



Global Emissions Within and Outside the Scope of Nationally Determined Contributions

A Preliminary Analysis of “Double Counting” Risks for Internationally Transferred Mitigation Outcomes

Analysis conducted by Gabriela Leslie, Climate Fellow, Environmental Defense Fund, with contributions from Alex Hanafi, Director of Multilateral Climate Strategy and Lead Counsel for EDF, and Annie Petsonk, International Counsel for EDF.

15 June 2018

Executive Summary

Key Findings

- This paper presents a preliminary analysis of the scope of potential double counting of emissions reductions traded as internationally transferred mitigation outcomes (ITMOs) under the Paris Agreement. The paper finds that a volume of emissions reductions equivalent to between 6.5% and 29.5% of current global emissions could be considered at “high risk” of double counting.
- In order to attain such estimates, four scenarios were crafted to explore the impact of a range of differing assumptions on what constitutes double counting “risk.” Estimates were based on sector and greenhouse gas coverage status, as well as GHG mitigation target type within each nation’s Nationally Determined Contribution (NDC).
- If nations that are not parties to the Paris Agreement are also considered as producers of “high risk” emissions reductions, the total share of the world’s emissions that are considered at “high risk” of double counting could increase further to 16% to 38% of world totals.
- To put such numbers in context, three out of four scenarios estimate that the total volume of emissions at risk of double counting exceeds the magnitude of the entire ambition of current NDCs relative to a 2030 current-policy baseline estimate. This suggests that double counting risk is not supply-limited, but rather demand-limited.

Background

Trading of emissions reductions through international carbon markets, including via the carbon market provisions of Article 6 of the Paris Agreement, has the potential to be a key tool for increasing global climate ambition by driving down the overall cost of reducing emissions.¹ Ensuring that these transfers are accounted properly towards national emissions reduction pledges, also known as “(Intended) Nationally Determined Contributions,” or (I)NDCs, will be vital to ensuring greenhouse gas (GHG) reductions are legitimate and contribute to achieving the Paris Agreement’s global mitigation goals.

One particular concern is that reductions, when traded, will be “double counted,” meaning counted once by the country of origin when reporting its emissions inventory, and again by the receiving country (or other entity) when justifying emissions above their pledged climate effort, usually via “offsetting” provisions. In a sense, allowing trades to be double counted means that, in actuality, none of the reported emissions reductions are achieved.

¹ EDF has estimated that, if such cost savings were reinvested into greater reductions, countries could nearly double the ambition of their existing climate goals at no additional cost. (Piris-Cabezas et al. “Carbon prices under carbon market scenarios consistent with the Paris Agreement: Implications for the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).” *EDF*. 20 March 2018. Web. https://www.edf.org/sites/default/files/documents/CORSIA%20Carbon%20Markets%20Scenarios_0.pdf)

Unlocking the potential climate gains offered by international trading requires comprehensive and enforceable rules to minimize the risk of double counting. Even so, opinions circulating within the climate talks aimed at developing the Paris Agreement’s rulebook for international carbon market cooperation are divided on the topic of accounting for internationally transferred mitigation outcomes (ITMOs). Should such rules seek to make the prohibition of double counting explicit for emissions reductions that happen both within and outside of the emissions coverage listed in NDCs? Discussions are complicated by the fact that the scope of the world’s emissions reductions that are at risk of double counting is still poorly understood.

Methodology

This paper seeks to address this lack of knowledge by quantifying the overall share of the world’s potential emissions reductions that, if traded, are likely at risk of double counting.² Shares of the world’s emissions were classified as either “high” or “low risk” of double counting based on two main criteria:

- 1) whether emissions are listed as covered under NDC sectors or gas types; and
- 2) whether an NDC proposes a GHG mitigation target type expressed in a metric that facilitates robust accounting.

It is a challenge to assess definitively the emissions reduction pathways within the world’s NDC submissions, due to their ambiguity and structural variety. Therefore, this paper assesses double counting risk under four scenarios, driven by different assumptions and interpretations. In all scenarios, we first assume nations adopt strong rules against double counting of mitigation outcomes that originate within clearly quantified (I)NDCS. As clear rules have yet to emerge with guidance on how and whether to avoid double counting in trades that occur outside (I)NDC coverage, emissions that fall outside explicit (I)NDC coverage are assumed to be “high risk.”³

In addition to the above assumptions, two different scenario categories were created to reflect alternate risk assumptions based on each nation’s (I)NDC GHG mitigation target type. “Category 1” scenarios do not assess risk by GHG mitigation target type; while “Category 2” scenarios assume that only nations with base year or baseline scenario GHG mitigation targets have the potential to produce “low risk” emissions reductions. China and India are also treated separately and have conditions that vary across scenarios, due to the materiality of their share of global emissions, the relative ambiguity of coverage under their NDCs, and the fact that they put forth intensity-based targets, rather than absolute caps.

Table 1: Scenario Comparisons and Descriptions

² For simplicity, these will be referred to from here on as “shares of the world’s emissions at high risk of double counting.”

³ The treatment of international bunker fuels—which under UNFCCC rules are reported separately, and which are a source of emissions not addressed under countries’ NDCs—also potentially influences our conclusions. This special category (in our dataset, estimated as a low bound of 2% of global emissions) is included under our estimate of world emissions, but not in either the low or high risk estimates for double counting described above. Depending on how rules for accounting for emissions offsetting done by these sectors unfold, the share of global emissions considered at risk of double counting could increase or decrease by the percentage of bunker totals.

