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Greenhouse Gas Emission Reduction Pledges by Selected Countries: Nationally Determined Contributions and Net-Zero Legislation

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SUMMARY

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Greenhouse Gas Emission Reduction Pledges by Selected Countries: Nationally Determined Contributions and Net-Zero Legislation

Human-related emission of greenhouse gases (GHG) has increased globally over time. These increasing emissions contribute to a changing climate. Many governments are taking steps to reduce GHG emissions in an effort to lessen the potential impacts of climate change. National governments are guiding efforts to reduce GHG emissions in two general ways: (1) by setting emission reduction targets in updated Nationally Determined Contributions (NDCs) to the Paris Agreement (PA), and (2) by enacting domestic legislation aimed at achieving net-zero emissions, referred to as net-zero legislation. Net-zero emissions or net-zero refers to situations where human-caused GHG emissions are balanced by removal of GHG from the atmosphere, including by natural storage in forests and other ecosystems and technological removal and storage.

NDCs are the primary communication of how Parties to the PA are seeking to achieve the agreement's goals. NDCs reflect countries' own national climate objectives and plans, including emission reduction goals, climate change adaptation plans, and other elements. All NDCs must address GHG emissions reductions and list quantifiable GHG emission reduction targets, with flexibility for some countries as to when. Many countries requesting financial assistance include two sets of targets: unconditional targets using a country's own resources, and additional, more ambitious targets that are conditional on international support. Parties must submit subsequent NDCs every five years, with the next due in 2025; these submissions are to reflect a progression to collectively increased ambition over time. Many countries submitted updated NDCs in 2020 and 2021 in advance of the 26th United Nations Climate Change Conference (COP26), held in November 2021 in Glasgow, UK. Increased ambition is reflected in some of the NDCs submitted, which, in many instances, identify countries' actions by the year 2030. Nonetheless, in the COP26 Glasgow Climate Compact, Parties asserted based on then-current NDCs that "the aggregate greenhouse gas emission level, taking into account implementation of all submitted nationally determined contributions, is estimated to be 13.7 per cent above the 2010 level in 2030." The Parties also "recogniz[ed] that limiting global warming to 1.5 °C requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide emissions by 45 per cent by 2030 relative to the 2010 level and to net zero around mid-century as well as deep reductions in other greenhouse gases." The Glasgow Climate Compact consequently requested Parties "to revisit and strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2022, taking into account different national circumstances."

The Congressional Research Service selected to track herein the NDCs of 51 countries, including the United States; the countries were identified using various criteria (e.g., G20 members, top 20 GHG emitters, countries with enacted or introduced net-zero legislation). As of September 30 2022, of the 51 countries, 44 have submitted updated or second NDCs, 39 of these clearly stated more ambitious GHG emission reduction targets than their country's first NDC. More generally, the PA asks countries to commit to increasingly ambitious GHG mitigation efforts and encourages countries to submit long-term low GHG emission development strategies. These strategies do not necessarily translate into clear pathways or concrete domestic efforts to reach net-zero emissions. Some countries have proposed or enacted legislation aiming to achieve net-zero emissions domestically, in addition to pledges in their NDCs. Other countries, like the United States, have references to net-zero emissions in policy documents without having enacted legislation.

Research by the Law Library of Congress indicates the EU, 11 of its member states, and 20 additional countries have enacted net-zero legislation and 3 countries have proposed net-zero legislation. Most countries or regions with enacted legislation have set a date of net-zero emissions, carbon neutrality, or climate neutrality by 2050. The most ambitious deadline is set by Iceland, which has enacted legislation requiring carbon neutrality by 2040. Germany and Sweden both have set deadlines of net-zero emissions by 2045. Several bills proposing net-zero emissions goals for the United States have been introduced in recent Congresses. Discussion of legislative proposals for U.S. net-zero emissions is beyond the scope of this analysis.

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Introduction

Human-related emission of greenhouse gases (GHG) has increased globally over time. These increasing emissions contribute to a changing climate, which is a concern to governments, organizations, and others. Many governments are taking steps to reduce GHG emissions in an effort to lessen the potential impacts of climate change. Such efforts are occurring on multiple levels, including globally, nationally, and sub-nationally, as well as by civil society and individuals. On the global and national scale, many countries are working toward the goals laid out in Article 2 of the Paris Agreement (PA), which commits collectively to, "Holding the increase in the global average temperature to well below 2ºC above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5ºC above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."[1]

This report presents information about Nationally Determined Contributions (NDCs), which communicate the primary targets and actions to 2030 by which Parties to the PA are seeking to achieve the agreement's goals. NDCs report countries' own national climate plans and include emission reduction goals, climate change adaptation plans, and financing needs, among other elements. Each country's NDC is to reflect its capacity to contribute to the collective reduction of global emissions, a principle described in the PA as "common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."[2]

This report also lists selected countries' enacted or proposed net-zero emissions legislation. *Net-zero emissions* refers to a situation where human-caused GHG emissions are fully balanced by removal of GHG from the atmosphere, including by natural storage in forests and other ecosystems as well as by technological removal and storage.[3]

Background and Context

NDCs and legislation focused on achieving net-zero emissions are the main tools countries use to guide their contributions to meeting the temperature goals of the PA and the broader objective of the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC was adopted in 1992 with the objective of achieving

> [S]tabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.[4]

[1] United Nations Treaty Collection, Chapter XXVII Environment, 7.d. Paris Agreement, Paris, December 12, 2015, at https://unfccc.int/sites/default/files/english_paris_agreement.pdf. (Hereinafter, Paris Agreement.) For more information, see CRS Report R44609, *Climate Change: Frequently Asked Questions About the 2015 Paris Agreement*, by Jane A. Leggett and Richard K. Lattanzio.

[2] Paris Agreement, Article 2.

[3] For more information, see CRS In Focus IF11821, *Net-Zero Emissions Pledges: Background and Recent Developments*, by Michael I. Westphal.

[4] United Nations Framework Convention on Climate Change (UNFCCC), agreed on May 9, 1992, entered into force March 21, 1994, 1771 U.N.T.S. 107, United Nations, *Treaty* Series, vol. 1771, p. 107; and U.S. depositary notifications C.N.148.1993, at https://treaties.un.org/doc/Publication/CN/1993/CN.148.1993-Eng.pdf.

The PA is a subsidiary agreement under the UNFCCC and Article 4 of the PA expands on the objectives of the UNFCCC:

> In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.[5]

Other ways in which countries individually and collectively work toward these goals include developing long-term low emissions development scenarios (LT-LEDS)[6] and implementing the United Nations Sustainable Development Goals (SDG), in particular SDG 13, Climate Action.[7] These latter efforts are outside of the scope of this report.

Congress has expressed interest in collective global efforts to reduce net GHG emissions for numerous reasons. The potential impacts from a warming climate pose already-detected risks globally, to varying degrees across countries and regions.[8] The United States is vulnerable to many potential impacts of climate change, including more variable water supplies, more extreme weather events, shifting crop yields and declining livestock productivity, rising energy costs, higher levels of air pollution, and coastal effects of sea level rise. The ability to stabilize climate change and avoid potential global and domestic effects depends on the participation of significant GHG emitters.[9]

As a Party to the PA, the United States submitted an NDC in 2016 and again when it rejoined the agreement in 2021.[10] Members of Congress have expressed interest in countries' relative emissions reductions efforts, including how they compare with U.S. efforts. They have expressed concerns about the relationships between efforts to mitigate GHG emissions, their fairness, and effects on economic competitiveness. Members and their staff meet with representatives from other nations to discuss potential needs and actions to address climate change; for example, they may meet at the annual UNFCCC Conference of Parties (COP) meetings and other bilateral and multilateral meetings. The United States helps build governance capacities and funds, including via multilateral funding mechanisms and overseas climate mitigation and adaptation programs that may be identified in NDCs.

Whereas most NDCs aim at the 2030 time frame, this report also lists a mid-century perspective of countries' enacted and proposed domestic laws that aim to reduce GHG emissions to net-zero (**Table 3**). This report presents a series of tables and visualizations to facilitate comparison of

[5] Paris Agreement, Article 4.

[6] UNFCCC, Communication of long-term strategies, at https://unfccc.int/process/the-paris-agreement/long-term-strategies.

[7] United Nations (U.N.), The 17 Sustainable Development Goals, at https://sdgs.un.org/goals.

[8] Intergovernmental Panel on Climate Change (IPCC), "AR6 Climate Change 2021: The Physical Science Basis - Summary for Policy Makers," August 9, 2021. https://www.ipcc.ch/report/ar6/wg1/.

[9] In 2019, the top 10 greenhouse gas (GHG) emitters are (from highest to lowest): China, the U.S., India, Indonesia, Russia, Brazil, Japan, Iran, Canada, and Saudi Arabia. World Resources Institute, Climate Watch Data, "Historical GHG Emissions," 2022, available at https://www.climatewatchdata.org/ghg-emissions.

