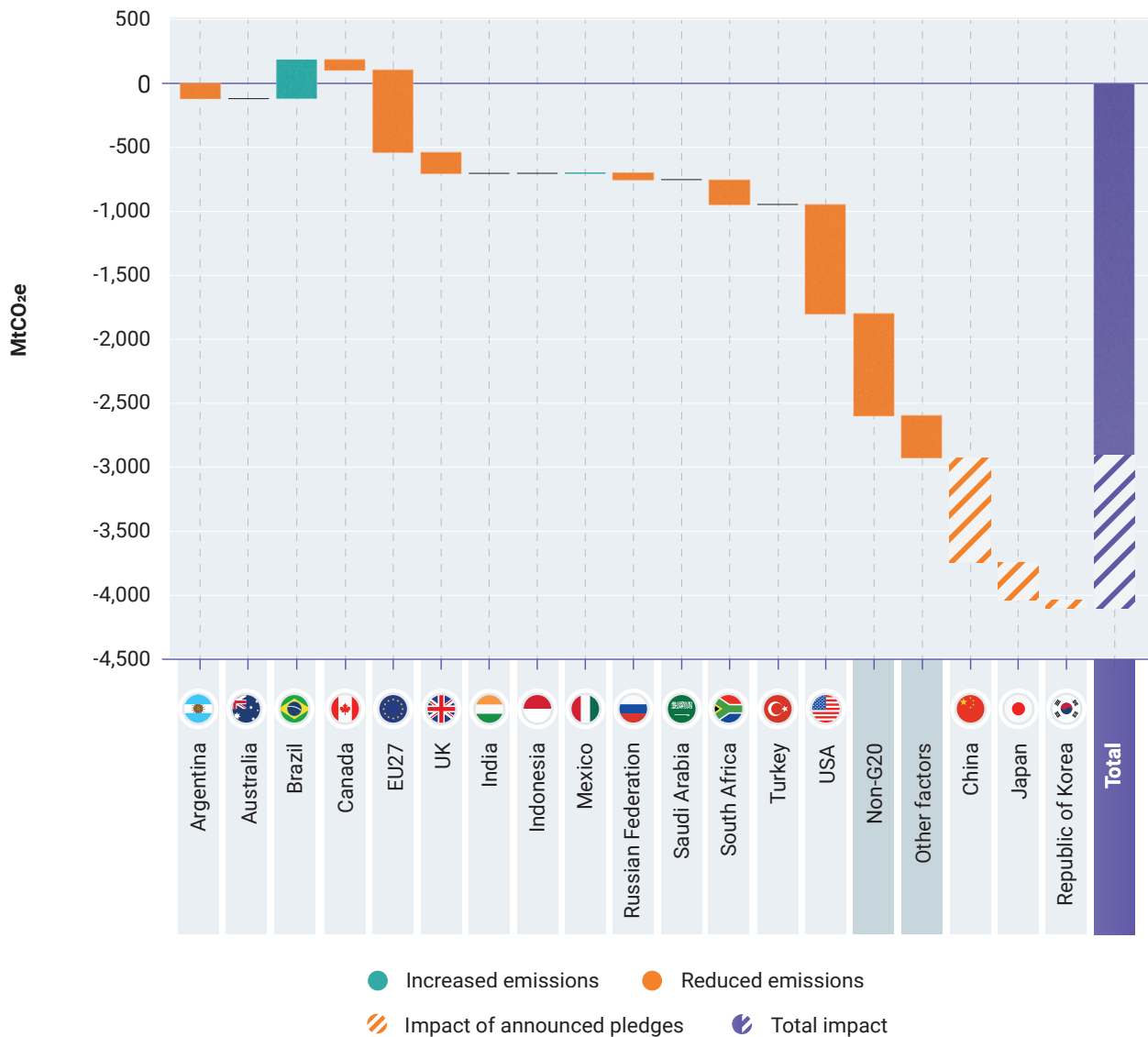
- ▶ Just under half (49 per cent) of the new or updated NDCs submitted (from countries accounting for 32 per cent of global emissions) result in lower 2030 emissions than the previous NDC. Around 18 per cent of the NDCs (from countries accounting for 13 per cent of global emissions) will not reduce 2030 emissions relative to the previous NDC. The remaining 33 per cent of NDCs (from countries accounting for 7 per cent of global emissions) contain insufficient detail to assess their impact on emissions relative to the previous NDC (figure ES.2). Typically, this is due to a lack of information in the previous NDC, rather than the current one; the current NDCs are more transparent.

Figure ES.2. Effect of new or updated nationally determined contributions on 2030 greenhouse gas emissions relative to previous nationally determined contributions