	Target Type Assumptions	China and India Assumptions
Scenario 1A	1. All targets considered low risk, filtered by sector and GHG coverage.	A. China economy-wide, just CO ₂ ; India economy-wide, all GHGs
Scenario 1B	1. All targets considered low risk, filtered by sector and GHG coverage.	B. China power sector, just CO ₂ ; India NDC mentioned sectors, all GHGs
Scenario 2A	2. Only absolute limit NDC targets considered low risk.	A. China economy-wide, just CO ₂ ; India economy-wide, all GHGs
Scenario 2B	2. Only absolute limit NDC targets considered low risk.	B. China power sector, just CO ₂ ; India NDC mentioned sectors, all GHGs

In a final test, Scenarios 1A and 2B were run with the additional assumption that nations that are not Parties to the Paris Agreement cannot provide “low-risk” emissions reductions.⁴ Thus, non-Party emissions totals were added to the “high-risk” categories in Scenarios 1A and 2B, resulting in two new scenarios termed “1A.N” and “2B.N.”

Results

In all scenarios, the share of the world’s emissions at high risk of double counting was substantial. Even in the most generous scenario, where all types of NDC mitigation targets were considered to entail low risks of double counting, we found that 6.5% of the world’s yearly emissions were at high risk of double counting—more than all of India’s emissions put together. Our most conservative estimate resulted in a much higher volume of high risk emissions, about 29.5% of the world’s emissions (Table 2).

In our additional scenarios 1A.N and 2B.N, the emissions that are classified as “low double counting risk” are reduced from 67 - 90% to 57 - 80% of world totals. If instead we include non-participating countries’ emissions in the high risk category, the total share of world emissions considered at risk of double counting increases from 6.5 - 29.5% to the range of 16 - 38% of world totals (Table 3).

⁴ The United States of America is considered in this analysis as a Party to the Paris agreement, as the process of withdrawal from the Agreement has not yet taken effect.

Table 2: Share of world’s emissions considered at “high risk” vs “low risk” of Double Counting, by Scenario.

	Total Low-Risk Emissions		Total High-Risk Emissions	
	Millions of tonnes (MMT CO ₂ e)	% of world’s emissions*	Millions of tonnes (MMT CO ₂ e)	% of world’s emissions*
Scenario 1A	45,593	90%	3,272	6.5%
Scenario 1B	37,290	74%	11,575	23%
Scenario 2A	42,228	83%	6,637	13%
Scenario 2B	33,925	67%	14,940	29.5%

*Percentages calculated relative to a world emissions total of 50613.26 MMT. Percentages do not add up to 100% as the following emissions are considered as part of the world’s total but not included as part of either high or low risk emissions: No NDC Submitted (211.83 MMT) and Remaining Emissions of 1536.22 MMT, including international bunker fuel emissions not attributed to individual countries, as well as certain regional emissions not disaggregated in the data (e.g. Monaco, Palestine, San Marino, South Sudan, and Timor-Leste).

Table 3: Total Volume of “High Risk” Emissions, if non-Parties are considered at risk of Double Counting

	Total Low-Risk Emissions		Total High-Risk Emissions	
	Millions of tonnes (MMT CO ₂ e/yr)	%* of world’s emissions	Millions of tonnes (MMT CO ₂ e/yr)	% of world’s emissions*
Scenario 1A.N	40,764	80.5%	8,102	16%
Scenario 2B.N	29,574	58.5%	19,291	38%

*Emissions from non-ratifying nations total 5157 MMT (10% of world) and are in this case considered as “high risk” emissions. Percentages do not add up to 100% as the following emissions are considered as part of the world’s total but not included as part of either the high or low risk emissions: No NDC Submitted (211.83 MMT) and Remaining Emissions of 1536.22 MMT, including international bunker fuel emissions not attributed to individual countries, as well as certain regional emissions not disaggregated in the data (e.g. Monaco, Palestine, San Marino, South Sudan, and Timor-Leste).