[10] See CRS In Focus IF11746, *United States Rejoins the Paris Agreement on Climate Change: Options for Congress*, by Jane A. Leggett.

countries' emission reduction targets, where available. Countries were selected for inclusion because they meet one or more of the following criteria:

- among the top 20 emitters of GHGs globally;
- a member of the Group of Seven (G7) or Group of 20 (G20) largest countries plus the European Union;
- among the top 50 emitters of GHGs globally and received over $10 million in economic assistance from the U.S. Agency for International Development (USAID) in 2019 or 2020;[11]
- among the top 50 emitters of GHGs globally and have received funding from the Green Climate Fund;[12]
- have been of interest to Members of Congress engaging in international congressional delegations; or
- introduced or enacted net-zero legislation.

This report is not comprehensive of data for all countries globally or all Parties to the Paris Agreement. The data in this report are current as of September 30, 2022, unless otherwise noted.

Nationally Determined Contributions

NDCs present countries' own efforts, dependent on their circumstances, to reduce emissions and adapt to the effects of climate change. Per Article 4 of the PA, "Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions."[14]

Each Party that signed the PA was required to submit an Intended NDC at that time, and that document became its First NDC upon ratification of the PA; otherwise, Parties must communicate their NDCs upon joining the agreement.[15] Parties are required to submit subsequent NDCs every five years, with the next due

NDCs Timeline[13]

2015 – COP21: Signatories to the PA were required to submit an Intended NDC (INDC); INDC becomes First NDC upon ratification of PA.

2020 (2021) – COP26: Parties to the PA are required to submit a new or updated NDC that includes the time frame to 2025 and 2030. COP26, which was scheduled to be held in 2020, was postponed until 2021 due to the COVID-19 pandemic.

2025 – Next round of NDCs expected.

[11] These countries were identified using the foreignassistance.gov database to search for all USAID economic (not military) obligations in 2019 and 2020 and totaling each countries' obligations to identify those that received more than $10 million in either year and Climate Watch Data to identify the top 50 emitters of GHG in 2019. Countries meeting both criteria were included in **Table 1**. This list is not comprehensive of all aid recipients. It does not include aid awarded regionally or to multiple countries.

[12] These countries were identified using the Green Climate Fund (GCF) Projects & Programs Countries website available at https://www.greenclimate.fund/countries and Climate Watch Data to identify the top 50 emitters. GCF recipient countries that were also among the top 50 emitters of GHG in 2019 are included in **Table 1**. This list should not be considered comprehensive of all GCF recipients.

[13] For more information, see UNFCCC, Nationally Determined Contributions (NDCs), at https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs.

[14] Paris Agreement, Article 4.

[15] UN Treaty Collection, "7.d Paris Agreement," Status as at 26-8-2021, at https://treaties.un.org/pages/

in 2025. Subsequent NDCs are to reflect a progression of contributions to collectively increase ambition over time. Article 4 of the PA states that, "Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."[16]

Parties decided that those who submitted first NDCs that did not include 2030 goals were required to submit new (second) NDCs by 2020. Others were asked to submit updated NDCs by 2020 that reflect increasing ambitions. The majority of countries met this deadline in advance of the 26th United Nations Climate Change Conference (COP26), held in November 2021 in Glasgow, UK. As of September 30, 2022, of 192 Parties to the PA, 165 have submitted new, updated, or second NDCs.[17]

Increased ambition is reflected in some of the new NDCs or updates submitted in 2020 or 2021, which, in many instances, identify countries' actions by the year 2030. Nonetheless, in the COP26 Glasgow Climate Compact, Parties noted analysis of then-current NDCs, finding that "the aggregate greenhouse gas emission level, taking into account implementation of all submitted nationally determined contributions, is estimated to be 13.7 per cent above the 2010 level in 2030." The Parties also "recogniz[ed] that limiting global warming to 1.5 °C requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide emissions by 45 per cent by 2030 relative to the 2010 level and to net zero around mid-century as well as deep reductions in other greenhouse gases." The Glasgow Climate Compact consequently requested Parties "to revisit and strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2022, taking into account different national circumstances."[18]

The UNFCCC divides Parties into three broad groups with differing emissions reduction capacities and expectations. *Annex I Parties* (listed in Annex I of the UNFCCC) are generally those countries that were considered developed in 1992; *non-Annex I Parties* are all the others. The United Nations considers 49 Parties to be *least developed countries*; the UNFCCC recognizes these countries to have limited capacity to respond and adapt to climate change, and therefore provides different treatment in some provisions.[19] The UNFCCC also refers to developed country Parties and developing country Parties, but these categories are not defined.

The PA largely erased the bifurcation of responsibilities between Annex I and non-Annex I Parties, such that all share the same mandatory requirements. It retains the UNFCCC principle of common but differentiated responsibilities, and sometimes acknowledges that the pace of implementation may vary by development status. Article 4 of the PA states the following:

> Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances.

ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en.

[16] Paris Agreement, Article 4.

[17] Climate Watch Data, NDC Enhancement Tracker, at https://www.climatewatchdata.org/2020-ndc-tracker.

[18] UNFCCC, *Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Glasgow from 31 October to 13 November 2021*, March 8, 2022, at https://unfccc.int/sites/default/files/resource/cma2021_10_add1_adv.pdf.

[19] UNFCCC, Parties & Observers, at https://unfccc.int/parties-observers.

> The least developed countries and small island developing States may prepare and communicate strategies, plans and actions for low greenhouse gas emissions development reflecting their special circumstances.[20]

All NDCs must address GHG emission reductions. Most NDCs list quantifiable GHG emission reduction targets. These targets appear in a variety of formats and include measurable reductions for specific sectors or GHGs and a specified year to reach peak emissions prior to reducing emissions. All Parties are required to include in their NDCs, "information necessary for clarity, transparency, and understanding,"[21] including a reference point (base year or scenario), implementation timeframe and sectors and gases included, among other details. Many countries requesting financial assistance include two sets of targets: targets unconditional on international support and additional, more ambitious, targets that are conditional on international support.[22] Countries' NDCs may include additional goals, for example, efforts to improve adaptation measures, increase forest coverage, or improve access to water.

The October 2022 *Nationally Determined Contributions Under the Paris Agreement Synthesis Report by the Secretariat* reviewed 166 NDCs, including 142 new or updated NDCs communicated by 193 Parties that were available in the NDC registry as of September 23, 2022.[23] The Synthesis Report estimates the Parties included in this review account for approximately 95% of total global emissions in 2019.[24] Selected observations in the Synthesis Report include the following:

- "Most Parties (90 percent) provided quantified mitigation targets, expressed as clear numerical targets, while the rest (10 per cent) included strategies, policies, plans and actions for which there is no quantifiable information as components of their NDCS";
- "Most Parties (80 percent) communicated economy-wide targets, covering all or almost all sectors defined in the 2006 IPCC Guidelines, with an increasing number of Parties moving to absolute emission reduction targets in their new or updated NDCs";
- "In terms of GHGs, all NDCs cover CO_2 [carbon dioxide] emissions; most cover CH_4 [methane] (91 percent), and N_2O [nitrous oxide] (per cent) emissions, many (53 per cent) cover HFC [hydrofluorocarbons] emissions and some cover PFC [perfluorocarbons], SF_6 [sulfur hexafluoride] (36 percent) and NF_3 [nitrogen trifluoride] (26 percent) emissions";
- "Most of the Parties (74 percent) that submitted new or updated NDCs have strengthened their commitment to reducing or limiting GHG emissions by 2025 and/or 2030"; and
- "Almost all Parties (93 percent) provided quantified information on their mitigation targets and reference points. Of the Parties that submitted new or updated NDCs, most (84 percent) updated the basis for defining their targets,

[20] Paris Agreement, Article 4.

[21] Paris Agreement, Article 4.

[22] UNFCCC, *Nationally Determined Contributions Under the Paris Agreement, Synthesis Report by the Secretariat*, October 26, 2022, at https://unfccc.int/documents/619180 (Hereinafter, Synthesis Report, 2022); Center for Climate and Energy Solutions, Q&A: Understanding Paris Agreement NDCs, at https://www.c2es.org/content/q-and-a-understanding-paris-agreement-ndcs/.

[23] Synthesis Report, 2022.

[24] Synthesis Report, 2022.

> including reference points and/or 'business as usual' scenarios. Such updates lead to higher-quality NDCs and, for some Parties, to significant changes in the estimated emission levels for 2025 and 2030."[25]

Observations of Selected NDCs

NDC Submission Status

Table 1 contains the NDC submission status for the 51 countries selected for inclusion in this report. Of the top 20 GHG emitters,[26] 16 submitted updated NDCs in 2020, 2021, or 2022 (as of September 30, 2022). Russia and Turkey submitted first NDCs in 2020 and 2021, respectively. The United States submitted its new first NDC after rejoining the PA in 2021. Iran has not submitted an NDC.

