

# Chapter 5

## Technical Annex

*Katie Lebling (World Resources Institute, WRI)*

*Elina Brutschin (International Institute for Applied Systems Analysis, IIASA)*

*Oliver Geden (German Institute for International and Security Affairs, SWP)*

*Leona Tenkhoff (German Institute for International and Security Affairs, SWP)*

*Carley Reynolds (Potsdam Institute for Climate Impact Research, PIK)*

*Alexis Dunand (Carbon Gap)*

*Lisa Voigt (German Institute for International and Security Affairs, SWP)*

*Nicoletta Brazzola (University of Oxford)*

*Nico Fairbairn (University of Wisconsin-Madison)*

*Gregory F. Nemet (University of Wisconsin-Madison)*

**Chapter scientist:** *Leona Tenkhoff (German Institute for International and Security Affairs, SWP)*

**Cite as:** *Lebling, K., Brutschin, E., Geden, O., Tenkhoff, L., Reynolds, C., Dunand, A., Voigt, L., Brazzola, N., Fairbairn, N., Nemet, G. F. Chapter 5: Policymaking and governance, in **The State of Carbon Dioxide Removal 3rd Edition 2026** (eds. Edwards, M. R. et al.). DOI:<https://doi.org/10.17605/OSF.IO/62548> (2026)*



## Technical Annex | Chapter 5

### A5.1 CDR Policy Database Codebook: Scope, definitions, and coding procedures

#### Database scope and sources

##### Definition of policy

A policy broadly refers to any public measure – such as a law, regulation, strategy, target or official communication – that is currently relevant and applicable, and that is in force, enacted or formally announced at the national or regional level. Only policies that remain valid at the time of data collection are included in the database (last update January 31, 2026). Policies may span multiple instrument types and sectors and are included when they have a clear and demonstrable connection to CDR methods, including by enabling or constraining relevant land- or ocean-based activities. The dataset includes binding policies (legally enforceable measures that are enacted or in force) and non-binding policies (formal announcements, strategies or targets that signal intent but lack legal force). Policy inclusion is guided by the coding framework but relies on informed expert assessment to evaluate relevance in ambiguous cases, particularly where links to CDR are indirect, emerging or context specific.

##### Unit of analysis

Each row represents a single policy instrument (e.g. law, regulation, strategy or official communication) that is in force, enacted, or formally communicated at the national or regional level. A single policy may cover multiple instrument types and sectors.

##### Revisions and document families

For policies that are periodically revised or that comprise multiple related documents, a single entry is maintained using the year of original publication or enactment. All subsequent amendment years are recorded separately, and coding reflects the most current provisions of the policy, including instruments, targets and other relevant attributes.

## Coding Approach

Once identified, each policy is systematically reviewed and coded using a standardized set of indicators (see table below). All policies are coded and validated by at least two experts, who assess whether the policy is clearly related to CDR and whether the coding is consistent with the categories and guidelines specified in the coding instructions document.

## Main Policy Data Sources

### *IEA Policies & Measures Database*

Policies listed in the IEA Policies & Measures database that were in force before December 31, 2025, were coded. The database is compiled and maintained by the IEA, with national governments invited to review and update their entries at least annually.

Each policy was tagged using the following IEA technology categories: CO<sub>2</sub> capture, CO<sub>2</sub> transportation, CO<sub>2</sub> storage, CO<sub>2</sub> capture and transport technologies, CO<sub>2</sub> capture and storage technologies and direct air capture (DAC).

### *OECD PIMA AFOLU Database*

The OECD Policy Inventory for Mitigation Actions in Agriculture, Forestry and Other Land Use (PIMA AFOLU) provides a comprehensive overview of AFOLU-sector mitigation policies in OECD and G20 countries. Policies are updated annually and reviewed by national experts; entries from the 2025 release were included in this assessment. Planned policies listed in the database were excluded.

To identify CDR-relevant policies, keyword searches were conducted using terms related to carbon sequestration, ecosystem restoration, land management, soil carbon, forestry, agriculture and blue-carbon activities (e.g. afforestation, reforestation, soil organic carbon, biochar, peatland restoration, mangrove restoration, carbon farming and related concepts).

Policy entries explicitly targeting emission-avoidance measures – such as deforestation prevention, degradation avoidance, fire management, fuelwood reduction or similar measures – were excluded. All entries were manually reviewed to identify relevant policies with limited descriptions and to remove irrelevant policies.

### *Additional Sources*

Policies were further supplemented and cross-checked against other global, regional and national policy databases, especially the Climate Change Laws of the World for overarching frameworks and NDCs, and CDR-specific databases including Carbon Gap's Carbon Removal Policy Tracker and Carbon Removal Standard Initiative's Carbon Removal Quantification, Integration and Policy database.

Country-specific sources included:

Country	Main Sources
China	University of Maryland Center for Global Sustainability, US–China CDR Report (2024); PKU Law legal database

**Table A5.1**

### *Use of Artificial Intelligence in Data Coding*

Artificial intelligence (AI) tools were used in a limited and supportive capacity during the construction and refinement of the policy dataset. AI was primarily employed to assist with data cleaning, formatting, and recoding tasks, ensuring consistent alignment of variables across entries in accordance with the coding framework.

