

3 Nationally determined contributions and long-term pledges: The global landscape and G20 member progress

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3.1 Introduction

This chapter provides an updated assessment of progress on nationally determined contributions (NDCs) and long-term pledges, focusing on three key questions:

- 1) What global progress has been made — overall and since the 2021 United Nations Climate Change Conference of the Parties COP 26 — by countries in their submissions of new or updated NDCs and long-term, net-zero emission pledges (section 3.2)?
- 2) What is the estimated impact on global greenhouse gas (GHG) emissions in 2030 of the latest NDCs, assuming they are fully achieved, and what progress is made by G20 members individually and collectively towards achieving their NDCs (section 3.3)?
- 3) What is the status of net-zero emission pledges by G20 members and are current policies and NDC targets aligned with the long-term pledges (section 3.4)?

Section 3.2 adopts a global perspective, whereas subsequent sections focus on G20 members. Currently, G20 members

account for about 75 per cent of global GHG emissions (see chapter 2), and their success in implementing and potentially exceeding their NDC targets will carry a major impact on 2030 emissions and the possibility for bridging the emissions gap.

The cut-off date for the assessment is 23 September 2022. All GHG emission figures are expressed using the 100-year global warming potentials (GWPs) from the Intergovernmental Panel on Climate Change (IPCC) *Sixth Assessment Report* (AR6). The United Nations Framework Convention on Climate Change (UNFCCC) inventory reports for historical emissions are referred to when comparing them to individual G20 members' NDC targets. The methodology and preliminary findings of this chapter were made available to the governments of the G20 members specifically mentioned to provide them with the opportunity to comment on the findings.

Findings related to the progress of G20 members towards their NDC and net-zero targets should be read with two important caveats in mind. The Emissions Gap Report does not assess the level of ambition of NDCs. However, the level of ambition is one of the factors likely to influence whether countries are on track to achieving their NDC targets. In

other words, a country currently on track to achieve its NDCs is not necessarily undertaking more mitigation action than a country not yet on track. Secondly, the Paris Agreement recognizes that each country faces unique national circumstances. Factors such as development stage and associated opportunities and barriers may affect both target ambition and target implementation.

3.2 Global developments in mitigation pledges for 2030 and beyond

3.2.1 NDCs

The ambition-raising cycle of the Paris Agreement builds on the submission by parties of increasingly ambitious NDCs every five years. Due to the COVID-19 pandemic, many parties submitted new or updated NDCs by COP 26 in 2021 instead of in 2020. As assessed by the Emissions Gap Report 2021, the new and updated NDCs showed some progress, but globally they remained highly insufficient to bridge the 2030 emissions gap. Reflecting this, the Glasgow Climate Pact, adopted at COP 26, requested that parties “revisit and strengthen” their 2030 targets by the end of 2022.

This section provides an update on the global landscape and the key characteristics of the new and updated NDCs (those that replaced an initial NDC between 1 January 2020 and 23 September 2022) as well as the initial NDCs (those in effect as of 31 December 2019).¹ Progress since COP 26 is highlighted.

As at 23 September 2022, 166 out of 194 Paris Agreement parties, representing around 91 per cent of 2019 global GHG emissions (Climate Watch 2022), have submitted new or updated NDCs, up from 152 parties as at COP 26. Since the European Union and its 27 member states submit a single NDC, this amounts to 139 new or updated NDCs having been submitted. These NDCs reflect emerging trends related to the ambition, form, coverage and conditionality of GHG mitigation pledges.

Effect on 2030 emissions: Of the 139 new or updated NDCs, just over half (74 NDCs from parties representing 77 per cent of global GHG emissions) would result in lower 2030 emissions relative to the initial NDCs (figure 3.1). This is up from 67 NDCs representing 69 per cent of global GHG emissions as at COP 26. Twenty-three NDCs, from parties representing 9 per cent of global GHG emissions, had communicated a new or updated NDC that would not reduce 2030 emissions relative to the previous NDCs. Forty-two NDCs from parties representing 5 per cent of global emissions could not be compared with the previous NDCs in terms of 2030 emissions, typically due to insufficient

information in the previous NDCs, as transparency has improved in the current NDCs.

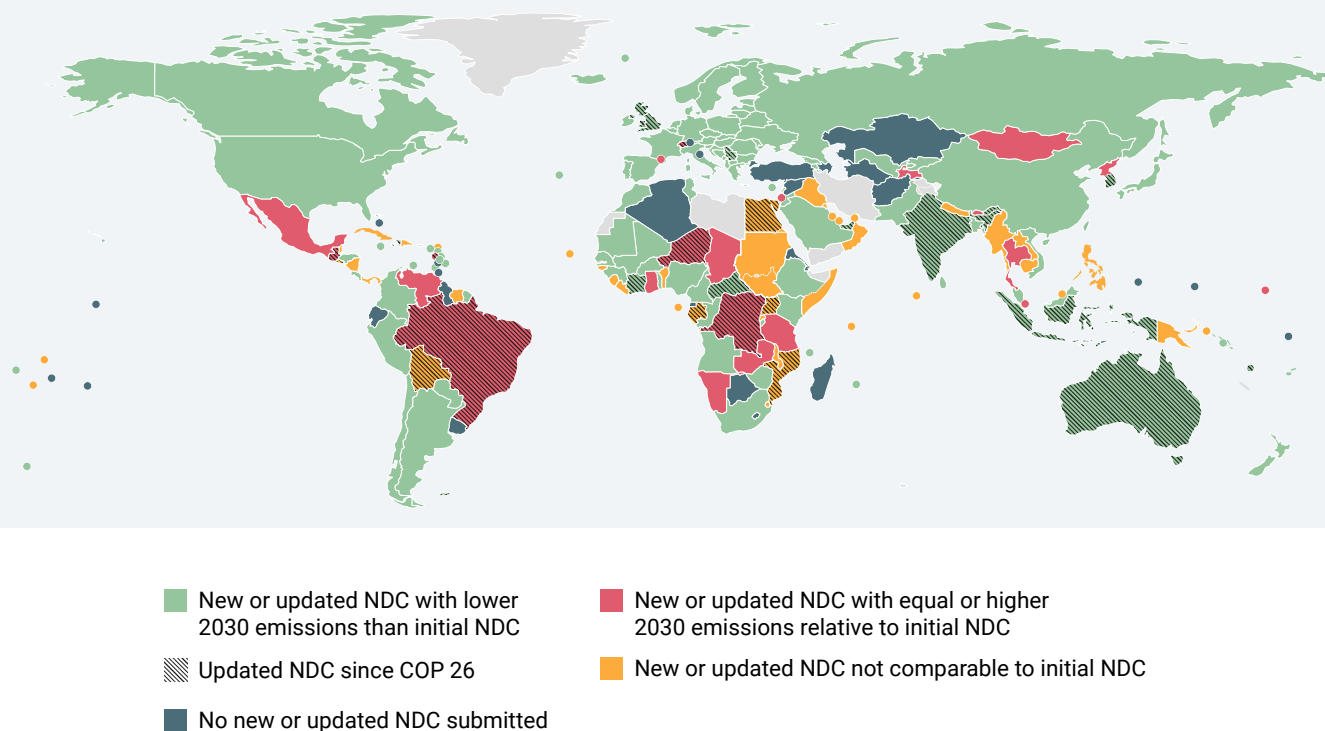
Pledge form: A total of 146 NDCs, from parties representing 91 per cent of global GHG emissions, now contain GHG targets. This is up from 128 initial NDCs (89 per cent of global emissions) and up from 143 NDCs as at COP 26 (90.5 per cent of global GHG emissions). These GHG targets comprise several different types, including base-year targets (commitments to reduce or control the increase in emissions by a specified amount relative to a base year, contained in 43 NDCs) and baseline scenario targets (commitments to reduce emissions by a specified amount relative to a projected emissions baseline scenario, contained in 83 NDCs), among other formulations (20 NDCs). Base-year targets typically result in emissions decreasing over time relative to historical levels, whereas baseline scenario targets are typically formulated to allow absolute emissions to continue to grow. A total of 43 NDCs, from parties representing 36 per cent of global GHG emissions, now contain a base-year target. This is up from 34 initial NDCs from parties representing 34 per cent of global GHG emissions. Of the 21 countries adopting a GHG target for the first time in their new or updated NDCs, 16 also adopted a baseline scenario target.