Table 1. Nationally Determined Contribution (NDC) Submission Status for Selected Countries

(as of September 30, 2022)

Most Recent NDC	Countries	No. of Countries
First NDC	Algeria, Iraq, Kazakhstan, Philippines, Russia, Turkey	6
First NDC, updated	Angola, Australia, Bangladesh, Bolivia, Brazil, Cameroon, Canada, Chile, China, Colombia, Democratic Republic of the Congo, Egypt, Ethiopia, European Union, France, Germany, Ghana, India, Indonesia, Italy, Japan, Kenya, Malaysia, Mexico, Morocco, Myanmar, Nigeria, Pakistan, Peru, Poland, Saudi Arabia, South Africa, South Korea, Spain, Sudan, Tanzania, Thailand, Ukraine, Uzbekistan, United Kingdom,[a] United States,[b] Venezuela, Vietnam	43
Second NDC	Argentina	1
No NDC	Iran	1

Source: United Nations Framework Convention on Climate Change (UNFCCC), Nationally Determined Contributions (NDCs) Registry, at https://unfccc.int/NDCREG.

a. The United Kingdom submitted its own First NDC on December 12, 2020, reflecting an increased ambition over the European Union's First NDC from 2016.

b. The United States submitted its First NDC on April 22, 2021, after rejoining the PA, reflecting an increased ambition over its First NDC from 2016.

Comparison of First NDCs to Updated or Second NDCs

In most instances, countries' updated or second NDCs reflect greater emissions reduction intentions—often referred to as "enhanced ambition"—when compared with their first NDCs. Additionally, many updated NDCs include specific emission reduction targets for 2030.[27] **Table 2** compares GHG mitigation targets between each country's first and updated or second NDC, where available.

[25] Synthesis Report, 2022.

[26] Based on 2019 Climate Watch Data.

[27] Article 4 of the Paris Agreement uses the term "ambition" to describe countries' emission reduction plans. The use of "ambition" throughout this report reflects this language and does not imply judgment by CRS.

Figure 1 shows a map of the selected countries and whether their updated or second NDCs include enhanced ambition. **Figure 1** distinguishes between G20 and non-G20 countries and includes the percentage of global GHG emissions estimates for each G20 member country in 2019. Collectively, G20 member countries accounted for approximately 75% of global GHG emissions in 2019.[28]

Countries without updated NDCs are excluded from **Table 2** and **Figure 1**.

[28] Climate Watch Data, Global Historical Emissions, at https://www.climatewatchdata.org/ghg-emissions.

Table 2. Increased Greenhouse Gas (GHG) Reduction Targets in Updated or Second NDCs from Selected Countries

GHG emissions estimates are in million metric tons (Mt) of carbon dioxide-equivalents (CO_2e) and include net of removals by land uses and forestry. BAU is "business-as-usual" scenario.
(as of September 30, 2022)

Country	First NDC (INDC) Mitigation Commitments	Second or Updated[a] NDC Mitigation Commitments
Angola	35% reduction from BAU (BAU = 193 in 2030) by 2030 (unconditional); 50% reduction from BAU (BAU = 193 in 2030) by 2030 (unconditional + conditional)	15% reduction from BAU (BAU = 108 in 2025) by 2025 (unconditional); 25% reduction from BAU (BAU = 108 in 2025) by 2025 (unconditional + conditional)
Argentina	Shall not exceed 483 in 2030	Shall not exceed 359 in 2030
Australia	26%-28% below 2005 levels by 2030	43% below 2005 levels by 2030
Bangladesh	5% reduction from BAU by 2030 in the power, transport, and industry sectors (unconditional); 20% reduction from BAU by 2030 in the power, transport, and industry sectors (unconditional + conditional)	6.73% reduction from BAU (BAU = 409 in 2030) by 2030 (unconditional); 21.85% reduction from BAU (BAU = 409 in 2030) by 2030 (unconditional + conditional)
Brazil	Reduce greenhouse gas emissions by 37% below 2005 levels in 2025; Reduce greenhouse gas emissions by 43% below 2005 levels in 2030	Reduce greenhouse gas emissions by 37% below 2005 levels in 2025; Reduce greenhouse gas emissions by 50% below 2005 levels in 2030
Cameroon	32% reduction from baseline (104) in 2035 (conditional)	12% reduction from 2010 levels by 2030 (unconditional) 35% reduction from 2010 levels by 2030 (unconditional + conditional)
Canada	30% reduction from 2005 levels by 2030	40%-45% reduction from 2005 levels by 2030
Chile	30% reduction of CO_2 emissions/GDP from 2007 levels by 2030; 35%-45% reduction of CO_2 emissions/GDP from 2007 levels by 2030, conditional and considering economic growth	Peak emissions by 2025; Maximum annual emissions up to 95 by 2030; Accumulated emissions between 2020 and 2030 shall not exceed 1,100
China	Peak CO_2 emissions around 2030; Reduce CO_2 emissions per unit GDP from 2005 levels by 60%-65%; Increase share of nonfossil fuels in primary energy consumption to around 20%; Increase forest stock by 4.5 billion cubic meters from 2005 level	Peak CO_2 emissions before 2030; Achieve carbon neutrality before 2060; Lower CO_2 emissions per unit of GDP by over 65% from the 2005 level; Increase share of non-fossil fuels in primary energy consumption to around 25%; Increase the forest stock volume by 6 billion cubic meters from the 2005 level; Bring total installed capacity of wind and solar power to over 1.2 billion kilowatts by 2030
Colombia	20% reduction from BAU by 2030 (unconditional); 30% reduction from BAU by 2030 (unconditional + conditional)	Emit a maximum of 169.44 in 2030 (equivalent to a 51% reduction compared with emissions projection in 2030 reference scenario)

Country	First NDC (INDC) Mitigation Commitments	Second or Updated[a] NDC Mitigation Commitments
Democratic Republic of the Congo	17% reduction from BAU (BAU = 430) by 2030	2% reduction from BAU by 2030 (unconditional); 21% reduction from BAU by 2030 (unconditional + conditional)
Egypt	INDC did not include quantified GHG reduction targets.	Reduction of electricity emissions by 33%; oil and gas emissions by 65%; and transport emissions by 7% by 2030 relative to BAU
Ethiopia	64% reduction from BAU by 2030	14% reduction from BAU (BAU = 403.5 in 2030) by 2030 (unconditional); 68.8% reduction from BAU (BAU = 403.5 in 2030) by 2030 (unconditional + conditional)
EU[b]	At least a 40% reduction from 1990 levels by 2030	At least a 55% reduction from 1990 levels by 2030
India	33% to 35% reduction in emissions intensity of GDP by 2030	45% reduction in emissions intensity by 2030 compared to 2005 levels
Indonesia	26% reduction from BAU (BAU = 2881 in 2030) by 2030 (unconditional); 41% reduction from BAU (BAU = 2881 in 2030) by 2030 (unconditional + conditional)	31.89% reduction from BAU (BAU = 2869 in 2030) by 2030 (unconditional); 43.20% reduction from BAU (BAU = 2869 in 2030) by 2030 (unconditional + conditional)
Japan	26% reduction from FY2013 levels by FY2030; (25.4% reduction compared with FY2005)	46% reduction from FY2013 levels by FY2030; Net zero by 2050
Kenya	30% reduction from BAU (BAU = 143) by 2030	32% reduction from BAU (BAU = 143) by 2030
Malaysia	35% reduction of GHG emissions intensity of GDP by 2030 (unconditional); 45% reduction of GHG emissions intensity of GDP by 2030 (unconditional + conditional)	45% reduction of economy-wide carbon intensity (per unit of GDP) from 2005 level by 2030
Mexico	25% reduction of GHG and short lived climate pollutants from BAU by 2030 including a 22% reduction of GHG and a 51% reduction of black carbon (unconditional); Up to a 40% reduction of GHG and short lived climate pollutants from BAU by 2030 including a 70% reduction of black carbon by 2030 (unconditional + conditional)	22% of GHG emissions and 51% reduction of black carbon emissions from BAU (BAU = 991 in 2030) by 2030 (unconditional); 36% reduction of GHG from BAU (BAU = 991 in 2030) by 2030 including a 70% reduction of black carbon by 2030 (unconditional + conditional)
Morocco	17% reduction below BAU (BAU = 171 in 2030) by 2030 (unconditional); 32% reduction below BAU (BAU = 171 in 2030) by 2030 (unconditional + conditional)	18.3% reduction compared to BAU (BAU = 142 in 2030) by 2030 (unconditional); 45.5% reduction compared to BAU (BAU = 142 in 2030) by 2030 (unconditional + conditional)
Myanmar	INDC did not include quantified GHG reduction targets.	244.52 reduction by 2030 (unconditional); 414.75 reduction by 2030 (unconditional + conditional)
Nigeria	20% reduction from BAU by 2030 (unconditional); 45% reduction from BAU by 2030 (unconditional + conditional)	20% reduction from BAU by 2030 (unconditional); 47% reduction from BAU by 2030 (unconditional + conditional)