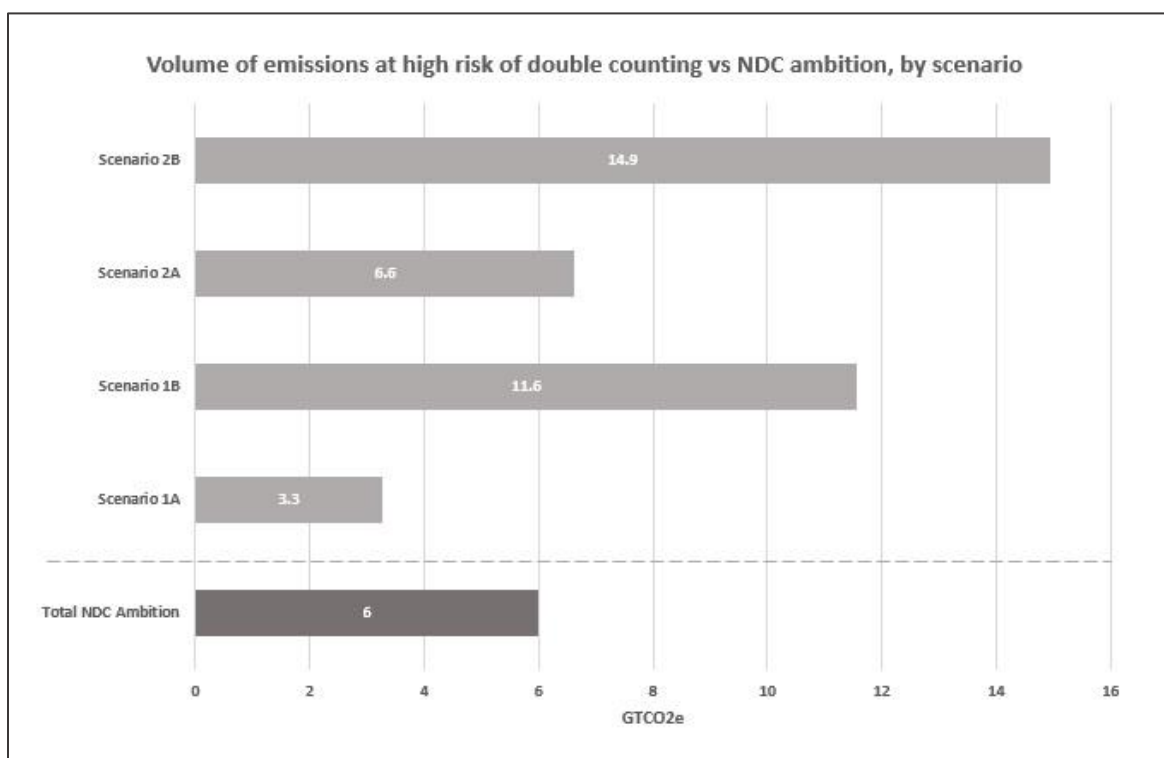
What’s more, these volumes of double counting risk are of a magnitude large enough to make a significant impact on the success of global GHG mitigation efforts through 2030. To illustrate, the total reductions predicted by full implementation of NDCs compared to a “current policy” baseline trajectory is estimated by the UNEP to total approximately 6 GTCO₂e (about 12% of current world emissions) by 2030.⁵

Three out of four of our scenarios estimate that the share of the world’s emissions at risk of double counting exceeds 6 GT, implying that, in the absence of rigorous “no double counting”

⁵ “The Emissions Gap Report 2017: A UN Environment Synthesis Report.” UNEP. November 2017. Web. https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf

rules under the Paris Agreement, every ITMO transferred for use to meet a country’s NDC could theoretically source from a “high risk” emissions reduction (except under Scenario 1A), and thus be double counted. In other words, while it may not be realistic to assume NDCs will be met entirely by trading ITMOs, the potential supply of high risk emissions is not currently the limiting factor; the potential demand under NDCs—and the quality of rules to be agreed to prevent double counting—would be.

Figure 1: Simplified visualization of the share of the world’s emissions considered at “high risk” of double compared to projected NDC ambition



Note: Scenario volumes are not intended to show predicted emissions trajectories through 2030, but rather are intended to compare the magnitude of emissions at risk of double counting with the total predicted climate gains from full implementation of both conditional and unconditional NDCs. Median estimates of total annual GHG emissions under “current policy trajectory” and “NDC implementation” scenarios are taken from the UNEP Emissions Gap Report 2017.

In conclusion, this preliminary analysis identifies the significant scope of emissions that are at special risk of being double counted, if accounting guidance to be adopted under Article 6 of the Paris Agreement were to discriminate between mitigation originating within versus outside of NDCs, or would fail to address the risks of double counting of transfers from mitigation target types that cannot be expressed as quantified GHG emissions limits. The analysis underscores the need for clear rules and strong transparency to avoid double counting of internationally transferred mitigation outcomes, regardless of whether they originate from within or outside of the scope of NDCs. Without such rules, the double counting of emissions reductions would substantially undermine the effectiveness of global emissions abatement efforts and prevent the world from taking full advantage of the climate gains presented by international trading, at a high cost to those most vulnerable to the impacts of climate change.

Full Results

Background

In the climate talks now underway aimed at developing the “rulebook” for implementing the carbon accounting, transparency, and carbon market-related provisions of the Paris Agreement,⁶ questions have arisen as to how best ensure environmental integrity within the Nationally Determined Contributions (“NDCs”) made by countries to limit and reduce their climate-damaging greenhouse gas emissions.

The Question of Double Counting

The official stances of negotiating Parties are varied on the issue of double counting, referring to the situation where emissions reductions are counted once by the issuing/host party, and again by the purchasing party. Some Parties are of the view that when countries select which sectors and greenhouse gas emissions to cover within their NDCs, they retain the prerogative to transfer mitigation outcomes from outside their NDCs, even though their NDCs do not explicitly cover those emissions reductions. These Parties reason that they should be able to transfer outcomes from outside their NDC without being accountable for those transfers when reporting on whether they achieved their national emissions reductions targets under Article 4.13 of the Paris Agreement.

Other Parties reason that if Parties generate emissions reductions in non-NDC sectors and attempt to claim such reductions in their inventory reports to the United Nations Framework Convention on Climate Change (UNFCCC) while also transferring such reduction credits to other Parties or to other entities with carbon compliance obligations, such as airlines, then those reductions are considered “double counted.”

In this case, the main concern is that such reductions will be counted once by the country of origin when reporting its emissions inventory, and again by the receiving country (or airline) when using the same reductions to justify an increase in their own emissions above pledged levels, usually via “offsetting” provisions.