AI was also used iteratively during the validation process to help reconcile entries following human expert review and comments, particularly when adjusting classifications, separating variables (e.g. targets and units), or harmonising terminology across policies.

In addition, AI supported the drafting of short descriptive statements linking each policy to CDR. These descriptions were generated based on policy documents and coding guidance but were reviewed and validated by human coders to ensure accuracy and consistency with the coding scheme.

## Database variables and definitions

Variable name	Definition
<b>Jurisdiction</b>	Official name of the country or region.
<b>Iso</b>	ISO code of the country or region.
<b>Document_full_title</b>	Full document title in English, with the original language in brackets.
<b>Year_enacted</b>	First calendar year in which the policy, law, or regulatory document entered into force (i.e. became legally effective or operational). For non-binding documents or strategies, record the year of publication. Policies that remain active retain their original enactment year. If a policy is substantively replaced or re-enacted as a new instrument, create a separate entry with its own enactment year. No formal cutoff year is imposed. Please do not include policies that are not applicable anymore.
<b>Years_amended</b>	All amendment years, separated by semicolons (;).
<b>Policy_scope</b>	<p><b>Framework:</b> Sets the strategic direction for national climate policy (legislative or executive) by defining long- or medium-term emissions targets and pathways, establishing governance arrangements, spanning multiple sectors, and embedding transparency and accountability.</p> <p><b>Instrument:</b> A focused policy tool or mechanism used to implement objectives (e.g. grants, tax credits, procurement).</p>
<b>CDR_link</b>	One sentence explaining the document's core relevance to CDR and why it matters.
<b>Broad_method</b>	<p>One or more of the following categories:</p> <ul style="list-style-type: none"> <li>• Conventional CDR</li> <li>• Novel CDR</li> <li>• Enabling infrastructure</li> <li>• Multiple</li> </ul>
<b>Specific_method</b>	<p><b>CDR methods:</b> Afforestation, reforestation, forest management; Agroforestry; Peatland and coastal wetland restoration; Soil carbon sequestration in croplands &amp; grasslands; Durable wood products; Biochar soil amendment; Mineral products (e.g. CO<sub>2</sub>-cured concrete, aggregates); Biomass burial; Enhanced weathering; Bio-oil storage; Bioenergy with carbon capture and storage (BECCS); Direct air capture with geological storage (DACCS); Direct ocean carbon capture and storage; Alkalinity enhancement of water bodies; Ocean fertilisation; Biomass sinking.</p> <p><b>Enabling infrastructure:</b> CO<sub>2</sub> geological storage; CO<sub>2</sub> transport.</p> <p><b>Multiple</b> (if unspecific)</p> <p>Multiple values allowed; separate with semicolons (;).</p>

Variable name	Definition
<b>Value_chain_focus</b>	<p><b>Cross-cutting:</b> Broad regulatory or institutional measures affecting multiple stages of the CDR value chain.</p> <p><b>Supply:</b> Measures that reduce cost, risk, or uncertainty for producing verified removals.</p> <p><b>Demand:</b> Measures that create or expand markets and buyers for verified removals.</p>
<b>Instrument_broad</b>	<p><b>Economic instrument:</b> Policies that use financial incentives, market mechanisms, or fiscal measures to influence behaviour by changing costs, revenues, or investment risks related to CDR.</p> <p><b>Regulatory instrument:</b> Legally binding rules, standards, or mandates that require, restrict, or enable specific actions related to the development, deployment, or use of CDR.</p> <p><b>Information instrument:</b> Measures that provide information, guidance, transparency, or capacity-building to influence decisions and practices related to CDR without direct financial incentives or binding requirements.</p> <p><b>Other:</b> Institutional, strategic, research, or hybrid measures that do not primarily rely on economic incentives, regulatory mandates, or information provision, or that combine multiple mechanisms without a single dominant instrument type.</p>
<b>Instrument_type</b>	<p>Specific instrument type (multiple values allowed; separate with semicolons ;).</p> <p><b>compliance_market_integration:</b> Rules governing whether and how CDR units are recognised for use in a compliance carbon market or other regulatory compliance framework.</p> <p><b>crediting_mechanism:</b> Policy frameworks that establish systems for generating, issuing, or certifying carbon removal credits (e.g., national carbon crediting schemes, certification frameworks, or offset mechanisms).</p> <p><b>target:</b> Quantitative emissions reduction objective relative to a baseline year or Quantified specific carbon dioxide removal objective (economy-wide or sectoral) or Quantified enabling technology target (geological storage).</p> <p><b>mr_v_standard:</b> MRV frameworks, accounting rules, certification schemes, and technical standards.</p> <p><b>regulatory_safeguard:</b> Permitting, siting, environmental impact assessment, liability, and safety rules.</p> <p><b>community_safeguard:</b> Public consultation, benefit-sharing mechanisms, and workforce or just transition measures.</p> <p><b>rd_d_funding:</b> Public funding for research, development, and demonstration activities.</p> <p><b>capital_subsidy:</b> Upfront or capital-focused grants/subsidies supporting assets or infrastructure (capex).</p> <p><b>operating_subsidy:</b> Ongoing support reducing operating costs or supporting delivery (opex), not structured as procurement or per-tonne crediting.</p>