Country	First NDC (INDC) Mitigation Commitments	Second or Updated[a] NDC Mitigation Commitments
Pakistan	INDC did not include quantified GHG reduction targets.	15% reduction from BAU (BAU = 1603 in 2030) by 2030 (unconditional); 50% reduction from BAU (BAU = 1603 in 2030) by 2030 (unconditional + conditional)
Peru	20% reduction from BAU by 2030 (unconditional); 30% reduction from BAU by 2030 (unconditional + conditional)	Not to exceed 208.8 in 2030 (unconditional); Not to exceed 179 in 2030 (unconditional + conditional)
Saudi Arabia	INDC did not include quantified GHG reduction targets.	Reduce and avoid GHG emissions by 278 annually by 2030
South Africa	398-614 in 2025-2030	398-510 by 2025, and 350-420 by 2030
South Korea	37% reduction from BAU (BAU = 850.6 in 2030) by 2030	40% reduction from 2018 emission levels (727.6) by 2030
Tanzania	10%-20% reduction from BAU (BAU =138-153 in 2030) by 2030	30%-35% reduction from BAU by 2030, whereby about 138-153 MtCO2e gross emissions is expected to be reduced
Ukraine	Not to exceed 60% of 1990 levels (883) by 2030	65% reduction from 1990 levels (883) by 2030; "Carbon neutrality" by 2060
United Kingdom	At least a 40% reduction from 1990 levels by 2030 (per EU First NDC)	At least 68% reduction compared to reference years by 2030
United States	26%-28% below 2005 levels by 2025	50%-52% reduction below 2005 levels by 2030
Uzbekistan	10% reduction of specific emissions of GHG per unit GDP from 2010 levels by 2030	35% reduction of specific GHG emissions per unit GDP from 2010 levels by 2030
Venezuela	At least 20% reduction relative to baseline scenario by 2030 (conditional)	20% reduction compared to BAU by 2030
Vietnam	8% reduction from BAU (BAU = 787 in 2030) by 2030 (unconditional); 25% reduction from BAU (BAU = 787 in 2030) by 2030 (unconditional + conditional)	9% reduction from BAU (BAU = 928 in 2030) by 2030 (unconditional); 27% reduction from BAU (BAU = 928 in 2030) by 2030 (unconditional + conditional)

Sources: Compiled by the Congressional Research Service (CRS) using data from UNFCCC, NDCs, at https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs; and World Resources Institute, Climate Watch Data, "NDC Enhancement Tracker," 2022, at https://www.climatewatchdata.org/2020-ndc-tracker.

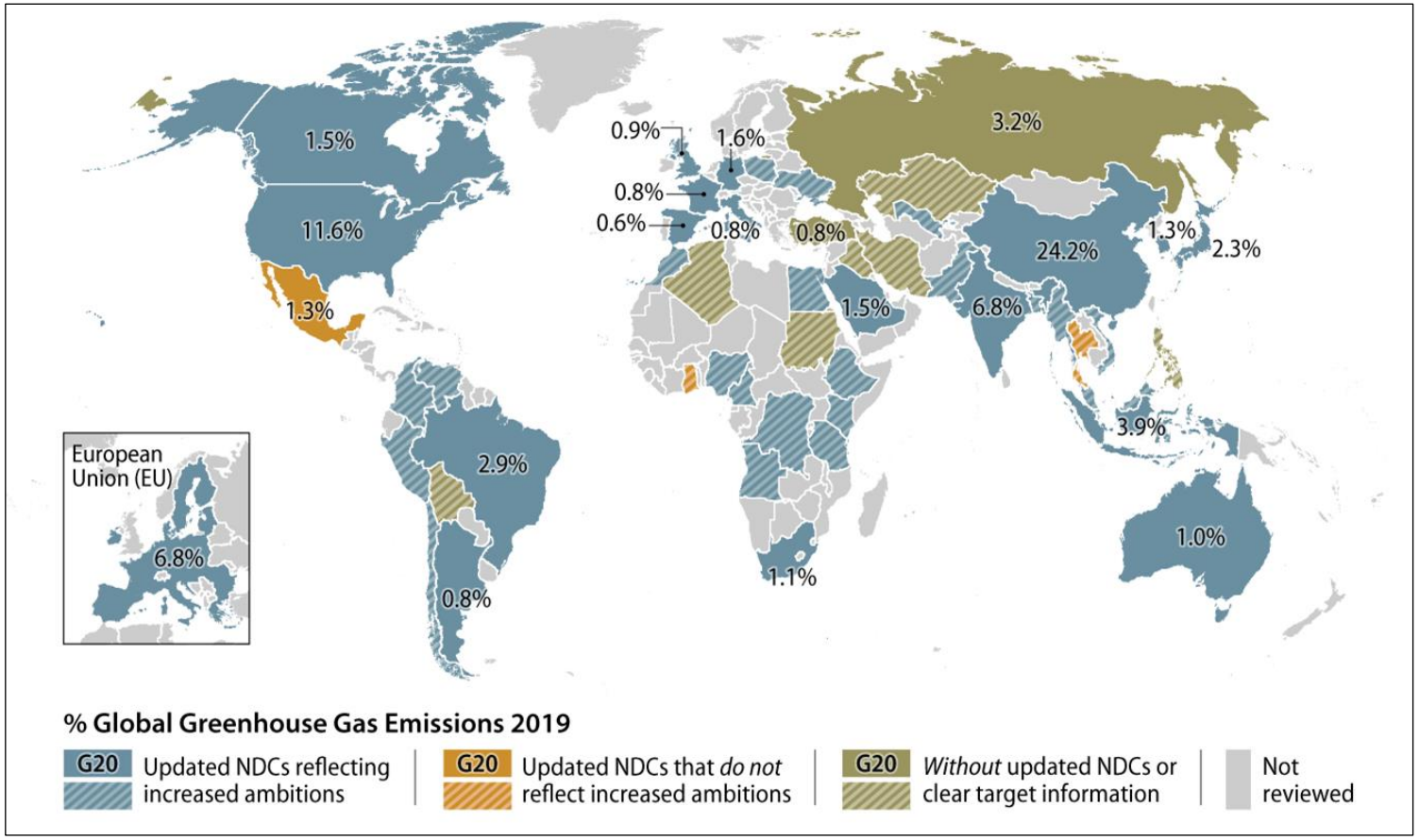
Notes: This table only includes emission reduction targets listed in NDCs and does not include other elements of NDCs, such as supporting information that may have been updated. Please see individual NDC documents for a complete description of gases, sectors, and other data and elements associated with each countries' targets.

a. In some instances, countries have submitted multiple updates to their NDCs. This table compares the initial NDC to the most recent NDC.

b. European Union (EU) member states included among the countries CRS selected for review for this report are France, Germany, Italy, Poland, and Spain.

Figure 1. Selected Countries' NDC Updates and Percent of Annual Global GHG Emissions in 2019

as of September 30, 2022



Sources: CRS using data from UNFCCC NDCs, at https://unfccc.int/NDCREG; and World Resources Institute, Climate Watch Data, "Historical GHG Emissions," at https://www.climatewatchdata.org/ghg-emissions.

Note: G20 member countries are shown with a solid color; countries that are not G20 members are shown with stripes.

Emission Reduction Targets and 2030 Projected Emissions

As described above, this report summarizes NDCs from selected countries. **Table A-1** in the **Appendix** provides GHG emissions and NDC data—including quantified targets and projected emissions for 2030—for all selected countries, where available. The majority of the selected countries' NDCs contain quantifiable emission reduction targets, but not all of these provide the data needed to calculate projected 2030 emissions. Angola, for example, provides a target for 2025 but not for 2030. Bolivia and Egypt provide emission reduction targets for specific sectors only. Myanmar and Algeria provide a percentage of emission reduction but no reference scenario. India and Malaysia provide targets to reduce emissions intensity and carbon intensity, respectively. In addition, China's updated NDC states that the country pledges to peak emissions before 2030 (versus peak emissions around 2030 from its first NDC), among other sector- and gas-specific pledges that do not allow for calculating a projected 2030 emissions target.

Countries that provide quantifiable 2030 targets do so in a number of different ways. Some countries (e.g., Democratic Republic of Congo and Japan) provide a single target; others (e.g., Indonesia, Nigeria, and Mexico) list targets conditional upon receiving foreign financial assistance in addition to not conditional targets; the EU and its member states present a "not to exceed" target; and the United States and Canada, for example, present a range of emissions reductions for 2030. Additional data presented in **Table A-1** include 2019 emissions, emissions per capita, emissions per gross domestic product (GDP), and emissions reductions targets included in each country's NDC, if available.

G20 Countries

G20 countries are responsible for the majority of annual GHG emissions globally,[29] and many stakeholders are invested in the emission reduction commitments of G20 members.[30] As of September 30, 2022, 18 members of the G20 have submitted new or updated NDCs all of which include plans for greater emissions reductions beyond their initial NDC (including the EU, Italy, Germany, and France).