Sector coverage: GHG targets can be formulated to cover a country’s entire economy or only a subset of it. Targets with economy-wide coverage include the energy, industrial process and product use, waste and land sectors. There are 95 current NDCs, from parties representing 55 per cent of global GHG emissions, that cover all sectors. This is up significantly from the 54 initial NDCs, from parties representing 46 per cent of global GHG emissions, that did so.

Gas coverage: Likewise, GHG targets can be formulated to cover all major GHGs – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorochemicals (PFCs), sulfur hexafluoride (SF₆) and nitrogen trifluoride (NF₃) – or only a subset of them. GHG coverage of NDCs has remained relatively constant from the initial to the current NDCs, 24 of which, from parties representing 30 per cent of global emissions, cover all gases.

Conditionality: Some parties have submitted NDCs that are entirely or partially conditional on factors such as international support (e.g., finance or technology transfer), while others have submitted NDCs that are not conditional. NDCs now include more unconditional elements than previously. One hundred and twenty-six current NDCs, from parties representing 80 per cent of global emissions, now include at least some unconditional elements. This is up from 103 initial NDCs, from parties representing 76 per cent of global emissions.

¹ Excluding updated first and second NDCs.

Figure 3.1 Effect of new or updated NDCs on 2030 GHG emissions relative to initial NDCs

3.2.2 Long-term and net-zero pledges

As at 23 September 2022, 88 parties covering approximately 79 per cent of global GHG emissions have adopted net-zero pledges either in law (21 parties), in a policy document such as an NDC or a long-term strategy (47 parties), or in an announcement by a high-level government official (20 parties). This is up from 74 parties as at COP 26. An additional eight parties covering an additional 2 per cent of global GHG emissions have another (non-net-zero) GHG mitigation target as part of their long-term strategy.

A total of 36 per cent of global GHG emissions are covered by net-zero targets for 2050 or earlier, while 43 per cent of global emissions are covered by net-zero pledges for years later than 2050. Currently, 21 per cent of global emissions are not covered by net-zero pledges.

A total of 53 net-zero targets cover all sectors, while 31 do not specify sectoral coverage. Moreover, 37 cover all gases, eight cover fewer than all gases and 40 do not specify. Two cover international shipping and aviation, one covers international aviation but not shipping, 12 cover neither and 71 do not specify. Five net-zero targets rule out the use of international offsets towards the net-zero targets, 19 anticipate the use of international offsets, and 61 do not specify.

3.3 Impacts of new and updated NDCs on global GHG emissions in 2030

This section estimates the impact on projected global 2030 emissions of new and updated NDCs as at 23 September 2022 (assuming they are fully implemented) compared to initial NDCs. The data come from three model groups that include updated NDCs with cut-off dates ranging from November 2021 to September 2022 (Keramidas *et al.* 2021; den Elzen *et al.* 2022; Meinshausen *et al.* 2022), and two open-source tools (Climate Action Tracker 2021; Climate Watch 2022).² To enable the inclusion of the updated NDCs of G20 members that were submitted after the cut-off dates of the five data sources (that is, Australia, Brazil, India, Indonesia, Republic of Korea and the United Kingdom), NDC emission estimates were recalculated based on the historical emissions data used in the respective studies.³

Full implementation of all new or updated unconditional NDCs is projected to lead to a total reduction in global GHG emissions for 2030 of about 4.8 gigatons (Gt) of CO₂e (range: 1.7–7.9 GtCO₂e) annually, compared with initial pledges (figure 3.2; see also appendix B and table B.2). New and updated NDCs submitted since the Emissions Gap Report 2021 account for about 0.7 GtCO₂e of this total, mainly due to additional reductions from the updated

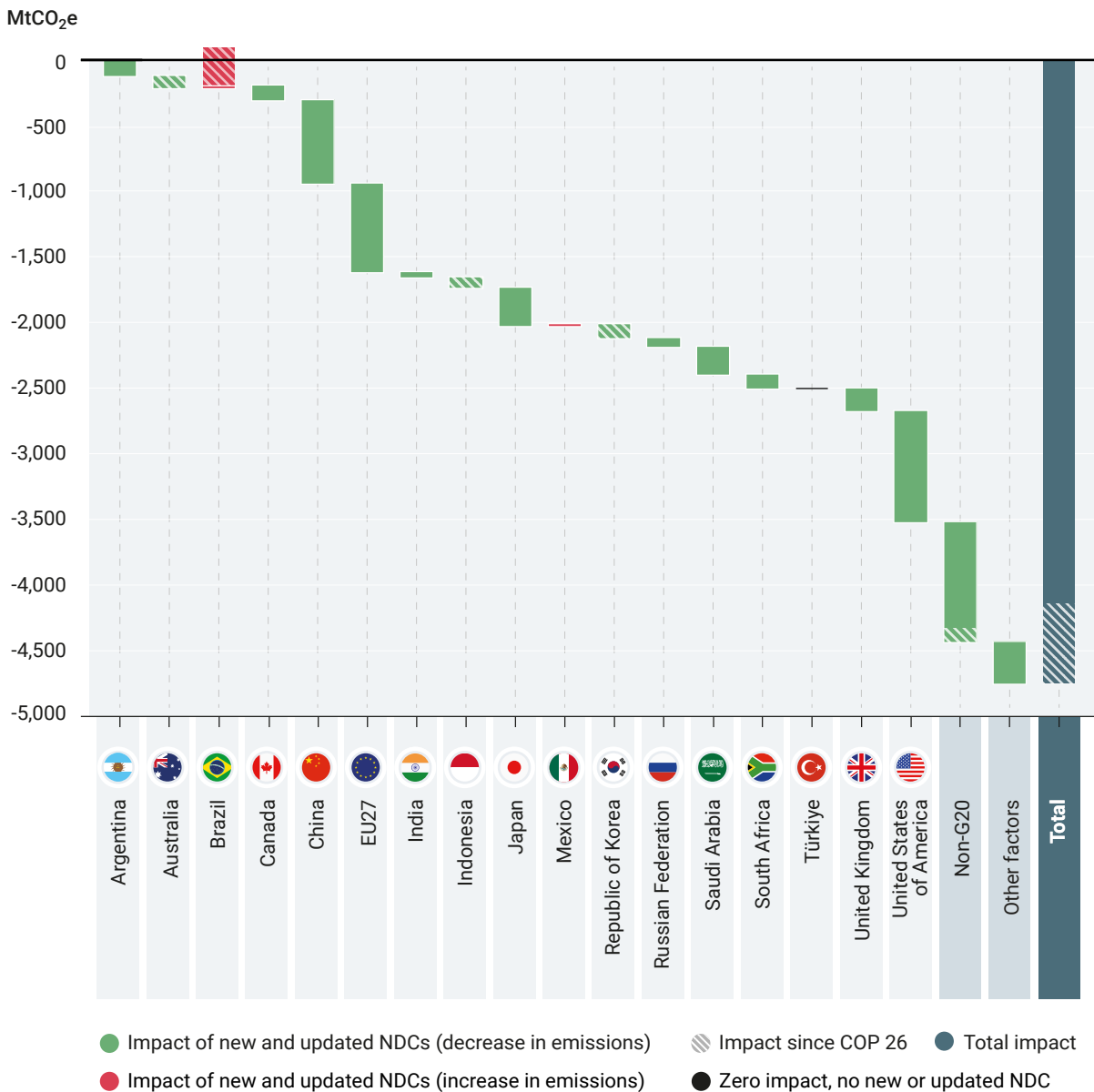
² This estimate includes reductions of around 0.3 GtCO₂e resulting from other factors, including lower projections of international aviation and shipping emissions.