- ▶ Of the countries that have submitted new or updated NDCs, more (89 per cent) have GHG targets than before (75 per cent). However, these targets are only marginally more comprehensive in terms of sector and gas coverage. The share of new or updated NDCs that are completely unconditional has increased from 24 per cent to 26 per cent, while the share of NDCs that are completely conditional has dropped from 31 per cent to 18 per cent.
- ▶ The **aggregate impact of the new or updated NDCs** formally submitted is limited: new or updated unconditional NDCs are estimated to lead to a total reduction in 2030 global GHG emissions of about 2.9 gigatons of CO₂ equivalent (GtCO₂e), compared with the previous NDCs (figure ES.3). This estimate includes reductions of around 0.3 GtCO₂e resulting from **other factors**, including lower projections of international aviation and shipping emissions, and adjustments of countries that are projected to overachieve their NDC targets. If the announced pledges of China, Japan and the Republic of Korea are also included, this aggregate reduction increases to just over 4 GtCO₂e. The impact of conditional targets is of similar magnitude.
- ▶ Taking a closer look at the **G20 members**, the combined impact of submitted NDCs and announced GHG reduction targets for 2030 is an annual reduction of about 3 GtCO₂e compared with the previous NDCs. Six G20 members have formally submitted updated NDCs with enhanced GHG mitigation pledges: Argentina, Canada, the EU27 (counting the EU27 and its three individual G20 member states France, Germany and Italy as one), South Africa, the United Kingdom and the United States of America – all of which entail reduced emissions in 2030 of about 2.1 GtCO₂e compared with previous NDCs. Two G20 members (Brazil and Mexico) have submitted targets that lead to an increase in emissions of 0.3 GtCO₂e, bringing the net reduction in global GHG emissions of new or updated NDCs submitted by G20 members to 1.8 GtCO₂e annually by 2030. In addition, China, Japan and the Republic of Korea have announced enhanced pledges that result in annual reductions of about 1.2 GtCO₂e, but have not yet formally communicated them to the UNFCCC.
- ▶ The largest reductions come from the United States of America, the EU27, the United Kingdom, Argentina and Canada (submitted) and China and Japan (announced). Two G20 members (Australia and Indonesia) have submitted NDC targets, which are assessed not to lead to additional reduction relative to the previous NDCs. One G20 member (the Russian Federation) has submitted an NDC that improves upon its previous NDC, but still does not go beyond its current policies and another three G20 members (India, Saudi Arabia and Turkey) have not yet submitted a new or updated NDC.

Figure ES.3. Impact of 2030 pledges (nationally determined contributions and other announced pledges) on 2030 global emissions compared with previous nationally determined contribution submissions



▶ In comparison, the aggregate impact of the new or updated NDC submissions for the **non-G20 members** is an annual reduction of 0.8 GtCO_{2e} by 2030.

3. As a group, G20 members are not on track to achieve either their original or new 2030 pledges. Ten G20 members are on track to achieve their previous NDCs, while seven are off track.

▶ When considering the impact of new pledges, it should be noted that collectively the G20 members are not yet on track to achieve their previous NDCs. If current policy projections are used for those countries where policy projections are lower than what NDCs would deliver, the G20 members as a group are projected to fall short of achieving their unconditional NDCs by 1.1 GtCO_{2e} annually.

▶ Only 10 G20 members (Argentina, China, EU27, India, Japan, the Russian Federation, Saudi Arabia, South Africa, Turkey and the United Kingdom) are likely to achieve their original unconditional NDC targets under current policies. Among them, three members (India, the Russian Federation and Turkey) are projected to reduce their emissions to levels at least 15 per cent lower than their previous unconditional NDC emissions target levels under current policies, indicating that these countries have significant room for raising their NDC ambition. As at 30 September 2021, India and Turkey have not yet submitted a new or updated NDC, while the Russian Federation has submitted a new NDC that reduces emissions, but still results in higher emissions than implied by current policies. Australia, Brazil, Canada, Mexico, the Republic of Korea and the United States of America are all assessed to require stronger policies to achieve

prior NDCs, while there is insufficient information to assess the progress of Indonesia.

- ▶ G20 members have adopted a range of policies in recent years. While there are many positive developments, there are also negative examples, such as fossil fuel extraction projects and coal-fired power plant construction plans moving forward as well as rollback of environmental regulations during the COVID-19 pandemic. Based on the central estimates of independent studies, a large number of G20 members (Argentina, Brazil, China, India, Indonesia, Mexico, the Russian Federation and Saudi Arabia) are expected to emit more in 2030 under implemented policies than they did in 2010.
- ▶ Collectively, the G20 members are projected to fall short of their new or updated unconditional NDCs and other announced mitigation pledges for 2030. This is to be expected and it would indicate a lack of enhanced ambition if the new 2030 pledges were projected to be achieved with currently implemented policies. It is worth noting that Canada and the United States of America have submitted strengthened NDC targets, while independent studies suggest that they are not on track to meet their previous NDC targets with currently implemented policies. These two countries therefore need to make significant additional efforts to meet their new NDC targets.

4. A promising development is the announcement of long-term net-zero emissions pledges by 52 parties, covering more than half of global emissions. However, these pledges show large ambiguities.

- ▶ Net-zero emissions is a state where the sum of all anthropogenic emissions and removals is zero. Net-zero emissions targets are being defined in a variety of ways – the most important aspect from a global geophysical perspective being whether they cover all GHGs or CO₂ only. Global net-zero CO₂ emissions stabilize global warming, whereas net-zero GHG emissions result in a peak then a decline in global warming. To align with a 1.5°C limit, global CO₂ emissions must reach net zero around 2050, with global GHG emissions reaching net zero 15–20 years later. A delay of 15–20 years in either net-zero CO₂ or net-zero GHGs implies limiting warming to 2°C rather than 1.5°C.
- ▶ Globally, 51 countries and one party (the EU27 in addition to the net-zero pledges made by its individual member states) have pledged a net-zero