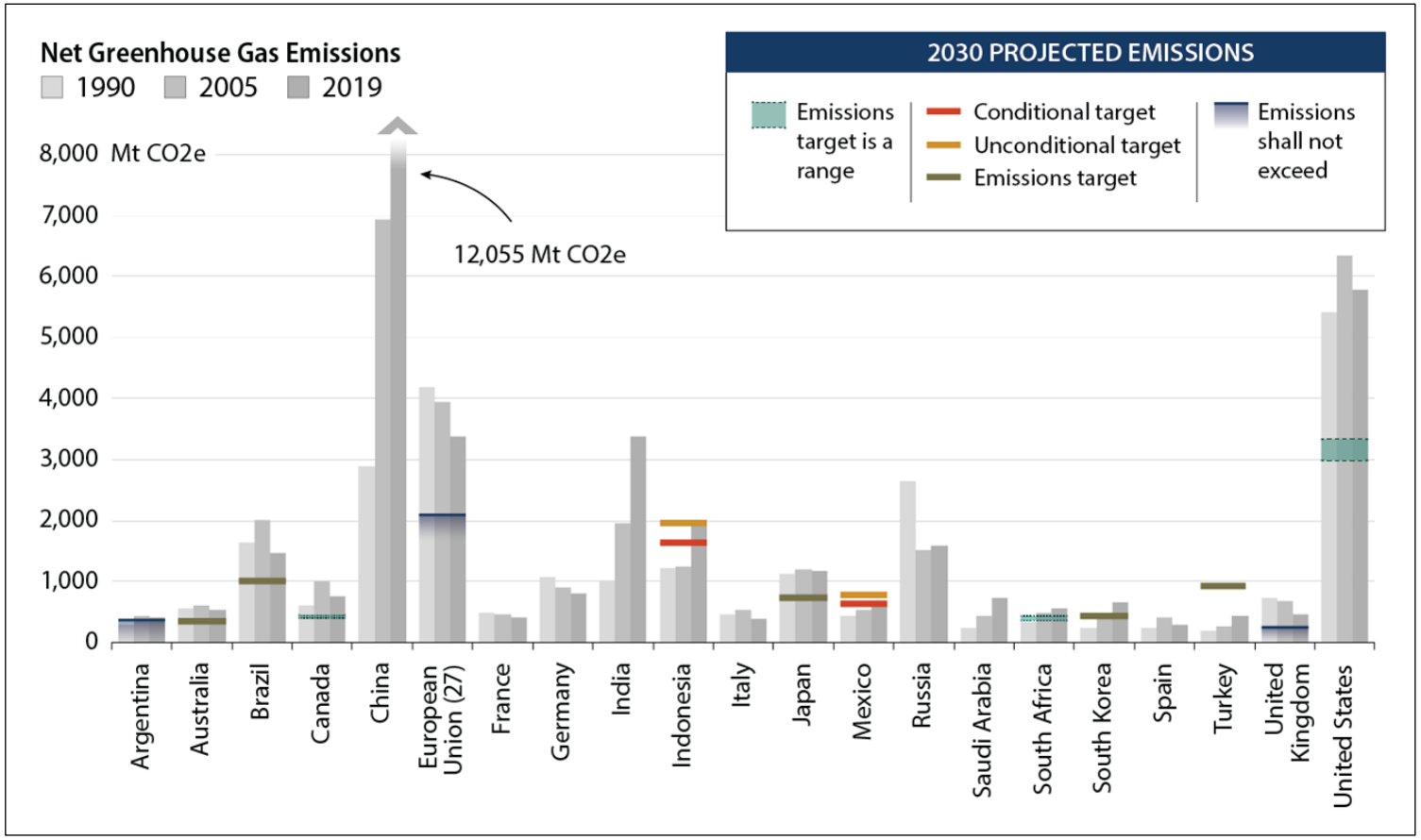
Figure 2 shows the percentage of global GHG emissions each G20 member was responsible for in 1990, 2005, and 2019 and each member's 2030 NDC target, where available. China, India, Russia, and Saudi Arabia's 2030 projections are not quantifiable with the information available in each country's NDC.

[29] G20 countries are Argentina, Australia, Brazil, Canada, China, France, Germany, Japan, India, Indonesia, Italy, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, the United States, and the European Union. Spain is invited as a permanent guest. See G20, About the G20, https://www.g20.org/about-the-g20/#participants.

[30] For additional analyses on G20 countries' NDCs and other climate-related activities as well as analyses on potential progress toward meeting the Paris Agreement's goals, see Synthesis Report, 2022; World Resources Institute, *Closing the Gap: The Impact of G20 Climate Commitments on Limiting Global Temperature Rise to 1.5ºC*, September 16, 2021, at https://www.wri.org/research/closing-the-gap-g20-climate-commitments-limiting-global-temperature-rise; and Climate Action Tracker, at https://climateactiontracker.org/.

Figure 2. G20 Countries: Historical GHG Emissions and 2030 Emissions Projections

as of September 30, 2022



Sources: CRS using data from UNFCCC, NDCs, at https://unfccc.int/NDCREG; and World Resources Institute, Climate Watch Data, "Historical GHG Emissions," at https://www.climatewatchdata.org/ghg-emissions. China's NDC does not provide a quantifiable 2030 target. Estimates for the EU-27 Member States (France, Germany, Italy, and Spain) are not available as of September 30, 2022. The EU's Effort Sharing Regulation (ESR), which creates binding minimum targets for emissions reductions by Member States, has not yet been aligned with the 55% target level. See, Technical Background Document Accompanying the report, *Trends and Projections in Europe 2021*, at https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2021/technical-background-document/view.

Net-Zero Legislation

In addition to working toward meeting 2030 emission reduction targets identified in their NDCs, some countries are seeking to achieve net-zero emissions within the next several decades, in conformance with the Article 4 provision to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." *Net-zero emissions* refers to a situation where any continued human-caused GHG emissions are balanced by any removal of GHG from the atmosphere, including carbon storage in forests and other ecosystems as well as technological removal and storage.[31] Multiple terms can refer to net-zero emissions, including *climate neutrality* or *carbon neutrality*, depending on whether the scope is all GHG or just CO_2. *Carbon neutrality* refers specifically to net-zero carbon emissions whereas other terms generally include all greenhouse gases. Although they have distinct meanings, some stakeholders or observers at times use the terms interchangeably or with ambiguity.[32]

The PA asks countries to commit to increasingly ambitious GHG mitigation efforts and encourages countries to submit long-term low greenhouse gas emission development strategies (LT-LEDS). Article 4 of the PA states, "All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."[33]

Many countries have submitted LT-LEDS,[34] but these strategies do not necessarily translate into clear pathways or concrete domestic efforts to reach net-zero emissions. Some countries, however, have introduced or enacted legislation aimed at reducing domestic emissions to net zero. Other countries may refer to net-zero in policy documents without having enacted legislation. **Table 3** provides a list of countries with enacted or proposed domestic net-zero or climate neutrality legislation, as of October 2022.[35] The table does not include countries that have *announced* net-zero policies or intentions but not taken action to embody them in law. The table is not a comprehensive list of enacted legislation.

[31] For more information, see CRS In Focus IF11821, *Net-Zero Emissions Pledges: Background and Recent Developments*, by Michael I. Westphal.

[32] For more information, see CRS In Focus IF11821, *Net-Zero Emissions Pledges: Background and Recent Developments*, by Michael I. Westphal.

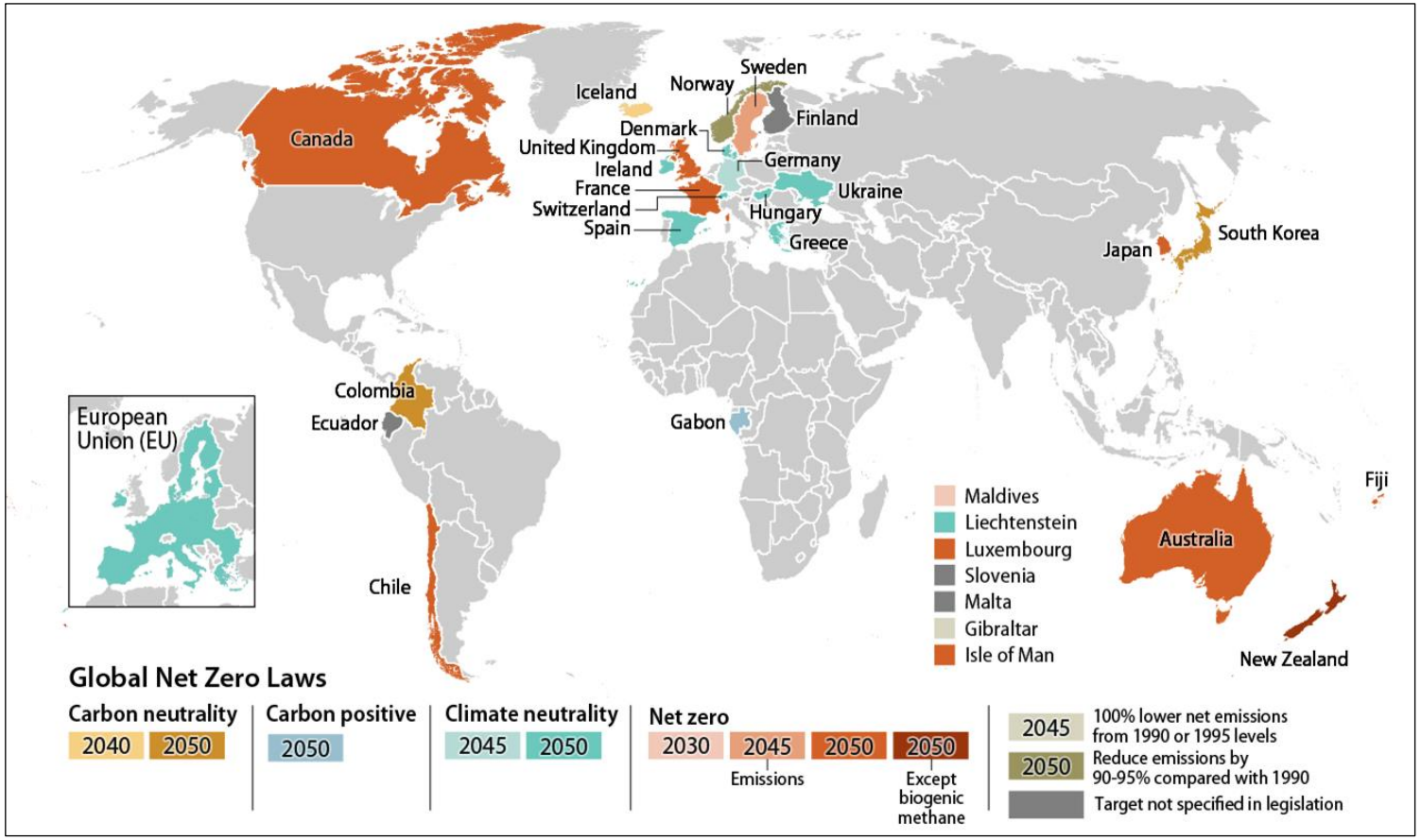
[33] Paris Agreement, Article 4.