These Parties note that Article 6.2 authorizes the development of guidance that applies robust accounting when mitigation outcomes are transferred towards NDCs, regardless of the source of the transfer. They reason that applying rigorous accounting guidance to both NDC-origin and non-NDC-origin transfers would support PA Article 4.4’s encouragement to move towards economy-wide targets, since non-NDC sectors would then not be at risk of generating double-countable credits. Furthermore, if transfers occur via PA Article 6.4, ensuring no transfers are double counted would support Article 6.4(d)’s aim to deliver overall mitigation of global emissions levels. Counting such transfers twice would not.

Still other Parties have noted that doublecounting questions are not limited to non-NDC sectors—emissions that are covered by NDCs also have the potential to be double counted, depending on the coverage and type of NDCs from which the transfers originate. For example, if mitigation transfers are accounted for using absolute emissions terms, while the corresponding NDCs such reductions originated from are accounted using intensity terms, then it may be less obvious how adjustments must be made to the issuing Party’s accounting process to avoid

⁶ Respectively, Article 4.13, Article 13, and Article 6 of the Paris Agreement

double counting the transfers. Thus, the risk of double counting of those transfers concomitantly increases.

The Question of Transparency

Article 13 of the Paris Agreement requires provision of information necessary to track progress in implementing NDCs. Some Parties interpret this language as meaning that only NDC-origin transfers need be reported. Other Parties point to the requirement in Article 13 and accompanying decisions to report information needed to provide “a clear understanding of climate change action in the light of the objective of the Convention.”

Such action, they note, is not limited to NDC sector activities, but rather speaks to any action. These Parties further point to language in the Paris Decisions indicating that the purpose of the guidance under Decision 1/CP.21 ¶92 is to ensure environmental integrity, transparency, accuracy, completeness, and the avoidance of double counting. Thus, in their view, the Decision necessitates the reporting and accounting of all transferred or transferable mitigation outcomes, as without such information, completeness and the avoidance of double counting could not be assured.

In sum, the fundamental test of the “clear understanding of climate change action in the light of the objective of the UN Framework Convention of Climate Change” (Paris Agreement Article 13.5) is the extent to which nations’ total emissions are going down. International market-based trading mechanisms offer the potential to increase the pace and extent of emissions reduction by lowering the cost of decarbonization.⁷ However, in order to fully benefit from carbon markets and to achieve the goal of limiting temperature rise under the Paris Agreement, ensuring environmental integrity in all emissions exchanges and inventory reporting will be essential.

Ambiguity and lack of comprehensiveness in Parties’ mitigation pledges and reporting frameworks risks leaving a meaningful share of the world’s emissions vulnerable to double counting – but discussions on the topic are complicated by the fact that the overall scope of the world’s emissions that can be considered at risk of double counting is poorly understood.

This paper sought to close this knowledge gap by assessing the possible upper and lower bounds of the share of the world’s potential emissions reductions vulnerable to double counting, and thus draw conclusions about the degree to which double counting rules should be prioritized within future climate talks.

Methodology

In this paper, we first assume nations adopt strong rules against double counting of mitigation outcomes that originate within NDCs that specify emissions limits. We then evaluate the total share of the world’s greenhouse gas emissions as of 2014 from which transferred mitigation outcomes would be at special risk of doublecounting, either because they lie outside of NDCs, or

⁷ Piris-Cabezas et al. “Carbon prices under carbon market scenarios consistent with the Paris Agreement: Implications for the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).” *EDF*. 20 March 2018. Web.

https://www.edf.org/sites/default/files/documents/CORSIA%20Carbon%20Markets%20Scenarios_0.pdf

because they originate in NDCs with GHG mitigation target types that are vulnerable to double counting.⁸

We begin by classifying NDCs based on their mitigation target type, sector coverage, and greenhouse gas (GHG) coverage. We estimate total emissions coverage by assessing which sectors and GHG types are reported as covered within each nation's official NDC submission to the UNFCCC. Then, we create four scenarios to allow us to estimate shares of emissions either at "high" or "low" risk for double counting.

Data Sources

For global emissions data, we used the World Resources Institute (WRI) CAIT Historical Emissions dataset for national estimates of sector-level and greenhouse-gas-specific emissions.⁹ In order to focus on gross emissions that can be mitigated, we include emissions from LULUCF only to the extent they are positive at the national level.¹⁰

In order to assess all countries' NDC contributions in a consistent fashion, we based our NDC classifications on those listed in Climate Watch NDC Content database.¹¹ As our analytical framework was designed to first interpret the share of the world's emissions that are covered under NDCs using the reported content from the NDCs themselves, we did not have a reliable method for estimating the emissions coverage of nations that did not submit an NDC (Libya, Nicaragua, and Syria). We classified the total emissions from these nations separately, as neither "high-" nor "low-risk."¹²

Presenting a second constraint, our emissions dataset did not have disaggregated emissions estimates for five submitted NDCs: Monaco, Palestine, San Marino, South Sudan, and Timor-Leste. As we do not have emissions estimates for these, we could not disaggregate their coverage totals, and thus did not classify their emissions as either high or low risk in our scenarios. Instead, their net total emissions are implicitly included in a second separate category, "Remaining Emissions." Like the Non-NDC emissions category, the "Remaining Emissions" category is not included in coverage scenarios. It reflects the difference between the sum total of national emissions estimates and global emissions volumes.