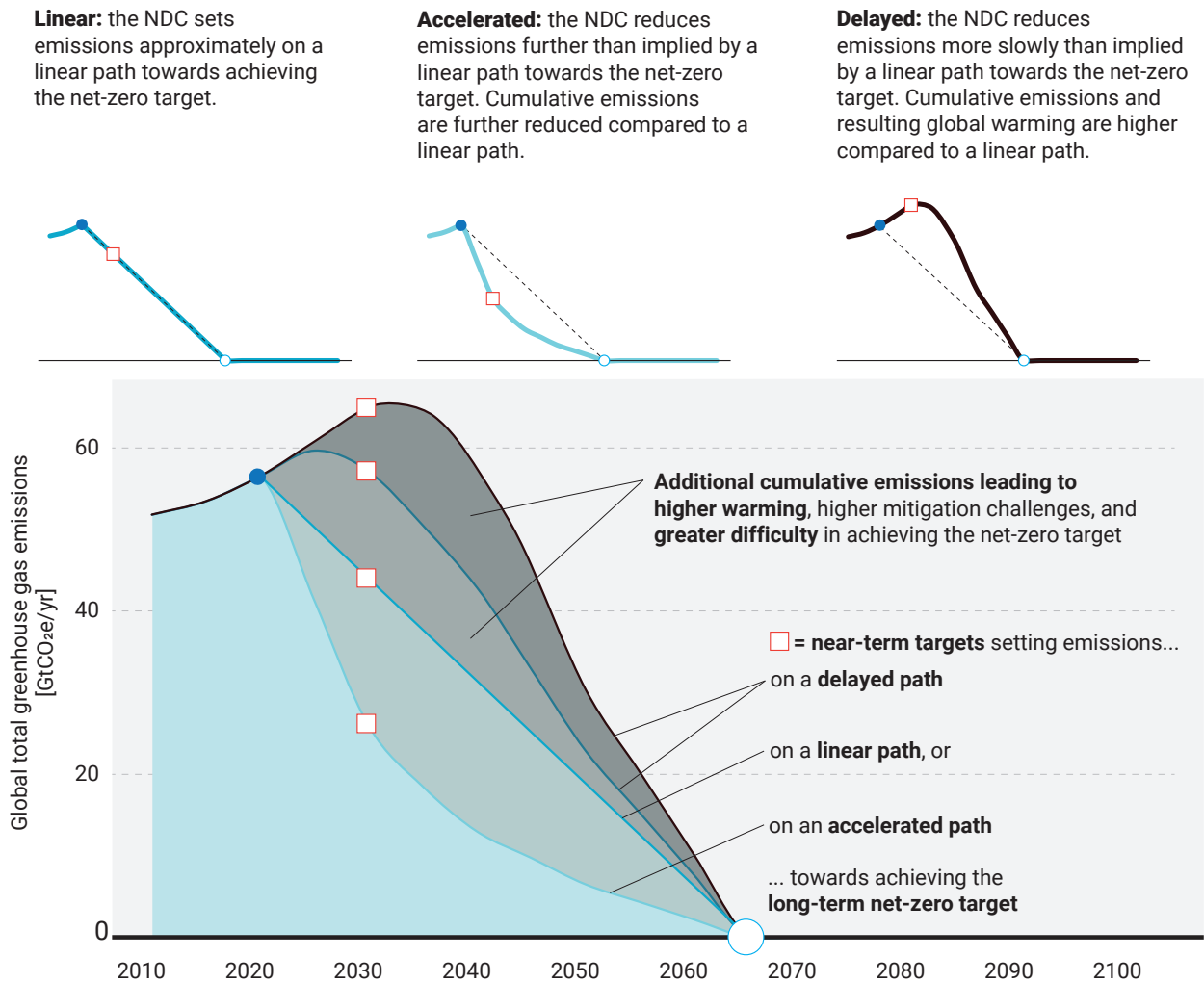
emissions target that is stated in national legislation, in a policy document or in a public announcement by the government or a high-level government official. These pledges cover more than half of current global domestic GHG emissions, over half of gross domestic product (GDP) and one third of the global population. Thirteen targets covering 12 per cent of global emissions are enshrined in law.

- ▶ By number, the majority of these targets (40) are for 2050, coincident with the mid-century timescale for global CO₂ emissions indicated by the IPCC as necessary for limiting warming to 1.5°C. Eight targets are aimed at earlier years (2030–2045) and four at later years. In terms of emissions, however, the targets are split almost entirely and equally between 2050 (due to the European Union and United States of America pledges) and 2060 (due to China's pledge).
- ▶ Existing targets show variations in scope and large ambiguities with respect to the inclusion of sectors and GHGs. The majority are furthermore unclear or undecided on the inclusion of emissions from international aviation and shipping and the use of international offsets.

5. Few of the G20 members' NDC targets put emissions on a clear path towards net-zero pledges. There is an urgent need to back these pledges up with near-term targets and actions that give confidence that net-zero emissions can ultimately be achieved and the remaining carbon budget kept.

- ▶ Twelve G20 members covering just over half of global domestic GHG emissions have currently pledged a net-zero target, of which six are in law, two are in policy documents and four are government announcements. All are for the year 2050, with the exception of China's 2060 target and Germany's target for 2045. The remaining eight G20 members have so far not set net-zero targets, but three of them have communicated long-term low GHG emission development strategies to the UNFCCC (Indonesia, Mexico and South Africa).
- ▶ G20 pledges also show ambiguity. Most targets are unclear or undecided on the inclusion of offsets and of international aviation and shipping emissions. Lack of clarity is also notable on coverage of sectors and gases, but pledges that are clear show a tendency for comprehensive coverage. However, most show a lack of transparency regarding the approach taken to fairness, the plans for achievement (including on use of removals), and