[34] As of October 18, 2022, 53 countries had submitted long-term low greenhouse gas emission development strategies to the UNFCCC, see https://unfccc.int/process/the-paris-agreement/long-term-strategies. As of October 18, 2022, 53 Parties had made submissions.

[35] Table 2 only includes legislation that explicitly proposes net-zero emissions. Other climate-related legislation is not included.

Figure 3. Countries with Net-Zero Legislation

as of October 2022



Source: CRS using data from Law Library of Congress, Global Legal Research Directorate, *Net Zero Emissions Legislation Around the World: 2022 Update*, at https://www.loc.gov/item/2022666110/.

Notes: Multiple terms can refer to net-zero emissions, including *climate neutrality* or *carbon neutrality*, depending on whether the scope is all GHG or just CO_2. The color-based distinctions in this figure reflect the language in each country's net-zero legislation. Gabon's 2021 law allows the country to trade carbon credits and retain its status as a "carbon positive" country through 2050. EU member states are shaded on the map only if they have domestic net-zero legislation in addition to the EU-wide law included.

Observations of Net-Zero Legislation

Table 3 is derived from the 2022 report published by the Global Legal Research Directorate at the Law Library of Congress, *Net Zero Emissions Legislation Around the World: 2022 Update*.[36] The Law Library identified 57 jurisdictions with enacted or proposed net-zero legislation. Of these 57, the EU, 11 of its member states, and 20 additional countries have enacted net-zero legislation. Three countries have proposed net-zero legislation. The remaining jurisdictions are sub-national. Laws have been enacted and proposed at the state and regional level in a number of countries and these are outside of the scope of this report. The Law Library of Congress report does not include analysis of proposed net-zero emission legislation in the United States. Several bills proposing net-zero emissions goals for the United States have been introduced in recent Congresses. Because analysis of U.S. net-zero legislative proposals is beyond the scope of this CRS report, **Table 3** does not include the United States.

The EU's European Climate Law, which establishes the framework for achieving climate neutrality by 2050, applies to all 27 of its member states. Eleven EU member states (Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Luxembourg, Malta, Spain, and Sweden) have enacted net-zero legislation in addition to the EU law. Two member states—Germany and Sweden—have set 2045 target dates, versus the EU's 2050 target date. Nine of the G20 members (Australia, Canada, the EU, France, Germany, Japan, South Korea, Spain, and the UK) have enacted net-zero legislation.

Most jurisdictions with enacted legislation have set a date of net-zero emissions, carbon neutrality, or climate neutrality by 2050. The most ambitious deadline is set by Iceland, which has enacted legislation requiring carbon neutrality by 2040. Four countries (Ecuador, Slovenia, Malta, and Finland) do not specify dates, according to the Law Library of Congress report.[37]

Table 3. Net-Zero Emissions Legislation for Selected Countries and Regions

(as of October 2022)

Country	Enacted Legislation (goal and date, if available)	Proposed Legislation
Argentina		Senate Bill 682/21 Amending Law 27.520 (on Minimum Standards for Global Climate Change Adaptation and Mitigation), on Carbon Neutrality by 2050, art. 1
Australia	Climate Change Act 2022 (Cth) s 10(1)(b) (came into effect Sept. 13, 2022), (net zero by 2050)	
Canada	Canadian Net-Zero Emissions Accountability Act, S.C. 2021, c.22, Royal Assent, June 29, 2031(net zero by 2050)	
Chile	Ley 21445 Ley Marco de Cambio Climático, Diario Oficial June 13, 2022, art. 1, (net zero by 2050)	

[36] Law Library of Congress, Global Legal Research Directorate, *Net Zero Emissions Legislation Around the World: 2022 Update*, at https://www.loc.gov/item/2022666110/.

[37] Law Library of Congress, Global Legal Research Directorate, *Net Zero Emissions Legislation Around the World: 2022 Update*, at https://www.loc.gov/item/2022666110/.

Country	Enacted Legislation (goal and date, if available)	Proposed Legislation
Colombia	Ley 2169, por Medio de la Cual se Impulsa el Desarrollo Bajo en Carbono del País Mediante el Establecimiento de Metas y Medidas Mínimas en Materia de Carbono Neutralidad y Resiliencia Climática y se Dictan otras Disposiciones, art. 5.2, Diario Oficial Dec. 22, 2021, (carbon neutrality by 2050)	
Denmark	Climate Act (No. 965 of June 26, 2020) art. 1(climate neutrality by 2050)	
Ecuador	Acuerdo Ministerial 018-2021 on Ecuador Carbon Neutral Program, Ministerio del Ambiente y Agua, Registro Oficial Aug. 18, 2021, (establishes Zero Carbon Ecuador program that provides incentives to achieve carbon neutrality)	
European Union (EU)	Regulation (EU) 2021/1119 (European Climate Law), art. 2, 2021 O.J. (L 243) 1 (climate neutrality by 2050)	
Fiji	Climate Change Act 2021(Act No. 43 of 2021) s 6(5), (net zero by 2050)	
Finland	Klimatlag (FFS 609/2015), §6	
France	Code de l'énergie, art. L100-4, as amended by Loi n° 2019-1147 du 8 novembre 2019 relative à l'énergie et au climat, art. 1, Nov. 8, 2019 (net zero by 2050)	
Gabon	Ordonnance N° 019/2021 du 13 septembre 021 relative aux changements climatiques, Sept. 13, 2021, (Gabon's status as carbon positive country will be maintained through 2050)	
Germany	Bundes-Klimaschutzgesetz [KSG], Dec. 12, 2019, Bundesgesetzblatt [BGBl.] I at 2513, as amended, art. 3, para. 2 (climate neutrality by 2045)	
Gibraltar	Climate Change Act 2019, No. 29/2019, ss 8, 25, (100% lower net emissions by 2045 from 1990 or 1995 baselines)	
Greece	National Climate Law, Law 4936/2022, E.K.E.D. 2022, A:105, (climate neutrality by 2050)	
Hungary	Law on Climate Policy: On the Declaration of a Climate Emergency, on Climate Protection, (T/7021), adopted on May 14, 2020, art. 3, §4 (climate neutrality by 2050)	
Iceland	Climate Act (Lög um loftslagsmál, 2012 nr. 70 29. Júní, (Legally binding emissions reductions for 2030; specifies that the government can issue further legally binding targets. Current policy is carbon neutrality by 2040.)	
Ireland	Climate Action and Low Carbon Development Act 2015, No. 46/2015, s 3(1), as amended by the Climate Action and Low Carbon Development (Amendment) Act 2021, No. 32/2021 (climate neutrality by 2050)	
Isle of Man	Climate Change Act 2021, AT 20/2021, s 9(1), (net zero emissions by 2050)	
Israel		Climate Law Bill 5782-2022