International bunker emissions (Maritime and Aviation) are also treated separately from our coverage scenarios, as, in keeping with IPCC Inventory guidance, Parties report them separately to the UNFCCC; they are not tracked by national emissions inventories and are not declared as covered under NDCs. Therefore, the total volume of international bunker emissions is also

⁸ Henceforth these will simply be referred to as "the share of the world's emissions at high risk of double counting."

⁹ "ClimateWatch: Historical GHG Emissions, CAIT, 2014." Climate Watch, 2018. Web.

<https://www.climatewatchdata.org/ghg-emissions>

¹⁰ WRI's database provides net rather than gross LULUCF emissions, which are separately reported and can be positive or negative at the national scale. We exclude cases where overall national LULUCF emissions are net negative, but, as those cases may have a certain amount of gross positive emissions that we do not see in net estimates, we still underestimate the total gross emissions from the land-use sector. This yields a lower bound estimate of total gross world emissions.

¹¹ "ClimateWatch: NDC Content." Climate Watch, 2018. Web. <https://www.climatewatchdata.org/ndcs/table>

¹² The total volume of emissions from nations that did not submit an NDC was 211.83 MMTCO_{2e}, approximately 0.4% of total world emissions. Thus, treating such emissions as a separate category that was neither "high" nor "low" risk only minimally affects the magnitude of the rest of our coverage scenarios.

included in the “Remaining Emissions” category for the purposes of this study.¹³ We did not impose assumptions on the double counting risk profile of international bunker emissions. Processes are underway in the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO) to address these emissions.¹⁴ However, it is unclear at this time whether those processes and the processes underway in the Paris Agreement context will insulate those emissions reductions from double counting. Bunker emissions, then, could feasibly influence the volume of emissions reductions vulnerable to double counting, especially as emissions volumes, and thus reduction needs, from aviation and marine shipping grow in the future. However, as the Paris Parties and ICAO/IMO have yet to complete their rulebooks, we chose to treat such emissions as a separate category from our country-level analysis.

Coverage Classification Standards

To assess the total volume of emissions under each NDC considered “covered,” we parsed the Climate Watch NDC Content dataset on emissions coverage under NDCs according to three criteria: mitigation target type, greenhouse gas (GHG) coverage, and sectoral coverage. These criteria serve as proxies for how nations may account for their emissions reductions in coming years. For the purposes of this analysis, we define emissions as “covered within NDCs” if they derive from sectors and greenhouse gas types that are listed as “covered” under NDCs with quantifiable GHG targets or are mentioned within action-based targets for NDCs without quantifiable targets.

Climate Watch classifies mitigation targets as either “GHG Targets,” “Non-GHG Targets,” or “Actions Only.” Within the scope of GHG Targets, the results are broken down further into “Base Year Targets,” “Baseline Scenario Targets,” “Fixed level Targets,” “Intensity Targets,” and “Trajectory Targets.” GHG coverage is classified according to the seven Kyoto Protocol gases (CO₂, CH₄, N₂O, SF₆, NF₃, HFCs, and PFCs), but due to emissions data limitations we only tracked coverage of CO₂, CH₄, N₂O, and F-gases. The Climate Watch dataset categorizes the sectoral coverage of NDCs into three main classes: “All Sectors” (with and without LUCF), “Partial Sectors,” and Unspecified.

For those nations that were classified as having “Partial Sector” coverage, we manually interpreted their NDCs and matched them to the closest IPCC Common Reporting Framework sub-category for which we had emissions data.¹⁵ In most cases, nations report sub-sector coverage using the criteria established by the IPCC and thus cleanly matched our emissions data. However, some reported sectors were not broken down along the sectoral lines recommended by the IPCC; in such cases, we mapped the sectors mentioned in the NDC to the most similar sector from IPCC. This approach is imperfect, but its impact on overall estimates is limited. In total, nations with reported “Partial Sector” coverage are responsible for about 8.9%

¹³ The total estimated volume of bunker emissions within the CAIT dataset is 1054 MMTCO₂e (approx. 2% of world emissions); depending on how one classifies the risk profile of emissions from these sectors, our total risk assessments could vary by up to 2%.

¹⁴ “Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).” *International Civil Aviation Organization*. 2018. Web. <https://www.icao.int/environmental-protection/Pages/market-based-measures.aspx>; “International: IMO Marine Engine Regulations.” *DieselNet*. 2018. Web. <https://www.dieselnets.com/standards/inter/imo.php>

¹⁵ “Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reporting Instructions.” *International Panel on Climate Change*. 1996. Web. <https://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ri.pdf>

of total world emissions. Within those, only 1,075 MMT came from nations with irregular sector reporting (2% of total world emissions).

For nations that had “unspecified” sector coverage, we applied a second layer of manual NDC interpretation. If a nation had listed GHG coverage, but no sector coverage, we filtered their NDC coverage totals according to the volume of emissions from covered gases. If a nation had neither formally specified their sectors nor greenhouse gas coverage, we matched the sectors mentioned within action-based mitigation targets in their NDCs with the closest IPCC sector category for which we had emissions data.

Scenario Assumptions

Four scenarios were used to classify the share of the world’s emissions that can be considered at “high risk” of double counting. The scenarios vary in two ways: firstly, by the type of mitigation targets that are considered to be sufficiently robust as to adequately account for emissions transfers and secondly, in how we interpret China and India’s NDC coverage. China and India are treated separately from other large emitters as they have intensity-based targets, rather than absolute caps or target reductions relative to a projected baseline. They are also treated separately from other nations with intensity-based targets due to the materiality of their emissions volumes, relative to global shares.