³ The impact of the new and updated NDCs from non-G20 members since the cut-off date of the studies was not included.

NDCs of Australia (10 per cent of the 0.7 GtCO₂e), Brazil (35 per cent), Indonesia (10 per cent), Saudi Arabia (about 25 per cent),⁴ Republic of Korea (5 per cent) and non-G20 members (15 per cent), while submissions since COP 26 account for 0.5 GtCO₂e of the total (mainly from Australia, Brazil, Indonesia and Republic of Korea). For some G20 members, the impact on global GHG emissions in 2030 is estimated at zero. This applies to members that have not

submitted an updated NDC (Türkiye), that have submitted NDCs with a similar target as in a previous update (United Kingdom) or where the updated target is estimated to result in higher emissions than emissions projected based on current policies for some studies (India and the Russian Federation). Brazil⁵ and Mexico show an increase in the emissions targets compared to the previous targets, due to a change in the reference emissions.

Figure 3.2 Impact of new and updated unconditional NDCs on 2030 global emissions compared with initial NDCs



Notes: The additional reduction resulting from other factors, including lower projections of international aviation and shipping emissions, is included in the figure. The updated NDC of Brazil lowers the projected increase in emissions in 2030 compared with the previous NDC.

⁴ Brazil's 2022 NDC submission reduced emissions relative to their previous submission, which explains the contribution to the 0.7 GtCO₂e reduction. However, the 2022 NDC submission still implies emissions that are higher than those of the initial NDC of Brazil.

⁵ According to the IPCC guidelines for national inventories for Brazil.

3.4 Progress of G20 members towards their NDC targets

Ambitious targets are important but matter little unless they go hand in hand with ambitious policies and accelerated implementation. This section provides an updated assessment of the progress of G20 members towards their latest NDC targets as at 23 September 2022 based on a synthesis of recently published studies of emissions projections.⁶ For each G20 member, GHG emissions projections were compiled and reviewed to assess the emission levels expected under existing policies i.e. the current policies scenario.⁷ Expected emission levels in 2030 under current policies were then compared to projected emissions under the NDC target to assess whether the G20 members are likely to meet their respective emissions reduction targets for 2030. The assessment is based on 'point in time' emissions projections in the NDC target year. European Union member states are not assessed individually.

3.4.1 Methods and limitations

Current policies scenario projections are compared to the latest unconditional NDCs or to conditional NDCs for G20 members whose NDCs do not have unconditional elements. The assessment of conditionality of NDCs follows the World Resources Institute (Climate Watch 2022), which considers Indonesia and Mexico to have both unconditional and conditional NDCs, and India and South Africa to have only conditional NDCs (see appendix B, table B.2, available online).

To enable a robust comparison of projections published by independent research institutions, the methodology of den Elzen *et al.* (2019) is followed. Official assessments published by national governments are compared with independent assessments. All data sources are presented in appendix B (table B.1), available online. The assessment is based on emissions including land use, land-use change and forestry (LULUCF) (see appendix B for details on adjustments of emission projections excluding LULUCF). Historical emissions data for energy and industry sectors were taken from the latest inventory submissions to the UNFCCC, supplemented by the Potsdam Real-Time Integrated Model for probabilistic Assessment of emission Paths (PRIMAP) database for interval years and most recent years after the last inventory data year (Gütschow, Günther and Pflüger 2021). For historical LULUCF emissions, harmonized data from Grassi, Conchedda *et al.* (2022) and Grassi, Federici *et al.* (2022) are used. For the emission data from the literature expressed in GWPs other than the 100-year GWPs from the

IPCC's AR6, conversion factors used in AR6 were applied (Lecocq *et al.* 2022).

The selection of studies projecting 2030 emissions is based on four main considerations: 1) whether the studies take into account the most recent societal, economic and policy developments—accordingly, only studies published in 2020 or later are included,⁸ 2) that peer-reviewed studies are included to the extent possible, 3) inclusion of studies published by national experts and 4) that all GHGs and sectors are covered. Policy cut-off dates ranged from 2019 to mid-2022 across studies, meaning that recently adopted policies, including most of those presented later in section 3.4.3, are fully reflected in some of the scenario studies reviewed.

Many studies took limited account of the potential impact of the COVID-19 pandemic on future emissions. Chapter 2 shows that long-term impacts of the pandemic on emissions remain uncertain, that global emissions are expected to rebound fully in 2021 and that impacts show large variation across G20 members and sectors. Therefore, studies that do not explicitly take the impact of the pandemic into account are also considered. Furthermore, none of the emissions projections consider the potential implications of the war in Ukraine. Other limitations are similar to previous Emissions Gap Reports (see appendix B.3).

For the three G20 members that recently submitted more ambitious NDCs (Australia, Brazil and Republic of Korea), a few studies compared their current policies scenario projections to earlier NDC targets. Where required, NDC emission levels are recalculated based on the historical emissions data used in respective studies. No recalculations were done for the NDCs of India and Indonesia, both of which were updated towards the end of the drafting process.

3.4.2 Synthesis of recently published scenario studies

Table 3.1 shows the progress of G20 members towards their latest NDC targets, organized by the status and assessment of whether these targets will be met, based on current policies. Most G20 members that submitted stronger NDC targets in 2020 and 2021 have just begun their implementation efforts to meet their new targets. Those that are projected to meet their latest NDC target based on policies currently in place are G20 members that have not submitted a new or updated NDC, did not strengthen or only moderately strengthened their target levels in their updated NDCs (table 3.1). All other G20 members will need additional policies to achieve their NDCs.

⁶ The updated NDCs of India and Indonesia submitted after the cut-off date were not considered in this section because no study reviewed in this section quantified and/or examined the target levels as the report went to press.