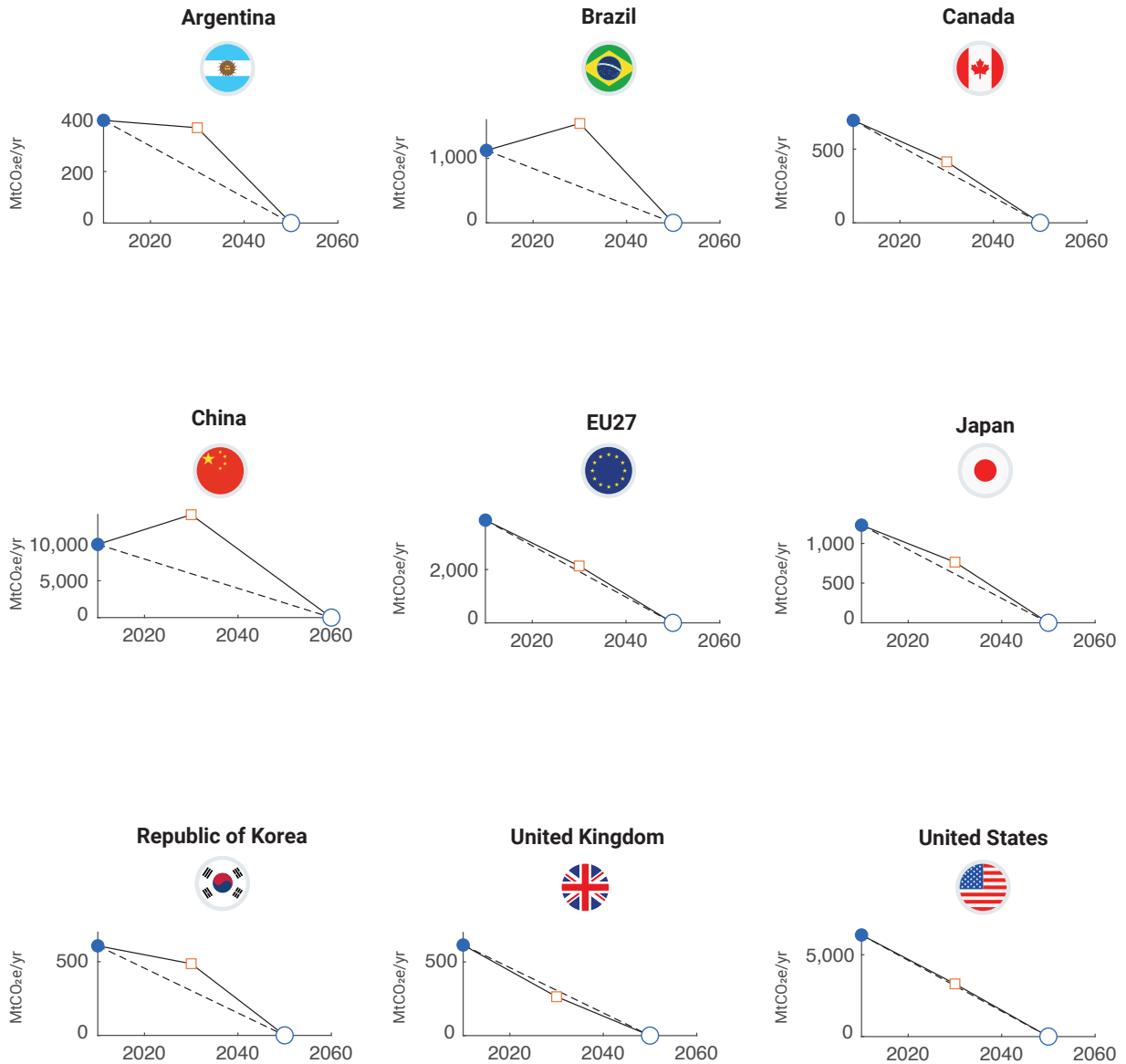
Figure ES.4. Near-term targets are critical to set global emissions on a clear path towards achieving long-term net-zero targets and stringent climate goals



- progress reporting and review. Only Canada, the European Union, France, Germany and the Republic of Korea have published their plans at the time of completing this report, and only these countries plus the United Kingdom have accountable processes for reviewing their targets.
- ▶ The pathway to net zero counts: the path followed from today until net-zero CO₂ emissions are reached determines the total amount of emitted CO₂ and thereby the total carbon budget used (see bullet below). Whether a linear, an accelerated, or a delayed path is followed will affect the climate outcome (figure ES.4).
 - ▶ Global warming is close to linearly proportional to the total net amount of CO₂ that has ever been emitted in the atmosphere as a result of human activities. Therefore, limiting global warming to a specified level requires that the total amount

- of CO₂ emissions ever emitted be kept within a finite carbon budget. New IPCC estimates put the remaining carbon budget to limit warming to 1.5°C relative to pre-industrial levels, with 66 per cent chance, at 400 GtCO₂. For 2°C, the estimate is 1,150 GtCO₂. Current annual global CO₂ emissions are above 40 GtCO₂/year, meaning that urgent and deep emissions reductions over the next decade are required to stay within the remaining budgets.
- ▶ As an indication of the consistency between nearer-term actions and net-zero targets, figure ES.5 plots the emissions paths for a subgroup of G20 members implied by their current NDCs and their net-zero target. Of the nine G20 members for which an emissions path can be estimated based on their net-zero target and their NDC, none have NDC targets that put them on an accelerated path towards their net-zero emissions targets. Five of

Figure ES.5. Overview of net-zero pathways implied by climate pledges by selected G20 members



Note: Only G20 members with net zero targets are included. Member states of the European Union have no separate assessment of their path to net zero, because their NDC is not assessed separately as part of this report.

these nine members, accounting for about one fifth of global domestic GHG emissions, have NDC targets that put the country's domestic emissions onto a linear path towards achieving their net-zero targets. In the other four cases, the NDCs lead to emissions in 2030 that are about 25 per cent to 95 per cent higher than a linear path towards their net-zero targets would imply. Recognizing that countries face very different circumstances, these countries urgently need strengthened and more ambitious near-term climate plans for their net-zero targets to remain achievable.