The four scenarios are broken down as follows:

Scenario 1A:

- All Mitigation Target types (total emissions limits and intensity or action-based targets) are considered eligible for providing “emissions at a low risk of having their reductions double counted.”
- Emissions considered “covered under NDCs” are filtered by reported sector coverage and GHG coverage.
- All of China’s CO₂ emissions are considered “covered under NDC,” and thus at a low-risk of double counting; emissions from remaining GHGs are considered “not covered under NDC,” and thus at a high risk of double counting.
- Emissions from all of India’s sectors, for all GHGs, are considered “covered under NDC,” and thus at a low-risk of double counting.

Scenario 1B:

- All Mitigation Target types (total emissions limits and intensity or action-based targets) are considered eligible for providing “emissions at a low risk of having their reductions double counted.”
- Emissions considered “covered under NDCs” are filtered by reported sector coverage and GHG coverage.
- Only China’s CO₂ emissions from the Power Sector are considered “covered under NDC,” and thus at a low risk of double counting reductions; remaining emissions are considered “not covered under NDC,” and thus at a high risk of double counting reductions.
- Emissions from only those sectors mentioned for specific actions in India’s NDC, for all GHGs, are considered “covered under NDC,” and thus at a low-risk of double counting

reductions. Non-mentioned sectors are considered “not covered under NDC,” and thus at a high risk of double counting reductions.

Scenario 2A:

- Only nations with Base Year, Baseline Scenario, or Fixed Year targets are considered eligible for providing “emissions at a low risk of having their reductions double counted;” Nations with “Intensity / Trajectory” targets, “Non-GHG” targets, or “Action-based” targets are considered at “high-risk” of having reductions double counted.
- Emissions considered “covered under NDCs” from the “low-risk” set are filtered by reported sector coverage and GHG coverage. Emissions from the “high-risk” set are not considered as “covered under NDCs.”
- All of China’s CO₂ emissions are considered “covered under NDC,” and thus at a low-risk of double counting reductions; emissions from remaining GHGs are considered “not covered under NDC,” and thus at a high risk of double counting reductions.
- Emissions from all of India’s sectors, for all GHGs, are considered “covered under NDC,” and thus at a low-risk of double counting reductions.

Scenario 2B:

- Only nations with Base Year, Baseline Scenario, or Fixed Year targets are considered eligible for providing “emissions at a low risk of having their reductions double counted;” Nations with “Intensity / Trajectory” targets, “Non-GHG” targets, or “Action-based” targets are considered at “high-risk” of having reductions double counted.
- Emissions considered “covered under NDCs” from the “low-risk” set are filtered by reported sector coverage and GHG coverage. Emissions from the “high-risk” set are not considered as “covered under NDCs.”
- Only China’s CO₂ emissions from the Power Sector are considered “covered under NDC,” and thus at a low risk of double counting reductions; remaining emissions are considered “not covered under NDC,” and thus at a high risk of double counting reductions.
- Emissions from only those sectors mentioned for specific actions in India’s NDC, for all GHGs, are considered “covered under NDC,” and thus at a low-risk of double counting reductions. Non-mentioned sectors are considered “not covered under NDC,” and thus at a high risk of double counting reductions.

The “Category 1 Scenarios” (Scenarios 1A and 1B) were crafted to reflect the following assumption: as long as nations list individual sectors or greenhouse gases in their NDC, either through official documentation of coverage or implied through action-based mitigation targets, such emissions targets will be of a sufficiently quality to ensure no double counting. Emissions that fall outside those sectors or those from non-reported GHGs are not considered to be subject to the same scrutiny as those covered by NDCs; thus, they are at a high risk of being double counted.

The “Category 2 Scenarios” (Scenarios 2A and 2B) were crafted to reflect the following assumption: NDCs with ambiguous boundaries and GHG mitigation targets that do not utilize emissions quantity limits make it harder to determine which emissions reductions trades are or are not at high risk of being double counted within an economy. This case applies particularly to

nations with Intensity targets, as developers of technological improvements that lower the carbon intensity of their nation's economy may also attempt to sell their emissions reduction credits on international markets, complicating the carbon accounting process. Finally, as NDCs are designed to evolve in their scope and ambition, there is the risk that nations that host trades outside of NDC coverage at present will then attempt to count such reductions in the future towards compliance with NDCs of a greater coverage scope or quantity ambition.

Both scenario categories are subject to two different assumptions about China and India's coverage status, referred to here as "Category A and B scenarios." In the first, China and India's intensity targets are interpreted as being "economy-wide," and we assume that their accounting mechanisms will be sufficiently robust to prevent double counting of emissions reductions that modify the carbon intensity of their economies. In the second, only CO₂ emissions from fossil fuel-based power sources are considered "covered" within China's NDC, and only the sectors that are mentioned for specific mitigation actions are considered "covered" within India's NDC.

We have selected to cover only CO₂ emissions in China for both Category A and B scenarios, as their NDC has listed only CO₂ emissions as formally "covered" under their pledge. In the most narrow coverage scenario, we have limited "coverage" to only CO₂ in China's power sector. This is because, despite plans to gradually expand sector coverage, their national Emissions Trading Scheme will begin by capping emissions within their power sector only.¹⁶ It is reasonable to assume that emissions traded under an ETS mechanisms will be accounted for with a high level of transparency and quality. However, the accounting mechanisms for non-ETS emissions reductions have yet to be defined, and thus are not considered as eligible for being categorized as "low risk" emissions in our conservative Category B scenarios.