Variable name	Definition
Instrument_type, cont.	<p><b>tax_incentive:</b> Tax credits, relief, or exemptions supporting CDR (cost-reducing or performance-based).</p> <p><b>public_loan:</b> Public loans.</p> <p><b>public_procurement:</b> Government purchasing or offtake of verified removals (e.g. contracts, framework agreements, Advance Market Commitments).</p> <p><b>Other:</b></p>
Target_year	Year when the stated target is intended to be achieved.
Target_amount	Numeric value of the stated target.
Target_unit	Unit associated with the target amount (e.g. MtCO <sub>2</sub> /year, %, hectares).
Target_type	<p><b>Emissions:</b> Targets related to reducing, limiting, or reaching net-zero greenhouse gas emissions (including net emissions targets where removals contribute to balance).</p> <p><b>CDR:</b> Targets for carbon dioxide removal from the atmosphere, including delivery of removals or removal capacity (e.g. tonnes removed, CDR deployment targets).</p> <p><b>CO<sub>2</sub> storage:</b> Targets for the storage or sequestration of captured CO<sub>2</sub>, regardless of storage type (e.g. geological, mineralisation, or other durable storage), including storage volume, injection, or capacity.</p>
Target_binding	Yes/No
Link	URL to the official document source.

---

Table A5.2

## Aggregation rules

This section defines how individual policy instruments are aggregated into an overall policy development stage.

Label	Stage	Definition	Key Criteria for Classification
<b>Not Evident</b>	–	No identifiable policy activity related to the technology group.	<ul style="list-style-type: none"> <li>• No frameworks, strategies, or regulatory instruments</li> <li>• No official references to the technology</li> </ul>
<b>Emerging</b>	√	Early policy attention without binding regulation.	<ul style="list-style-type: none"> <li>• High-level strategies, roadmaps, or political signals</li> <li>• Exploratory or uncertain discussion of CDR</li> <li>• Supply-side measures only</li> </ul>
<b>Emerging+</b>	√+	Strengthening supply-side support with early demand-side discussion.	<ul style="list-style-type: none"> <li>• Multiple concrete supply-side instruments implemented</li> <li>• Explicit discussion of future demand-side measures</li> <li>• No formal demand-side instrument adopted</li> </ul>
<b>In Active Development</b>	√ √	Concrete policy portfolio with non-binding demand-side elements.	<ul style="list-style-type: none"> <li>• At least one non-binding demand-side instrument (e.g. targets, pilots, voluntary markets, proposed ETS inclusion)</li> <li>• And/or multiple active supply-side measures</li> </ul>
<b>In Active Development+</b>	√ √ +	Demand-side regulation imminent but not yet in force.	<ul style="list-style-type: none"> <li>• Fully designed demand-side instrument pending implementation</li> <li>• Regulatory text finalized but not yet legally binding</li> </ul>
<b>Advanced</b>	√ √ √	Binding demand-side regulation actively driving deployment.	<ul style="list-style-type: none"> <li>• Binding CDR targets</li> <li>• CDR eligible under an operational compliance ETS</li> <li>• Binding procurement mandates or enforced crediting mechanisms</li> </ul>

**Table A5.3**

Notes for coders:

- Classification should reflect the highest applicable stage based on the current policy environment.
- “Demand-side instruments” refer to policies that create enforceable demand, not only support supply.
- When uncertainty exists, coders should document assumptions in the comments field.

## A5.2 Estimation of CDR pledges and credibility assessment

### Estimation of CDR pledges

#### Definition of CDR

We follow the State of Carbon Dioxide removal convention for defining and estimating CDR: human activities that capture CO<sub>2</sub> from the atmosphere and store it durably in geological, land or ocean reservoirs, or in products. This includes human enhancement of natural removal processes, but excludes natural uptake not caused directly by human activities.<sup>1</sup>

Since natural uptake is excluded, care is needed when interpreting removals from the land use, land use change and forestry (LULUCF) sector, as reported by countries in their national inventories and Nationally Determined Contributions (NDCs). In the State of Carbon Dioxide Removal assessment of current levels of CDR (Chapter 7), the forest land and harvested wood product (HWP) sectors in inventories are considered relevant for CDR, but for baseline estimates of CDR “indirect anthropogenic effects” from the atmospheric CO<sub>2</sub> fertilisation effect are excluded based on modelling studies. In the assessment of national pledges, we also consider the forest land and HWP sectors for our baseline estimates of removals (Table 5.4 in Chapter 5, column 4) and other fluxes as emissions (Table 5.4, column 3), but we make no change to the baseline levels to exclude indirect anthropogenic effects. This allows readers to directly relate our estimates to those reported in Nationally Determined Contributions (NDCs) and national inventories. Consistent with the *State of CDR*, we consider estimated changes to these fluxes in the next decade (i.e. up to 2035) as representing “direct” removals (Table 5.4, column 5). For longer term modelling of emissions reductions up to 2050, it is important to take account of differences between direct and indirect anthropogenic effects.<sup>2</sup>

#### Estimation of CDR pledges in 2030 or 2035

Parties to the Paris Agreement present their mitigation targets in different formats, with varying levels of detail and comprehensiveness. As these mitigation targets do not generally include specific targets for removals, our estimates of pledged removals are based on sectoral information as available in national sources and in some cases supplemented with additional assumptions. If there is no indication of the expected contribution of the LULUCF sector or novel CDR to achievement of the mitigation target, we assume no pledged increase in removals. Exclusions were also made where there is ambiguity in the wording or formulation of a pledge, or if non-standard accounting conventions were used. Generally, we do not consider projections of removals as pledges in themselves.