⁷ Current policies scenario projections assume that no additional mitigation action is taken beyond current policies, even if it results in NDC targets not being achieved or being overachieved (United Nations Environment Programme [UNEP] 2015; den Elzen *et al.* 2019). Current policy projections reflect all adopted and implemented policies, which for the purpose of this report are defined as legislative decisions, executive orders or their equivalent. This implies that officially announced plans or strategies alone would not qualify, while individual executive orders to implement such plans or strategies would qualify.

⁸ Exceptions were made in a few cases, where external reviewers suggested national studies published before 2020, that were assessed to provide relevant information.

Table 3.1 Assessment of progress towards achieving the current NDC targets, 2022 (unconditional, unless otherwise mentioned) for the G20 under current policies, based on independent studies mainly published in 2020 or later

		Projected progress towards the latest NDC target		
		<i>Meet the target with existing policies (Indicated by +, if overachieved by more than 15)</i>	<i>Miss the target with existing policies</i>	<i>Uncertain</i>
Status of new or updated NDC	Submitted stronger target	China (4/7), India (conditional: 4/7), ⁱ Saudi Arabia (2/2)	Argentina (0/3), Australia (0/4) ⁱⁱ , Brazil (0/4, one within reach), Canada (0/4) EU27 (0/3), ^{ii,iii} Japan (0/3), Republic of Korea (0/3) ^{iv} , South Africa (conditional: 0/3), UK (0/1), United States of America (0/4)	Indonesia (0/3, one within reach)
	No new target submitted	Türkiye (3/3)		
	Submitted equivalent or weaker target	Russian Federation ⁺ (5/5) ⁱⁱ	Mexico (1/3)	

Notes: See appendix B.1 for the list of studies reviewed. The number of independent studies that project a country to meet its previous or the first NDC target are compared to the total number of studies and indicated in brackets. "Within reach" indicates that only the lower bound estimate of the current policies scenario projections is within the NDC target range.

ⁱ Submitted updated NDC after 1 August 2022, which has not been possible to consider in this assessment.

ⁱⁱ Current policies scenario projections from official publications were also examined. The official publications for three G20 members (Canada, the European Union and United Kingdom) show that they do not project to meet their 'point in time' NDC target under their current policies scenario. Australia's most recent official report reported its progress towards their earlier NDC (Australia, Department of Industry, Science, Energy and Resources 2021).

ⁱⁱⁱ For the EU27, we refer to the European Union Reference scenario, which assumes full implementation of the National Energy and Climate Plans (NECPs) for the period 2021–2030 by European Union member states and sees European Union emissions reduce by around 43 per cent below 1990 levels by 2030 (European Commission 2021a). Including net removals from LULUCF, this increases to -45 per cent. This baseline scenario indicates that additional effort would be required to meet the European Union's current 2030 energy efficiency target while its current 2030 renewable energy target would be met. Additional member state measures will update to fully implement their NECPs for the period 2021–2030 by June 2023 (draft) and June 2024 (final plans) with additional measures, taking into account recent policy and geopolitical developments (European Commission 2020).

^{iv} The Republic of Korea's Emissions Trading Scheme (K-ETS) is an instrument to fully achieve the country's NDC target and covers more than 70 per cent of its GHG emissions. The implementation phase 3 (2021–2025) has not been updated since the updated NDC was announced (International Carbon Action Partnership 2022).

Collectively, the G20 members are projected to fall short of their new or updated NDCs by 1.8 GtCO₂e (central estimate) annually by 2030. In other words, there is an implementation gap, defined as the difference between projected emissions in 2030 (assuming full implementation of NDC) and emissions based on current policies scenario projections. For two G20 members, the projected emissions under the NDC have consistently been assessed to significantly exceed current policies projections (the Russian Federation and Türkiye) since the Emissions Gap Report 2015 (UNEP 2015), thereby lowering the implementation gap compared to what can be reasonably expected. If NDC projections for these two members are substituted by current policies scenario projections, the G20 members would collectively

fall short of achieving their NDCs in 2030 by an annual 2.6 GtCO₂e.

The 2030 GHG emission estimates of the G20 and its individual members under current policies scenario, unconditional NDCs and conditional NDCs (for four G20 members) are presented in figure 3.3 in comparison with historical emissions for 2015, the year in which countries adopted the Paris Agreement and submitted their intended NDCs. For most G20 members, central estimates of emissions projections under current policies for 2030 are lower than at the time of the Emission's Gap Report 2021. The central estimate of aggregate emissions projections for G20 members in 2030 under current policies decreased

by 1.3 GtCO₂e or about 4 per cent compared with the 2021 assessment, mainly due to the expected emission reductions from the Inflation Reduction Act (of about 1 GtCO₂e) that would bring the United States of America's emissions projections for 2030 closer to the NDC target. The G20 members with 10 per cent lower projections compared with the 2021 assessment are: Indonesia, Mexico, Saudi Arabia and the United States of America. It is worth noting that the lower bound estimate has decreased by about 2.4 GtCO₂e (compared to 1.1 GtCO₂e for the upper bound estimate), indicating a varied interpretation of NDC implementation policies and varied forecasts on the deployment of low-emission technologies across studies. Also note that for China and India, which are assessed to meet their NDCs with existing policies in table 3.1, the central estimates of the current policies scenario projections are higher than the central estimates of the NDC targets mainly due to the large variation of emissions projections across studies.