Country	Enacted Legislation (goal and date, if available)	Proposed Legislation
		(Government Bill No. 1551, p. 1042, S48B-M76S (net zero by 2050)
Japan	Amendment (Act No. 54 of 2021) of Act on Promotion of Global Warming Countermeasures, Act No. 117 of 1998, art. 2-2 (net zero by 2050)	
Liechtenstein	Emissionshandelsgesetz [EHG], Sept. 19, 2012, Landesgesetzblatt-Nummer [LGBl.-Nr.] 012.346, as amended, art. 4, para. 4, (climate neutrality by 2050)	
Luxembourg	Loi du 15 décembre 2020 relative au climat et modifiant la loi modifiée du 31 mai 1999 portant institution d'un fonds pour la protection de l'environnement, art. 4, Dec. 15, 2020 (net zero by 2050)	
Maldives	Climate Emergency Act, Law No. 9/2021 (net zero by 2030)	
Malta	Climate Action Act, cap. 543	
New Zealand	Climate Change Response Act 2002 s 5Q, inserted by Climate Change Response (Zero Carbon) Amendment Act 2019 s 8 (net zero by 2050; except biogenic methane)	
Norway	Lov om klimamål (klimaloven) (LOV-2017-06-16-60) §4 (reduce emissions by 90%-95% compared with 1990 by 2050)	
Slovenia	Resolution on Slovenia's Long-Term Climate Strategy Until 2050, No. 801-08/21-5/, adopted by National Assembly on July 13, 2021	
South Korea	Framework Act on Carbon Neutral and Green Growth to Respond to Climate Crisis, Act No. 18469, Sept. 24, 2021, art. 7(1) (carbon neutrality by 2050)	
Spain	Ley 7/2021, de 20 de mayo, de cambio climático y transición energética, art. 3-2, Boletin Oficial del Estado, May 21, 2021(climate neutrality by 2050)	
Sweden	Klimatlag (SFS 2017:720), §3 (Does not set specific timelines for emissions reductions, but government must review and set targets every four years. Official policy as of March 2021 is net-zero emissions by 2045; 85% reduction compared with 1990.)	
Switzerland	Bundesgesetz über die Ziele im Klimaschutz, die Innovation und die Stärkung der Energiesicherheit [KIG], Sept. 30, 2022, Bundesblatt [BBl.] 2022, 2403, art. 3, para. 2, (climate neutrality by 2050)	
Taiwan		On April 21, 2022, the Executive Yuan passed the draft revision of the Greenhouse Gas Reduction and

Country	Enacted Legislation (goal and date, if available)	Proposed Legislation
		Management Act. The draft revision was reviewed by the Legislative Yuan committees in May 2022. The revision will rename the act to "Climate Change Response Act" and incorporate the goal of net-zero carbon emissions by 2050. (Change from Greenhouse Gas Reduction and Management Act to Climate Change Response Act Approved, Environmental Protection Administration (July 19, 2022)
Ukraine	Law of Ukraine on the Principles of Monitoring, Reporting, and Verification of Greenhouse Gas Emissions, No. 377-IX, adopted Dec. 12, 2019, in force since Jan. 1, 2021, (BBP), 2020, No. 22, p. 150, pmbl. (harmonizes Ukrainian legislation with standards of EU law [an obligation for Ukraine under the EU-Ukraine Association Agreement] and implements the provisions of Directives No. 2003/87/EC and No. 004/101/EC)	
United Kingdom of Great Britain and Northern Ireland	United Kingdom: Climate Change Act 2008, c.27, s 1(1),https://perma.cc/2HJ4-KNRJ, as amended by theClimate Change Act 2008(2050 Target Amendment)Order 2019, SI 2019/1056, (net zero by 2050) Northern Ireland: Climate Change Act (Northern Ireland) 2022, c. 31, (Northern Ireland to have 100% lower emissions by 2050 from 1990 or 1995 baselines) Scotland: Climate Change (Scotland) Act 2009, asp 12, https://perma.cc/748L-CXP8, as amended by Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, asp 15, (Scotland to achieve net zero by 2045)	

Source: Law Library of Congress, Global Legal Research Directorate, *Net Zero Emissions Legislation Around the World: 2022 Update*, at https://www.loc.gov/item/2022666110/.

Notes: This table includes all countries listed in the Law Library of Congress report and is not limited to the set of selected countries as described earlier in this report. EU member countries are listed only in their own row if they have domestic net-zero legislation in addition to the EU-wide law included. Links to legislation (including links to English translations) available in the referenced Law Library of Congress report.

Appendix. Table of GHG Emissions and NDC Data for Selected Countries

Table A-1 provides GHG emissions data and NDC information for the selected countries discussed in this report. The emissions data, including net GHG emissions, emissions per capita, and emissions per GDP are the most recent year available (2019) from Climate Watch Data.[38] NDC targets are as reported in Parties' NDCs. The Congressional Research Service calculated 2030 emissions targets using data available via Climate Watch Data and stated NDC targets (e.g., a percentage reduction from a base year), unless otherwise noted. This table is not comprehensive of all Parties' NDC targets, emissions, and projections.

[38] Climate Watch Data integrates emissions inventories from the UNFCCC and other sources, then it provides access to the most complete annual emissions data across all countries. Article 12 of the UNFCCC requires that all Parties to Annex I countries submit annual emissions inventories (the most recent of which is for emissions in 2019). Non-Annex I countries submit emissions inventories less frequently. CRS relies on countries' own emissions inventory data, as available via Climate Watch Data, wherever possible. In instances where countries have not provided 2018 emissions data, CRS relies on data from CAIT, as available via Climate Watch Data. (See Climate Watch, "About," at https://www.climatewatchdata.org/about/faq/ghg).

Table A-1. GHG Emissions Data and NDC Information for Selected Countries

Emissions data, including 2019 emissions, NDC targets and references, and 2030 projections are carbon dioxide-equivalent (CO_2e) and are shown as million metric tons (Mt) CO_2e, unless otherwise noted, and emissions per capita and per million $ GDP are shown as metric tons (t).

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Algeria[c] (First NDC, 2016)	282	+161	+97	6.56	1,643	7% reduction from BAU (BAU not available) by 2030 (unconditional); Up to 22 % reduction from BAU (BAU not available) by 2030 (unconditional + conditional)	not available
Angola[c] (First NDC, updated 2021)	128	+62	+13	4.03t	1,851t	15% reduction from BAU (BAU = 108 in 2025) by 2025 (unconditional); 25% reduction from BAU (BAU = 108 in 2025) by 2025 (unconditional + conditional)	not available
Argentina[c] (Second NDC, updated 2021)	399	+106	-19	8.88t	881t	Shall not exceed 359 in 2030	No more than 359 (from NDC)
Australia (First NDC, updated 2022)	519	-97	-93	20.46t	373t	43% below 2005 levels by 2030	349
Bangladesh[c] (First NDC, updated 2021)	238	+121	+82	1.46t	677t	6.73% reduction from BAU (BAU = 409 in 2030) by 2030 (unconditional); 21.85% reduction from BAU (BAU = 409 in 2030) by 2030 (unconditional + conditional)	320-381

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Bolivia[c] (First NDC, updated 2022)	139	+26	+36	12.05t	3392t	Sector-specific targets for energy and forests.	not available
Brazil[c] (First NDC, updated 2022)	1,450	-190	-560	6.88t	775t	Reduce greenhouse gas emissions by 37% below 2005 levels in 2025; Reduce greenhouse gas emissions by 50% below 2005 levels in 2030	1,001
Cameroon[c] (First NDC, updated 2021)	125	+51	-2	4.82t	3,146t	12% reduction by 2030 from 2010 levels (unconditional) 35% reduction by 2030 from 2010 levels (unconditional + conditional)	113 (unconditional); 83 (unconditional + conditional)
Canada (First NDC, updated 2021)	740	+195	-7	19.68t	425t	40%-45% reduction from 2005 levels by 2030	411-448
Chile[c] (First NDC, updated 2020)	55	+27	+16	2.92t	199t	Peak emissions by 2025; Maximum annual emissions up to 95 by 2030; Accumulated emissions between 2020 and 2030 shall not exceed 1,100	No more than 95 (from NDC)
China[c] (First NDC, updated 2021)	12,060	+9,170	+5,130	8.6t	844t	Peak CO_2 emissions before 2030; Achieve carbon neutrality before 2060; Lower CO_2 emissions per unit of GDP by over 65% from the 2005 level;	not available

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
						Increase share of non-fossil fuels in primary energy consumption to around 25%; Increase the forest stock volume by 6 billion cubic meters from the 2005 level; Bring total installed capacity of wind and solar power to over 1.2 billion kilowatts by 2030	
Colombia[c] (First NDC, updated 2020)	271	+54	+45	5.37t	837t	2% reduction from BAU by 2030 (unconditional);	169.44 (from NDC)
Democratic Republic of the Congo[c] (First NDC, updated 2021)	680	+249	+239	7.83t	13,125kt	21% reduction from BAU by 2030 (unconditional + conditional)	1,303 (unconditional); 1,050 (unconditional + conditional)
Egypt[c] (First NDC, updated 2022)	352	+218	+108	3.51t	1,161t	Reduction of electricity emissions by 33%; oil and gas emissions by 65%; and transport emissions by 7% by 2030 relative to BAU	not available
Ethiopia[c] (First NDC, updated 2021)	183	+88	+61	1.64t	1,912t	14% reduction from BAU (BAU = 403.5 in 2030) by 2030 (unconditional); 68.8% reduction from BAU (BAU = 403.5 in 2030) by 2030 (unconditional + conditional)	347 (unconditional); 126 (conditional + unconditional)
European Union-27[d]	3,370	-1,270	-860	7.53t	215t	At least a 55% reduction from 1990 levels by 2030	No more than 2,088