- ▶ There is an urgent need for (i) more G20 members – and indeed all countries – to pledge net-zero emissions, (ii) all countries to increase the robustness of their net-zero pledges, and (iii) all net-zero targets to be backed up by near-term actions that give confidence that the net-zero targets can ultimately be achieved.

6. The emissions gap remains large: compared to previous unconditional NDCs, the new pledges for 2030 reduce projected 2030 emissions by only 7.5 per cent, whereas 30 per cent is needed for 2°C and 55 per cent is needed for 1.5°C.

- ▶ As in previous reports, the emissions gap for 2030 is defined as the difference between total global GHG emissions from least-cost scenarios that keep global warming to 2°C, 1.8°C or 1.5°C with varying levels of likelihood and the estimated total global GHG emissions resulting from the full implementation of the NDCs.
- ▶ This year, the NDC scenario has been expanded to include all the most recent NDCs (new or updated NDCs if submitted, and previous NDCs otherwise) as well as all officially announced climate change mitigation pledges for 2030 with a cut-off date of 30 August 2021. The three least-cost scenarios consistent with the Paris Agreement have been updated and their temperature outcomes re-assessed based on the Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. As a result, global emissions in 2030 consistent with keeping global warming below 2.0°C with a 66 per cent chance are now estimated at 39 GtCO_{2e}, which is about 2 GtCO_{2e} lower than in earlier reports. Similarly, the estimate for 1.8°C is about 2 GtCO_{2e} lower than the 1.8°C estimate of previous reports. There are no changes to the

1.5°C estimate (table ES.1). This implies that while the aggregate effect on global emissions in 2030 of new or updated NDCs and announced pledges is estimated at 4 GtCO_{2e} (see point two of this summary), the gap with respect to 2°C is only reduced by 2 GtCO_{2e} compared with last year.

- ▶ The updated current policies scenario is estimated to reduce global GHG emissions in 2030 to about 55 GtCO_{2e} (range: 52–58 GtCO_{2e}) in 2030, which is 4 GtCO_{2e} lower than the median estimate of the 2020 Emissions Gap Report and 9 GtCO_{2e} lower than the 2010-policies scenario (table ES.1). Around half of the decrease between the 2020 and 2021 Reports reflects climate policy progress in the countries, while the other half is because of the general slowdown of economies due to the COVID-19 pandemic.
- ▶ Collectively, countries are falling short of meeting their new or updated NDCs and announced pledges with current policies. This implementation gap in 2030 is 3 GtCO_{2e} for unconditional NDCs and 5 GtCO_{2e} for conditional NDCs.
- ▶ Compared to last year, the emissions gap is only slightly narrowed by the new or updated NDCs and announced mitigation pledges. By 2030, annual emissions need to be 13 GtCO_{2e} (range: 10–16 GtCO_{2e}) lower than current unconditional NDCs imply for the 2°C goal, and 28 GtCO_{2e} (range: 25–30 GtCO_{2e}) lower for the 1.5°C goal. Both estimates are for a 66 per cent chance of staying below the stated temperature limit. If conditional NDCs are also considered, these gaps are reduced by around 2 GtCO_{2e} and 3 GtCO_{2e} respectively (figure ES.6, table ES.1).

Table ES.1. Total global greenhouse gas emissions in 2030 under different scenarios, temperature implications, and the resulting emissions gap