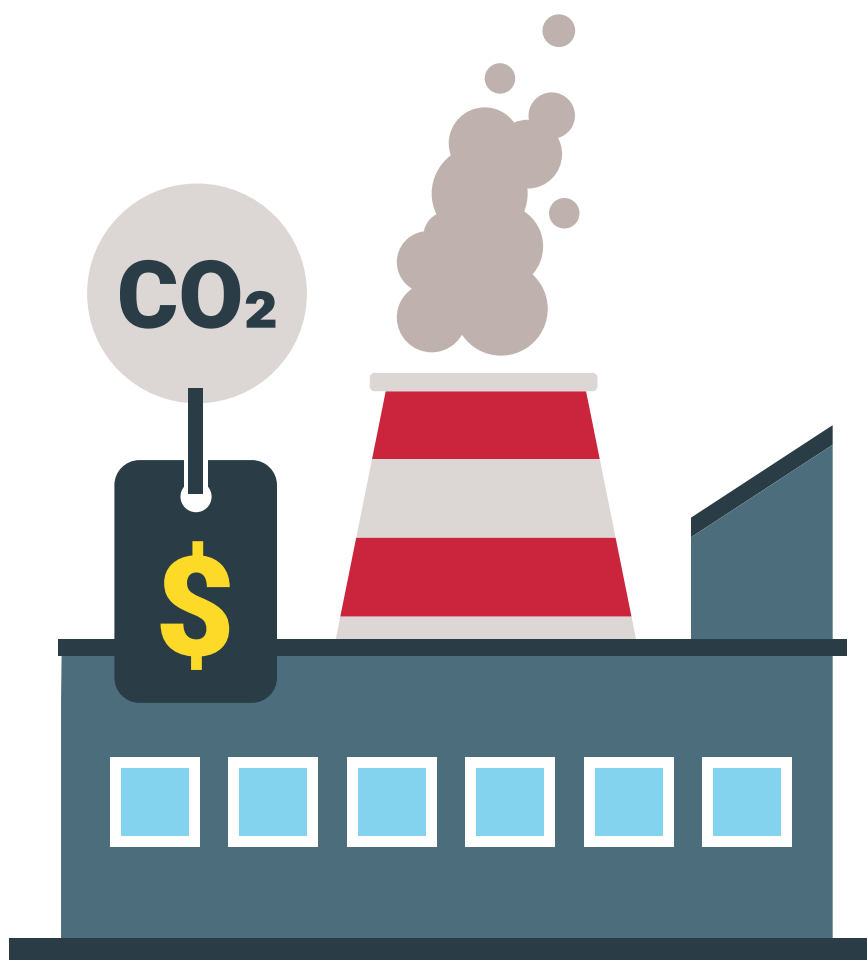
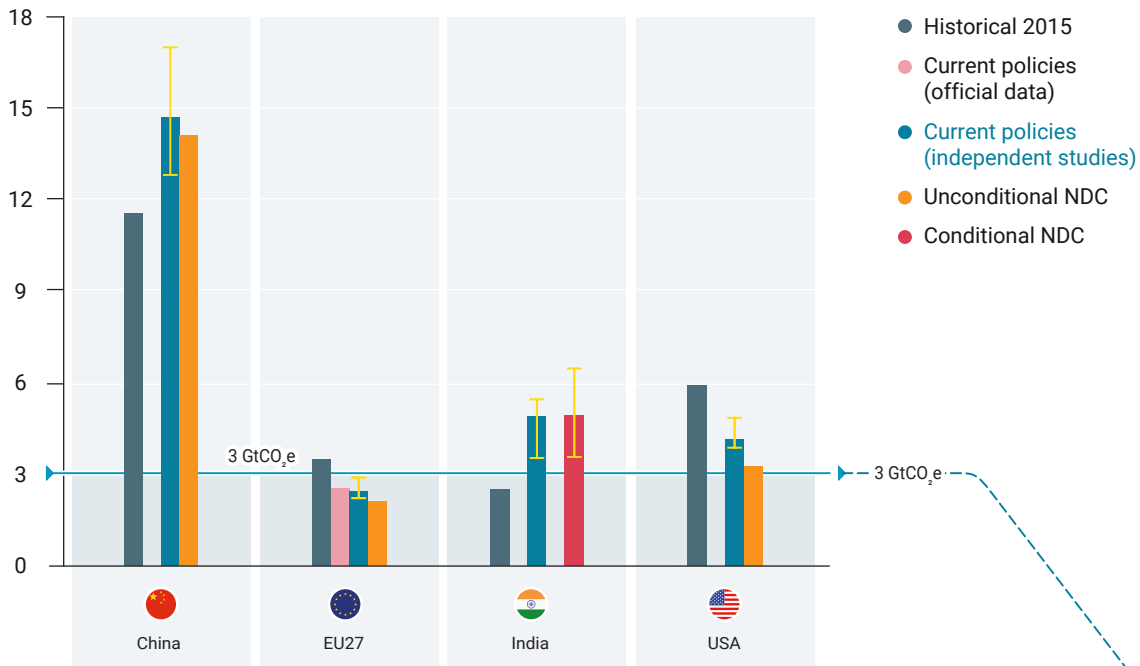
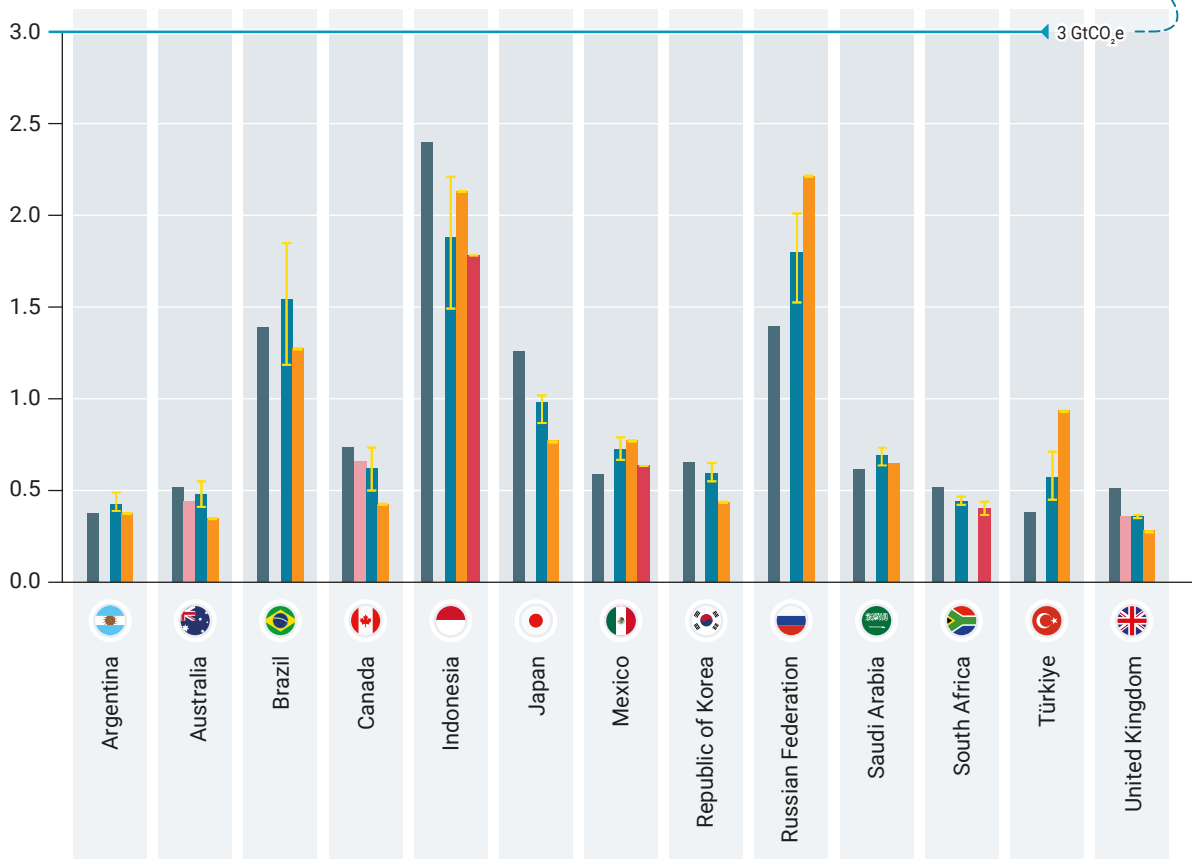


Figure 3.3 GHG (all gases and sectors, including LULUCF) of the G20 and its individual members by 2030 under current policies scenario, unconditional NDCs, and conditional NDCs (for four G20 members), compared with 2015 historical emissions

GHG emissions (GtCO₂e/yr)



GHG emissions (GtCO₂e/yr)



Notes: For current policies scenario projections, estimates based on independent studies are presented. Bars show the average values (median values in case of five or more studies) and error bars show the minimum and maximum values (tenth and ninetieth percentiles in case of five or more studies). For NDCs, official values (adjusted to AR6's GWPs) are presented where available. For reporting reasons, the emissions projections for China, the EU27, India and United States of America are shown in the top figure and the other G20 members are shown in the bottom figure, using two different vertical axes. See appendix B.1 for details on the underlying studies.

