



INTERPRETING INDCs: ASSESSING TRANSPARENCY OF POST-2020 GREENHOUSE GAS EMISSIONS TARGETS FOR 8 TOP-EMITTING ECONOMIES

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EXECUTIVE SUMMARY

In advance of the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), Parties put forward their post-2020 climate action plans. Known as intended nationally determined contributions, or INDCs, these plans help to lay a foundation for Parties’ actions to address climate change, including the mitigation of greenhouse gas (GHG) emissions.

The transparency of INDCs—that is, the completeness and clarity with which the intended meaning of INDC content is presented—is critical to assessing both national and global ambition on reducing GHG emissions. In addition, transparency in the INDCs can promote trust and accountability among Parties, both of which are essential for successful implementation of international agreements.

Transparency is particularly important with respect to GHG emissions targets. For example, the gases and sectors covered by the emissions targets and the methods and assumptions used in emissions accounting can affect the quantity of reductions required to fulfill a stated target and evaluations of whether the target has or has not been achieved.



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Working Papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback, and to influence ongoing debate on emerging issues. Working Papers may eventually be published in another form and their content may be revised.

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This paper evaluates the transparency of the GHG emissions targets presented in the INDCs of eight top-emitting Parties—Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States—which, together, contribute nearly two thirds of annual global GHG emissions. Using the Open Book framework developed by World Resources Institute, we present information in each Party’s INDC related to its emissions target(s) and identify any transparency gaps—that is, information that is unclear or not made explicit. Gaps might include, for example, lack of clarity about the scope of the emissions target or missing information on how the land sector will be accounted for in achieving the target (Table ES-1). Based on the Open Book framework, we also suggest ways in which these Parties can improve the transparency of their GHG emissions targets. Although some Parties’ INDCs include elements related to GHG mitigation other than emissions targets—for example, targets related to renewable energy and forestry—our paper focuses on the transparency of the emissions targets.

In addition, this working paper presents GHG emissions trajectories for each of the eight Parties assessed through 2030, which reflect estimated pathways to achieve the INDC GHG emissions target(s). The purpose of these trajectories is not to predict future emissions, but to highlight—and quantify, where possible—uncertainties in the intention of the targets that are the result of transparency gaps.

We present the following key messages from our analysis of eight Parties’ INDCs:

Parties analyzed have adhered to most of the general guidelines in the *Lima Call for Climate Action*. They have addressed categories mentioned in the text negotiated at COP20, such as a target reference point, time frames and/or periods for implementation, as well as scope and coverage, when describing their GHG emissions target.

Transparency gaps remain for all Parties, which affect understanding of their proposed GHG emissions targets. We lay out these gaps based on WRI’s Open Book framework, and quantify them where possible. For some Parties, and cumulatively, the uncertainty in emissions resulting from gaps in transparency is significant.

The degree of transparency provided by INDCs is associated with target type. Parties that put forward absolute/base-year GHG emissions targets tend to have presented them more transparently than Parties proposing other types of targets, according to the Open Book framework. The framework’s transparency requirements for absolute/base-year emissions targets are more straightforward and appear to be easier for Parties to meet. This is true of all Parties assessed here, regardless of their economic development status.

Details on land-sector accounting and use of market mechanisms, in particular, are generally lacking. While six of the eight Parties specified whether the land sector was covered by their GHG emissions target, most Parties did not provide details on the accounting approach to be applied to the sector. Likewise, although the majority of Parties specified whether or not they intend to use international market mechanisms to achieve their target, they did not specify at what level. Nor did they specify how they would ensure that traded units are not double-counted toward more than one Party’s target.

Parties assessed here are encouraged to enhance the transparency of their GHG emissions targets based on the opportunities we have identified in this working paper. Revisions could be provided through the INDC portal of the UNFCCC while it remains open, in “final” submissions to the UNFCCC following COP21 (if such an opportunity is provided by an agreement), or in separate documents published by governments at any point in time. To improve transparency, we also offer the following general recommendations to governments, negotiators, and other practitioners:

Review the *Lima Call for Climate Action* and WRI’s Open Book framework to ensure INDCs adhere to all transparency guidance provided therein. Parties could improve the transparency of their GHG emissions target(s) by coming forward with additional details that more closely follow the *Lima Call for Climate Action* and WRI’s Open Book framework (which is based on the *Lima Call for Climate Action*) and providing a comprehensive list of information regarding relevant assumptions and methodologies necessary for interpretation of emissions targets.

Table ES-1 | Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
Brazil	37% GHG reduction by 2025 from 2005 level and indicative contribution of 43% GHG reduction by 2030 from 2005 level	Economy-wide All Kyoto GHGs, excluding NF ₃	IPCC guidelines 100-year GWPs from the 5th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Brazil “reserves its position in relation to the possible use of any market mechanisms that may be established under the Paris agreement”
China	Peak emissions by 2030 or earlier and reduce CO ₂ emissions per unit of GDP by 60% to 65% below 2005 level by 2030 No peak level is specified and no base level or GDP assumptions for the base year and target year are specified for the intensity target	Various sectors mentioned for policies and actions Sector coverage is not specified CO ₂ only CO₂ sources covered by the target are not specified^a	Not specified	China includes as one of its INDC targets an increase in forest stock volume by around 4.5 billion cubic meters compared to the 2005 level It is unclear whether the land sector is included in CO₂ emissions peaking and intensity targets If it is included, accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Not specified
European Union	At least 40% GHG reduction by 2030 from 1990 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	No contribution from international credits Effect of banking of domestic market mechanism credits (allowances from the EU Emissions Trading Scheme) is not specified

Table ES-1 | **Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps, continued**

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
India	Reduce emissions per unit of GDP by 33% to 35% below 2005 level by 2030 No base level or GDP assumptions for the base year and target year are specified	Various sectors mentioned for policies and actions Sector coverage is not specified Greenhouse gas coverage is not specified	Not specified	India includes as one of its INDC targets an additional carbon sink of 2.5 to 3 billion tCO ₂ e through additional forest and tree cover by 2030 It is unclear whether the land sector is included in GHG intensity target If it is included, accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Not specified
Indonesia	29% unconditional and 41% conditional GHG reduction by 2030 from baseline scenario Baseline emissions provided for 2030 Limited methodology information available and static or dynamic nature of baseline is not specified	All IPCC sectors CO ₂ , CH ₄ , N ₂ O	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Indonesia “welcomes bilateral, regional and international market mechanisms...” Any limits to use of market mechanism units, and how double counting will be avoided, are not specified
Japan	26% GHG reduction by 2030 from 2013 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approach is specified as Kyoto Protocol approach ^b Methodologies to quantify and account for natural disturbances are not specified	Estimated number of units from the Joint Crediting Mechanism is included Any limits to use of market mechanism units, and how double counting will be avoided, are not specified

Table ES-1 | **Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps, continued**

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
Mexico	22% unconditional and 36% conditional GHG reduction by 2030 from baseline scenario Baseline emissions provided for 2020, 2025, and 2030 Limited methodology information available and static or dynamic nature of baseline is not specified	All IPCC sectors All Kyoto GHGs, excluding NF ₃ ^c	IPCC guidelines 100-year GWPs from the 5th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Unconditional commitment will be met “regardless of such mechanisms” Conditional target will require inter-national credits For conditional target only, any limits to use of market mechanism units, and how double counting will be avoided, are not specified
United States	26-28% GHG reduction by 2025 from 2005 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines ^d 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in target Net-net accounting is specified ^e If natural disturbances are excluded, this exclusion will be “consistent with available IPCC guidance” It is unclear whether emissions from natural disturbances will be excluded	No contribution from international credits “at this time” Could specify whether, and under what circumstances, treatment of international market mechanism units might change

Notes: Material transparency gaps according to WRI’s Open Book framework are in bold font.

This summary table focuses on transparency gaps that materially impact the level of emissions in the stated target year. Other transparency issues that are consistent with best practice, but are less critical to interpreting and estimating a Party’s emissions trajectory and target, may be discussed in the text, but are excluded here. “All IPCC sectors” includes energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry. “All Kyoto GHGs” includes carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆) and nitrogen trifluoride (NF₃).

a. Because China does not specify a percentage of total emissions covered by the emissions target, it is unclear which CO₂ emissions are included in the target.

b. The Kyoto Protocol, in its second commitment period, specifies that countries should account for sinks from lands afforested and reforested since 1990, emissions from deforestation, and changes in net emissions from forest management measured against a forest management reference level.

c. Mexico’s INDC also covers emissions of black carbon.

d. The U.S. INDC states that accounting is consistent with the U.S. national GHG inventory, which is itself consistent with IPCC guidelines.

e. The United States also specifies that it intends “...to use a ‘production approach’ to account for harvested wood products consistent with IPCC guidance.”

Consider providing indicative information on the trajectory that national emissions are expected to follow in advance of the target year. Although having an end point (or GHG emissions level) in mind is good practice for goal-setting, it is ultimately the trajectory of a country's GHG emissions and the cumulative emissions released to the atmosphere that will have the greatest impact on our planet's climate. Ideally, Parties would document an expected trajectory for their total GHG emissions through 2030 (in addition to providing a target goal for a specific year), so that the anticipated cumulative emissions released to the atmosphere can be estimated.

Consider reframing GHG targets as target types with more straightforward transparency guidance. Any GHG emissions target can be translated into any target type without affecting ambition (Levin et al. 2015); Parties that struggle to meet transparency guidance associated with more complex types of targets could consider reframing their targets as other target types. Targets to reduce emissions from a baseline scenario, in particular, have extensive and complex transparency requirements, according to the Open Book framework. Absolute and fixed-level targets are most straightforward.

In addition, UNFCCC negotiators should:

Encourage Parties to enhance the transparency of their GHG targets, in particular, if and when there is an opportunity for the INDCs to be communicated or finalized after COP21 in Paris. Parties may agree that countries should “finalize,” communicate, or otherwise formalize their INDCs (which would then become NDCs) following COP21. Negotiators could adopt language encouraging Parties to use that opportunity to further enhance the transparency of their contributions.

Maintain and build on the information guidance provided in the *Lima Call for Climate Action*. While the guidance in the Lima decision is entirely voluntary, it is clear that Parties consulted it and, to an extent, formulated their INDCs around it. This demonstrates the value of providing such guidance in the context of a COP decision. Negotiators can build on this experience by continuing to adopt such guidance and refining it in ways that encourage Parties to continue to close transparency gaps in line with their capacities.

Work toward clear and robust accounting rules for the land sector and market mechanisms. A number of Parties have retained flexibility on the role of these factors in their INDCs pending their treatment in an eventual international agreement, signaling the importance of developing clear and consistent rules. While details will be developed subsequent to COP21, an agreement in Paris can help by outlining strong principles to guide this development.

The analysis presented in this working paper aims to inform governments responsible for developing and reporting INDCs, analysts and civil society groups seeking to understand and evaluate the INDCs, and other stakeholders who will be directly affected by Parties' post-2020 plans. This work is relevant in the lead-up to COP21 in December 2015, and also provides a foundation for discussion and analysis in 2016 and beyond.

INTRODUCTION

In advance of the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC), countries (known as Parties under the Convention) put forward plans for post-2020 climate action. Also known as intended nationally determined contributions (INDCs),¹ these plans constitute an initial step toward mitigating greenhouse gas (GHG) emissions post-2020 and preparing for the unavoidable impacts of climate change.² As of 29 November, 2015,³ 156 INDCs had been submitted, representing 183 countries⁴ and more than 95 percent of global GHG emissions (WRI and OCN 2015).

INDCs may contain content relevant to GHG mitigation, adaptation, finance, and capacity building, among other information. The completeness and clarity of information presented in the INDCs—that is, INDC transparency—is crucial to promoting trust among Parties at COP21 and for monitoring implementation progress and Party accountability in years to come.

Transparency is particularly important for understanding how the GHG emissions targets of Parties could affect national and global emissions. At COP20 in Lima, Peru, Parties agreed to the *Lima Call for Climate Action*, which includes a list of information that Parties may present when formulating their INDCs to “facilitate clarity, transparency, and understanding” (UNFCCC, 2014b). This information includes:

“quantifiable information on the reference point (including, as appropriate, a base year), time frames and/or periods for implementation, scope and coverage, planning processes, assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals, and how the Party considers that its intended nationally determined contribution is fair and ambitious, in light of its national circumstances, and how it contributes towards achieving the objective of the Convention.”

Based on this text, World Resources Institute (WRI) developed a complementary list of more detailed information—the Open Book framework (WRI 2015)⁵—that, if used, would enable Parties to go beyond the Lima text and fully realize the Lima principle of formulating GHG emissions targets within their INDCs in a way that facilitates “clarity, transparency and understanding.”

Purpose and Scope of the Working Paper

This working paper adapts and uses the Open Book framework—arguably a more comprehensive framework for transparency than the Lima text itself—to highlight critical transparency gaps related to the post-2020 GHG emissions targets contained in the INDCs of eight major emitters, and makes recommendations for how each Party could improve the transparency of its GHG emissions target(s).⁶ Parties assessed are Brazil, China, the European Union (EU),⁷ India, Indonesia, Japan, Mexico, and the United States. These Parties represent approximately 62 percent of global GHG emissions;⁸ they were prioritized because they are Parties where the Open Climate Network⁹ (an initiative for which WRI serves as the Secretariat) has an institutional presence through WRI or its partners. For each Party, this working paper assesses the following information, based on the Open Book framework:

Target reference point, time frame, and information specific to target type

The reference point, against which a GHG emissions target is measured, could be the emissions or emissions intensity in a particular base year, or a projected baseline emissions scenario. The time frame is the year, or range of years, when a target should be met, but it could also include a year when a milestone should be achieved, like a peak in emissions. Depending on the type of mitigation target, additional supporting information may be necessary to

fully understand the meaning of the target. Examples of such information include the level of economic output (gross domestic product or GDP) in the base year and the target year assumed for an emissions intensity target, and the underlying methodologies and assumptions that inform a baseline emissions scenario in a baseline emissions target.

Target coverage

The coverage of the GHG emissions target should include economic sectors and greenhouse gases covered by the target.

Assumptions and methodologies: General target accounting, land-sector accounting, and use of market mechanisms

To facilitate quantification of the GHG emissions target, it is important to communicate the accounting assumptions and methodological approaches. These include:

- General assumptions such as the basis for inventory calculation (i.e., which national inventory methodology guidelines published by the Intergovernmental Panel on Climate Change, or IPCC, will be used) and the global warming potential (GWP) values (applied to emissions data to convert non-CO₂ gas totals to CO₂ equivalent totals) to be used.¹⁰
- Land-sector accounting information such as whether the land sector¹¹ is included in an economy-wide target and/or as a separate target; whether an activity- or land-based emissions accounting approach is used, and the emissions accounting methods used, including for afforestation, reforestation, and deforestation; forest management accounting including the treatment of legacy effects; and the treatment of natural disturbances such as wild fires and storms.¹²
- The use of any international or domestic market mechanisms and associated transferable emissions units in target accounting, which requires, among other information, clarity on any limit to the amount of reductions that can be derived from the use of emissions units from market mechanisms, and how the Party will ensure international units are not also being counted toward the targets of other Parties.

Although we have made an effort to adhere to this consistent template, differences in language and content framing within the INDCs require interpretation and it is important to note that our interpretations and viewpoints may differ from others’ assessments.

This working paper also presents an estimated GHG emissions trajectory, or range of trajectories, for each Party assessed, based on author interpretation of the INDC emissions target and assuming that the targets are achieved. Each Party's trajectory is presented in terms of the emissions scope (sectors and gases) of the target contained in the INDC. When possible, key uncertainties in the GHG emissions that would result from achieving an INDC target are quantified, based on author assumptions, and presented as a range of possible emissions trajectories. Some of these uncertainties are explicit, like a target range, whereas others result from a lack of transparency in target definition and in emissions-accounting assumptions and methodologies. International market mechanisms are treated as representing an uncertain quantity of reductions because of the questionable quality of international offset credits to date.¹³

This analysis does not predict future emissions, but rather it aims to quantify, where possible, the potential impact of ambiguity in the INDC emissions targets on the domestic GHG trajectories associated with those targets. It visually represents that ambiguity in emissions-trajectory graphs, and highlights the potential for greater transparency.

In addition, the transparency of information associated with a Party's emissions target and trajectory does not necessarily reflect the ambition of that target and trajectory. However, improved transparency, especially as it relates to defining a Party's emissions trajectory, can lead to improved accuracy in assessing the level of ambition contained in an emissions target. Put simply, transparency is a means to an end.