India's NDC does not specify which gases are covered versus not covered;¹⁷ therefore, we assume that all GHG emissions have the potential to be covered under their NDC. Similarly to China, their intensity-based mitigation target could be interpreted as "economy-wide;" hence, in our Category A scenario we consider their emissions to be fully covered, as in China. However, in our Category B scenarios, we impose the assumption that only sectors that are tied to specific mitigation actions as listed in their NDC will have sufficiently stringent accounting mechanisms in place as to be considered "low risk." Therefore, only select sectors are considered as such in the Category B scenarios. Our approach only considers the emissions from entire sectors, despite the fact they may only have partial mention within mitigation actions. While this approach lacks nuance, assessing the sub-sector share of coverage and reduction potential within India's national mitigation actions would require a separate study in and of itself, and thus is not within the scope of this preliminary analysis.

Thus, the four scenario permutations (1A, 1B, 2A, and 2B) emerge as described in Table 4.

¹⁶ "ETS Detailed Information: China." *International Carbon Action Partnership*. 2018. Web.

[https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems\[\]=55](https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=55)

¹⁷ India's NATCOM has reported six different greenhouse gases, so we base our assumption on that reporting (<http://pib.nic.in/newsite/PrintRelease.aspx?relid=135727>). However, INCCA estimates report only three gases, so our assumptions may be an overestimate of actual gas coverage if INCCA standards are to be used (http://www.moef.nic.in/downloads/public-information/Report_INCCA.pdf).

Table 4: Scenario Comparisons and Descriptions

	Target Type Assumptions	China and India Assumptions
Scenario 1A	1. All targets considered low risk, filtered by sector and GHG coverage.	A. China economy-wide, just CO ₂ ; India economy-wide, all GHGs
Scenario 1B	1. All targets considered low risk, filtered by sector and GHG coverage.	B. China power sector, just CO ₂ ; India NDC mentioned sectors, all GHGs
Scenario 2A	2. Only absolute limit NDC targets considered low risk.	A. China economy-wide, just CO ₂ ; India economy-wide, all GHGs
Scenario 2B	2. Only absolute limit NDC targets considered low risk.	B. China power sector, just CO ₂ ; India NDC mentioned sectors, all GHGs

Finally, we compared the results of all scenarios to our best estimate of total world gross emissions in 2014 (50,613 MMT). This estimate includes the CAIT dataset’s global estimate of emissions excluding land use change (45,740 MMT) plus the total of LULUCF emissions (4,872 MMT) in the cases where these are net positive for the country.^{18,19} To summarize, the share of “low risk” emissions under each scenario is the following:

$$\frac{\text{Total volume of Covered Emissions (MMT), within (I)NDCs deemed low risk according to scenario, considering all nations that have submitted an (I)NDC, regardless of ratification status}}{\text{Total Global Emissions (MMT)}}$$

The share of emissions considered to be “high risk” under each scenario is the following:

$$\frac{\text{Total volume of Uncovered Emissions (MMT), across all (I)NDC mitigation target types + all emissions from (I)NDCs with high risk mitigation target types according to scenario, considering all nations that have submitted an (I)NDC, regardless of ratification status}}{\text{Total Global Emissions (MMT)}}$$

One further cut of the data was performed to examine results for only nations that are Parties to the Paris Agreement (at the time of data collection). The reasoning for this is rules crafted by the Parties to the Paris Agreement to prevent double counting might not apply to non-Parties.²⁰ With this cut of the data, we sought to explore whether our prior coverage estimates would substantially change when non-Party nations were omitted from consideration. Within our

¹⁸ WRI’s database only provides net LULUCF emissions. Thus, while excluding cases where overall national LULUCF emissions are net negative, we still underestimate the total gross emissions from the land-use sector, yielding a lower bound estimate of total gross world emissions.

¹⁹ The total estimate of net-negative LUCF emissions from the CAIT dataset total -1726.067 MMT, with nearly half of those emissions coming from the top five sequestering nations: China, Romania, Russia, Malaysia, and Chile.

²⁰ It may be noted that many multilateral environmental agreements include provisions authorizing trade with non-Parties provided that the non-Parties observe comparable environmental protections. Whether the Paris Agreement Parties might adopt such an approach remains to be seen.

dataset, 171 out of 191 nations are listed as having ratified the Agreement (including the United States, as the withdrawal process is not yet complete).²¹

To simplify the scope of this corollary assessment, only the highest and lowest coverage scenarios were applied (Scenarios 1A and 2B, respectively). To distinguish the two, these scenarios will be referred to henceforth as Scenarios 1A.N and 2B.N. In this case, the share of “low risk” emissions under each scenario is the following:

$$\frac{\text{Total volume of Covered Emissions (MMT), within NDCs deemed low risk according to scenario, considering only nations that are Parties to the Paris Agreement}}{\text{Total Global Emissions (MMT)}}$$

The share of emissions considered to be “high risk” under each scenario is the following:

$$\frac{\text{Total volume of Uncovered Emissions (MMT), across all NDC mitigation target types + all emissions from (I)NDCs with high risk mitigation target types according to scenario, considering all nations that have submitted (I)NDCs}}{\text{Total Global Emissions (MMT)}}$$

Results

The four scenarios vary in terms of how stringent a definition of emissions coverage they impose upon emissions subsets, with the Category A scenarios being substantially less stringent than the Category B scenarios, which imposed limitations on China and India’s NDC coverage. As a result, Scenario 1A was our most generous estimate of “low-risk” emission totals, with only 6.5% of the world’s emissions classified as “high-risk.” Scenario 2A was the next most optimistic, with only 13.1% of the world’s emissions classified as “high risk.” The more conservative scenarios 1B and 2B totaled “high-risk” emissions at 22.9% and 29.5% of world emissions, respectively.