To supplement the findings presented above, table 3.2 presents per capita GHG emissions in 2015, which are projections for 2030 under the current NDC targets and current policies scenario, and the expected emission peaking year for the G20 members. The average per capita emissions in 2030 of G20 members under the latest NDCs are projected to be about 10 per cent lower (6.7 tCO₂e) than under the current policies scenario (7.4 tCO₂e). However, they are not lowered compared with 2010 levels and remain very far from the median estimates consistent with 2°C and 1.5°C scenarios by 2050, which are 1.9 tCO₂e (tenth and ninetieth percentile range: 1.2–2.3 tCO₂e) and 0.6 tCO₂e (0.3–1.1 tCO₂e), respectively.

Per capita emissions range widely across G20 members: emissions of India are about half of the G20 average, whereas Saudi Arabia reaches more than twice the G20

average. Australia, the European Union and South Africa are projected to reduce their per capita emissions by more than one third between 2010 and 2030 under current policies. The United Kingdom even reaches half. Mexico also reaches -10 per cent and -15 per cent of the projected development of per capita emissions under both current policies and NDC scenarios, respectively. Per capita emissions under current unconditional NDC targets are projected to increase between 2010 and 2030 for seven G20 economies.

On the peaking of emissions, all Annex I G20 members and some non-Annex I G20 members (Argentina, Brazil, Republic of Korea and South Africa) have peaked their emissions already while the NDCs of a few non-Annex I G20 members (China) are projected to peak their emissions by 2030. However, six of the non-Annex I G20 members do not project a peaking by 2030 under the current policies scenario.

Table 3.2 Overview of G20 member status and progress towards meeting NDC targets

Country	Unconditional NDC: per capita GHG emissions		Current policies scenario: per capita GHG emissions		Emission peaking	
	tCO ₂ e/cap in 2030	vs. 2015 levels	tCO ₂ e/cap in 2030	vs. 2015 levels	Peaking year unconditional NDC	Peaking year current policies
Argentina	7.7	-11%	8.7	0%	around 2005	Not clear
Australia	12.2	-44%	16.8	-22%	2007	2009
Brazil	6.2	-9%	6.7	-1%	around 2005	Not clear
Canada	10.2	-50%	14.9	-28%	2007	2007
China	9.8	18%	10.3	24%	Before 2030 (CO ₂ only)	Not clear
EU27	4.8	-39%	5.4	-31%	1990 or earlier	1990 or earlier
India	3.1	62%	3.2	69%	No commitment to peak	Not expected to peak before 2030
Indonesia	7.0	-25%	6.2	-33%	No commitment to peak	Not clear
Japan	6.5	-35%	8.3	-17%	2013	2013
Mexico	5.7	16%	5.3	9%	No commitment to peak	Not expected to peak before 2030

Republic of Korea	8.5	-34%	11.5	-10%	By 2018	Possibly peaked by 2020
Russian Federation	15.2	58%	12.4	28%	1990 or earlier (former Soviet republic)	Peaked, but projected to be on an increasing trend by 2030
Saudi Arabia	16.7	-12%	16.7	-12%	No commitment to peak	Not expected to peak before 2030
South Africa	6.1	-34%	6.8	-26%	around 2015	around 2015
Türkiye	10.5	121%	6.4	34%	No commitment to peak	Not expected to peak before 2030
United Kingdom	4.0	-49%	5.1	-34%	1990 or earlier	1990 or earlier
United States of America	9.2	-49%	11.7	-36%	2007	2007
G20	6.9	-7%	7.3	-1%	Not assessed	Not assessed

Source: Adapted from den Elzen *et al.* (2022), basing the assessment of expected emission peak year on the method of Levin and Rich (2017)

Notes: The population projections are based on the medium fertility variant of the United Nations Population Prospects 2022 edition (United Nations Department of Economic and Social Affairs, Population Division 2022).

3.4.3 Overview of recently adopted policies

Table 3.3 presents selected energy and climate policy developments that may carry significant, direct impact on the implementation of NDC targets and long-term emission reduction goals adopted in late 2021 and 2022 for the top-seven emitting economies (Brazil, China, EU27, India, Indonesia, Russian Federation and the United States of America; for other G20 members' policies, see chapter 2

and appendix B.4). Policy responses to the energy crisis and the war in Ukraine are not included. Some of the policies highlighted by national policy experts were adopted after the publication of the scenario studies reviewed in section 3.4.1. Notable exceptions include the Inflation Reduction Act and the Infrastructure Investment and Jobs Act of the United States of America.

Table 3.3 Overview of recent policy measures adopted by the top seven GHG-emitting G20 members in 2021 and 2022 that are expected to affect the achievement of their NDC targets and long-term pledges

Brazil	• In its updated NDC, Brazil commits to reducing its GHG emissions by 37 per cent in 2025 and by 50 per cent in 2030 relative to 2005 levels. It has also committed to eliminating illegal deforestation by 2028 (Brazil 2022a). • In May 2022, Brazil adopted a federal decree establishing the procedures for setting up a national system for reducing GHG emissions as well as sectoral plans for climate change mitigation. The decree also establishes a single register of carbon and methane credits and classifies carbon credits as financial assets. The decree is expected to become a management mechanism and an operational instrument for the sectoral plans, which should establish gradual sectoral targets for emission reductions. These sectoral plans must be approved by the Interministerial Committee on Climate Change and Green Growth. Deadlines and specific rules are not yet specified under the decree (Brazil 2022b).
China	• The renewable energy development in China has continued its strong growth. By the end of 2021, the installed solar photovoltaics (PV) and wind capacity was more than 300 gigawatts (GW). Since 1996, the annual newly installed solar PV and wind capacity has accounted for about 55 per cent of new energy capacity (Statista 2022). • In April 2022, China announced that it would increase coal production by 300 million tons in 2022 through coal mining capacity increase, expanded and new production, and other measures. This comes despite China's pledge to strictly control coal-fired power generation projects, limit the increase in coal consumption over the 14th Five-Year Plan period (2021–2025) and phase down coal consumption during the 15th Five-Year Plan period (2026–2030). The transformation away from coal infrastructures is challenged by energy security concerns (China, National Development and Reform Commission [NDRC] 2022; China, National State Energy Administration 2022; Xinhua 2022). • To peak CO₂ emissions and achieve carbon neutrality, China has released an Action Plan for Carbon Dioxide Peaking before 2030 and a Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality. Specific objectives and implementing plans are published at the regional level and across all sectors covering energy, industry, urban-rural development, transportation, carbon sink, technology development, carbon market, climate and green finance, climate adaptation and social awareness (China, NDRC 2021a; China, NDRC 2021b).
European Union	• In December 2021, the European Commission proposed legislation to boost the renovation and decarbonization of buildings and reduce methane emissions in the energy sector by 80 per cent in 2030 (European Commission 2021b; European Commission 2021c). New requirements to promote sustainable products and construction were proposed in March 2022, which could lead to 132 million tons of oil equivalent (Mtoe) of primary energy savings (European Commission 2022a). • In May 2022, the European Commission presented its REPowerEU Plan in order to phase out Russian fossil fuels. Among others, the plan includes proposals to invest €210 billion mostly in clean energy and industry, speed up permitting procedures for renewable energy projects, and increase ambitions for renewable energy and energy efficiency. The plan would bring the EU's total renewable energy generation to 1236 GW by 2030 if adopted (European Commission 2022b; European Commission 2022c). • The EU's revision and update of legislation under the "Fit for 55" package to implement its 2030 climate target is in its final phase. The European Commission, European Parliament and member states have already supported a ban on the sale of new fossil fuel cars and vans by 2035, an EU Carbon Border Adjustment Mechanism (CBAM), and an expansion of emissions trading to new sectors (European Council 2022a; European Council 2022b; European Parliament 2022).