Further, if sufficient documentation of a Party's proposed GHG emissions trajectory, or range of trajectories, exists, analysts and other non-government entities should be able to derive similar results with limited assumptions and uncertainty.¹⁴ Of course, no Party can predict its future GHG emissions trajectory, but an estimated trajectory is an essential step toward aggregating mitigation commitments to assess their collective emissions levels against a trajectory consistent with the 2°C goal¹⁵ (an exercise that is beyond the scope of this paper, but that has been taken up by other initiatives, including the UNFCCC Secretariat and the UNEP Emissions Gap Report).¹⁶

Some information suggested in the *Lima Call for Climate Action* and included in Parties' INDCs was not analyzed in this report, notably planning processes, and Parties'

explanations of their INDCs' fairness, ambition, and contribution to the objective of the Convention. Although important, this information does not directly affect the GHG trajectory that could be expected from the emissions target put forward in each Party's INDC. In addition, in an effort to highlight the common and most salient points related to transparency across the eight Parties, this analysis has not considered all information categories included in the Open Book framework.¹⁷ For a full analysis of the transparency of information contained within these and other Parties' submitted INDCs, according to the Open Book framework, please see the CAIT Paris Contributions Map (WRI and OCN 2015). An overview of transparency across all INDCs is also presented in Box 1.

There are some important caveats regarding the representativeness of Parties studied in this paper. First, because we look only at a subset of major economies (developed and developing), the patterns of transparency identified cannot be generalized across all INDCs. It's possible, indeed likely, that other Parties (e.g., smaller countries, least-developed countries) might prioritize and present different elements within their INDCs—which would have different transparency requirements according to the Open Book framework from those analyzed here—or lack capacity to fully implement the guidance from Lima, meaning that their INDCs may be less transparent. While Box 1 provides a general overview of transparency across all INDCs, we have not analyzed this possibility in depth. A second, but related point is that even among the Parties we look at, there is diversity in the content of their INDCs and their respective capacities. For example, developed countries have significantly more experience producing GHG inventories and have more publicly available information regarding future emissions trajectories. They also universally select base-year targets, for which the transparency requirements are more straightforward. In other words, their transparency requirements according to the Open Book framework are easier to meet and they have better capacity to meet them.

The analysis presented in this working paper suggests opportunities for Parties to provide additional clarification regarding their post-2020 GHG emissions targets. It also aims to make negotiators, governments, analysts, civil society groups, and other stakeholders aware of any transparency gaps that limit understanding of these eight Parties' proposed GHG mitigation targets and associated emissions trajectories. This work is relevant in the lead-up to COP21, and also provides a foundation for discussion and analysis in 2016 and beyond.

Box 1 | Overview of Transparency in the INDCs

As of 29 November, Parties submitted 156 INDCs, 123 of which contain some form of GHG emissions target. Figure B-1 shows the extent to which the INDCs with GHG emissions targets provide transparent information regarding key elements of their intended targets. The evaluation is based—for all targets—on whether the INDC contains information about specific sectors and gases covered by the target, whether the land sector is included in the target, and the intended use of market mechanisms. For specific target types, transparency is assessed for elements including:

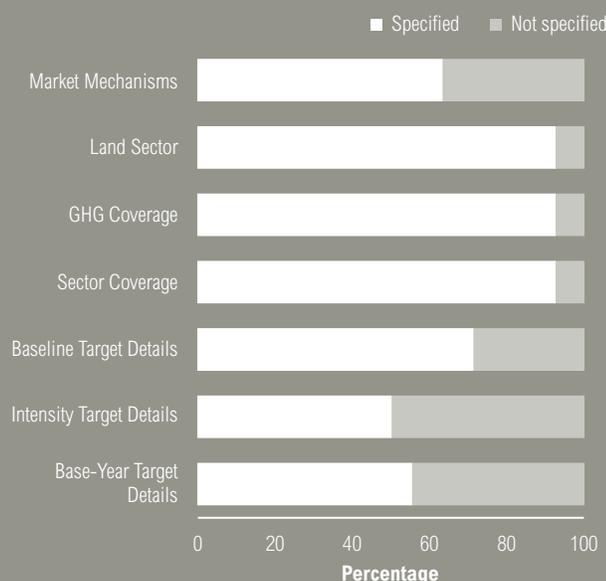
- Base-year target details: Does the INDC specify base-year emissions?
- Intensity target details: Does the INDC specify base-year emissions intensity?
- Baseline target details: Does the INDC specify baseline emissions in the target year?

The INDCs reflect at least a basic level of information regarding sector and gas coverage, as well as whether land use is included in the target. Information specific to target type, as well as intended use of market mechanisms, is not universal, but is included in a significant share of INDCs. By contrast, the 73 2020 pledges adopted

in association with the Copenhagen Accord and the Cancun Agreement contained 34 GHG emissions targets. Of these pledges (Figure B-2), only base-year emissions were widely reported. Details for other types of targets are missing, and only about half of pledges provide any information about sector and gas coverage, inclusion of the land sector in the target, and intended use of market mechanisms.

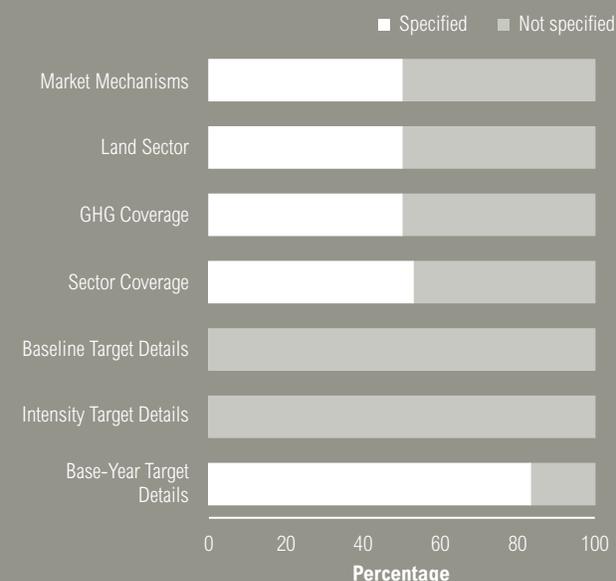
This analysis therefore suggests that the overall transparency of information related to post-2020 GHG emissions targets has improved relative to the submitted 2020 pledges.

FIGURE B-1 | TRANSPARENCY OF KEY ELEMENTS IN THE INDCs



Note: Based on 125 INDCs submitted as of October 21, 2015. Adapted from WRI and OCN (2015).

FIGURE B-2 | TRANSPARENCY OF KEY ELEMENTS IN 2020 PLEDGES



Note: Based on 34 GHG targets in 73 2020 pledges. Adapted from WRI and OCN (2015).

BRAZIL

Transparency Assessment

Target reference point, time frame, and information specific to target type

Brazil’s INDC puts forward an unconditional¹⁸ GHG emissions reduction target of 37 percent by 2025 relative to a 2005 base year, with a subsequent indicative

target to reduce GHG emissions by 43 percent by 2030, relative to the same base year (Federative Republic of Brazil 2015). Notably, Brazil is one of the first major emerging economies to present an absolute emissions reduction target. In the “additional information” section, the INDC provides details regarding both the reference GHG emissions level (2.1 gigatonnes of carbon dioxide equivalent or GtCO₂e in 2005) and expected emissions in 2025 (1.3 GtCO₂e) and 2030 (1.2 GtCO₂e). Brazil is

also one of the few countries to express its GHG target in a variety of ways in its INDC document: as a fixed-level target, as an emissions-intensity target (both in per unit of GDP and per capita terms), and as a base-year target (relative to 1990 levels, relative to its 2020 national voluntary commitment, and relative to the application of a Global Temperature Potential metric.)¹⁹

Target coverage

Brazil's GHG target is economy-wide and covers six Kyoto gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF₆).

Assumptions and methodologies

GENERAL ACCOUNTING METHODS

Brazil clarifies that its approach for estimating and accounting for GHG emissions and removals is based on “applicable IPCC guidelines,” and uses 100-year GWP values from the IPCC's Fifth Assessment Report (IPCC 2014).

LAND-SECTOR ACCOUNTING

As Brazil's target is economy-wide, it is assumed that a full accounting of the land sector is included. The INDC states that Brazil intends to apply an “inventory-based approach for estimating and accounting anthropogenic greenhouse gas emissions and, as appropriate, removals in accordance with the applicable IPCC guidelines.” The INDC further clarifies that the contribution “takes into account the role of conservation units and indigenous lands as forest managed areas, in accordance with the applicable IPCC guidelines on the estimation of emission removals.” These two points suggest that Brazil will account for both emissions and emissions removals from its land sector.

Opportunities for improvement: Although Brazil has articulated a general accounting approach for the land sector as part of its INDC, specific accounting details are unclear. Brazil could provide additional information on the emissions accounting method used for the land sector: whether relative to an historic/base-year period (net-net), relative to a projection of net emissions²⁰ in the target year (forward-looking baseline), or without reference to base-year or baseline-scenario emissions (gross-net).²¹ In addition, the INDC does not specify the type of land-sector accounting approach used (activity-based or land-based), nor does it provide information on the treatment of natural disturbances and legacy effects. Brazil could

clarify these points in its INDC, since this type of information is already included in Brazil's Second National Communication (MCTI 2010).

USE OF MARKET MECHANISMS

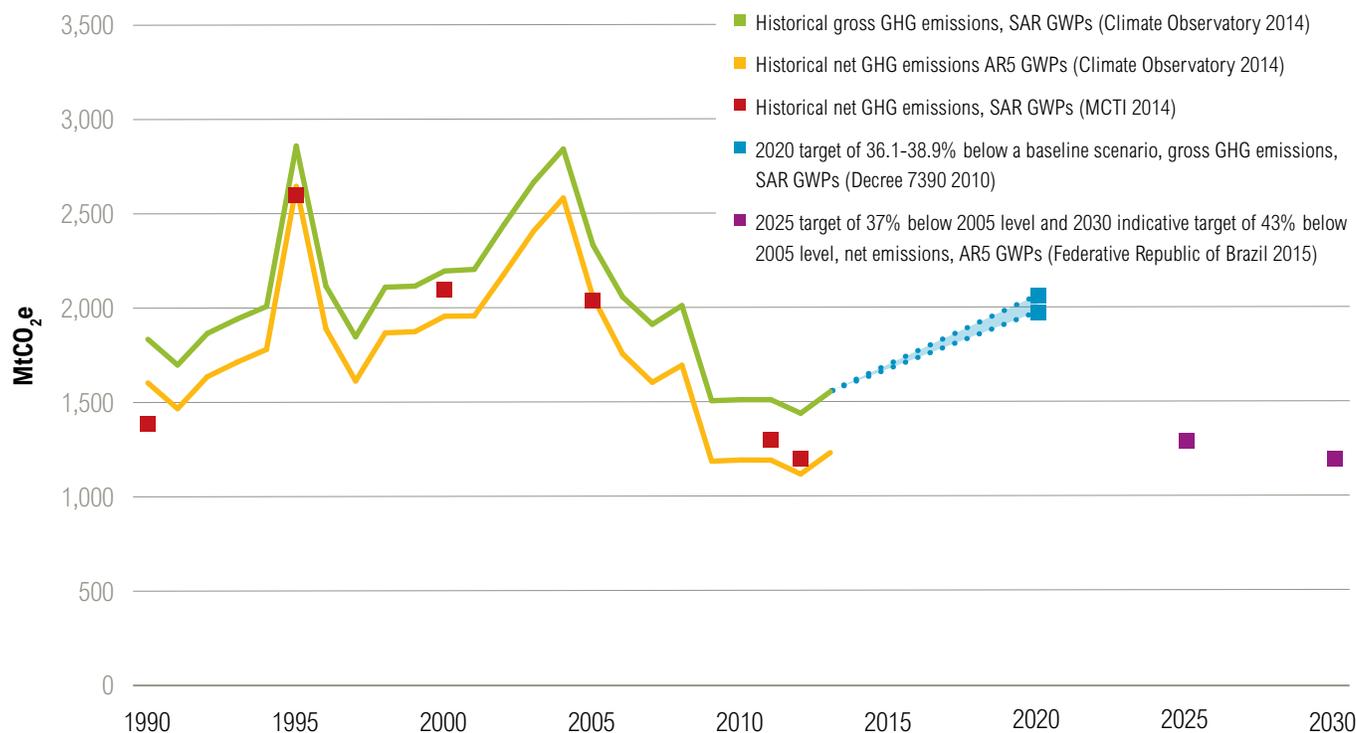
Brazil “reserves its position in relation to the possible use of any market mechanisms that may be established under the Paris agreement.” The INDC further emphasizes that “any transfer of units resulting from mitigation outcomes achieved in the Brazilian territory will be subject to prior and formal consent by the Federal Government” and that the country “will not recognize the use by other Parties of any units resulting from mitigation outcomes achieved in the Brazilian territory that have been acquired through any mechanism, instrument or arrangement established outside the Convention, its Kyoto Protocol or its Paris agreement.” This statement emphasizes that Brazil will only recognize international credits that go through a UNFCCC-established mechanism, which presumably would ensure that double counting is avoided.

Estimated Emissions Trajectory

Brazil's INDC specifies that the country aims to reduce GHG emissions by 37 percent from 2005 levels by 2025. The INDC further presents an indicative target for 2030 of a 43 percent reduction from the same base year and level. Brazil was one of the first major emerging economies to commit to an absolute/base-year reduction target in its INDC. It also provided detailed information regarding its target in a supplemental section to its INDC. The emissions reference levels provided in the INDC supplementary information are presented in Figure 1 (in units of MtCO₂e). If Brazil successfully achieves its 2025 and 2030 emissions-reduction targets, its level of net GHG emissions in these years will be 1.3 GtCO₂e and 1.2 GtCO₂e, respectively, based on GWPs from the IPCC Fifth Assessment Report.

Brazil's INDC also presents and reconfirms information related to its voluntary 2020 pledge to reduce emissions from a baseline scenario by between 36.1 and 38.9 percent (Federative Republic of Brazil 2015). According to the INDC and Decree 7390 (2010), achieving this target would result in an estimated gross emissions level range of 1.977–2.068 GtCO₂e (assuming the use of GWPs from the IPCC Second Assessment Report). This range, although not directly comparable to the INDC targets—because they are framed in net terms and apply GWPs from the IPCC Fifth Assessment Report—is also presented in Figure 1. Finally, because of time-series data gaps, Figure 1 makes

Figure 1 | **Estimated GHG Emissions Trajectory: Brazil**



Sources: Climate Observatory (2014); Federative Republic of Brazil (2015); MCTI (2014).

Notes: Sectors covered in this analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). Raw historical data (1990–2013) are reported using GWPs from the IPCC Second Assessment Report (SAR; IPCC 1995). We also present historical emissions data from Climate Observatory (2014) that have been converted using GWPs from the IPCC Fifth Assessment Report (AR5; IPCC 2014) for comparison with the INDC targets, which will also be considered using GWPs from AR5. Additionally, historical data from Climate Observatory (2014) is presented in gross terms—that is, excluding emissions sequestration from protected areas and indigenous lands—to align with Brazil's 2020 target. Brazil's INDC targets consider this sequestration and are presented in net terms. We do not connect projected emissions levels for 2020 and 2025 because emissions are reported in different terms (gross vs. net) and Brazil has not specified a year when emissions will peak. If Brazil chooses at some point in the future to apply emissions credits from international market mechanisms, the amount of absolute reductions resulting from its quantitative target would be affected. For example, the use of transferable emissions units to meet its target would result in fewer domestic emissions reductions. Brazil's total GHG emissions in 2025 and 2030 will also be affected by its accounting treatment of the land sector.

use of historical emissions data from both government sources (MCTI 2014) and non-government sources (Climate Observatory 2014).

CHINA

Transparency Assessment

Target reference point, time frame, and information specific to target type

China's INDC emphasizes two emissions targets to be achieved by 2030:²²

- Peaking of carbon dioxide (CO₂) emissions “around 2030,” with best efforts to peak earlier

- Reducing emissions intensity (CO₂ emissions per unit of GDP) by 60–65 percent below the 2005 level by 2030 (Government of China 2015)

Opportunities for improvement: China's INDC does not articulate a level at which CO₂ emissions should peak. An estimated peaking level (or peaking range) is particularly important for China given its status as the world's largest emitter (CAIT 2015) and its expected contribution to future emissions.²³

With regard to its CO₂ emissions-intensity target, China does not specify a 2005 base level against which its target of a 60–65 percent reduction by 2030 will be measured. Although a 2005 emissions total is reported in China's

Second National Communication (NDRC 2012), neither a 2005 nor a 2030 emissions level is made explicit in the INDC. In addition, assumptions related to GDP in the base and target years are not made available in China's INDC, so emissions intensity cannot be calculated directly.

Target coverage

China's emissions targets focus on emissions of CO₂, although the text of the INDC includes lists of mitigation policies and actions that will affect multiple sectors of the economy, including energy, buildings, transportation, industrial processes, agriculture, and forestry. Most of these sectors include emissions of non-CO₂ gases as well as CO₂.²⁴

Opportunities for improvement: To fully assess China's GHG targets, additional clarification is needed regarding both the scope and coverage of CO₂ emissions. For example, it is not clear whether the CO₂ peaking target or the CO₂ intensity target include emissions from the land sector, shipping fuels, and non-energy-related CO₂ emissions, such as those from cement production.²⁵ These factors are not insignificant—in 2012, China's industrial processes emitted approximately 1.1 GtCO₂, approximately as much as Japan's total CO₂ emissions that same year (CAIT 2015).²⁶ A comprehensive breakdown of economic sectors covered by this target and/or a stated percentage of national emissions covered would be important analytical inputs.