Unless otherwise detailed in the country-specific sections below, we follow a standard approach to estimating pledged increases in LULUCF removals. First, the expected change in overall net LULUCF CO<sub>2</sub> emissions (i.e. including emissions from deforestation as well

as removals from afforestation, alongside other fluxes) is calculated against our baseline of the historical decadal average (2014-2023). From net changes in the LULUCF sector, unless noted otherwise, we estimate removals assuming that the historic ratio (2014-2023) of emissions to removals remains consistent through to 2030 or 2035. All pledges are harmonised to historical emissions from the LULUCF Data Hub.<sup>3</sup>

Novel CDR removals are more straightforward than for the LULUCF sector, as examples of these to date have not been mixed with emissions.

Individual assumptions for the calculation of CDR pledges in G20 members and select additional countries are provided below.

### Argentina

Argentina's NDC (submitted in 2021) does not specify the expected contribution of the land use, land use change and forestry (LULUCF) sector or novel CDR to its target.

### Australia

Australia's NDCs (submitted in 2022 and 2025) do not indicate the expected role of removals or LULUCF sector more broadly in contributing to their mitigation targets for 2030 and 2035. However, modelling by the Commonwealth Scientific and Industrial Research Organisation (CSIRO)<sup>4</sup> commissioned by the government as well as the 2035 Targets Advice report<sup>5</sup> published by the Climate Change Authority (CCA) both include information on the expected net land sink and novel CDR. While the CCA's report uses slightly more up to date historical data and projections, both sources are generally aligned in terms of the expected net land use sink but deviate somewhat on novel CDR.

The CCA's report provides a range for the expected net land sink of approximately -80 to -82 MtCO<sub>2</sub>e in 2030 and -85 to -89 MtCO<sub>2</sub>e in 2035, using a plot reader to extract data. We assume the CCA uses a similar approach as the CSIRO modelling, which considers current projections for the land sector (net, including non-CO<sub>2</sub> gases) plus additional land sequestration from new plantings (assumed only CO<sub>2</sub> removals). The CCA report uses 2024 projections<sup>6</sup> from the Department of Climate Change, Energy, the Environment and Water, which we use to exclude non-CO<sub>2</sub> gases and to separate removals from net LULUCF. This is compared to the 2014-2023 decadal average to determine the change in removals.

For novel CDR, the CCA's report similarly provides a range for expected novel CDR, or "engineered removals", in a graph. We used a plot reader to approximate the ranges as 2 to 6 MtCO<sub>2</sub>e in 2030 and 3 to 10 MtCO<sub>2</sub>e of removals in 2035. This varies from CSIRO's modelling, which assumes 14 MtCO<sub>2</sub>e of removals in 2035 in their scenario corresponding to the less ambitious end of the 2035 NDC target.

## Brazil

Brazil's NDCs (submitted in 2023 and 2024) do not specify the expected contribution of the LULUCF sector to its target, but the National Mitigation Strategy published in 2026 includes sectoral plans with expected sectoral contributions.<sup>7</sup> The land use components of the strategy are further disaggregated between avoided land use conversion and maintenance and recovery which was taken as their targeted removals. This was compared to historical average removals to determine the pledged additional removals in 2030 and 2035.

## Canada

In Canada's NDCs (submitted in 2022 and 2025), emissions and removals from the LULUCF sector are not included in reference year emissions but are counted towards achievement of the target as the "LULUCF accounting contribution". Neither the 2030 nor 2035 target specify a targeted LULUCF accounting contribution.

## China

China's NDC (submitted in 2021) includes a target for an increase in forest stock by 6 billion m<sup>3</sup> compared to 2005 levels by 2030. Its new NDC, submitted in 2025, further targets an increase in forest stock to a total 24 billion m<sup>3</sup> by 2035. As these are non-emissions targets, there is significant uncertainty in the potential implications for future removals if the targets were achieved, discussed in further detail below. Given this uncertainty and the size of China's land sink, we do not include an estimate of expected removals associated with the 2030 and 2035 targets.

One possible approach to estimating the associated removals would be to estimate the annual change in forest stock and use conversion factors based on historical data to estimate how much carbon would then be sequestered annually to achieve the target. Given the 2030 forest stock target was already met around 2018, this would imply a decline in China's forest sink. Similarly, the rate of increase in carbon stock implied by the 2035 target would suggest a decline in China's forest carbon sinks using this approach.