India	• In August 2022, the Cabinet approved an update of India's NDC. The updated NDC has led to major policies being pushed forward, including 1) electric vehicles (EVs), 2) co-firing of biomass pellets in thermal power plants by 7 per cent, 3) ethanol blending in petrol by 20 per cent, 4) inclusion of agroforestry and private forestry, 5) solarization of agricultural pumps, 6) clean cooking (by shifting to liquefied petroleum gas [LPG]), and 7) rooftop solar PV. The Government of India is considering coal gasification, conversion of coal into chemical projects, ammonia and hydrogen as future fuels. Energy storage is supported through a production linked scheme to promote renewable energy (India, Press Information Bureau 2022). • In recognition of the role of lifestyles, the movement Lifestyle for Environment has been proposed to foster a citizen-centric approach to combat climate change (Bhaskar 2022; India, Press Information Bureau 2022). • The Lok Sabha passed the Energy Conservation (Amendment) Bill on 9 August 2022, aiming to facilitate the establishment and development of domestic carbon markets. The markets' objective is to incentivize actions for emission reduction expected to result in increased investments in clean energy and energy efficiency areas, especially in the private sector (PRS Legislative Research 2022).
Indonesia	• In February 2022, the Ministry of Environment and Forestry released Ministerial Decree No. 168/2022 on Forestry and Other Land Use (FOLU) Net Sink 2030 along with its operational plan. This regulation is expected to remove GHG emissions while implementing the energy transition and decarbonization. The FOLU Net Sink commitment was introduced in the last Long-Term Strategy to Low-Carbon and Climate Resilience 2050 published in 2021 (Forest Hints 2022). • The Ministry of Energy and Mineral Resources has announced a net-zero emission road map for the energy sector, which indicates that Indonesia will no longer build new fossil fuel power plants, with the exception of the 35 GW power capacity addition plan, and begin to retire subcritical coal power plants from 2030 onwards. In the period of 2031–2060, 45 GW of coal power plants will be retired and shut down. In addition, the Indonesian State-owned electricity company Perusahaan Listrik Negara seeks to cancel some coal plants under construction. However, despite the verbal statement and political decision, no regulation to phase out coal has been issued yet (International Energy Agency [IEA] 2022; Indonesia, Ministry of Energy and Mineral Resources 2022; Organisation for Economic Co-operation and Development [OECD] Clean Energy Finance and Investment Mobilisation Programme 2021). • The Electricity Supply Business Plan 2021–2030, published in October 2021, aims to achieve renewable energy capacity to account for 51.6 per cent of total power addition until 2030. Hydropower dominates the upcoming renewable plan by around 25.6 per cent, followed by solar (11.5 per cent), geothermal and other renewables (Indonesia, Ministry of Energy and Mineral Resources 2021; OECD Clean Energy Finance and Investment Mobilisation Programme 2021).
Russian Federation	• In November 2021, the Russian Federation released the newest version of their Transport Strategy until 2030. The strategy outlines measures including energy-efficient or electric vehicles, low-carbon infrastructure and alternative fuels intended to reduce transport emissions by 1.2 per cent relative to total emissions in 2017 by 2030 (Russian Federation 2021a). • The Concept for the Development of Electric Vehicle Production was approved by the Russian Federation in August 2021, setting a target for EVs to make up at least 10 per cent of the Russian market by 2030. In addition to measures promoting EV production, the Government plans to stimulate demand by providing subsidies covering up to 25% of the price of domestically produced EVs (Russian Federation 2021b; Reuters 2021). • In August 2021, the Russian Government approved the concept for the Development of Hydrogen Energy. The plan presents strategic initiatives towards the development, use and export of low-carbon hydrogen energy (Russian Federation 2021a).

United States of America

- In August 2022, the United States of America enacted the Inflation Reduction Act, projected to reduce GHG emissions by 1 Gt. The law makes major investments in clean energy technologies including utility-scale and distributed solar, wind and other renewable resources, existing zero-emitting nuclear plants, carbon capture facilities in the power and industrial sectors, light, medium and heavy-duty clean vehicles as well as heat pumps and other energy-efficient upgrades for homes and businesses. The Act also provides tax credits for emerging clean technologies like clean hydrogen production, direct air capture facilities and clean fuel production (United States of America, Congress 2022a; United States of America, Department of Energy 2022; Jenkins *et al.* 2022; Larsen *et al.* 2022; Mahajan *et al.* 2022).
- The United States of America also enacted the Infrastructure Investment and Jobs Act in November 2021, which makes US\$27 billion in power grid and transmission investments, creates a new US\$7.5 billion grant programme for EVs and alternative fuel infrastructure deployment, and provides US\$3.5 billion and US\$8 billion for direct air capture and clean hydrogen hubs, respectively, among other key investments (United States of America, Congress 2022b).
- In 2021 and 2022, the Environmental Protection Agency and National Highway Traffic Safety Administration adopted standards for light-duty vehicles through model year 2026. The Environmental Protection Agency estimates that the standards will avoid more than 3 billion tons of GHG emissions through 2050 (United States of America, Department of Transportation undated; United States of America, Environmental Protection Agency 2021; United States of America, Environmental Protection Agency 2022).

3.5 Details on G20 members' net-zero pledges

A total of 19 G20 members have committed to achieving net-zero emissions, up from 17 as at COP 26. These targets vary in a number of important characteristics, including their legal status; timeline; explicit consideration of fairness and equity; which sources, sectors and gases they cover; whether they will allow the use of international offsets to count towards their achievement; the level of detail they provide on the role of carbon dioxide removal; and the nature of planning, review and reporting on target implementation (table 3.4).

Figure 3.4 visualizes the direction needed for countries to get from their current emission levels to their NDC targets for 2030 and indicates their net-zero targets for each G20 member that has a net zero target (noting that France, Germany and Italy are only assessed as part of the European Union). Those G20 members whose emissions have already

peaked will need to further accelerate their emission declines to their net-zero target year, while those members whose emissions will continue to increase through 2030 under the NDCs will require further policy shifts and investments (including adequate support to developing countries, where applicable) to achieve the emission reductions implied by their national net-zero targets. This illustration does not consider the relative merit in terms of the equity or fairness of the choices countries make regarding their nationally determined pathways to net zero. However, it highlights the discrepancy between current emissions, near-term NDC targets and long-term net-zero targets. This serves as a clear reminder to all G20 members, or indeed any country, that aspirational targets such as NDCs or net-zero targets need to be backed up with effective policies. It also serves as an important reminder that current evidence does not provide confidence that the nationally determined net-zero targets will be achieved. This has clear repercussions for the anticipated global temperature projections (see chapter 4).