Another important omission, although not a transparency issue according to the Open Book framework, is that China's INDC gives no indication of potential mitigation pathways for emissions of non-CO₂ gases.²⁷ Non-CO₂ sources—including the agriculture and waste sectors—are significant, accounting for an estimated 15 percent of national emissions. To put this in perspective, if these sectoral emissions constituted a country, it would be the 5th largest emitter in the world (CAIT 2015).

Assumptions and methodologies

China's INDC does not specify any accounting assumptions or methodologies that will be considered when the country evaluates its CO₂ emissions targets. However, with respect to the land sector, China has put forward a target to increase forest stock volume by around 4.5 billion cubic meters compared to the 2005 level.

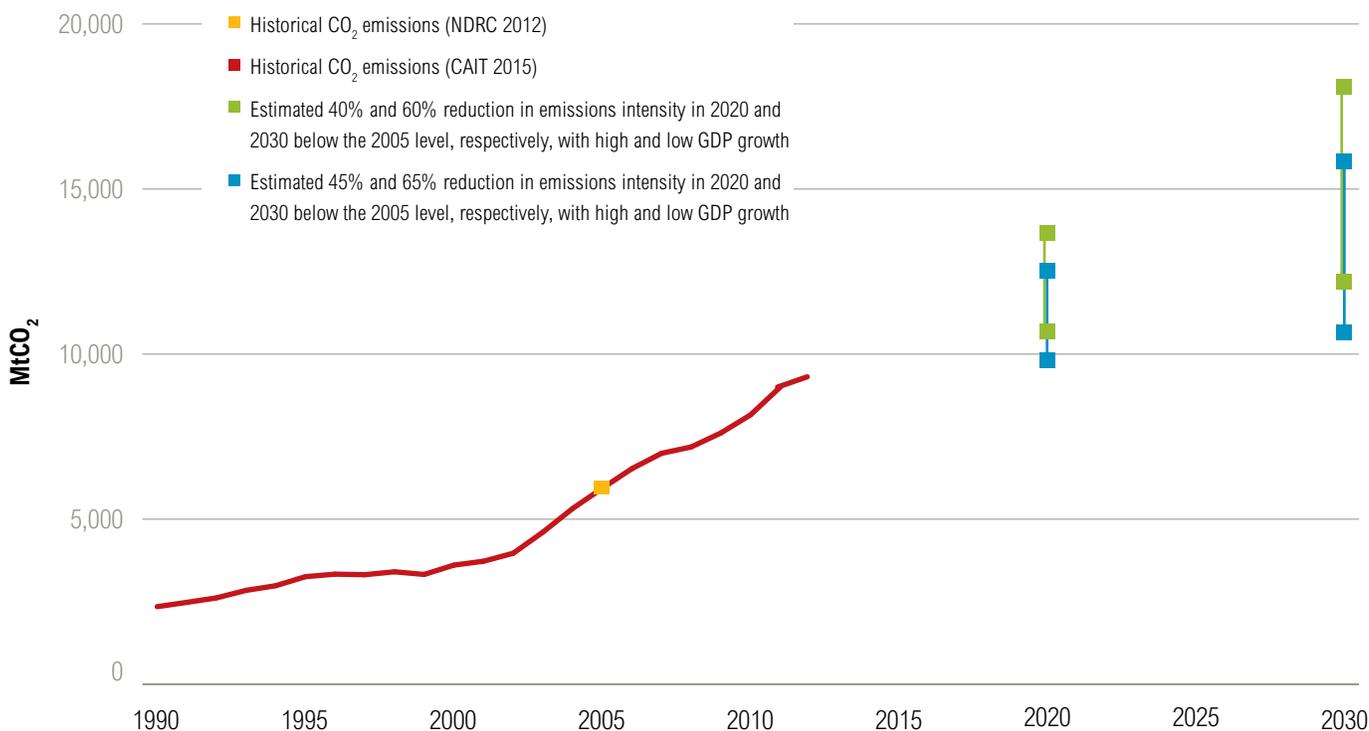
Opportunities for improvement: A clarification of methodological assumptions for emissions accounting could include specifying which IPCC guidelines and GWP values will be used to calculate China's national emissions inventory, the accounting treatment of the land sector, and the use or avoidance of international market mechanisms.

Estimated Emissions Trajectory

China has framed the GHG targets of its INDC in terms of targets for CO₂ intensity and an approximate emissions-peaking year. However, the INDC does not provide details regarding its expected peak level for CO₂ emissions in absolute terms. Additional information, such as assumptions about GDP growth, is also lacking.

In the case of China, therefore, we present a range of plausible CO₂-only trajectory ranges through which China could achieve an intensity reduction of 60 percent or 65 percent in 2030 (the end points of China's CO₂-intensity target). We assume that China's CO₂-intensity target refers to total CO₂ emissions as reported in China's Second National Communication (NDRC 2012), excluding China's carbon sink from land-use change and forestry, although this is not specified in the INDC (see above). We apply this framing also to China's 2020 target of reducing CO₂ emissions per unit of GDP by 40–45 percent from 2005 levels (NDRC 2010). The trajectory ranges are calculated using historical 2005 data from China's Second National Communication (NDRC 2012) and a range of GDP growth estimates published by international institutions, and energy and climate modeling teams based in China and elsewhere (see Appendix for more details). Based on the studies used, the average annual GDP growth rate from 2005–2030 ranges between 6.7 and 8.4 percent.

Figure 2 presents a range for China's CO₂ emissions in 2020 and 2030 (in units of MtCO₂e), based on this range of published GDP projections. Historical emissions data from a non-government source is provided in Figure 2 (CAIT 2015), due to data constraints. The 2005 CO₂ emissions total from NDRC (2012), however, is also presented in Figure 2. The limits of the range represent estimated trajectories assuming China achieves the low end and high end of its 2020 and 2030 emissions intensity targets—40 percent and 60 percent, and 45 percent and 65 percent, respectively. This analysis assumes that China achieves its 2020 target goal of a 40–45 percent reduction in CO₂ emissions intensity from 2005 levels, because this target is reiterated in its INDC.

Figure 2 | Estimated Range of CO₂ Emissions Trajectories: China


Sources: Author calculations based on GDP data from various sources (see Appendix); CAIT (2015); NDRC (2012).

Notes: Analysis assumes China's emissions target covers CO₂ emissions only, which account for approximately 85 percent of China's emissions (CAIT 2015). China's total emissions would be affected by which CO₂ emissions China chooses to include under its target, how the CO₂ and other GHG emissions not included under its target change over time, as well as China's choice of inventory calculation methodologies, the use of international market mechanisms, and its accounting treatment of the land sector. Historical data use 100-year GWP values from the IPCC Second Assessment Report (IPCC 1995).

This analysis results in a range for China's energy-related CO₂ emissions in 2030 of 10.7–18.1 GtCO₂, and in 2020 of 9.8–13.7 GtCO₂. A simple linear interpolation results in an estimated range for 2025 emissions of 10.2–15.9 GtCO₂. However, due to data constraints, we do not interpolate a trajectory between historical, 2020, and 2030 data points in Figure 2.²⁸

EUROPEAN UNION

Transparency Assessment

Target reference point, time frame, and information specific to target type

The EU's INDC puts forward a target of reducing domestic GHG emissions by at least 40 percent by 2030, relative to 1990 levels (European Commission 2015). The EU's INDC also notes that its 2030 target "is in line with the EU objective...to reduce its emissions by 80–95 percent by 2050 compared to 1990."

Opportunity for improvement: The EU makes historical emissions data available to the public through its annual GHG inventory (EEA 2014). However, specifying whether the 1990 inventory value is used as the baseline, or otherwise explicitly citing and describing an updated value, would help to ensure consistency among assessments of the EU target and improve transparency.

Target coverage

The EU is explicit about the sector and greenhouse gas coverage included in its target. The INDC lists the economic sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry) and sub-sectors that are covered. It notes that the EU's accounting of emissions includes all greenhouse gases not controlled by the Montreal Protocol, namely: carbon dioxide (CO₂), methane (CH₄), nitrous

oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), and nitrogen trifluoride (NF₃).

Assumptions and methodologies

GENERAL ACCOUNTING METHODS

The EU's INDC clarifies that accounting of emissions for its target will be based on IPCC (2006) and will use 100-year GWPs from the IPCC's Fourth Assessment Report (IPCC 2007).

LAND-SECTOR ACCOUNTING

The INDC text states that a “policy on how to include Land Use, Land-Use Change and Forestry into the 2030 greenhouse gas mitigation framework will be established as soon as technical conditions allow and in any case before 2020.”

Opportunity for improvement: The EU's INDC provides information about land-sector coverage related to its GHG emissions target, noting land categories likely to be included in the EU's accounting framework.²⁹ However, the INDC does not specify the EU's approach to land-sector accounting in its GHG emissions target. How the EU chooses to account for emissions and reductions in this sector can have implications for the overall target (see next section).

USE OF MARKET MECHANISMS

The EU INDC confirms that no contribution of international market-based mechanisms will be considered in the accounting of its emissions target.³⁰

Opportunity for improvement: The EU estimates that 2.6 billion surplus allowance credits will be available from Phase III of the EU Emissions Trading Scheme (ETS), for use under the ETS from 2021 onward (UK Government 2014). The EU created a market stability reserve to draw some of those credits out of the market. To the extent that the surplus from Phase III of the ETS is used in Phase IV, the ambition of the target is weakened. The EU should make explicit in its INDC the number of Phase III allowance credits that could possibly be used between 2021 and 2030 and the possible effect of those credits on its target.

Emissions Trajectory Assessment

As noted above, the EU's INDC makes clear several important aspects of the accounting methods used in its base-year target, including the exclusion of transferable

emissions units from international market mechanisms, and full sector and greenhouse gas coverage, consistent with its national inventory. Assuming an accounting of the land sector that is consistent with other sectors (i.e., net-net accounting³¹) and assuming a 40 percent reduction in GHG emissions from 1990 levels by 2030 (3,277 MtCO₂e), we can interpolate a straight-line emissions trajectory for the EU from 2012 to 2030 (see Figure 3, in units of MtCO₂e). Based on this approach, 2025 emissions would be 3,538 MtCO₂e. We ignore the EU's 2020 pledge in this analysis as several sources indicate that the EU is likely to reduce emissions lower than this level by 2020.³²

However, two accounting issues could affect the quantity of reductions needed to achieve the EU's 2030 target: the type of land-sector accounting used and the over-allocation of transferable emissions units (allowances) under the EU emissions trading system (EU ETS).

- **Land-Sector Accounting.** In its INDC, the EU indicates that it will account for 100 percent of its emissions, but explicitly leaves open the methods it will use to account for land-based emissions and sinks. So far, different land-use accounting methods, following different UN guidance, have been applied to the EU's Kyoto Protocol first and second commitment-period emissions, the 2020 pledge, and emissions inventories. The EU's decision on how it will account for land use under its INDC target will have an impact on the strength of that target. Based on model results from a recent report by the Öko Institut (Böttcher and Graichen 2015), if the EU were to continue its current land-use accounting approach during the next Kyoto Protocol commitment period,³³ it would lessen the reductions required to meet the 2030 target by roughly 3.8 percent of 1990 levels. That is, the EU's net emissions in 2030 could be 36.2 percent below its 1990 levels rather than 40 percent below. (See Appendix for more details.) Figure 3 presents a range of possible effects of the EU's land-use accounting decisions, from no weakening to the weakening that could occur given the continuation of current practice.
- **Over-supply of allowances for the EU ETS.** The EU anticipates having an excess of approximately 2.6 billion allowances at the end of Phase III (2013–2020) of the EU ETS, going into Phase IV (2021–2030) (European Commission 2014). This large surplus, equal to approximately 80 percent of the EU's 2030 target, is understood to result in part from reduced

demand following the economic downturn of 2008 and a large supply of low-cost international offset credits (UK Government 2014).

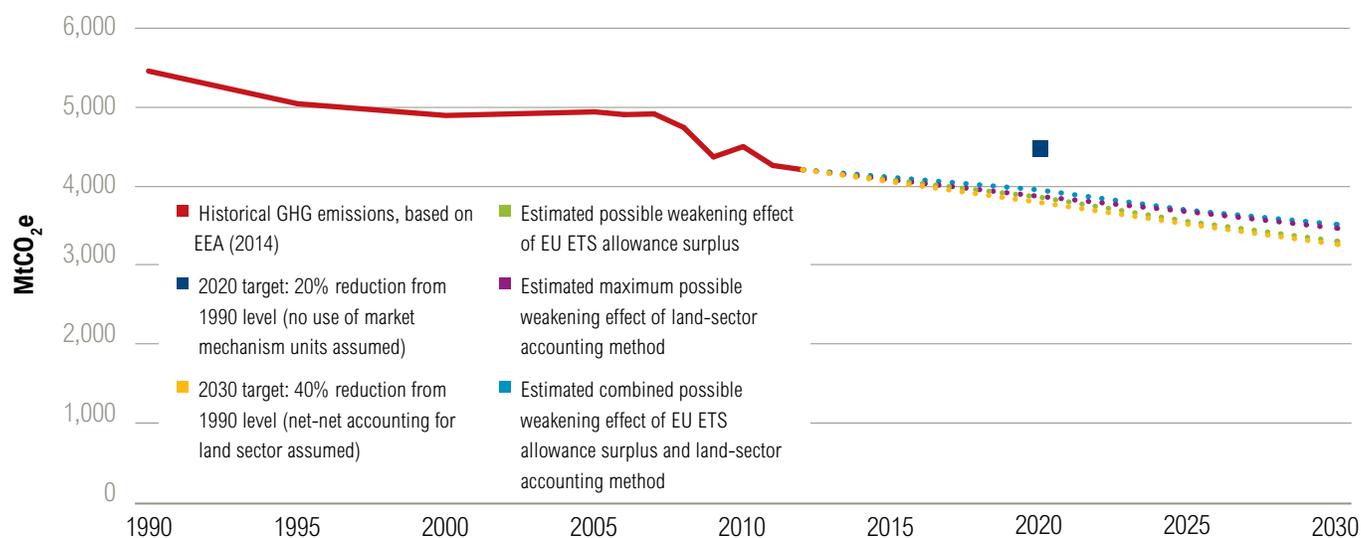
The EU implemented a market stability reserve (MSR) to lessen some of the price effects of this allowance surplus.³⁴ The market reserve will draw credits out of the market and return them back to the market, based on a set of non-discretionary rules related to allowance-credit supply and cost. As currently structured, the MSR would allow all credits eventually to be returned to the market. Achieving the actual reductions required under the EU target will be influenced by the extent to which the MSR draws surplus allowances and keeps them out of the market through 2030.

If no surplus allowances were to be used by 2030, the EU target would remain intact as a 40 percent reduction below 1990 levels by 2030 (all else constant). However, if the MSR withholds only a portion of surplus allowances from the market, those credits left in circulation could be used in Phase IV, lessening the emissions reductions required by EU countries to meet the 2030 target.

The UK Department of Energy and Climate Change commissioned a study modeling several possible outcomes of the MSR. The study finds that, under various modeled scenarios, approximately 0.4 to 1.5 billion of the expected 2.6 billion allowance surplus would be held in the market stability reserve in 2030, leaving the remaining allowances in the market available for use (Ecofys 2015).^{35, 36} This report's middle scenario predicts that approximately 650 million allowances will remain in the market through 2030, and that the use of surplus allowances toward the EU ETS will average 36 million allowances each year during 2021 to 2030. The use of this level of surplus allowances would result in emissions of 39.3 percent, rather than 40 percent, below 1990 levels. Another modeling study forecasts that all of the surplus allowances will be drawn into the MSR and remain there beyond 2030, leaving none available for use in the market (Bloomberg 2015).³⁷

Figure 3 presents a range of effects of the allowance surplus on EU emissions from no effect to the middle estimate of the Ecofys model.

Figure 3 | **Estimated Range of GHG Emissions Trajectories: European Union**



Sources: Author calculations based on Bloomberg (2015), Böttcher and Graichen (2015), Ecofys (2015); EEA (2014).

Notes: Trajectories are based on INDC and potential target weakening due to accounting uncertainties. Sectors covered by historical data and the EU target in our analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). Historical emissions data are based on the EU 2014 inventory but recalculated using 100-year GWP values from the IPCC's Fourth Assessment Report (IPCC 2007). Values for 2012–2029 are linearly interpolated.

INDIA

Transparency Assessment

Target reference point, time frame, and information specific to target type

India's INDC puts forward a target to reduce the emissions intensity of the country's GDP by 33 to 35 percent by 2030, relative to the 2005 level (Government of India 2015).³⁸

India's INDC notes that implementation "...is contingent upon an ambitious global agreement including additional means of implementation to be provided by developed country parties, technology transfer and capacity building following Article 3.1 and 4.7 of the Convention." India further outlines specific means of implementation, noting that, according to preliminary estimates, at least USD 2.5 trillion (at 2014–2015 prices) will be required to fund the full suite of India's climate change actions between now and 2030. Technology transfer, support, and capacity-building needs are also articulated in the INDC to explain the conditionality of India's achieving its INDC goals (Government of India 2015).