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
(First NDC, updated 2020)							
France[b] (EU First NDC, updated 2020)	413	-113	-99	6.14t	151t	EU target (at least a 55% reduction from 1990 levels by 2030)	not available
Germany[b] (EU First NDC, updated 2020)	793	-477	-199	9.55t	204t	EU target (at least a 55% reduction from 1990 levels by 2030)	not available
Ghana[c] (First NDC, updated 2021)	13	-9	-53	.42t	187t	Implement 34 mitigation measures to achieve absolute emission reductions of 64 by 2030. Nine unconditional measures are expected to lead to a 24.6 reduction. An additional 25 conditional measures can be implemented to further achieve an additional 39.4 reduction.	not available
India[c] (First NDC, updated 2022)	3,360	+2,360	+1,410	2.46t	1,188t	45% reduction in emissions intensity by 2030 compared to 2005 levels	not available
Indonesia[c] (First NDC, updated 2022)	1,960	+730	+710	7.24t	1,751t	31.89% reduction from BAU (BAU = 2869 in 2030) by 2030 (unconditional); 43.20% reduction from BAU (BAU = 2869 in 2030) by 2030 (unconditional + conditional)	1954 (unconditional); 1,630 (conditional + unconditional)
Iran[c]	894	+590	+269	10.78t	3,068t	No NDC communicated to UNFCCC	not available

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Iraq[c] (First NDC, 2021)	321	+201	+176	8.17t	1,375t	not available	not available
Italy[b] (EU First NDC, updated 12/18/2020)	377	-321	-177	6.31t	187t	EU target (at least a 55% reduction from 1990 levels by 2030)	not available
Japan (First NDC, updated 2021)	1,160	-40	-130	9.16t	226t	46% reduction from FY2013 levels by FY2030; Net zero by 2050	724
Kazakhstan (First NDC, 2016)	364	-9	+80	19.69t	2,006t	15% reduction from 1990 levels by 2030 (unconditional); 25% reduction from 1990 levels by 2030 (unconditional + conditional)	290-328
Kenya[c] (First NDC, updated 2020)	73	+43	+19	1.4t	731t	32% reduction from BAU (BAU = 143) by 2030	97
Malaysia[c] (First NDC, updated 2021)	396	+199	+68	12.4t	1,084t	45% reduction of economy-wide carbon intensity (against GDP) from 2005 level by 2030	not available
Mexico[c] (First NDC, updated 2020)	671	+245	+138	5.26t	528t	22% of GHG emissions and 51% reduction of black carbon emissions from BAU (BAU = 991 in 2030) by 2030 (unconditional); 36% reduction of GHG from BAU (BAU = 991 in 2030) by 2030 including a 70% reduction of black carbon by 2030 (unconditional + conditional)	773 (unconditional); 634 (conditional + unconditional)

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Morocco[c] (First NDC, updated 2021)	91	+59	+34	2.5t	760t	18.3% reduction compared to BAU (BAU = 142 in 2030) by 2030 (unconditional); 45.5% reduction compared to BAU (BAU = 142 in 2030) by 2030 (unconditional + conditional)	78-116 (from NDC)
Myanmar[c] (First NDC, updated 2021)	243	+35	+26	4.5	3,537t	244.5 reduction by 2030 (unconditional); 414.8 reduction by 2030 (unconditional + conditional)	not available
Nigeria[c] (First NDC, updated 2021)	354	+86	+56	1.76t	791t	20% reduction from BAU (453) by 2030 (unconditional); 47% reduction from BAU (453Mt) by 2030 (unconditional + conditional)	362 (unconditional); 240 (conditional + unconditional)
Pakistan[c] (First NDC, updated 2021)	439	+272	+154	2.03t	1,370t	15% reduction from BAU (BAU = 1603 in 2030) by 2030 (unconditional); 50% reduction from BAU (BAU = 1603 in 2030) by 2030 (unconditional + conditional)	1363 (unconditional); 802 (unconditional + conditional)
Peru[c] (First NDC, updated 2020)	191	+87	+58	5.86t	835t	Not to exceed 208.8 in 2030 (unconditional); Not to exceed 179 in 2030 (conditional)	No more than 208.8 (unconditional) ; no more than 179 (conditional) (from NDC)

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Philippines[c] (First NDC, updated 2021)	237	+139	+87	2.2t	628t	2.71% reduction from BAU (3.3 Gt cumulative emissions) for the period 2020-2030 (unconditional) 75% reduction from BAU (3.3 Gt cumulative emissions) for the period 2020-2030 (unconditional + conditional)	not available
Poland[b] (EU First NDC, updated 2020)	376	-70	+21	9.91t	641t	EU target (at least a 55% reduction from 1990 levels by 2030)	not available
Russia (First NDC, 2020)	1,580	-1510	+150	10.97t	936t	70% reduction relative to 1990 levels by 2030	927
Saudi Arabia[c] (First NDC, updated 2021)	723	+482	+294	21.1t	900t	Reduce and avoid GHG emissions by 278 annually by 2030	not available
South Africa[c] (First NDC, updated 2021)	562	+224	+80	9.6t	1,449t	398-510 by 2025, implementation period of 2021-2025; 350-420 by 2030, implementation period 2026-2030	350-420 (from NDC)
South Korea[c] (First NDC, updated 2021)	653	+414	+164	12.61t	395t	40% reduction from 2018 emission levels (727.6) by 2030	437
Spain[b] (EU First NDC, updated 2020)	277	+23	-127	5.88t	199t	EU target (at least a 55% reduction from 1990 levels by 2030)	not available

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Sudan[c] (First NDC, updated 2021)	127	+56	+16	2.97	3,929	Sector-specific targets for energy, forests, and waste.	not available
Tanzania[c] (First NDC, updated 2021)	155	+57	+32	2.67t	2,533t	30%-35% reduction from BAU by 2030, whereby about 138-153 gross emissions is expected to be reduced	not available
Thailand[c] (First NDC, updated 2020)	437	+264	+155	6.28t	804t	20% reduction from BAU (BAU = 555) by 2030 (unconditional); Up to 25% reduction from BAU (BAU = 555) by 2030 (unconditional + conditional)	416-444
Turkey (First NDC, 2021)	422	+258	+159	5.06t	555t	Up to 21% reduction from BAU (BAU = 1,175 in 2030) by 2030	929 (from NDC)
Ukraine (First NDC, updated 2021)	332	-552	-76	7.48t	2,159t	65% reduction from 1990 levels (883) by 2030; "Carbon neutrality" by 2060	309
United Kingdom (First NDC, updated 2022)	459	-354	-239	6.87t	159t	At least 68% reduction from 1990 levels by 2030	No more than 260
United States (First NDC after rejoining the Paris Agreement, 2021)	5,770	+230	-860	17.57t	270t	50%-52% reduction from 2005 emissions levels by 2030	2,984-3,315
Uzbekistan[c] (First NDC, updated 2021)	185	+21	+24	5.52t	3,095t	35% reduction of specific GHG emissions per unit GDP from 2010 levels by 2030	not available

Country (date)	2019 Net GHG Emissions	Change in Net GHG Emissions 1990-2019	Change in Net GHG Emissions 2005-2019	GHG Emissions/ Capita in 2019	GHG Emissions/ Million GDP in 2019	NDC Targets[a]	Projected 2030 GHG Emissions Per NDC Targets[b]
Venezuela[c] (First NDC, updated 2021)	300	-97	-143	10.51t	not available	20% reduction compared to BAU by 2030	not available
Vietnam[c] (First NDC, updated 2020)	438	+436	+230	4.54t	1,326t	9% reduction from BAU (BAU = 928 in 2030) by 2030 (unconditional); 27% reduction from BAU (BAU = 928 in 2030) by 2030 (unconditional + conditional)	677-844

Sources: World Resources Institute, Climate Watch Data "Country Profiles," at https://www.climatewatchdata.org/countries; and UNFCCC NDC Registry, at https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx.

Notes: GHG emissions data from 2019, 2005, and 1990 and GHG emissions per capita and per GDP data are from countries' reported submissions to the UNFCCC as available from Climate Watch Data, except where noted (see table note c). CO2e is the tons of CO2 that would have the equivalent effect of the GHG on forcing global average temperature (positive or negative) as one ton of the GHG in question. Emissions data include those emissions from land use, land use change, and forestry (LULUCF). Also, t = metric tons; and Gt (gigatons) = 1 billion metric tons. BAU = "business-as-usual."

a. NDC targets extracted from most recently submitted NDCs available in the UNFCCC NDC Registry.

b. Year 2030 emissions targets calculated using NDC 2030 target reductions and base year emissions as reported by each country to the UNFCCC, where available. Estimates for the EU-27 Member States (France, Germany, Italy, Poland, and Spain) are not available as of September 30, 2022. The EU's Effort Sharing Regulation (ESR), which creates binding minimum targets for emissions reductions by Member States, has not yet been aligned with the 55% target level. See, Technical Background Document Accompanying the report, *Trends and Projections in Europe 2021*, at https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2021/technical-background-document/view.

c. Because certain countries submitted GHG emissions data to the UNFCCC for intermittent years only, some emissions data are from CAIT (formerly known as the Climate Analysis Indicators Tool), as available from Climate Watch Data. CAIT compiles emissions data from nongovernmental sources to supplement countries' intermittent emissions reporting (see https://cait.wri.org/faq.html).

d. EU-27 emissions data for all years exclude emissions from the UK.

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