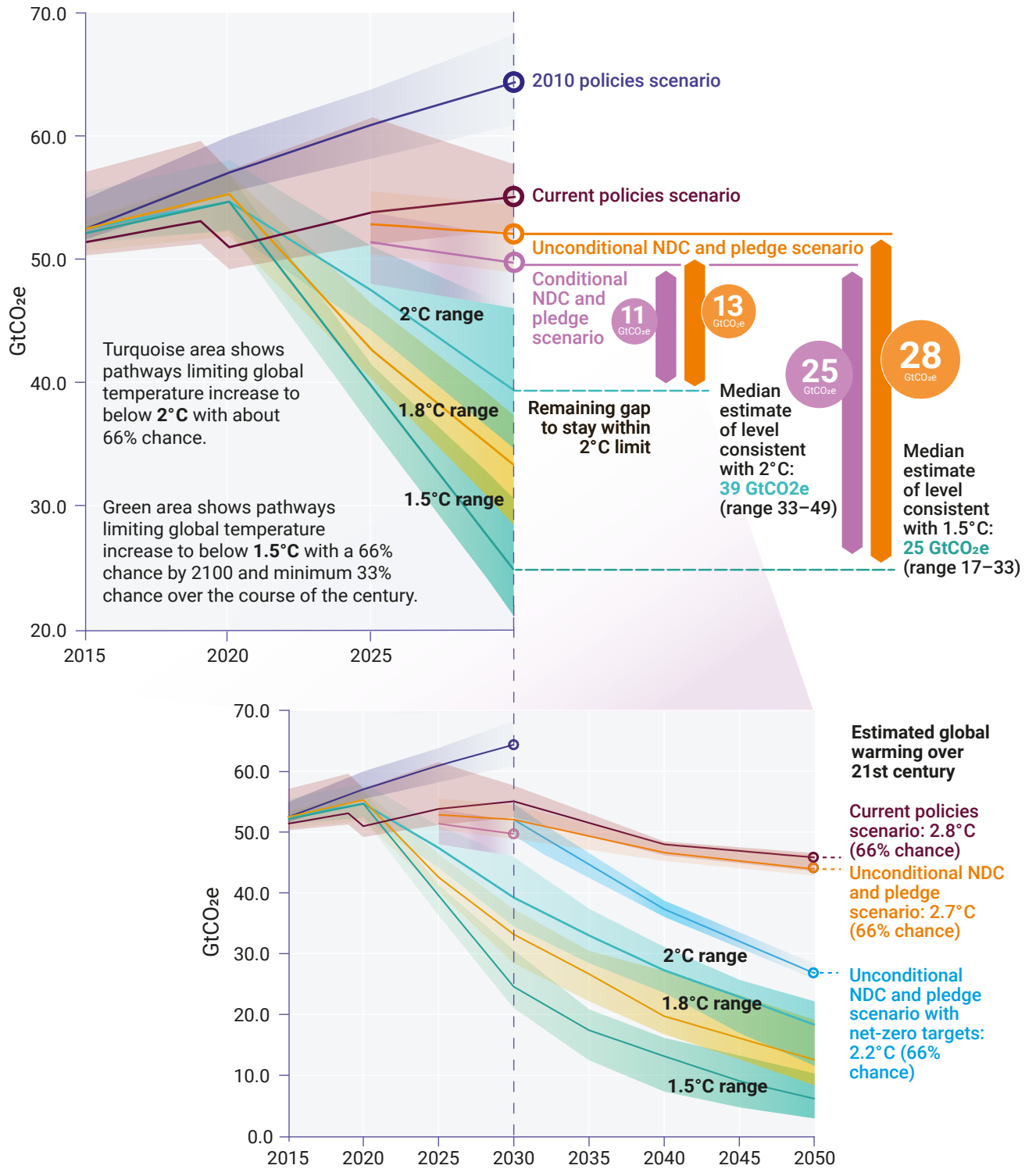
Scenario (rounded to the nearest gigaton)	Number of scenarios in set	Global total emissions in 2030 [GtCO ₂ e]	Estimated temperature outcomes			Closest corresponding IPCC SR1.5 scenario class	Emissions gap in 2030 [GtCO ₂ e]		
			50% chance	66% chance	90% chance		Below 2.0°C	Below 1.8°C	Below 1.5°C
Year 2010 policies	6	64 (60–68)							
Current policies	9	55 (52–58)					15 (12–18)	22 (19–25)	30 (28–33)
Unconditional NDCs (updated NDCs and announcements)	8	52 (49–55)					13 (10–16)	19 (16–22)	28 (25–30)
Conditional NDCs (updated NDCs and announcements)	8	50 (46–52)					11 (7–13)	17 (13–19)	25 (22–28)
Below 2.0°C (66% chance)	71	39 (33–49)	Peak: 1.7–1.8°C In 2100: 1.3–1.7°C	Peak: 1.8–2.0°C In 2100: 1.5–1.9°C	Peak: 2.2–2.4°C In 2100: 1.9–2.4°C	Higher-2°C pathways			
Below 1.8°C (66% chance)	23	33 (27–41)	Peak: 1.6–1.7°C In 2100: 1.2–1.6°C	Peak: 1.7–1.8°C In 2100: 1.4–1.8°C	Peak: 2.0–2.2°C In 2100: 1.8–2.2°C	Lower-2°C pathways			
Below 1.5°C (66% chance in 2100 with no or limited overshoot)	26	25 (17–33)	Peak: 1.5–1.6°C In 2100: 1.0–1.3°C	Peak: 1.6–1.7°C In 2100: 1.2–1.5°C	Peak: 1.9–2.1°C In 2100: 1.5–1.9°C	1.5°C with no or limited overshoot			

7. Global warming at the end of the century is estimated at 2.7°C if all unconditional 2030 pledges are fully implemented and 2.6°C if all conditional pledges are also implemented. If the net-zero emissions pledges are additionally fully implemented, this estimate is lowered to around 2.2°C.

- To estimate the global warming implications at the end of this century, estimated emissions for the year 2030 are projected out to 2100, and their climate outcomes assessed using a climate model. This approach assumes a continuation of climate action beyond 2030, without further strengthening. Extrapolations until the end of the

century are inherently uncertain and subject to scenario assumptions, such as the level at which climate action continues or technology costs. This uncertainty is currently of the order of $\pm 0.5^\circ\text{C}$ around the best-estimate 2.7°C projection, but is reduced to $\pm 0.3^\circ\text{C}$ when taking into account countries' net-zero targets. Furthermore, it should be noted that this year's estimates are based on improved methods and the latest climate assessment of Working Group I in the IPCC Sixth Assessment Report (AR6). These methodological updates alone lower temperature projections for unconditional NDCs by about 0.2°C compared to last year's estimates.