Opportunities for improvement: India's emissions-intensity target does not specify a 2005 level against which the 2030 target will be measured. Including this level, and/or information regarding specific emissions and GDP assumptions³⁹ in the base year and target year, would improve the transparency of the country's emissions-intensity target. India's INDC does include an indicator table that includes estimates of GDP (at 2011/2012 prices) for 2014 and 2030. However, this data point is not explicitly linked to India's emissions intensity-reduction target. Further detail on the specific international finance, technology, and capacity-building requirements would facilitate subsequent evaluation of whether the conditions associated with implementation of India's INDC have been met.

Target coverage

India's INDC does not specify target coverage.

Opportunities for improvement: Although the text of the INDC includes mitigation measures that will affect many sectors of the economy, including energy, industry, waste, transport, and forestry, India does not specify the sector or greenhouse gases covered in its emissions-intensity target. It is unclear whether India's emissions-

intensity target is inclusive or exclusive of the agriculture and land sectors (see next section). A comprehensive list of sectors and GHGs covered by India's target would improve transparency.

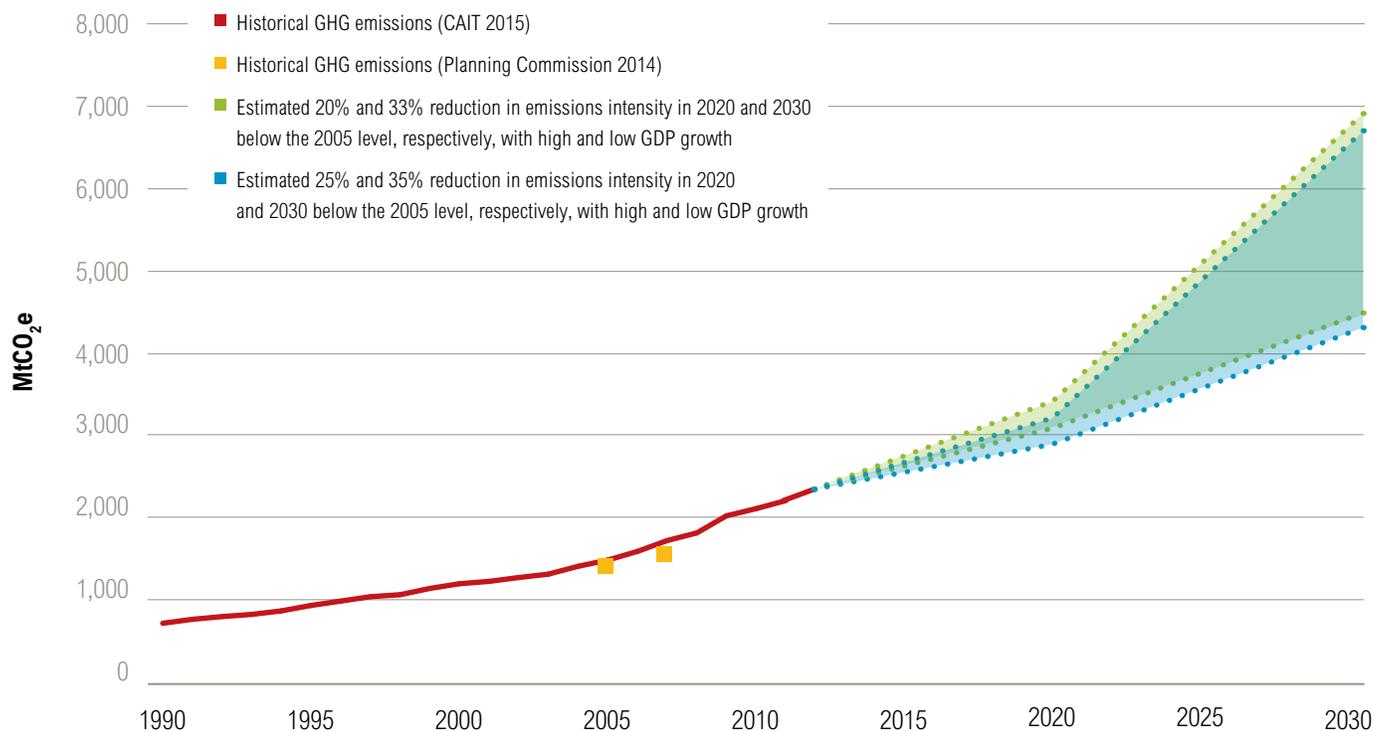
Assumptions and methodologies

The INDC includes projections of key macro-indicators that "provide a reflection of India's future needs as the economy grows in the coming years." These indicators, which are presented for 2014 and 2030, include population, GDP at 2011/2012 prices, and per capita GDP; they provide context for India's emissions-intensity target. India also has put forward a specific target for the land sector: the creation of an additional carbon sink of 2.5–3 GtCO₂e through additional forest and tree cover by 2030.

Opportunities for improvement: India can improve the transparency of its emissions-intensity target by: (i) detailing the assumed IPCC inventory methodologies and GWP values to be used to track progress; (ii) including information that relates to the accounting assumptions used for emissions and removals from the land sector (information should apply to both the forest-sector target and the overall emissions-intensity target, if the land sector is within its scope); and (iii) describing whether the country will use international market mechanisms to achieve its stated goals. These specifics would facilitate a better understanding of India's emissions targets, and would ensure that a consistent accounting approach is followed throughout the INDC's implementation.

Emissions Trajectory Assessment

India's INDC frames its GHG emissions target in terms of reducing the emissions intensity of national GDP by 33 to 35 percent by 2030, relative to the 2005 level. India has also previously announced its aim to reduce its emissions (excluding agriculture) per unit of GDP by 20 to 25 percent by 2020 compared with the 2005 level (Government of India 2010). Other government publications such as Planning Commission (2014) suggest both agriculture and land-sector emissions are excluded from India's base and target year emissions. Because no clear information on coverage is provided, we assume that both targets cover greenhouse gas emissions excluding those from agriculture and excluding India's net sequestration from the land sector (as reported in Planning Commission (2014)).

Figure 4 | **Estimated Range of GHG Emissions Trajectories: India**

Sources: Author calculations based on GDP data from various sources (see Appendix); CAIT (2015); Planning Commission (2014).

Notes: The analysis assumes that India's emissions target covers total GHG emissions excluding agriculture emissions and net sequestration of emissions by the land sector. That is, sectors covered in our analysis and presented in the figure include energy, industrial processes and product use, and waste. However, India's total GHG emissions in 2030 will be affected by (a) the sectors and GHGs that India chooses to include under its target, and how any sectors and GHGs not included under its target change over time; (b) the extent of support received from developed Parties including financial resources, technology transfer, and capacity building. Additionally, these emissions will be impacted by India's choice of inventory calculation methodologies, its accounting treatment of the land sector, and the use of international market mechanisms, if applicable, as well as other conditions set out in India's INDC. Historical data use 100-year GWP values from the IPCC Second Assessment Report (IPCC 1995).

We estimate a number of average annual GDP growth rates for the period 2005–2030 based on figures published by national and international institutions (see Appendix for more details). GDP growth rates used range from 6.3 percent to 8.2 percent. Using base year (2005) emissions of 1.4 GtCO₂e (total GHG emissions excluding agriculture emissions and net land-sector sequestration) from Planning Commission (2014), and the range of GDP growth rates, we estimate a range of possible GHG emissions trajectories, assuming India achieves its emissions-intensity targets in 2020 and 2030 (Figure 4, in units of MtCO₂e). A time series is extrapolated from historical emissions data from a non-government source (CAIT 2015), because of insufficient official data availability. However, historical emissions data from Planning Commission (2014) are also presented in Figure 4.

The analysis indicates that India's emissions level will be 2.9–3.4 GtCO₂e in 2020, and will continue to rise through 2030 to 4.3–6.9 GtCO₂e (5.8–9.2 GtCO₂e if agriculture and net land-sector sequestration are included). This implies a range of total emissions in 2025 of 3.6–5.2 GtCO₂e assuming simple linear growth.

INDONESIA

Transparency Assessment

Target reference point, time frame, and information specific to target type

Indonesia's INDC puts forward an unconditional GHG emissions target of a 29 percent GHG emissions reduction relative to a "business-as-usual" baseline of 2,881 MtCO₂e by 2030. Indonesia also has put forward a 41 percent GHG emissions-reduction target for the same year that is

conditional on international support “covering technology development and transfer, capacity building, payment for performance mechanisms, technical cooperation and access to financial resources” (Government of Indonesia 2015).

The INDC specifies that Indonesia has derived its baseline projections (which start in 2010) based on its historical emissions trajectory (2000–2010) and in the absence of mitigation actions. It emphasizes that the historical data used were available with various data intervals. For example, land-sector data were available from 1990–2012 (however, the INDC does not provide similar details for other sectors). Indonesia has further identified a number of general assumptions used in its baseline projection regarding socio-economic trends. In addition, two key policies—the Electricity Supply Business Plan 2015–2024 and the National Energy Policy were considered in developing a scenario that is consistent with achieving the country’s emissions mitigation target.

Opportunities for improvement: Although Indonesia’s INDC outlines several elements of the baseline-scenario projection method, it does not clarify a number of other key elements in its baseline-scenario methodologies. For example, Indonesia could specify whether its baseline scenario could change from current projections, and if so, under what circumstances it would change. Indonesia could also specify its projected baseline emissions for a number of interim years between 2020 and 2030. This would allow analysts and policymakers to assess whether the country is on track to meet its 2030 target, and help to calculate Indonesia’s projected cumulative emissions leading up to 2030. In addition to stating that baseline projections start at 2010, absent any mitigation policies, Indonesia could state explicitly whether any significant policies have been excluded from its baseline-scenario calculations.

Regarding Indonesia’s conditional emissions target, the INDC does not specify the details of the international assistance the country would need in order to achieve this target. It would be helpful if Indonesia were to provide an estimate of the amount of support required (previously stated in Indonesia’s draft INDC to be at least \$6 billion)⁴⁰ or information on other support factors, as well as details of Indonesia’s plans in the event that conditions are only partially met.

Target coverage

The INDC states that its GHG emissions target covers emissions from five sectors: energy (including transport); industrial processes and product use; agriculture; land use, land-use change, and forestry; and waste. Indonesia’s target covers nationwide emissions of three greenhouse gases: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

Assumptions and methodologies

GENERAL ACCOUNTING METHODS

Accounting methodologies for Indonesia’s GHG emissions target outlined in its INDC include IPCC (2006) and 100-year GWP figures from the IPCC Fourth Assessment Report (IPCC 2007).

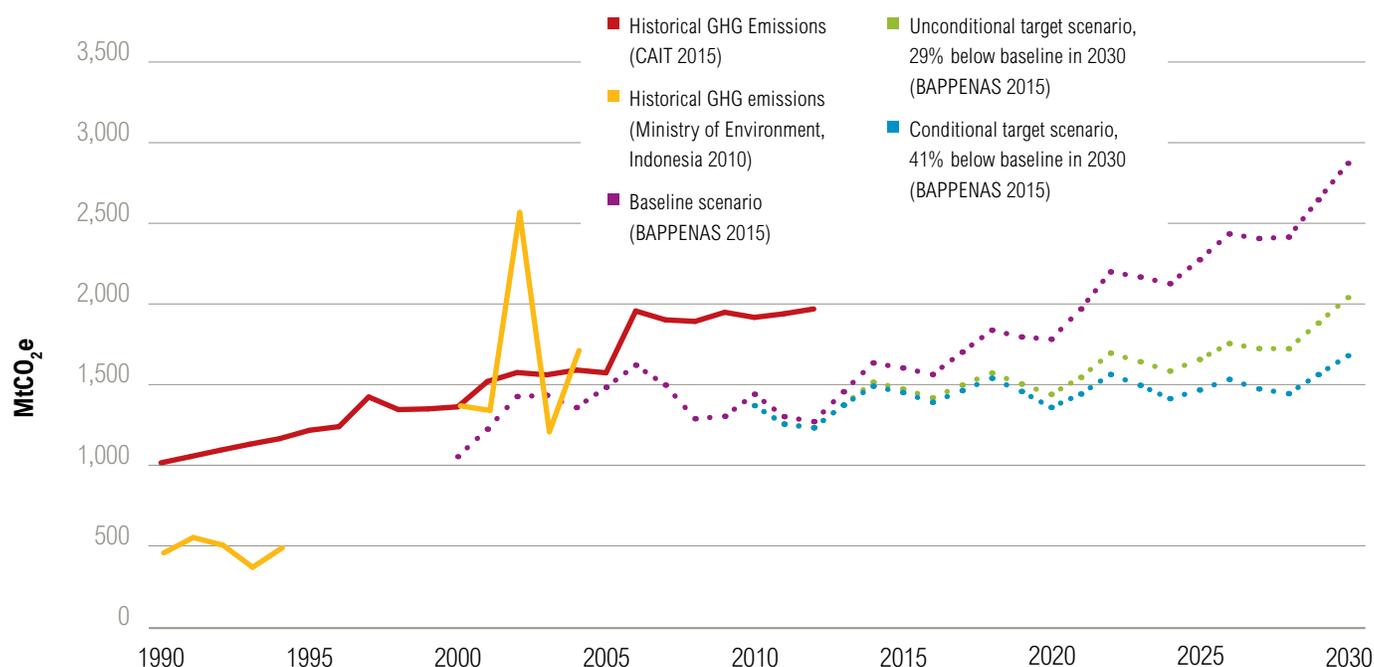
LAND-SECTOR ACCOUNTING

Indonesia’s INDC clarifies that the land sector is included in its target and contains some additional information about the country’s approach to managing land-sector emissions.⁴¹

Opportunities for improvement: The INDC does not provide details regarding the assumed accounting approach (activity-based or land-based) and assumed accounting method (net-net, forward-looking baseline, or gross-net) for the land sector. The INDC also does not provide any specific information on what methodologies the country is planning to use to account for natural disturbances and legacy effects. According to Indonesia’s INDC, land-use change and peat and forest fires were responsible for 63 percent of Indonesia’s total emissions in 2005. This is an atypical situation and, in light of Indonesia’s history of recent fires,⁴² including reliable information on land-use change and fire-related emissions will be vital to ensuring the integrity and robustness of Indonesia’s INDC.

USE OF MARKET MECHANISMS

The INDC states that Indonesia will meet its unconditional commitments regardless of the existence of international market mechanisms and its conditional commitment only with the provision of supportive resources. Indonesia states that it “welcomes bilateral, regional, and international market mechanisms that facilitate and expedite technology development and transfer, payment for performance, technical cooperation, and access to financial resources.”

Figure 5 | **Estimated GHG Emissions Trajectories: Indonesia**


Sources: BAPPENAS (2015); CAIT (2015); Ministry of Environment, Indonesia (2010).

Notes: Sectors covered by the Indonesia target and our analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). Indonesia's target and historical emissions presented here cover the following GHGs: CO₂, CH₄, and N₂O. Indonesia's total emissions in 2030 will be affected by its accounting treatment of the land sector, and the use of international market mechanisms, if applicable, as well as other conditions set out in Indonesia's INDC. Historical emissions data use 100-year GWP values from the IPCC Second Assessment Report (IPCC 1995).

Opportunities for improvement: Indonesia could clarify any limit on the percentage of emissions reductions that may be achieved through the use of international market mechanisms and how the environmental integrity and avoidance of double counting will be ensured.

Emissions Trajectory Assessment

Indonesia has provided few details in its INDC that permit an assessment of the country's anticipated GHG emissions trajectory. Indonesia's post-2020 GHG emissions target is relative to a baseline or business-as-usual (BAU) emissions projection. The INDC includes a baseline emissions projection for 2030 of 2,881 MtCO₂e, from which we are able to calculate the unconditional and conditional 2030 targets for that year: 2,046 MtCO₂e (a 29 percent reduction from BAU) and 1,700 MtCO₂e (a 41 percent reduction), respectively. This calculation assumes that Indonesia's baseline is static and will not be revised in the future (see above).

The INDC provides no additional information regarding the BAU scenario. However, the Government of Indonesia has separately published a BAU scenario, as well as scenarios for its unconditional and conditional targets, which also include years prior to 2030 (BAPPENAS 2015). These scenarios are presented in Figure 5. Our calculated estimates for 2030 agree well with those reported in the scenarios (2,049 MtCO₂e and 1,689 MtCO₂e for unconditional and conditional targets, respectively). For Indonesia's 2020 emissions target—a 26 percent reduction from the BAU scenario—we calculate a value of 1,325 MtCO₂e; the unconditional scenario reports a 2020 value of 1,449 MtCO₂e (BAPPENAS 2015). The 2025 figures reported in the unconditional and conditional scenarios from BAPPENAS (2015) are 1,665 MtCO₂e and 1,476 MtCO₂e, respectively.