While the NDCs' forest targets are formulated as forest stock targets, other national policy documents generally include both forest stock and forest cover targets. China's working guidance for carbon dioxide peaking and carbon neutrality<sup>8</sup> targets the same level of forest stock as the NDC target for 2030, as well as forest cover of 25%. For 2035, China's *Master Plan of National Major Ecological System Protection and Restoration*<sup>9</sup> targets a lower level of forest stock compared to the NDC and forest cover of 26%. An assessment of forest expansion based on these national forest cover targets indicate their achievement would result in an increase in China's net sink in the target years.<sup>10</sup>

## European Union

The European Union's targeted net LULUCF emissions was taken as  $-310 \text{ MtCO}_2\text{e}$  per year, as provided in the LULUCF Regulation.<sup>11</sup> To exclude non- $\text{CO}_2$  gases, we assumed the historical 10-year average remains constant. Note, however, the EU Climate Law sets a limit on the net carbon sink that can be used towards the NDC as  $-225 \text{ MtCO}_2\text{e}$  in 2030.

## India

In March 2026, India announced its NDC targets for 2035, including an additional carbon sink through forest and tree cover of 3.5–4 billion  $\text{tCO}_2\text{e}$  by 2035 from the 2005 level.<sup>12</sup> Based on information provided in India's State of Forest Report 2023,<sup>13</sup> we take this as total additional carbon stock added to the forest and tree cover from 2005–2035. We therefore average this over the same period to estimate the annual additional forest sinks in 2035. Interpreting the target as an increase in cumulative carbon stock rather than removals, we do not consider it "additional" to 2005 levels for forest removals. We assume non-forest LULUCF emissions remain constant from the 2014–2023 decadal average. As of 31 March 2026, India has not formally submitted its new NDC with this target to the UNFCCC.

We apply the same approach to India's 2030 forest target in its NDC submitted in 2022, which targets "an additional carbon sink of 2.5 to 3 billion tonnes of  $\text{CO}_2\text{e}$  through additional forest and tree cover by 2030." While the reference year is not provided, it is assumed to be 2005 consistent with the new announced target.

As the targets provided are cumulative, there is inherent uncertainty in targeted removals in a specific year (i.e. 2030 or 2035). According to 2023 forest report and 2035 target announcement, India has already achieved 2.29 billion  $\text{tCO}_2\text{e}$  of additional carbon sinks from 2005–2021, which puts India on track to overachieve its target. If progress towards the targets was taken into account, this would reduce the average annual removals needed to reach the target.

## Indonesia

Indonesia's 2035 NDC includes conditional and unconditional mitigation scenarios, including sectoral information, towards achieving their 2035 mitigation targets. These pathways include emissions values for 2030 which we use instead of the targets provided in the 2030 NDC.

The historical base year emissions used for the mitigation scenarios are not aligned with the most recent national inventory submitted with the first Biennial Transparency Report (BTR).<sup>14</sup> The 2035 NDC reports historical net forestry and other land use (FOLU) GHG emissions of  $221 \text{ MtCO}_2\text{e}$  in 2019 while the BTR reports LULUCF GHG emissions in 2019 of  $819 \text{ MtCO}_2\text{e}$ . The 2035 NDC notes data for the FOLU sector were taken from a dashboard for the land sector although the exact source is unclear. It is also unclear to what extent the base year emissions differ due to differences in scope versus differences in source methodologies.

We therefore harmonize the mitigation scenario to our historical estimate for LULUCF CO<sub>2</sub> emissions in 2023. While this substantially changes the targeted LULUCF emissions in 2035, it avoids an inflated estimate of the change in removals relative to historical levels.

### Japan

In Japan's NDCs (submitted in 2021 and 2025), emissions and removals from the LULUCF sector are not included in reference year emissions but are counted towards achievement of the target. The 2021 NDC indicates targeted sectoral emissions for 2030, including 'greenhouse gas removals' of -47.7 MtCO<sub>2</sub>e per year. However, the BTR specifies that this reflects net removals accounted for using an activity-based approach for identified "NDC-LULUCF activities" that is not aligned with historical emissions estimates in the national greenhouse gas inventory.<sup>15</sup> The BTR provides separate projections that include the contribution of the NDC-LULUCF activities as well as remaining LULUCF emissions and removals based on the scope of the national inventory. This is used as the basis for our estimation of the change in pledged CDR. Removals in 2030 are separated from emissions based on data provided in Table II-22.<sup>15</sup>

The 2025 NDC does not provide any information on LULUCF's expected contribution or novel CDR to their 2030 target so it is not estimated here.

### Mexico

Mexico's NDC (submitted in 2022) does not specify the expected contribution of the LULUCF sector to its 2030 target; however, the NDC submitted in 2025 notes that the new 2035 target is based on the commitment that land sinks would increase to at least 200 MtCO<sub>2</sub> per year by 2030. We use this as the basis for Mexico's 2030 pledged CDR. The NDC further notes that for 2035, sectoral allocations for achieving the target are not yet validated, so the expected CDR pledge is not assessed for this year.

### Russia

Russia's NDCs (submitted in 2022 and 2025) do not specify the expected contribution of the LULUCF sector or novel CDR to its targets.

### Saudi Arabia

Saudi Arabia's NDCs (submitted in 2021 and 2025) do not specify the expected contribution of the LULUCF sector or novel CDR to its targets.