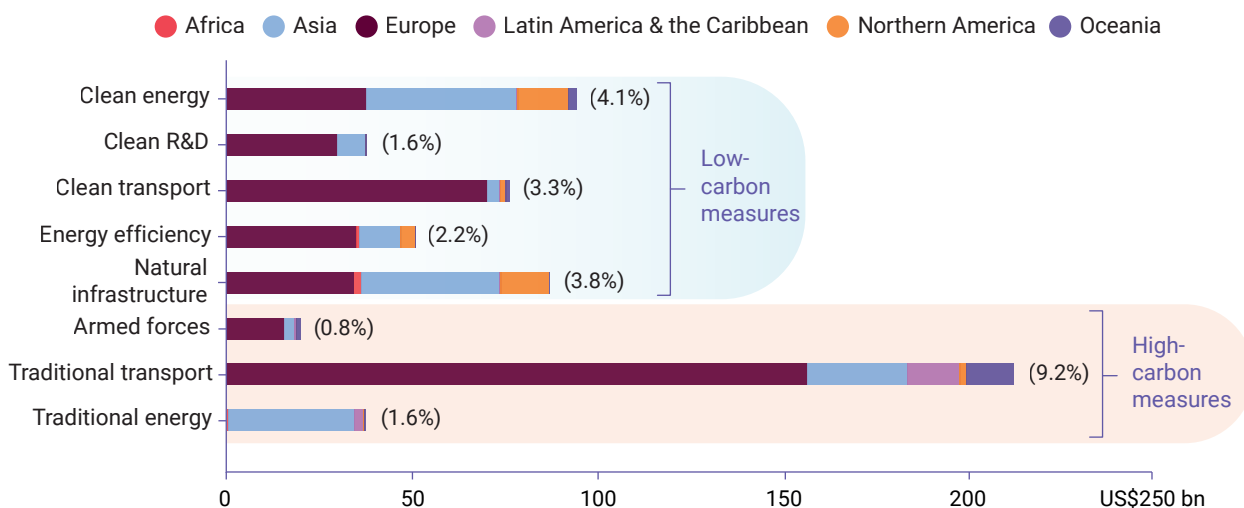
Figure ES.6. Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and tenth to ninetieth percentile range)



- ▶ Acknowledging these caveats, a continuation of the new or updated unconditional NDCs and pledge announcements is estimated to limit warming to 2.7°C (range: 2.2–3.2°C) by the end of the century with a 66 per cent chance. If conditional pledges are also fully implemented, these estimates are lowered to 2.6°C (range: 2.1–3.1°C). By contrast, a continuation of current policies, which are insufficient to meet the 2030 pledges, is estimated to limit warming to 2.8°C (range 2.3–3.3°C).
- ▶ The full implementation of the net-zero pledges, in addition to new or updated unconditional NDCs and

announced pledges, further lower these temperature estimates markedly to 2.2°C (range 2.0–2.5°C) with 66 per cent chance. Even under this scenario, there is still more than 15 per cent chance that global warming will exceed 2.5°C by the end of the century, and just short of 5 per cent chance that it will exceed 3°C. Finally, these estimated improvements from net-zero targets should be caveated by the fact that only a few current NDCs set countries' emissions on a linear path towards reaching longer-term net-zero targets.

Figure ES.7. Global recovery spending as at May 2021 across sectors by region (US\$ billion). Low-carbon initiatives (top) and high-carbon initiatives (bottom)



Note: R&D stands for research and development.

8. The opportunity to use COVID-19 fiscal rescue and recovery spending to stimulate the economy while fostering a low-carbon transformation has been missed in most countries so far. Poor and vulnerable countries are being left behind.

- ▶ The COVID-19 pandemic has precipitated an enormous increase in public expenditure, in the form of: (i) short-term rescue spending, to keep businesses and people alive; (ii) longer-term recovery investment, to reinvigorate the economy; and (iii) reinforcement spending, to embed new economic trajectories into long-term development plans. Low-carbon rescue spending has incentivized decarbonization through green

conditionalities attached to short-term business support. Low-carbon recovery investment has set out to accelerate the low-carbon transition directly by supporting green projects and indirectly by incorporating green incentives into traditional investment. Green reinforcement initiatives deliver long-term support to the projects and sectors targeted by green recovery investment.

- ▶ Approximately US\$16.7 trillion was spent to May 2021 on COVID-19-related rescue and recovery packages (excluding unallocated European Union funds). However, most resources have been for immediate rescue spending, mostly on unemployment and worker support programmes, pandemic management, and health-care

Figure ES.8. COVID-19-related spending per capita across development categories (US\$)



services. US\$2.25 trillion is considered recovery spending. Of this, only around 17–19 per cent (US\$390–440 billion) is likely to reduce GHG emissions.

- ▶ Low-carbon fiscal spending has covered a wide range of sectors. Over 500 green rescue and recovery measures have been introduced globally. Policies have covered most emerging and established green industries (figure ES.7). The range of spending has been notably wider in advanced economies, with emerging market and developing economies focusing their green recovery funds on clean energy generation and natural capital investments.
- ▶ International disparities are large in terms of both total spending and low-carbon spending. Almost 90 per cent of recovery spending is accounted for by seven countries: the Republic of Korea, Spain, Germany, the United Kingdom, China, France and Japan. The Global Recovery Observatory finds that, up to May 2021, France, Germany, Canada, Finland, Norway and Denmark can be classified as 'leaders' on green recovery, with green spending as a share of recovery spending ranging from 39 per cent to 75 per cent. The United Kingdom, Spain and Sweden also rank highly, according to Vivid Economics' Greenness of Stimulus Index.
- ▶ Vulnerable nations are being left behind. COVID-19 spending has been far lower in low-income economies (~US\$60 per person) than advanced economies (~US\$11,800 per person)

(figure ES.8). Less diversified economies, rising debt as a percentage of GDP, and corresponding limited fiscal space have constrained the ability of emerging economies and low-income countries to mobilize resources.