Because of time series data gaps, historical emissions data presented in Figure 5 are from both government sources (Ministry of Environment, Indonesia 2010) and non-government sources (CAIT 2015). Disparities between historical and BAU emissions are likely due to revisions in Indonesia's national inventory.

JAPAN

Transparency Assessment

Target reference point, time frame, and information specific to target type

Japan's INDC communicates a target of a 26 percent reduction in GHG emissions by 2030⁴³ compared to the level in 2013. According to the INDC, this corresponds to a 25.4 percent reduction compared to the level in 2005 (Government of Japan 2015). The estimated emissions level in 2030 is 1,042 MtCO₂e. The period of implementation for the mitigation target is specified as 1 April 2021 to 31 March 2030 (FY 2021 to FY 2030). The INDC provides detailed information regarding both the reference GHG emissions level and expected emissions in 2030, laid out by energy sub-sectors for energy-originated CO₂, as well as by gas for non-energy-originated CO₂, and non-CO₂ gases.

Target coverage

Japan's GHG emissions target covers all IPCC sectors: energy; industrial processes and production; agriculture; land use, land-use change, and forestry; and waste. All seven Kyoto Gases—carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF₆), and nitrogen trifluoride (NF₃)—are covered.

Assumptions and methodologies

GENERAL ACCOUNTING METHODS

Japan plans to use methodologies “in line with the Guidelines for National Greenhouse Gas Inventories prepared by the IPCC, and adopted by the COP.” It also plans to use “Global Warming Potentials of a 100-year time horizon which were presented in the IPCC Fourth Assessment Report” as the “metrics used for the total GHG emissions and removals.”

LAND-SECTOR ACCOUNTING

According to its latest national GHG inventory report,⁴⁴ the Japanese land sector serves as a natural emissions sink. The INDC states that Japan intends to account for its land sector “in line with approaches equivalent to those under the Kyoto Protocol” suggesting that it intends to measure its forest management emissions/sinks against a projected reference level. In its latest national GHG inventory report, Japan defines its forest management reference

level as zero, allowing it to claim full credit for its net forest management sinks (MOE-Japan 2015). In other words, to achieve its 2030 emissions reduction target, Japan may count net removals through its forest sector as an offset against the emissions from other sectors.

Opportunity for improvement: The INDC does not specify accounting methods for natural disturbances and legacy effects.

USE OF MARKET MECHANISMS

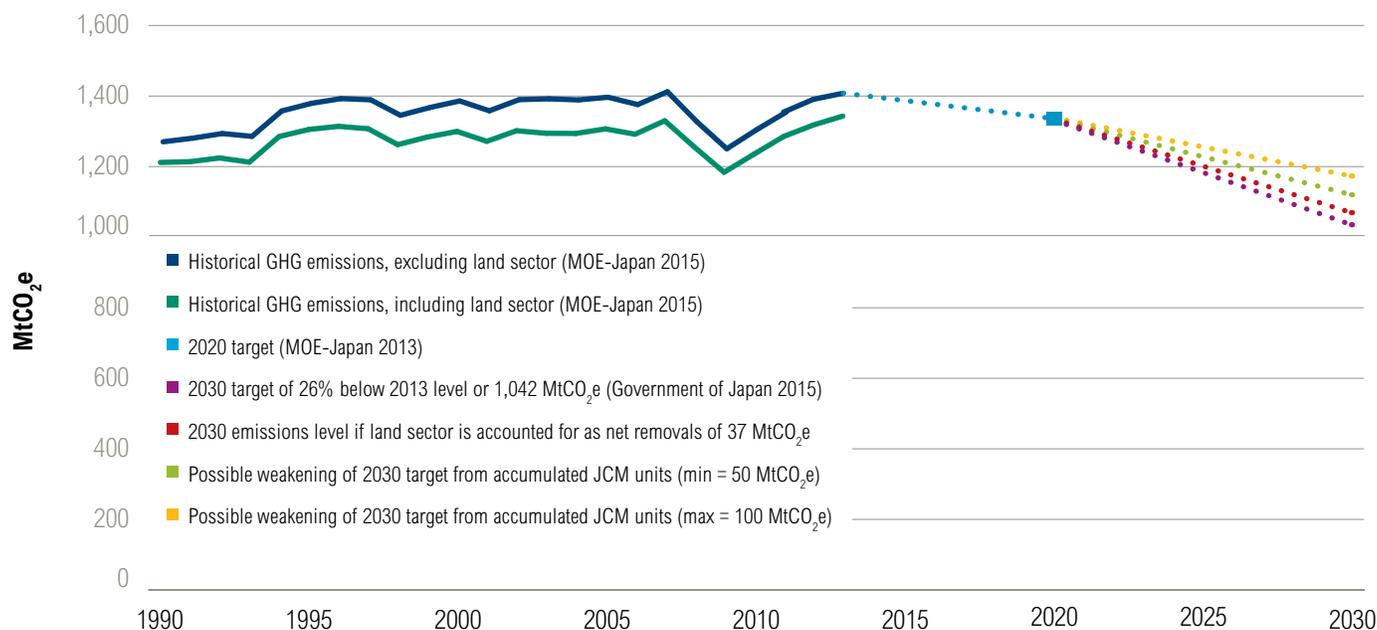
The Joint Crediting Mechanism (JCM) has been established by Japan to quantify GHG reductions or removals achieved through distribution of low-carbon technologies and products, as well as mitigation actions in developing countries. While the JCM is not explicitly considered in Japan's GHG reduction target, Japan's INDC states that those “emission reductions and removals acquired by Japan under the JCM will be appropriately counted as Japan's reduction.” Japan's INDC states the expectation that publicly funded JCM projects will achieve reductions of 50 to 100 MtCO₂ through 2030, which could be counted toward the country's emissions target (see next section).

Opportunities for improvement: Although Japan notes a range for JCM units, it does not specify whether there is any limit on using transferable emissions units toward its target; the degree to which transferable emissions units are used would impact the achievement of the target. In addition, the INDC does not provide information regarding how Japan intends to ensure that emissions units purchased from developing countries are not double-counted by those countries. This is important because such double counting would affect the emissions targets of other countries.

Estimated Emissions Trajectory

The Japanese INDC states the estimated target level of emissions—1,042 MtCO₂e—and lays out sectoral measures to achieve the GHG emissions-reduction target. However, a range of emissions-reductions may be expected given Japan's treatment of the land sector and planned use of transferable emissions units from international market mechanisms.

According to the information provided in the INDC, to reduce emissions by 26 percent compared to 2013 levels, the annual reductions expected in the year 2030 are

Figure 6 | **Estimated Range of GHG Emissions Trajectory: Japan**


Sources: Author calculations based on Government of Japan (2015); MOE-Japan (2015).

Notes: Calculations take account of potential weakening due to accounting uncertainties. For Japan, we present historical emissions excluding and including the land-use sector because Japan has applied a “Kyoto Approach” to land-use accounting for its emissions target (see text for more information). Sectors covered in our analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). Historical data assume GWPs from the IPCC Fourth Assessment Report (IPCC 2007), in line with Japan’s INDC.

approximately 366 MtCO₂e (Government of Japan 2015). Of these reductions, 37 MtCO₂e are expected to come from the land sector. This corresponds to a weakening of the target by 2.6 percent of 2013 levels compared to what the target would be if the land sector were considered in the base year as well as the target year rather than being used as an offset. Japan’s INDC states that “Japan establishes and implements the JCM...to achieve Japan’s emissions-reduction target.” If the estimated 50-100 MtCO₂e of emissions units from the JCM are also counted and applied exclusively in the year 2030,⁴⁵ the domestic reductions excluding the land sector could be 279–329 MtCO₂e (corresponding to 20–23 percent reduction compared to 2013 levels) in 2030 (Figure 6). As a result of these uncertainties, Japan’s domestic emissions in 2030 could be between 1,042 and 1,179 MtCO₂e. If we assume that Japan achieves its 2020 target of a 3.8 percent emissions reduction relative to 2005 levels (MOE-Japan 2013), and further assume a linear reduction trajectory between 2020 and 2030 targets, then 2025 emissions would be between 1,193 and 1,261 MtCO₂e.

MEXICO

Transparency Assessment⁴⁶

Target reference point, time frame, and information specific to target type

Mexico’s INDC sets out the country’s target to reduce its GHG emissions by 22 percent and black carbon⁴⁷ emissions by 51 percent by 2030, relative to a “business-as-usual” (BAU) scenario (Government of Mexico 2015a).⁴⁸ If its mitigation goal is achieved, Mexico estimates that its net emissions will peak in 2026, and that its emissions intensity per unit of GDP will decline by 40 percent between 2013 and 2030.

This target is unconditional, meaning that Mexico intends to achieve it regardless of an international agreement or international financial support. The INDC also includes a conditional target of reducing GHG emissions by 36 percent and black carbon emissions by 70 percent by 2030, using the same BAU scenario.⁴⁹ This conditional target is “subject to a global agreement addressing important topics including international carbon price, carbon border

adjustments, technical cooperation, access to low-cost financial resources and technology transfer, all at a scale commensurate to the challenge of global climate change” (Government of Mexico 2015a).

Mexico’s GHG reductions will be measured relative to a BAU scenario (Table 1), based on the 2013 national GHG inventory (INECC 2015).⁵⁰ The INDC states that the baseline is a “business-as-usual scenario of emissions projections based on economic growth in the absence of climate change policies, starting from 2013, which is the first year of applicability of Mexico’s General Climate Change Law (LGCC)” (DOF 2014). Notably, while 2012/2013 is the threshold after which mitigation policies are excluded from the baseline, the baseline does factor in some assumptions stemming from energy-reform legislation, which was enacted early in 2013.⁵¹

Table 1 | **INDC Business-as-Usual Scenario: Mexico**

YEAR	GREENHOUSE GASES (MtCO ₂ e)	BLACK CARBON (MtCO ₂ e)
2020	792	114
2025	888	125
2030	973	137

Opportunities for improvement: Mexico’s emissions target is set relative to a BAU or baseline scenario; if that baseline scenario is permitted to change, the INDC might not adequately discourage policy decisions that would increase emissions,⁵² thus hindering Mexico’s ability to achieve its long-term, aspirational goal.⁵³ In addition, a full detailing of the methodologies and assumptions that informed the development of the baseline would be useful so that they can be systematically revisited over time.⁵⁴ Because baseline scenarios often become outdated and inaccurate over time, periodic re-evaluation is a reasonable strategy provided that the initial level of ambition is not compromised. Mexico should clarify whether the baseline scenario associated with its 2030 goal will be allowed to change, and if so, under what circumstances.

In addition, Mexico’s INDC notes that “achieving the conditional goal will require fully functional bilateral, regional, and international market mechanisms.” However, absent further details on key provisions, it will not be possible to evaluate whether Mexico’s conditions have been met and, therefore, whether it ought to achieve its conditional target. Mexico could address this by clarifying its expectations for how the global agreement needs to address the topics mentioned in the INDC (such as carbon pricing and technical cooperation), what it means by “a scale commensurate to the challenge of global climate change,” and what the country will do if these conditions are met partly but not in full.

Target coverage

The GHG emissions target of Mexico’s INDC covers all IPCC sectors (energy; industrial processes and product use; agriculture; waste; land use, land-use change, and forestry) and nationwide emissions of six Kyoto gases—carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆)—as well as emissions of black carbon, a short-lived climate pollutant, that is accounted for separately as part of the national GHG inventory.

Assumptions and methodologies

GENERAL ACCOUNTING METHODS

Relevant accounting methods documented in Mexico’s INDC include reference to IPCC guidelines and the use of GWP figures from the IPCC Fifth Assessment Report (IPCC 2014), as well as 100-year GWP figures for black carbon as described in Bond et al. (2013). The INDC also notes the use of national statistics about sector activity and economic forecasts as part of Mexico’s methods for estimating emissions.

LAND-SECTOR ACCOUNTING

Mexico’s emissions target includes emissions from “afforestation, reforestation, deforestation, forest management, cropland management, grazing land management, or equivalent land-based accounting using UNFCCC reporting categories, and other categories.” Given that the INDC targets are consistent with the most recent national GHG inventory that includes emissions from land-use change but excludes Mexico’s “permanent” carbon sinks (*permanencias*), this implies that Mexico’s emissions target will be met including emissions from land-use change and excluding sinks from lands remaining under the same practice.

Opportunity for improvement: Mexico could make their accounting approach (activity-based or land-based) and accounting method (e.g. net-net, gross-net, or reference level approach) for the land sector explicit. Mexico could also specify methodologies to quantify and account for natural disturbances and legacy effects.

USE OF MARKET MECHANISMS

Mexico’s INDC states that its unconditional INDC commitment will be met regardless of international market mechanisms, although the INDC also notes that international market mechanisms “...would assist cost-effective implementation” (Government of Mexico 2015a). Achieving the conditional goal will, however, require fully functional bilateral, regional, and international market mechanisms.

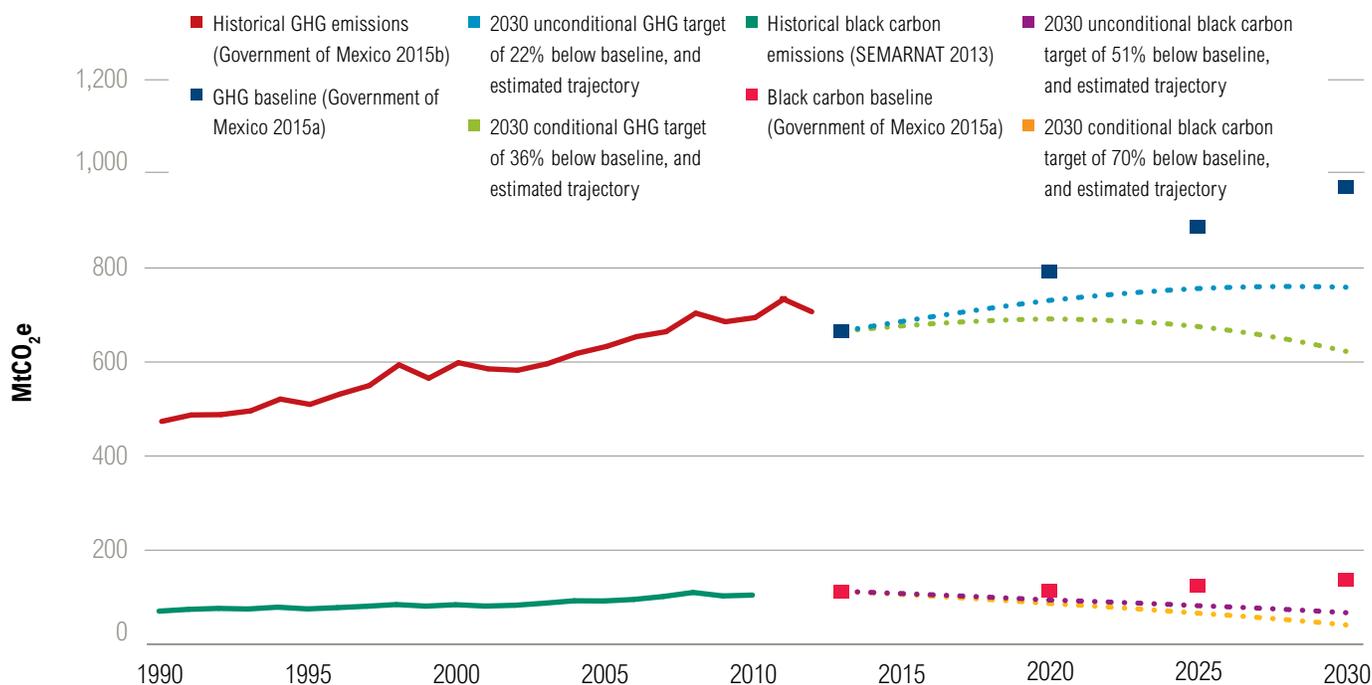
Opportunity for improvement: Mexico has not specified the terms of its conditional goal, for example, in terms of any limits on the percentage of emission reductions that may be achieved through international market

mechanisms, and whether and how use of market mechanisms will ensure environmental integrity and avoid double counting.

Estimated Emissions Trajectory

Mexico’s transparent quantification of its baseline GHG and black carbon emissions enables a calculation of its 2030 emissions goals—both unconditional and conditional, assuming that its baselines are static and will not be revised in the future (this is not certain: see discussion above). Based on the GHG emissions trajectory details provided in Mexico’s INDC, we calculate that GHG emissions in 2030 will be 759 MtCO₂e achieved through unconditional action (a 22 percent reduction from BAU), or 623 MtCO₂e achieved through actions conditional on outside support (a 36 percent reduction from BAU). Similar calculations for black carbon⁵⁵ result in 2030 emissions levels of 67 MtCO₂e achieved through unconditional action (a 51 percent reduction from BAU) and 41 MtCO₂e achieved through conditional action

Figure 7 | **Estimated Emissions Trajectories for Greenhouse Gases and Black Carbon: Mexico**



Sources: Author calculations (see Appendix); Government of Mexico (2015a, 2015b); SEMARNAT (2013b).