### South Africa

South Africa's NDCs (submitted in 2021 and 2025) do not specify the expected contribution of the LULUCF sector or novel CDR to its targets.

### South Korea

While South Korea's NDC submitted in 2021 does not specify the expected contribution from the LULUCF sector in meeting the national target, South Korea published its plan to achieve its target in the same year.<sup>16</sup> The plan provides the targeted sink in 2030, to be achieved through different land use measures. We take this as net LULUCF emissions, since the historical value provided for 2018 sinks closely aligns with net LULUCF emissions in the national inventory. Non-CO<sub>2</sub> gases are assumed to be negligible.

South Korea's NDC submitted in 2025, with a new mitigation target for 2035, similarly does not specify the expected contribution from the LULUCF. However, the Presidential Commission on Climate Crisis Response has published sectoral greenhouse gas reduction goals to achieve the target which we've used to estimate pledged CDR for 2035.<sup>17</sup> As with 2030, the values are assumed to be net and non-CO<sub>2</sub> gases are assumed negligible.

### Türkiye

While Türkiye's NDC submitted in 2023 does not specify the expected contribution from the LULUCF sector in meeting the national target, its BTR provides some information on the expected contribution.<sup>18</sup> The BTR provides a With Measures (WM) scenario that achieves the economy-wide target of its NDC and "illustrates the anticipated contributions across different sectors". While there are multiple tables in the BTR and its annexes that provide different values for LULUCF, we take the pledged net LULUCF CO<sub>2</sub> emissions as the difference between CO<sub>2</sub> emissions including LULUCF and excluding LULUCF from the CTF table NDC annex, as this allows the disaggregation of gases.

Türkiye's NDC submitted in 2025 similarly does not specify the expected contribution from the LULUCF sector. As the BTR scenarios do not go beyond 2030, we cannot assess pledged CDR for 2035.

### United Kingdom

While the United Kingdom's NDCs (submitted in 2022 and 2025) do not specify the expected contribution from the LULUCF sector in meeting the national target, the Climate Change Commission's Seventh Carbon Budget includes modelling that was used in setting the 2035 target and achieves the 2030 target and 2050 net zero target (the Balanced Pathway).<sup>19</sup>

In addition to sectoral and gas projections for LULUCF, the Balanced Pathway includes information on engineered removals (i.e. novel CDR, not shown in the graph above). For the pledged change in novel CDR, we provide a range based on the Balanced Pathway and targets set in the Net Zero Strategy for 2030 and 2035.<sup>20</sup>

### United States

As the United States has withdrawn from the Paris Agreement, we do not assess the CDR pledges of previously submitted NDCs.

### Democratic Republic of the Congo

The Democratic Republic of the Congo's NDC (submitted in 2021) targets emission reductions of 21% below a business-as-usual scenario. It does not specify whether it includes or excludes removals. Comparing the historical data provided in the NDC for the forest sector to that provided in the inventory, we assume removals are not included in the business-as-usual scenario. However, based on mitigation potentials of planned actions, removals are counted towards achievement of the target. Given uncertainty in how the mitigation potentials for activities that increase removals (e.g. afforestation and reforestation) are determined when the baseline scenario does not include them, we do not provide an estimate for the Democratic Republic of the Congo's pledged CDR.

### Ethiopia

Ethiopia submitted its 2035 NDC in 2025, which included unconditional and conditional mitigation targets. The NDC provides target emissions scenarios in five-year timesteps; however, sectoral information was only included for the conditional target, so we do not assess the expected removals of the unconditional target. We use the conditional scenario to estimate both the 2030 and 2035 pledged change in removals, though the 2030 value in the new NDC is a larger net sink than targeted in the 2030 NDC.

The 2035 NDC does not provide a historical estimate of LULUCF emissions that its mitigation and business-as-usual scenarios are based on; however, the emission projections for 2025 in these scenarios for LULUCF (-5.3 to -19.2 MtCO<sub>2</sub>e) indicate there have been significant revisions to historical emissions. While the previous NDC submitted in 2021 and last inventory submitted in 2024 both report the LULUCF sector was one of the most significant sources of emissions, the 2035 NDC anticipates the sector to be a net sink already in 2025, even under the business-as-usual scenario.<sup>21</sup>

As the scenarios don't provide a historical base year, we estimate 2023 emissions under the scenarios by assuming the emissions grow at the same rate from 2023-2025 as they do for 2025-2030. We then harmonize the mitigation scenario to our historical estimate for LULUCF CO<sub>2</sub> emissions in 2023. While this substantially changes the targeted LULUCF emissions in 2035, it avoids an inflated estimate of the change in removals relative to historical levels if Ethiopia did significantly revise their historical LULUCF estimates.

### Nigeria

Nigeria's NDC, submitted in 2025, includes mitigation targets for the years 2030 and 2035, formulated as reductions below 2018 baseline emissions. For 2030, the NDC provides the expected contributions of each sector as shares of absolute emissions reductions, expressed as percentages, which we use to calculate 2030 targeted LULUCF net emissions.