Table 3.4 Details on net-zero targets of G20 members

G20 member	Annex	Fundamentals			Scope and coverage				Carbon removal		Planning, review, reporting		
		Source	Target year	Reference to fairness	Covers all sectors	Covers all gases	Covers int'l shipping and aviation	Excludes int'l offsets	Separate removals targets	Removals transparency	Published plan	Review process	Annual reporting
Argentina	Non-Annex I	announcement	2050	✗	?	?	?	?	✗	✗	✗	?	✗
Australia	Annex I	law	2050	[inconclusive]	✓	✓	?	✗	✗	[inconclusive]	[inconclusive]	✓	✓
Brazil	Non-Annex I	policy	2050	✗	✓	?	?	?	✗	✗	✗	?	✗
Canada	Annex I	law	2050	[inconclusive]	✓	✓	?	?	✗	[inconclusive]	✓	✓	✓
China	Non-Annex I	policy	2060	✓	?	✗	?	?	✗	[inconclusive]	✓	✓	✗
European Union	Annex I	law	2050	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓
France	Annex I	law	2050	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
Germany	Annex I	law	2045	✓	✓	✓	✗	✗	✗	[inconclusive]	[inconclusive]	✓	✓
India	Non-Annex I	policy	2070	✗	?	?	?	?	✗	✗	✗	?	✗
Indonesia	Non-Annex I	policy	2060	✗	✓	?	?	?	✗	[inconclusive]	[inconclusive]	?	✗
Italy	Annex I	policy	2050	✓	?	?	?	✗	✗	✓	✓	[no data]	✓
Japan	Annex I	law	2050	✗	✓	✓	?	?	✗	[inconclusive]	[inconclusive]	✓	✓
Mexico	Non-Annex I	[no net-zero target]											
Russian Federation	Annex I	law	2060	✗	?	?	?	✗	✗	[inconclusive]	[inconclusive]	✓	✗
Saudi Arabia	Non-Annex I	announcement	2060	✗	?	?	?	?	✗	✗	[inconclusive]	✓	✗
South Africa	Non-Annex I	policy	2050	[inconclusive]	✓	✗	?	?	✗	✗	✗	?	✗
Republic of Korea	Non-Annex I	law	2050	✗	✓	✓	?	?	✗	✗	[inconclusive]	?	✓
Türkiye	Annex I	announcement	2053	✗	?	✓	?	?	✗	✗	✗	?	✓
United Kingdom	Annex I	law	2050	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
United States of America	Annex I	policy	2050	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓

✗ Not fulfilled

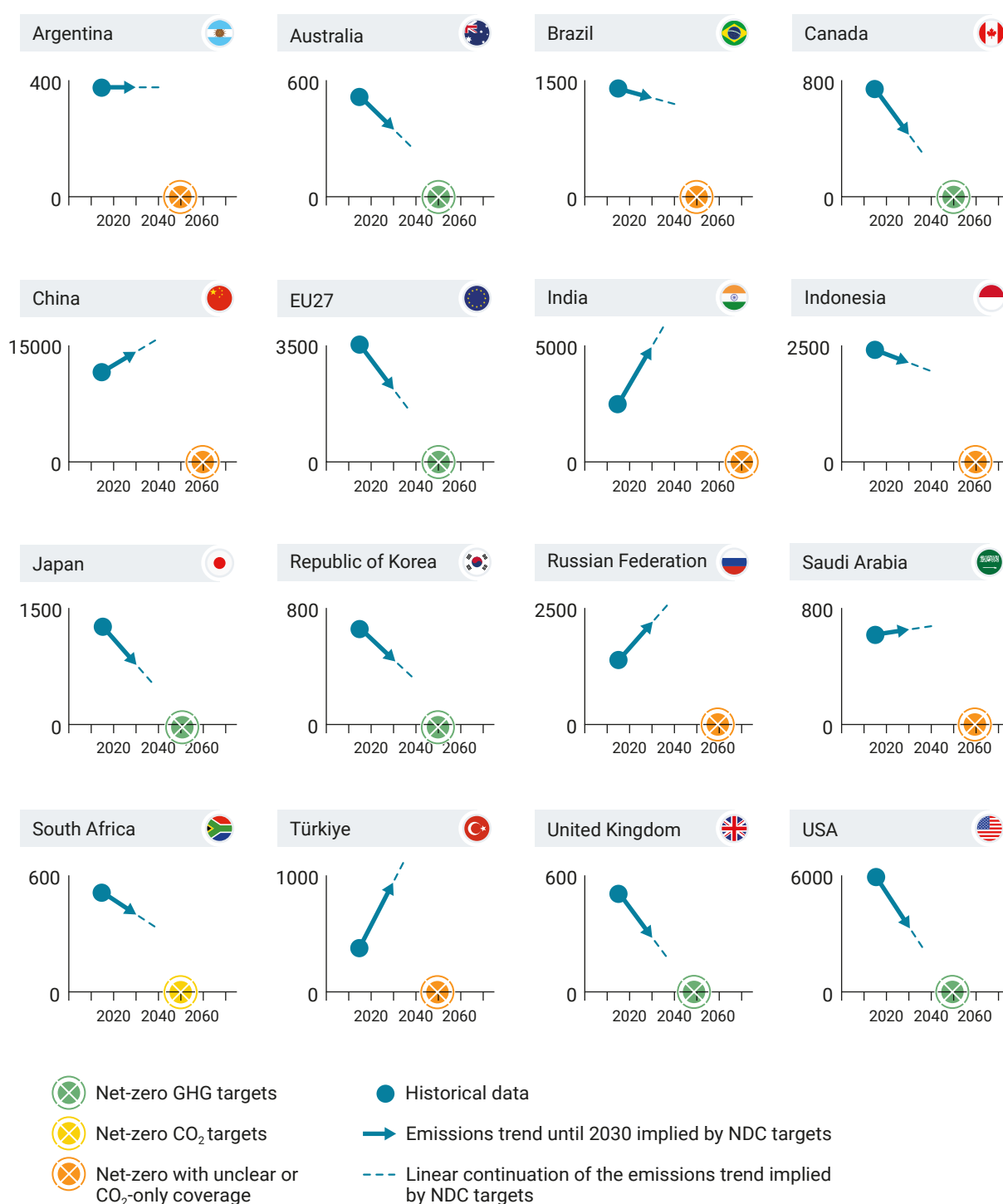
✓ Partially fulfilled

✓ Fulfilled

? No information

Sources: All indicators are based on a reconciliation of data from Climate Action Tracker (2022), Climate Watch (2022) and Net Zero Tracker (2022) with the following exceptions: "Covers all sectors" is based on Climate Watch (2022); "Review process" is based on Climate Action Tracker (2022); "Annual reporting" is based on Net Zero Tracker (2022); "Removals transparency" and "Reference to fairness" are based on Climate Action Tracker (2022) and Net Zero Tracker (2022).

Notes: Green checkmarks indicate the criterion is fulfilled; yellow checkmarks indicate the criterion is partially fulfilled or fulfilled to a lower level of robustness; red "X" indicates the criterion is not fulfilled; "?" indicates the member has not provided information on the criterion (where relevant); "[inconclusive]" indicates inconsistency across data sources consulted; "[no data]" indicates the data sources consulted do not track data on the member. See appendix B.5 and the respective trackers for further explanations of indicators and coding criteria.

Figure 3.4 Emissions trajectories implied by NDCs and net-zero targets of G20 members

Notes: The figure shows national net emissions in MtCO₂e/year over time. The timing of net-zero targets is approximate in this figure for G20 countries that have net-zero targets that only apply to CO₂. CO₂-only net-zero targets imply later (or no) achievement of net-zero GHG emissions (see table 3.4).