Notes: Sectors covered in our GHG analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). Historical GHG data for 2013 and Mexico’s INDC apply GWPs from the IPCC Fifth Assessment Report (IPCC 2014). However, historical GHG data for 1990-2012 are not directly comparable with estimates for 2013 and the INDC baseline due to differences in inventory methodologies (see Government of Mexico (2015b) for more information). Likewise, black carbon data for 2013 presented in the INDC may not be directly comparable with those historical figures reported for 1990-2012 in SEMARNAT (2013b). We do not consider Mexico’s 2020 pledge due to uncertainties noted in the text. The conditional and unconditional targets for 2030 are defined as a percentage reduction from Mexico’s BAU emissions projections. If Mexico chooses to change its projected BAU scenario, its quantitative targets would also change.

(a 70 percent reduction from BAU). However, several assumptions and calculations are required to estimate emissions levels in intervening years. Figure 7 presents our interpretation and estimation of plausible emissions trajectories for GHGs and black carbon given the information provided in Mexico’s INDC and its latest national inventory (INECC 2015). We also make an explicit assumption regarding future GDP growth that was taken from SEMARNAT (2013a) (see the Appendix for more details). Notably, we do not consider Mexico’s 2020 pledge⁵⁶—which is also a baseline target—in this analysis because its relationship to the target presented in the INDC has not been clarified. Our calculations result in GHG emissions levels for 2025 of 756 MtCO₂e and 676 MtCO₂e for unconditional and conditional scenarios, respectively, and black carbon levels of 82 MtCO₂e and 66 MtCO₂e for unconditional and conditional scenarios, respectively.

UNITED STATES

Transparency Assessment

Target reference point, time frame, and information specific to target type

The U.S. INDC puts forward a target to reduce total GHG emissions by 26 to 28 percent by 2025, relative to 2005 levels (Government of the United States 2015). The INDC also notes that the 2025 target “is consistent with a straight-line emission reduction pathway from 2020 to... reductions of 80 percent or more by 2050.”⁵⁷

Opportunity for improvement: The United States makes historical emissions data available to the public through its annual GHG inventory (U.S. EPA 2015). However, specifying whether the 2005 inventory value is used as the baseline, or otherwise explicitly citing and describing an updated value would help to ensure consistency among assessments of the U.S. target and improve transparency.

Target coverage

The U.S. target covers all IPCC sectors (energy; industrial processes and product use; agriculture; land use, land-use change, and forestry; and waste). It also covers all seven Kyoto gases—carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF₆), and nitrogen trifluoride (NF₃).

Assumptions and methodologies

GENERAL ACCOUNTING

Relevant accounting methods documented in the U.S. INDC include an accounting approach fully consistent with its greenhouse gas inventory (which, in turn, is consistent with IPCC (2006)), and the use of GWPs from the IPCC Fourth Assessment Report (IPCC 2007) (with consideration for future updates).

LAND-SECTOR ACCOUNTING

The U.S. INDC specifies a net-net based approach⁵⁸ to accounting for the land sector. Additional details on land-sector accounting include the use of a “production approach”⁵⁹ to account for harvested wood products. The INDC also states that emissions from natural disturbances may be excluded, consistent with IPCC guidance.⁶⁰

Opportunity for improvement: The U.S. INDC notes that emissions from natural disturbances “may be excluded” from their land-sector accounting methods. The United States could specify explicitly whether it intends to account for natural disturbances.

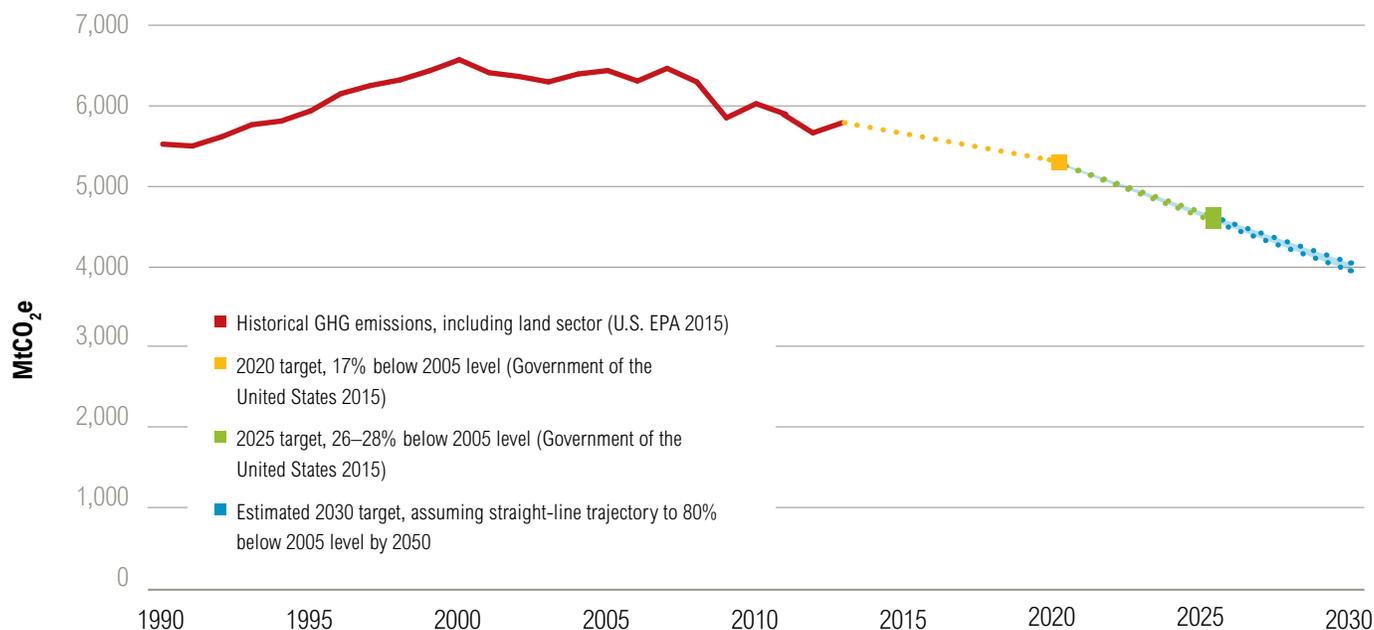
USE OF MARKET MECHANISMS

The U.S. INDC notes that “at this time, the United States does not intend to utilize international market mechanisms to implement its 2025 target.” This suggests that all emissions reductions will be domestic and avoids possible double-counting of transferable emissions units by another Party.

Opportunity for improvement: The inclusion of the phrase “at this time” in the U.S. INDC description of how units from international market mechanisms will be treated leaves the door open for potential future adjustments to the U.S. target accounting approach, which could affect the anticipated total amount of domestic emissions reductions. The United States could clarify whether its treatment of international market mechanism units might change and under what circumstances.

Estimated Emissions Trajectory

Based on the information presented in the U.S. INDC (Government of the United States 2015), we estimate U.S. emissions in 2025 will be 4,636–4,764 MtCO₂e, representing a 28 percent to 26 percent reduction (Figure 8). Figure 8 also includes an emissions estimate for 2030 of 3,966–4,069 MtCO₂e (37–38 percent) below 2005 levels). Emissions levels for 2030 are calculated by assuming

Figure 8 | **Estimated GHG Emissions Trajectories: United States**

Sources: Government of the United States (2015); U.S. EPA (2015).

Notes: Sectors covered in our analysis include all IPCC sectors (energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry). If the United States chooses at some point in the future to apply units from international market mechanisms, the amount of absolute reductions resulting from its quantitative target would be affected. For example, the use of transferable emissions units to meet its target would result in fewer domestic emissions reductions. Historical data and the 2025 target assume 100-year GWP values from the IPCC Fourth Assessment Report (IPCC 2007).

straight-line reductions from the 2025 target range to the 2050 target of at least 80 percent below 2005 levels as stated in the INDC. Values for intervening years (2012–2024 and 2026–2029) are linearly interpolated with an assumption that the United States also achieves its 2020 target of around a 17 percent reduction below the 2005 level, as reiterated in its INDC.

FINDINGS, DISCUSSION, AND RECOMMENDATIONS

Findings

Parties generally followed the broad, negotiated transparency guidelines. The emissions targets and related information set out in the INDCs of the eight Parties assessed here—Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States—demonstrate considerable variability in the framing of Parties’ emissions targets (different target types, base years, gas and sector coverages, GWPs, accounting assumptions, and so on). Nevertheless, all eight Parties generally adhere to the guidelines in the

Lima Call for Climate Action. For example, all Parties include an emissions target with a specific reference point and time frame for implementation. A majority of Parties assessed also include specific information related to the greenhouse gases and sectors covered by their emissions target, as well as the general accounting methods (i.e., IPCC inventory guidelines and GWP values) to be used in the assessment of their target. This is an encouraging result and suggests that some degree of consistency and transparency is recognized by major emitting Parties as a precondition to building trust and securing a successful international climate agreement.

Despite the Lima guidelines, transparency gaps remain that materially affect understanding of emissions targets in the INDCs. While Parties typically touched on the broad information categories put forward in the *Lima Call for Climate Action*, they did not always provide the level of granularity needed to quantify their impact with full certainty. Table 2 presents the major elements of the GHG emissions targets in the eight INDCs

assessed, and notes where the INDCs fail to provide detail consistent with the *Lima Call for Climate Action* guidelines and WRI's Open Book framework.

All of the Parties provided basic information regarding the target level and target year, but details that are necessary to interpret certain types of targets were sometimes missing. Likewise, some Parties did not provide full details regarding the sectors and gases covered by their targets, and many INDCs lack full accounting details.

These transparency gaps affect understanding of anticipated future global GHG emissions, as well as future national GHG emissions in the case of some Parties. In an effort to make all ambiguities explicit, this paper identifies, describes, and, where possible, quantifies uncertainty to provide a range of trajectories that could meet the GHG emissions targets as stated in the INDC submissions of eight major emitters. Cumulatively, explicit and implicit uncertainties quantified in our analysis result in a range in 2030 emissions of more than 10 GtCO₂e. It is important to note that this large range is based on interpreting the INDCs at face value. In some cases, educated assumptions—for example, about what GDP growth rates are most likely—can narrow the uncertainty significantly for a given country. Nonetheless, as a result of this lack of clarity in the INDCs, global INDC studies vary significantly in their conclusions regarding 2030 emissions (Levin and Fransen 2015). To address these uncertainties, all Parties could improve the transparency of one or more aspects of their post-2020 GHG emissions target.

Target type matters. Best practice transparency guidance varies according to the target type. According to the Open Book framework, transparency requirements for GHG targets that are characterized as an absolute change in emissions relative to a base year are simpler than those for GHG targets characterized as changes in emissions

intensity relative to a base year, or in emissions relative to a baseline scenario. Among the INDCs reviewed for this report, those with absolute base-year targets contained fewer transparency gaps than those with intensity or baseline targets. This is true regardless of a country's status as Annex I or non-Annex I. Looking beyond the large countries whose INDCs are analyzed here, there is a practical challenge. Many small countries, including least developed countries, have put forward baseline-scenario targets in their INDCs, which require the greatest level of detail in order to be presented transparently. Significant capacity building may be required to render these targets transparent enough for the countries in question, as well as analysts and other members of the international community, to monitor their progress toward meeting them.

Details on land-sector accounting and use of market mechanisms are lacking across the board.

While six out of eight Parties assessed specified whether the land sector was covered by their GHG target, most Parties did not provide details on the accounting approach to be applied to the sector. This can materially affect total emissions associated with the INDCs. For example, according to one estimate, differences in land-sector accounting approaches can change global 2030 emissions under the INDCs by 0.8 to 3.4 GtCO₂e (Dockweiler 2015).

Likewise, many Parties assessed did not specify whether or not they would use transferable emissions units from international market mechanisms to achieve their target, at what level they would use such units, or how they would ensure that traded units are not double-counted toward more than one Party's target. Because Parties submitted their INDCs in advance of the adoption of accounting rules governing these factors, the INDCs may reflect a desire to retain flexibility depending on how these rules evolve. This suggests that it will be important for the international negotiations to provide further clarity on such modalities.

Table 2 | **Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps**

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
Brazil	37% GHG reduction by 2025 from 2005 level and indicative contribution of 43% GHG reduction by 2030 from 2005 level	Economy-wide All Kyoto GHGs, excluding NF ₃	IPCC guidelines 100-year GWPs from the 5th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Brazil “reserves its position in relation to the possible use of any market mechanisms that may be established under the Paris agreement”
China	Peak emissions by 2030 or earlier and reduce CO ₂ emissions per unit of GDP by 60% to 65% below 2005 level by 2030 No peak level is specified and no base level or GDP assumptions for the base year and target year are specified for the intensity target	Various sectors mentioned for policies and actions Sector coverage is not specified CO ₂ only CO₂ sources covered by the target are not specified^a	Not specified	China includes as one of its INDC targets an increase in forest stock volume by around 4.5 billion cubic meters compared to the 2005 level It is unclear whether the land sector is included in CO₂ emissions peaking and intensity targets If it is included, accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Not specified
European Union	At least 40% GHG reduction by 2030 from 1990 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	No contribution from international credits Effect of banking of domestic market mechanism credits (allowances from the EU Emissions Trading Scheme) is not specified

Table 2 | Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps, continued

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
India	Reduce emissions per unit of GDP by 33% to 35% below 2005 level by 2030 No base level or GDP assumptions for the base year and target year are specified	Various sectors mentioned for policies and actions Sector coverage is not specified Greenhouse gas coverage is not specified	Not specified	India includes as one of its INDC targets an additional carbon sink of 2.5 to 3 billion tCO ₂ e through additional forest and tree cover by 2030 It is unclear whether the land sector is included in GHG intensity target If it is included, accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Not specified
Indonesia	29% unconditional and 41% conditional GHG reduction by 2030 from baseline scenario Baseline emissions provided for 2030 Limited methodology information available and static or dynamic nature of baseline is not specified	All IPCC sectors CO ₂ , CH ₄ , N ₂ O	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Indonesia “welcomes bilateral, regional and international market mechanisms...” Any limits to use of market mechanism units, and how double counting will be avoided, are not specified
Japan	26% GHG reduction by 2030 from 2013 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in the target Accounting approach is specified as Kyoto Protocol approach ^b Methodologies to quantify and account for natural disturbances are not specified	Estimated number of units from the Joint Crediting Mechanism is included Any limits to use of market mechanism units, and how double counting will be avoided, are not specified

Table 2 | **Major Elements of the Post-2020 GHG Emissions Targets of Brazil, China, European Union, India, Indonesia, Japan, Mexico, and the United States, and an Identification of Transparency Gaps, continued**

COUNTRY	TARGET DEFINITION Reference point, time frame, and information specific to target type (e.g., intensity or baseline scenario target)	TARGET COVERAGE Economic sectors and greenhouse gases covered	GENERAL ACCOUNTING METHODS Intergovernmental Panel on Climate Change (IPCC) inventory methodologies and global warming potential (GWP) values used to track progress	LAND SECTOR ACCOUNTING Treatment of land sector in target; accounting approaches (activity-based or land-based) and methodologies (net-net, forward-looking baseline, or gross-net); methodologies to quantify and account for natural disturbances and legacy effects	USE OF MARKET MECHANISMS Planned use of units and, if used, any limits to use, and how use will ensure environmental integrity and avoid double counting
Mexico	22% unconditional and 36% conditional GHG reduction by 2030 from baseline scenario Baseline emissions provided for 2020, 2025, and 2030 Limited methodology information available and static or dynamic nature of baseline is not specified	All IPCC sectors All Kyoto GHGs, excluding NF ₃ ^c	IPCC guidelines 100-year GWPs from the 5th IPCC Assessment Report	Land sector is included in the target Accounting approaches and methodologies are not specified Methodologies to quantify and account for natural disturbances and legacy effects are not specified	Unconditional commitment will be met “regardless of such mechanisms” Conditional target will require inter-national credits For conditional target only, any limits to use of market mechanism units, and how double counting will be avoided, are not specified
United States	26-28% GHG reduction by 2025 from 2005 level	All IPCC sectors All Kyoto GHGs	IPCC guidelines ^d 100-year GWPs from the 4th IPCC Assessment Report	Land sector is included in target Net-net accounting is specified ^e If natural disturbances are excluded, this exclusion will be “consistent with available IPCC guidance” It is unclear whether emissions from natural disturbances will be excluded	No contribution from international credits “at this time” Could specify whether, and under what circumstances, treatment of international market mechanism units might change

Notes: Material transparency gaps according to WRI’s Open Book framework are in bold font.