- ▶ Without a substantial increase in foreign aid, the difference in spending between advanced economies and emerging markets and developing economies will exacerbate gaps in development and restrict progress against climate change. Additionally, without significantly increased climate finance, emerging markets and developing economies are likely to become the world's top GHG emitters, all while disproportionately suffering the burden of climate change, which has historically been caused primarily by high-income nations.

9. Reduction of methane emissions from the fossil fuel, waste and agriculture sectors can contribute significantly to closing the emissions gap and reduce warming in the short term.

- ▶ Methane is the second-most-important GHG in terms of current anthropogenic climate forcing, and global anthropogenic methane emissions continue to increase.
- ▶ With a lifetime of about 12 years, and a global warming potential (GWP) of approximately 82 over a 20-year period and 29 over a 100-year period, reducing methane emissions represents

an important opportunity to slow down the rate of warming in the short term, reduce peak warming during this century and help bridge the emissions gap between current trajectories and those consistent with the 2°C or 1.5°C temperature goals.

- ▶ Strong abatement potential exists at net-negative and low costs (<US\$600/tCH₄; <~US\$20/tCO₂e using GWP100), especially in the fossil fuel sector, even without accounting for the avoided costs of environmental damages. Abatement potential via technical measures is also large in the waste sector and to a lesser extent in agriculture, where it will be difficult to greatly mitigate emissions without changing diets at the global or regional levels.
- ▶ Available net-negative or low-cost technical mitigation measures alone could reduce anthropogenic methane emissions by approximately 20 per cent by 2030, whereas all targeted measures could reduce emissions by about one third. Additional measures, such as switching from natural gas to renewables, dietary changes and food waste reduction could add 15 per cent to the 2030 mitigation potential. This is consistent with methane reductions in most 2°C and 1.5°C pathways, which are approximately 34 per cent and 44 per cent, respectively, at the global level in 2030 compared to 2015.
- ▶ Current NDCs cover only about one third of the methane reduction required to be consistent with a 2°C temperature goal, and only about 23 per cent of what is needed for the 1.5°C goal. There are, however, excellent opportunities to include additional methane reduction measures in NDCs, as several countries are already demonstrating, for example through actions such as upstream leak detection and repair in oil and gas systems, elimination of gas flaring, energy recovery from landfill gas, and reducing food waste and loss.
- ▶ Action is often hampered by the fact that reported methane emissions are highly uncertain given the large number and complexity of emission sources and the uncertainty over emission factors. Recent developments in measurement capabilities enable total emissions rates to be monitored, including at the facility scale for larger emission sources. Although these measurements will provide a much better basis for decisive actions, they need to be used systematically and to become a key element in preparing national policies.

10. Carbon markets can deliver real emissions abatement and drive ambition, but only when rules are clearly defined, designed to ensure that transactions reflect actual reductions in emissions, and supported by arrangements to track progress and provide transparency.

- ▶ Article 6 of the Paris Agreement and international markets are not a direct source of ambition but can function as a lever for implementing and unlocking greater ambition. Markets can provide an opportunity for countries, companies and other actors to achieve their emission reduction goals at lower costs and thereby create room to enhance their ambition in both the near- and long term. Particularly, participants with hard-to-abate emissions would be enabled to meet their mitigation goals at lower costs.
- ▶ From a market-integrity perspective, the optimal situation would be for NDCs to come with comprehensive GHG coverage, clearly quantifiable mitigation goals, and robust accounting, but NDCs are currently very heterogeneous. This creates challenges for developing a robust international market. The agreed rules need to ensure environmental integrity and encourage enhanced ambition. A global market system would best facilitate progress towards meeting the Paris goals, if countries are not allowed to capture the benefits of lower cost without raising ambition, or if countries that are selling off cheap mitigation options subsequently ensure delivery on the costlier ones.
- ▶ The use of market mechanisms could have important implications for both mitigation and sustainable development pathways. In addition to potentially lowering the cost of additional ambition everywhere, markets could lead to a shift in capital investment towards selling regions, and in this way affect metrics such as local air quality, employment and sustainability, and shift costs. Nevertheless, there is a risk that this could lead to reduced incentives for technological innovation in buying regions.
- ▶ Global modelling studies estimate that if all NDCs were transformed into tradable emissions abatement and all countries had economy-wide targets, around 4–5 GtCO₂e could be traded per year by 2030. If the savings from more cost-

effective global implementation of NDCs were redeployed towards increased ambition, the emissions reductions planned in current NDCs could be roughly doubled over the next decade at no added cost to parties, compared to parties acting alone to implement their commitments.

- ▶ These studies indicate the significant theoretical potential of carbon markets. For this potential to be realized, these theoretical findings need to be translated into real-world policy changes. The challenge for COP26 negotiations is to decide on the necessary guidance for article 6 that can launch a global market that is able to gradually expand and improve as pledges evolve and experiences are gained.
- ▶ The number of countries that in their new or updated NDCs have indicated the planned or possible use of voluntary cooperative approaches has almost doubled compared to the previous NDCs, indicating significantly increased interest.
- ▶ For markets to play a role in the process towards net-zero emissions, NDCs should cover all sectors and gases and have economy-wide quantitative goals. With narrowing cost differences over time, the volume of trading would likely diminish, while the transactional value would increase. The market would increasingly focus on CO₂ removal from the atmosphere.



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United Nations Avenue, Gigiri
P.O. Box 30552, 00100 Nairobi, Kenya
Tel. +254 20 762 1234
unep-publications@un.org
www.unep.org