For 2035, the NDC provides absolute emissions reductions (also referred to as "mitigation potential") by sector resulting from measures earmarked for implementation. However, the sum of sectoral reductions far exceeds the NDC's total targeted reductions for 2035. The

reason for the discrepancy is unclear, though it could be that the sectoral reductions are assessed against a different baseline or that they refer to maximum potentials rather than targeted reductions. We therefore use the sectoral 2035 absolute emissions reductions to calculate the share of LULUCF reductions and apply this to total 2035 target reductions.

We further use the 2035 LULUCF mitigation measures provided to disaggregate increased removals versus avoided emissions. As this is only provided for 2035, we assume the same share of increased removals in 2030.

While the NDC does not provide separate unconditional mitigation targets, it does note that 20% of total resources needed (for both mitigation and adaptation) would be met through domestic resources. We therefore estimate the unconditional CDR pledge assuming 20% of reductions from LULUCF measures targeting increased removals are achieved without international support.

### **Switzerland**

Switzerland NDCs (submitted in 2022 and 2025) do not specify the expected contribution of the LULUCF sector or novel CDR to its targets.

### **Thailand**

Thailand's 2035 NDC includes the expected sectoral greenhouse gas emissions in 2035, including for the LULUCF sector. According to data provided in the first BTR, non-CO<sub>2</sub> gases in the sector made up less than 1% of emissions in 2021 and 2022, so these were considered negligible in the target year.

Thailand's 2030 NDC did not cover emissions from the LULUCF sector.

## Credibility assessment

The credibility analysis is based on our own assessment of the NDCs and BTRs, as well as additional analysis sourced from the Climate Action Tracker.<sup>22</sup>

Question	Source	Explanation of codes
<b>Sufficient information on CDR in NDC?</b>	Own assessment	<p><b>Yes:</b> sufficient information is presented in national documents to estimate a CDR pledge in 2030 or 2035 (see Individual Country Assessments)</p> <p><b>No:</b> insufficient information is presented in national documents to estimate a CDR pledge in 2030 or 2035</p>
<b>Net zero target is in law?</b>	Climate Action Tracker 2026	<p><b>Yes:</b> Target is in law</p> <p><b>Somewhat:</b> Target has been announced or described in proposed legislation or in a policy document</p> <p><b>No:</b> No net zero target exists</p>
<b>BTR has LULUCF projections?</b>	Own assessment	<p><b>Yes:</b> BTR includes a LULUCF projection reflecting the expected impact of existing or planned policies</p> <p><b>Somewhat:</b> BTR includes projection, but no distinction between projections and targets. Alternatively, the LULUCF component is unclear or reporting is Incomplete.</p> <p><b>No:</b> No BTR or no projection</p>
<b>Is there a published implementation plan for reaching net zero?</b>	Climate Action Tracker 2026	<p><b>Yes:</b> Analysis that identifies a pathway to and key measures for reaching net zero, including sector-specific details.</p> <p><b>Somewhat:</b> Some information on expected pathway/measures for net zero available, but with limited detail</p> <p><b>No:</b> No information available on expected pathway or measures</p> <p><i>(Note that we upgrade the CAT assessment for the United Kingdom from “somewhat” to “yes” based on the comprehensive nature of its Net Zero Strategy document and consider Australia’s Net Zero Plan which was published after the CAT’s assessment.)</i></p>
<b>BTR describes conventional CDR measures?</b>	Own assessment	<p><b>Yes:</b> BTR includes a description of a conventional CDR relevant policy (i.e. with the objective to enhance sinks or forest land cover). An implementation date before 2025 is described and there is sufficient information to determine the policy area and type, objectives and anticipated outcomes.</p> <p><b>Somewhat:</b> BTR includes a description of a conventional CDR relevant policy, but the policy has not yet been implemented.</p> <p><b>No:</b> BTR does not describe a conventional CDR relevant policy or provide sufficient information to determine the policy area and type, objectives and anticipated outcomes.</p>

Question	Source	Explanation of codes
<p><b>BTR describes novel CDR measures?</b></p>	<p>Own assessment</p>	<p><b>Yes:</b> BTR includes a description of a novel CDR relevant policy (i.e. with the objective to support the upscaling of direct air carbon capture, bioenergy with carbon capture and storage, or others; including support for storage infrastructure). An implementation date before 2025 is described and there is sufficient information to determine the policy area and type, objectives and anticipated outcomes.</p> <p><b>Somewhat:</b> BTR includes a description of a novel CDR relevant policy, but the policy has not yet been implemented.</p> <p><b>No:</b> BTR does not describe a novel CDR relevant policy or provide sufficient information to determine the policy area and type, objectives and anticipated outcomes.</p>