This summary table focuses on transparency gaps that materially impact the level of emissions in the stated target year. Other transparency issues that are consistent with best practice, but are less critical to interpreting and estimating a Party’s emissions trajectory and target, may be discussed in the text, but are excluded here. “All IPCC sectors” includes energy; industrial processes and product use; agriculture; waste; and land use, land-use change, and forestry. “All Kyoto GHGs” includes carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆) and nitrogen trifluoride (NF₃).

a. Because China does not specify a percentage of total emissions covered by the emissions target, it is unclear which CO₂ emissions are included in the target.

b. The Kyoto Protocol, in its second commitment period, specifies that countries should account for sinks from lands afforested and reforested since 1990, emissions from deforestation, and changes in net emissions from forest management measured against a forest management reference level.

c. Mexico’s INDC also covers emissions of black carbon.

d. The U.S. INDC states that accounting is consistent with the U.S. national GHG inventory, which is itself consistent with IPCC guidelines.

e. The United States also specifies that it intends “...to use a ‘production approach’ to account for harvested wood products consistent with IPCC guidance.”

Discussion: Ambiguity in the INDCs

All Parties assessed here have included some flexibility or ambiguity in the wording of the GHG mitigation targets in their INDCs, though some Parties' INDCs are more ambiguous than others. This ambiguity may be characterized as explicit uncertainty⁶¹ (for example, a specified target range or the inclusion of both unconditional and conditional targets) or as a lack of transparent information (for example, unclear information about the scope of the target or how the land sector will be accounted for in achieving the target). Finally, even when Parties have been fully transparent about their target, ambiguity regarding their total expected future emissions can remain. For example, a Party may transparently state that a certain sector or gas falls outside of the scope of its target. Such ambiguities create a source of uncertainty regarding the Party's total emissions and ambition under the INDC.

Several factors may explain why Parties have included ambiguity in their targets:

- It allows Parties to adjust their efforts if changing circumstances make the proposed target easier or harder to achieve.
- It is a part of the international agreement negotiation process and gives Parties something with which to negotiate, to encourage more reduction efforts from other Parties.⁶²
- It can give Parties some leeway to deal with political uncertainty concerning what national governments are able to achieve and what their negotiators can promise internationally with confidence.
- It may be due to a lack of time, capacity, and/or political will by the Party to fully consider all issues relevant to an emissions target.
- It is uncertain whether and in what form international rules governing emissions accounting, including international market mechanisms, for example, will be finalized.

Although ambiguity in the meaning and intention of Party emissions targets may be understandable, a lack of transparency also risks undermining trust among Parties. Lack of trust will make a strong global agreement more difficult to negotiate and implement. In addition, without a clear sense of projected emissions trajectories—even given acknowledged uncertainties about the future—Parties, analysts, and other stakeholders are more limited in their ability to accurately estimate the level of global emissions, and their impact on global temperature, associated with the INDCs.

Recommendations

Governments responsible for developing and submitting INDCs, as well as negotiators, have an important role to play in continuing to reduce uncertainty regarding future emissions and fostering trust and accountability in the negotiations. Parties can provide clarifications regarding their emissions targets through the INDC portal of the UNFCCC while it remains open, in “final” submissions to the UNFCCC following COP21 (if such an opportunity is provided by an agreement), or in separate documents published by governments at any point in time.

To improve the transparency of their emissions targets, country governments responsible for developing and submitting INDCs should:

Review the *Lima Call for Climate Action* and WRI's Open Book framework to ensure that their INDCs adhere to all transparency best practices and guidance provided therein. Although we are able to quantify uncertainties in the emissions targets of some Parties and have identified specific ways in which each Party assessed can improve the transparency of the GHG mitigation targets in its INDC, Parties more generally could improve the transparency of their GHG emissions targets by more closely following WRI's Open Book framework (based on the *Lima Call for Climate Action*) and providing a comprehensive list of information concerning the assumptions and methodologies relevant to interpreting GHG emissions targets. The Parties reviewed in this report are major economies whose governments have conducted and commissioned extensive analysis in preparation of their INDCs. This analysis could be drawn on, in dialogue with national stakeholders, to improve INDC transparency.

Consider providing indicative information on the trajectory national emissions are expected to follow in advance of the target year. INDCs included in this assessment, as well as those of other nations, tend to link their GHG mitigation goals to a specific year—most commonly 2030. Although having an end point (or emissions level) in mind is good practice for goal setting, it is ultimately the trajectory of a Party's emissions pathway, and the cumulative emissions released to the atmosphere, that will have the greatest impact on our planet's climate.⁶³ Consequently, it would be useful for Parties that have set 2030 targets to set additional, intermediate milestones for 2025 or additional intervening years. This would enable the evaluation of a general trajectory, including

a plateauing or peaking of emissions, as applicable, with specified emissions levels. For countries (such as the United States) that have target years other than 2030, providing an indicative 2030 target (as Brazil has done) would more readily enable comparisons with other Parties' mitigation goals. Parties cannot perfectly predict the future, but clarifying these points—or simply publishing an expected time series of emissions under the INDC—would shed light on expected cumulative emissions with an expected trajectory for their total GHG emissions through 2030 (in addition to providing a target goal for a specific year). It would then be possible to estimate the cumulative emissions expected to be released to the atmosphere.

Consider reframing GHG targets as target types with more straightforward transparency guidance. As discussed above, future emissions levels are often transparent for Parties with base-year emissions targets and fixed-level targets, as they are straightforward to calculate. In contrast, it may be more difficult to understand future emissions levels associated with baseline-scenario targets (unless the baseline-scenario emissions level is specified and is fixed) and base-year intensity targets (in which emissions can fluctuate with the level of output). Any target can be translated into any target type without affecting ambition (Levin et al. 2015); Parties that struggle to meet Open Book transparency requirements associated with more complex types of targets should consider reframing their targets as other target types.

UNFCCC Negotiators should:

Encourage Parties to enhance the transparency of their GHG targets, in particular, if and when there is an opportunity for the INDCs to be communicated or finalized after COP21 in Paris. Parties may agree that countries should “finalize,” communicate, or otherwise formalize their INDCs (which would then become NDCs) following COP21. Negotiators could adopt language encouraging Parties to use that opportunity to further enhance the transparency of their contributions.

Maintain and build on the information guidance provided in the *Lima Call for Climate Action*.

While the guidance in the Lima decision is entirely voluntary, it is clear that Parties consulted it and, to an extent, formulated their INDCs around it. This demonstrates the value of providing such guidance in the context of a COP decision. Negotiators can build on this experience by continuing to adopt such guidance and refining it in ways that encourage Parties to continue to close transparency gaps in line with their capacities.

Work toward clear and robust accounting rules for the land sector and market mechanisms. A number of Parties have retained flexibility on the role of these factors in their INDCs pending their treatment in an eventual international agreement, signaling the importance of developing clear and consistent rules. While details will be developed subsequent to COP21, an agreement in Paris can help by outlining strong principles to guide this development.

The formulation of INDCs presents an important opportunity for all Parties to discuss and document a plan of action that supports ambitious reductions of GHG emissions, as well as economic growth and social well-being. Recent studies have shown that these goals are compatible with emissions mitigation and can lead to significant economic benefits.⁶⁴ Although they do not predict the future, INDCs are critical for the international community's collective understanding of country priorities and projected emissions trajectories. For all countries, and in particular for major emitters who will play an outsized role in determining the world's future emissions pathway, transparent INDCs are an essential component of building trust and ensuring a successful agreement at COP21 in Paris and its future implementation.

APPENDIX: METHODS FOR EMISSIONS TRAJECTORY ASSESSMENTS OF CHINA, EUROPEAN UNION, INDIA, AND MEXICO

China

To interpret China's CO₂ emissions intensity target, we first calculate an estimate of base year (2005) CO₂ emissions intensity for China, using the 2005 estimate from China's Second National Communication (NDRC 2012) and 2005 GDP data from World Bank (2015). We then calculate CO₂ emissions intensity levels in 2020, using both 40 percent and 45 percent reductions from 2005 levels; 2030 levels are calculated using both a 60 percent and a 65 percent reduction. Because China's targets are presented in terms of intensity reductions, assumptions on GDP projections are needed to translate the target into absolute emissions.

We assess China's emissions target against a range of projections for China's GDP in 2020 and 2030 taken from published studies. All of the studies used have been published since 2009 and are compatible with a low emissions scenario or a CO₂ peaking in 2030.

GDP projections are provided in different forms from different sources; the GDP values are therefore converted into relative values with respect to 2005 GDP figures to facilitate comparison. If a GDP projection does not include a 2005 value then the ratio between 2005 and the earliest historical GDP value is assumed to be the same as in the "World Development Indicators" estimates, which are in USD (World Bank 2015). Based on this approach, the range of GDP average annual growth rates (AAGR) for 2005–2030 used in the assessment is 6.7 to 8.4 percent (Table A-1).

To calculate absolute emissions levels in 2020 and 2030, we then make the following calculation for each intensity reduction target under high and low GDP estimates (using 2030 target year as an example):

$$\text{Emission}_{2030} = \frac{\text{Emission}_{2005}}{\text{GDP}_{2005}} \times (1 - \text{intensity reduction rate}\%) \times \text{GDP}_{2030}$$

Table A-1 | **Summary of China's GDP Growth 2005–2030, Based on Publications Used in This Study**

STUDY (IN ORDER OF PUBLICATION YEAR)	RELATIVE GDP (2005 = 1)				AVERAGE ANNUAL GROWTH RATE (AAGR)	
	2005	2010	2020	2030	2005–2020 (%)	2005–2030 (%)
Sha et al. (2015)	1	1.7	3.2	5.2	8.1	6.8
Green and Stern (2015)—Continued Emissions Reduction Scenario	1	1.7	3.5	5.8	8.7	7.3
Green and Stern (2015)—Accelerated Emissions Reduction Scenario	1	1.7	3.5	6.0	8.7	7.4
Zhang et al. (2014)—Accelerated Effort Scenario	1	1.7	3.4	5.5	8.5	7.1
IEA (2014)	1	1.7	3.4	5.7	8.6	7.2
SDSN and IDDRI (2014)	1	1.7	3.5	6.0	8.7	7.4
World Bank and DRCSC (2013)	1	1.7	3.6	6.1	8.9	7.5
Zhou et al. (2011) ^a	1	1.7	3.6	6.4	8.9	7.7
UNDP (2010) ^a	1	1.6	3.0	5.1	7.6	6.7
ERI (2009) ^a	1	1.7	3.8	7.6	9.3	8.4

a. Values for UNDP (2010) are obtained from Mischke and Karlsson (2014); Values for Zhou et al. (2011) and ERI (2009) are obtained from Li and Qi (2011).

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European Union

The effects of land-sector accounting methods on the EU’s 2030 emission target

We estimate that the EU’s choice of land-use accounting methods could weaken the emissions-reduction effect of the EU target by an amount equivalent to up to 3.8 percent of the EU’s 1990 emissions. Our estimates are based on modeling results presented in a report prepared by the Öko Institut (Böttcher and Graichen, 2015). That report presents the results of various options for land-use accounting. For forest management accounting, the authors model four options: net-net accounting (scenario D) and three possible forest management reference levels (scenarios A–C). They also model two options for afforestation/reforestation accounting: the Kyoto Protocol approach (scenarios A–D) and IPCC inventory methods (scenario E).

We use Öko Institut’s scenario A as the least ambitious end of the range of likely outcomes of EU land-use accounting choices. This scenario models the accounting outcomes if the EU were to continue its current land-use accounting practice into the period 2021–2030. This scenario applies current methods of estimating a business-as-usual forest management reference level (FMRL), against which 2030 sinks are measured, and applies a Kyoto Protocol approach to afforestation/reforestation accounting. It results in a modeled credit of 135.0 MtCO₂ during the period 2021–2030 from the land-use sector (an average of 13.5 MtCO₂ per year). This result means that if EU member states were to allow a business-as-usual scenario to play out in the land-use sector without any intervention (without exerting effort to lessen emissions or enhance sinks), the land-use sector would be credited for reductions of 13.5 MtCO₂ per year. This would mean that emissions reductions from the EU’s mitigation efforts to achieve its 2030 target could be reduced by an equivalent amount. We choose scenario A—extension of current practice—as our least ambitious likely scenario, rather than Öko Institut’s less stringent scenario C, because our expectation is that the EU is unlikely to weaken its land-use accounting methods from current practice, and indeed might strengthen them.

For our most-ambitious scenario we combine two Öko Institut scenarios. We apply net-net accounting of forest management from scenario D, which uses a base-year period instead of a projected forest management reference level as the baseline, and UNFCCC reporting methods for afforestation/reforestation from scenario E. This combined scenario would result in an underestimate of forest management sinks of –73.9 MtCO₂ (–7.4 MtCO₂ per year) when compared with Öko Institut’s business-as-usual projection. This number combines forest management sinks of –140.2 MtCO₂ from scenario D and afforestation/reforestation emissions of 42.1 MtCO₂ from scenario E (the other land-use categories remain the same across all scenarios). This most ambitious scenario matches the land use accounting approach used by the United States.

Figure 3 in this paper shows that the effect of various land-use accounting methods on the EU target varies from no effect (the most-ambitious scenario), to a weakening of the target by an amount equivalent to 3.8 percent of 1990 emissions levels (the least-ambitious scenario). Note that we use net-net accounting for forest management and UNFCCC reporting methods for afforestation/reforestation as the default method for land-use accounting; any other land-use accounting method is treated as weakening or strengthening the target relative to the effects of using that default method.⁶⁵

Note that some of the projected and historical land-use data used in the Öko Institut model have since been updated by EU member states.

India

To estimate India's GHG intensity target, we estimate the possible range of GDP growth in 2020 and 2030 using the publications cited in Table A-2 and below. Because no sector or gas coverage is specified in the INDC, we assume the same coverage as specified in India's 2020 target (i.e., gross emissions excluding agriculture emissions) for both 2020 and 2030 targets. We use a base-year greenhouse gas emissions estimate of 1,433 MtCO₂e in 2005, based on the emissions estimates provided in Planning Commission (2014).

Due to the various units used in different publications, all reported GDP values (and growth rates) are harmonized in terms of the relative values of 2005 GDP, and the average annual growth rate (AAGR) between 2005–2020, and 2005–2030. If a GDP projection does not include a 2005 value, then we assume the ratio between 2005 and the earliest historical GDP value to be the same as in the World Bank "World Development Indicators" estimates, which are in USD (World Bank 2015). The maximum and minimum of relative GDP are used as high GDP and low GDP when estimating emission levels for 2020 and 2030, respectively. The range of GDP AAGR (2005–2030) used in the assessment is 6.3 to 8.2 percent (Table A-2).

To calculate absolute emissions levels in 2020 and 2030, we make the following calculation for each intensity-reduction target under high and low GDP estimates (using 2030 target year as an example):

$$\text{Emission}_{2030} = \frac{\text{Emission}_{2005}}{\text{GDP}_{2005}} \times (1 - \text{intensity reduction rate}\%) \times \text{GDP}_{2030}$$

Intervening years are interpolated.

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Table A-2 | **Summary of India's GDP Growth 2005-2030, Based on Publications Used in This Study**

STUDY	RELATIVE GDP (2005 = 1)			AVERAGE ANNUAL GROWTH RATE (AAGR)	
	2005	2020	2030	2005–2020 (%)	2005–2030 (%)
Government of India (2015)	1	—	7.2	—	8.2
IEA (2014)	1	2.7	5.1	6.9	6.8
IIASA (2015)—SSP1-Sustainability	1	2.8	5.5	7.2	7.0
IIASA (2015)—SSP2-Middle-of-the-Road	1	2.9	5.0	7.3	6.7
IIASA (2015)—SSP3-Fragmentation	1	2.9	4.6	7.3	6.3
IIASA (2015)—SSP4-Inequality	1	2.8	4.8	7.2	6.5
IIASA (2015)—SSP5-Conventional Development	1	2.9	5.9	7.3	7.4
Planning Commission (2014)—BIG scenario	1	3.0	5.7	7.6	7.2
Planning Commission (2014)—LCIG scenario	1	3.0	5.5	7.5	7.1
Shukla et al. (2015)—Conventional scenario	1	—	6.9	—	8.1
Shukla et al. (2015)—Sustainable scenario	1	—	6.4	—	7.7

Mexico

All trajectories presented in Figure 7 assume 2013 emissions levels consistent with the most recent national inventory: total GHG emissions for 2013 were 665 MtCO₂e, excluding emissions sequestration from natural sinks (*permanencias*). Emissions of black carbon were 113 MtCO₂e (INECC 2015).⁶⁶

To calculate separate trajectories for GHG emissions and black carbon, we first linearly interpolate a baseline (business-as-usual) emissions trajectory that sums these emissions based on data points provided in the INDC for 2020, 2025, and 2030. Next, we calculate 2030 emissions values for the unconditional and conditional cases according to the baseline and reduction figures provided in the INDC: unconditional case represents a 25 percent reduction from BAU, and conditional case represents a 40 percent reduction from BAU.

We then produce a time series for emissions intensity ((GHGs + black carbon)/GDP). To do so, we calculate the 2013 value for emissions intensity by taking total emissions and dividing by an estimate of Mexico's 2013 GDP (in current USD) from the World Bank.^{67, 68} GDP values are then extrapolated to 2030 by assuming an average annual growth rate of 3.6 percent, which is the figure used for developing the baseline presented in SEMARNAT (2013a).⁶⁹ We then calculate emissions intensity values for the unconditional and conditional cases for 2030, based on these estimates. Our estimate of emissions intensity in 2030 for the unconditional case is approximately 41.3 percent below the 2013 value, which agrees well with the text of the INDC: "...emissions intensity per unit of GDP will reduce by around 40 percent from 2013 to 2030." According to our estimates, emissions intensity in the conditional case would reduce by about 53 percent between 2013 and 2030. Estimates of emissions intensity for intervening years (2014–2029), in both the unconditional and conditional scenarios, are then linearly interpolated. Finally, we calculate emissions values for the intervening years (2014–2029) by multiplying estimated emissions intensity and GDP values.

Encouragingly, this approach also results in a peaking year for the unconditional contribution of 2026, which is again consistent with the text of the INDC: "...a net emissions peak starting from 2026, decoupling GHG emissions from economic growth" (Government of Mexico 2015a).

To develop the separate baseline trajectories for GHGs and black carbon presented in Figure 7, we use a similar calculation approach to that described above. First, we interpolate a baseline and calculate emissions levels for 2030, using numbers published in the INDC. For intervening years (2014–2029) for GHG and black carbon unconditional and conditional trajectories, we then assume a constant proportional contribution of GHGs and black carbon equal to that in 2030 and relative to the summed GHG and black carbon unconditional or conditional trajectory lines.

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ENDNOTES

1. For more information, see <http://www.wri.org/indc-definition>.
2. As agreed to by Parties at COP17: UNFCCC, "Ad Hoc Working Group on the Durban Platform for Enhanced Action," 2011. <http://unfccc.int/bodies/body/6645.php>.
3. Parties were urged to communicate their INDCs well in advance of COP21 and no later than 1 October, 2015 to allow sufficient time for other Parties, as well as civil society and other stakeholders, to review the content of these documents (UNFCCC 2014a). 1 October, 2015, was the deadline for INDCs to be included in a Synthesis Report prepared by the UNFCCC Secretariat.
4. The European Union (EU) is considered a Party under the UNFCCC and a single INDC was submitted by the EU on behalf of its 28 Member States.
5. The Open Book list is informed by two international GHG accounting and reporting standards developed by the Greenhouse Gas Protocol—the Mitigation Goal Standard (Greenhouse Gas Protocol 2014a) and Policy and Action Standard (Greenhouse Gas Protocol 2014b)—and was developed through a consultative process involving more than 270 participants from 40 countries. For more information, see <http://www.wri.org/our-work/project/open-book>.
6. In focusing on transparency, this analysis differs from other analyses that primarily examine the ambition of INDCs. For example, the Climate Action Tracker: <http://climateactiontracker.org/>.
7. The 28 EU Member States presented a single, joint INDC.
8. The respective contributions to global GHG emissions for these economies are: Brazil—3.8%; China—22.4%; the EU—8.7%; India—6.1%; Indonesia—4.2%; Japan—2.5%; Mexico—1.6%; and the United States—12.2%. Data are for 2012 and are taken from CAIT (2015).
9. The Open Climate Network (OCN) brings together independent research institutes and civil society groups from key countries to track and report on their countries' progress toward addressing climate change. For more information, see: <http://openclimatenetwork.org>.
10. If there is no breakdown of gases in documents provided by Parties (e.g., for a baseline or historical emissions) comparing targets with different GWPs becomes difficult.
11. Defined here in accordance with the Greenhouse Gas Protocol (2014a): "Land sector refers to the following land-use categories: forestland, cropland, grassland, wetland, and settlement, consistent with Volume 4 of the IPCC Guidelines for National Greenhouse Gas Inventories (2006). It includes emissions and removals from land in agricultural production and grazing lands/grasslands. However, it does not cover accounting for GHG fluxes from on-farm agricultural activities, such as manure management or fossil-fuel-based emissions from on-farm use of electricity, heat, or vehicles."
12. Emissions from forest management can be accounted for relative to a historical base year/period (net-net), relative to a projection of net emissions in the target year (forward-looking baseline), or without reference to base-year or baseline-scenario emissions (gross-net) (WRI 2015). "Legacy effects" refers to how past management practice can affect future changes in carbon stocks that may vary even in the presence of sustainable management (Greenhouse Gas Protocol 2014a).
13. For example, see Schneider and Kollmuss (2015); Kollmuss et al. (2015); Haya (2009).
14. According to the Greenhouse Gas Protocol (2014a), information related to a GHG mitigation goal "...should be sufficient to enable a party external to the goal assessment process to derive the same results if provided with the same source data."
15. A threshold of 2°C global average temperature increase relative to pre-industrial levels was agreed to by Parties to the UNFCCC as the long-term goal for GHG mitigation. See UNFCCC (2010). This level is, in part, based on risk assessment evaluations associated with projected increases in global average temperatures, such as those published by the IPCC (e.g., https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf).
16. At COP20, the UNFCCC Secretariat was tasked with providing a synthesis report by 1 November 2015 on the aggregate effect of INDCs communicated by Parties by 1 October, 2015 (UNFCCC 2014a). Additionally, through its Emissions Gap Report, the United Nations Environment Programme is leading an effort to compile literature on the aggregate effect of INDCs on GHG emissions.
17. For example, the percentage of national emissions covered by the emissions target and the expected types and years of any units used from market mechanisms toward achieving the target.
18. "The implementation of Brazil's INDC is not contingent upon international support, yet it welcomes support from developed countries with a view to generate global benefits." However, Brazil's INDC notes one exception: "Specifically concerning the forest sector, the implementation of REDD+ activities and the permanence of results achieved require the provision, on a continuous basis, of adequate and predictable results-based payments in accordance with the relevant COP decisions." (Federative Republic of Brazil 2015)
19. According to the IPCC's Fourth Assessment Report (IPCC 2007) "the Global Temperature Potential (GTP) metric provides an alternative approach by comparing global mean temperature change at the end of a given time horizon. Compared to the global warming potential (GWP), the GTP gives equivalent climate response at a chosen time, while putting much less emphasis on near-term climate fluctuations caused by emissions of short-lived species (e.g., CH₄)." Although Brazil communicates its GHG target primarily using 100-year GWP values from the IPCC's Fifth Assessment Report "with a view to assuring full transparency, clarity and understanding," the country chooses to provide additional estimates of its GHG target using 100-year GTP values from the IPCC's Fifth Assessment Report (IPCC 2014). Brazil emphasizes that "the contrast between GTP and GWP sheds light on the importance, for analysis and policy-making, of recognizing the predominant role of CO₂ emissions in temperature increase, thus avoiding overestimating the effects of non-CO₂ greenhouse gases with shorter lifetimes in the atmosphere, in particular methane."
20. Net GHG emissions are "the aggregation of GHG emissions (positive emissions) and removals (negative emissions)." (Greenhouse Gas Protocol 2014b).
21. As noted, Brazil's INDC states that it intends to use an "inventory-based approach for estimating and accounting anthropogenic greenhouse gas emissions and, as appropriate, removals in accordance with the applicable IPCC guidelines." Although we infer that further clarification is needed, it is possible that this statement suggests a net-net accounting approach.

22. China's INDC also includes targets to increase the share of non-fossil fuels in primary energy consumption to around 20 percent by 2030, and to increase the forest stock volume by around 4.5 billion cubic meters above the 2005 level by 2030. While progress on these targets might affect the trajectory of greenhouse gas emissions, assessing these targets is beyond the scope of this paper.
23. Notably, various analysts have estimated peaking levels or ranges for China. For instance, see Zhang et al. (2014). See also "Estimated Emissions Trajectory" section.
24. See, for example, IPCC (2006) and the "Classification and Definition of Categories of Emissions and Removals." Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8_Ch8_Reporting_Guidance.pdf.
25. However, the accounting guidelines for provincial CO₂ intensity targets released by China's National Development and Reform Commission cover CO₂ emissions from fossil-fuel combustion and net power consumption only. The provincial CO₂ intensity targets were allocated based on a national CO₂ intensity target. See http://qhs.ndrc.gov.cn/zcfg/201504/t20150427_689390.html.
26. However, Green and Stern's (2015) prediction of a peak in GHG emissions earlier than 2030 includes non-energy CO₂ emissions.
27. Notwithstanding the absence of non-CO₂ gases from China's INDC targets, Climate Action Tracker (CAT) rated the estimated 2025 and 2030 greenhouse gas emission levels (including non-CO₂ gases) resulting from China's INDC, with the exception of its carbon-intensity target, "medium," the same rating given to the United States and the European Union. This analysis does not include the plans in China's INDC to mitigate HCFC-22 and HFC-23, although CAT estimates that when implemented, they will further reduce greenhouse gas emissions. See CAT (2015). A number of other provisions in China's INDC should result in reductions in emissions of non-CO₂ gases. In predicting a peak in China's greenhouse gas emissions before 2030, Green and Stern (2015) include non-CO₂ gases, based on an assumption that the ratio of CO₂ and non-CO₂ emissions remains constant, which they describe as a conservative assumption.
28. Notably, our analysis interprets an emissions trajectory by focusing on the CO₂ emissions-intensity target China has put forward in its INDC. Other analysts find that by including all policies and targets in the INDC, emissions will turn out much lower than this, rendering the emissions-intensity target essentially irrelevant. For example, CAT (2015) states "Setting aside the carbon intensity target, China's INDC's actions and non-fossil energy target lead to GHG emission levels of around 13.6 GtCO₂e in 2030. The intensity target, if dominating other elements of the INDC, national policies and actions, would lead to much higher 2030 emission levels of 15-16.9 GtCO₂e."
29. According to the INDC (European Commission 2015), these include "afforestation, reforestation, deforestation, forest management, cropland management, and grazing-land management or equivalent land-based accounting using UNFCCC reporting categories, and other categories/activities elected by the EU and its Member States...."
30. This is also a notable change from the EU's 2020 target, which has provisions to include in its accounting transferable emissions units from market-based mechanisms.
31. A net-net accounting approach is defined as accounting relative to base year/period emissions. For more information on net-net and other land-use accounting methods, see Chapter 6 of Greenhouse Gas Protocol (2014a).
32. See, for example, Climate Action Tracker, available at: <http://climateactiontracker.org/countries/eu.html>.
33. We assume the EU will not choose an accounting practice that is less ambitious than current practice.
34. The market stability reserve was approved by the European Parliament in July 2015 (European Commission 2014).
35. This range is estimated from figures 13, 15, and 16 of the report.
36. The report modeled the effects of the MSR if it were to start in 2021. The EU has since decided to implement the MSR in 2019.
37. It is important to note that the EU INDC prohibits the use of international credits during 2021 to 2030. However, it is still possible for emitters in the EU to increase their use of international credits during Phase III, which could increase the surplus quantity of allowances available during Phase IV of the EU ETS.
38. India's INDC also includes quantifiable targets to achieve about 40 percent cumulative electric power installed capacity from non-fossil-fuel-based energy resources by 2030, and creating an additional carbon sink through additional forest and tree cover by 2030. While progress on these targets might affect the trajectory of greenhouse gas emissions, assessing these targets is beyond the scope of this paper.
39. In its most recent five-year plan (2012–2017), the Government of India estimated a national GDP growth rate of 8%.
40. <http://www.wri.org/blog/2015/09/details-indonesia%E2%80%99s-climate-plan-remain-hazy>.
41. For example, the INDC mentions the 2010–2016 moratorium on the clearing of primary forests and the prohibited conversion of peat lands, as well as Indonesia's ongoing efforts to reduce deforestation and forest degradation by including multiple stakeholders, sub-national jurisdictions, and the most vulnerable indigenous adat communities in both the planning and implementation of conservation initiatives (Government of Indonesia 2015).
42. <http://www.wri.org/blog/2015/10/indonesia%E2%80%99s-fire-outbreaks-producing-more-daily-emissions-entire-us-economy>.
43. To align with Japan's national inventory accounting practices, all the years mentioned here refer to Japan's fiscal year (April 1 to March 31).
44. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php.
45. This approach is highly uncertain because the treatment of JCM credits has not been explicitly characterized in the INDC. 2030 emissions levels would be different if, for example, credits were applied throughout the period of the INDC target, that is, 2021–2030. How the credits are allocated between Japan and the JCM partner country would further affect the reductions Japan could achieve in 2030.
46. Section text is adapted from Fransen et al. (2015).
47. Black carbon is a short-lived climate pollutant. Reducing black carbon offers a range of climate and human-health benefits. However, significant uncertainty and regional variation around the global warming potential of black carbon have led researchers to question whether it is appropriate to use a single metric to track greenhouse gas and black carbon reductions (Bond et al. 2013). It is helpful that Mexico disaggregated its goals and, given these uncertainties, the aggregated 25 percent goal, which Mexico has also provided, should be interpreted with caution.

48. According to the INDC, this commitment would result in a combined reduction of 25 percent in GHG and black carbon emissions relative to the 2030 baseline, assuming a GWP of 900 for black carbon.
49. According to the INDC, this commitment would result in a combined reduction of 40 percent of GHG and black carbon emissions relative to the 2030 baseline, assuming a GWP of 900 for black carbon.
50. http://www.inecc.gob.mx/descargas/cclimatico/2015_inv_nal_emis_gei.pdf.
51. Personal communication, Daniel Buira Clark, Instituto Nacional de Ecología y Cambio Climático (INECC) (June, 2015).
52. Informally, Mexican officials have suggested that the INDC baseline is dynamic, and that it could increase if, for example, new fossil-fuel reserves are discovered (Personal communication, Daniel Buira Clark, INECC (June, 2015)).
53. Mexico's LGCC puts forward a goal to achieve an absolute 50 percent reduction relative to 2000 levels by 2050.
54. More specifically, Mexico could provide information about its projection method (e.g., name and type of models used); the emissions drivers included; data sources used for these key drivers; and assumptions made for calculations regarding included policies and the policy cut-off year. For more information, see WRI (2015).
55. Despite this paper's focus on GHG mitigation targets, we include an assessment of Mexico's black carbon target here because our calculations are based on the INDC data specific to aggregated GHG and black carbon targets (see Appendix for more details).
56. http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/mexicocphaccord_app2.pdf.
57. Assuming the U.S. 2020 target of GHG emissions reductions in the range of 17 percent relative to 2005 levels is achieved.
58. A net-net accounting approach is defined as accounting relative to base year/period emissions (Greenhouse Gas Protocol 2014).
59. For more information, see https://unfccc.int/land_use_and_climate_change/lulucf/items/4015.php.
60. The U.S. INDC further acknowledges that there are "material data collection and methodological challenges to estimating emissions and removals" from the land sector.
61. This discussion does not consider additional areas of inherent uncertainty in assessing mitigation goals, such as the technical uncertainties in measuring GHG emissions.
62. Since GHGs are a global environmental problem where emissions from anywhere on the globe affect the climate everywhere on the globe, emissions reductions by any one Party are largely irrelevant if other Parties do not also reduce their emissions. Thus, the main reason a Party would commit to reducing its own emissions is that the commitment should encourage other Parties to do the same (Kantha 2015).
63. <http://www.wri.org/blog/2014/03/visualizing-global-carbon-budget>
64. <http://2015.newclimateeconomy.report/>.
65. The Öko Institut report uses land-use emissions from its projected business-as-usual scenario as the level against which any strengthening or weakening of the target is estimated, rather than net-net accounting for forest management and UNFCCC reporting methods for afforestation/reforestation. This approach results in an estimated strengthening of the target in some scenarios.
66. Mexico's most recent inventory uses 100-year GWP values from the IPCC's Fifth Assessment Report (IPCC 2014).
67. <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>.
68. Our calculated number is equal to a number provided in public presentations made by Mexican officials, which estimates 2013 emissions intensity to be approximately 40 kgCO₂e/1,000 pesos.
69. It is not specified whether the stated annual GDP growth rate of 3.6 percent is in real or nominal terms. We assume the former.

ACRONYMS AND ABBREVIATIONS

AAGR	Average Annual Growth Rate
BAU	Business-as-Usual
°C	Degree Celsius
CAIT	Climate Analysis Indicators Tool
CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
COP	Conference of the Parties to the UNFCCC
EU ETS	European Union Emissions Trading System
FMRL	Forest Management Reference Level
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GtCO ₂ e	Gigatonnes Carbon Dioxide Equivalent
GTP	Global Temperature Potential
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
INDC	Intended Nationally Determined Contribution
JCM	Joint Crediting Mechanism
LGCC	Ley General de Cambio Climatico (General Climate Change Law)
MSR	Market Stability Reserve
MtCO ₂ e	Million Tonnes Carbon Dioxide Equivalent
NF ₃	Nitrogen Trifluoride
N ₂ O	Nitrous Oxide
OCN	Open Climate Network
PFCs	Perfluorocarbons
SF ₆	Sulfur Hexafluoride
UNFCCC	United Nations Framework Convention on Climate Change
USD	U.S. Dollars
WRI	World Resources Institute

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ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

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COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

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We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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