**Table A5.4**

## References

1. Smith, S. M. *et al.* *The State of Carbon Dioxide Removal – 2nd Edition*. <https://osf.io/f85qj/> (2024) doi:10.17605/OSF.IO/F85QJ.
2. Gidden, M. J. *et al.* Aligning climate scenarios to emissions inventories shifts global benchmarks. *Nature* **624**, 102–108 (2023).
3. Melo, J. *et al.* The LULUCF Data Hub: translating global land use emissions estimates into the national GHG inventory framework (Version 3.0, 2025 NGHGI release). Zenodo <https://doi.org/10.5281/zenodo.17153438> (2025).
4. CSIRO. Data - Modelling Sectoral Technology and Emissions Pathways to 2035 and Net Zero. (2025).
5. Climate Change Authority. *2035 Targets Advice*. <https://www.climatechangeauthority.gov.au/sites/default/files/documents/2025-09/2035%20Targets%20Advice%20Report.pdf> (2025).
6. DCCEEW. *Australia's Emissions Projections 2024*. <https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2024.pdf> (2024).
7. Ministério do Meio Ambiente e Mudança do Clima, Ministério da Ciência, Tecnologia e Inovação, & Casa Civil da Presidência da República. *Plano Clima 2024-2035: Sumário Executivo*. <https://www.gov.br/mma/pt-br/centrais-de-conteudo/publicacoes/mudanca-do-clima/sumario-executivo-plano-clima.pdf> (2026).
8. Department of Resource Conservation and Environmental Protection. Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy. *National Development and Reform Commission* [https://en.ndrc.gov.cn/policies/20211/t20211024\\_1300725.html](https://en.ndrc.gov.cn/policies/20211/t20211024_1300725.html) (2021).
9. Climate Cooperation China. Policy Summary on the 'Master Plan of National Key Ecosystem Protection and Restoration Major Projects (2021-2035)'. *Climate Cooperation China* <https://climatecooperation.cn/environment/policy-summary-on-the-master-plan-for-national-key-ecosystem-protection-and-restoration-major-projects-2021-2035/> (2020).
10. He, Y., Piao, S., Ciais, P., Xu, H. & Gasser, T. Future land carbon removals in China consistent with national inventory. *Nat. Commun.* **15**, 10426 (2024).
11. Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU. <https://eur-lex.europa.eu/eli/reg/2018/841/oj/eng> (2018).
12. Cabinet approves India's Nationally Determined Contribution (2031-2035) to be communicated to the United Nations Framework Convention on Climate Change. *PM India* [https://www.pmindia.gov.in/en/news\\_updates/cabinet-approves-indias-nationally-determined-contribution-2031-2035-to-be-communicated-to-the-united-nations-framework-convention-on-climate-change/](https://www.pmindia.gov.in/en/news_updates/cabinet-approves-indias-nationally-determined-contribution-2031-2035-to-be-communicated-to-the-united-nations-framework-convention-on-climate-change/) (2026).
13. Forest Survey of India. *India State of Forest Report 2023*. [https://fsi.nic.in/uploads/isfr2023/isfr\\_book\\_eng-vol-1\\_2023.pdf](https://fsi.nic.in/uploads/isfr2023/isfr_book_eng-vol-1_2023.pdf) (2023).
14. Republic of Indonesia. *Indonesia First Biennial Transparency Report*. [https://unfccc.int/sites/default/files/resource/INDONESIA%20BTR1\\_SUBMIT%20FINAL.pdf](https://unfccc.int/sites/default/files/resource/INDONESIA%20BTR1_SUBMIT%20FINAL.pdf) (2024).
15. Government of Japan. *Japan's First Biennial Transparency Report*. [https://unfccc.int/sites/default/files/resource/Japan's%20First%20Biennial%20Transparency%20Report\\_250402r.pdf](https://unfccc.int/sites/default/files/resource/Japan's%20First%20Biennial%20Transparency%20Report_250402r.pdf) (2024).
16. Government of South Korea. *2030 National Greenhouse Gas Reduction Target (NDC) Upgrade Plan*. [https://climate-laws.org/documents/2030-national-greenhouse-gas-reduction-target-ndc-upgrade-plan\\_16ba](https://climate-laws.org/documents/2030-national-greenhouse-gas-reduction-target-ndc-upgrade-plan_16ba) (2018).
17. Presidential Commission on Climate Crisis Response. Nationally Determined Contribution (NDC). <https://www.pcccr.go.kr/base/contents/view?contentsNo=59&menuLevel=2&menuNo=109&tab=2>.
18. Directorate of Climate Change. *First Biennial Transparency Report of Türkiye*. [https://unfccc.int/sites/default/files/resource/T%C3%BCrkiye\\_1BTR.pdf?download](https://unfccc.int/sites/default/files/resource/T%C3%BCrkiye_1BTR.pdf?download) (2024).
19. Climate Change Committee. *The Seventh Carbon Budget*. <https://www.theccc.org.uk/publication/the-seventh-carbon-budget/#the-seventh-carbon-budget> (2025).
20. HM Government. *Net Zero Strategy: Build Back Greener*. <https://assets.publishing.service.gov.uk/media/6194dfa4d3bf7f0555071b1b/net-zero-strategy-beis.pdf> (2021).
21. Federal Democratic Republic of Ethiopia. *Ethiopia's Third National Communication to the United Nations Framework Convention on Climate Change*. [https://unfccc.int/sites/default/files/resource/Ethiopia\\_Revised%20third%20NC.pdf](https://unfccc.int/sites/default/files/resource/Ethiopia_Revised%20third%20NC.pdf) (2022).
22. Climate Analytics & NewClimate Institute. *Climate Action Tracker*. <https://climateactiontracker.org/countries/> (2026).