The summary of total results across all four scenarios can be found in Table 5 and Figure 2, with a full breakdown of results in Tables 6 and 7 below.

Table 5: Share of world’s emissions considered at “high risk” vs “low risk” of Double Counting, by Scenario.

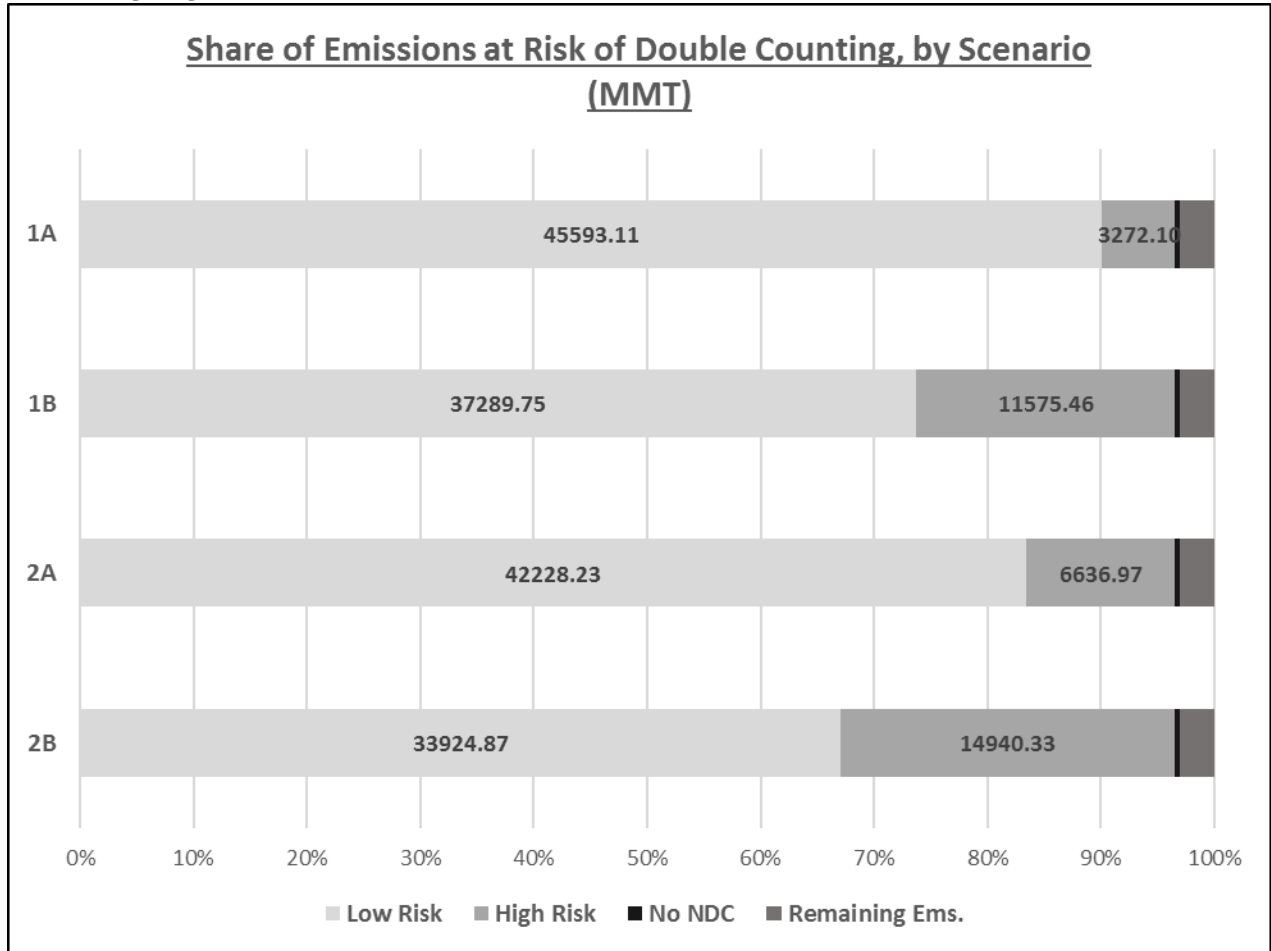
	Total Low-Risk Emissions		Total High-Risk Emissions	
	Millions of tonnes (MMT CO ₂ e)	% of world’s emissions*	Millions of tonnes (MMT CO ₂ e)	% of world’s emissions*
Scenario 1A	45,593	90%	3,272	6.5%
Scenario 1B	37,290	74%	11,575	23%
Scenario 2A	42,228	83%	6,637	13%
Scenario 2B	33,925	67%	14,940	29.5%

*Percentages calculated relative to a world emissions total of 50613.26 MMT. Percentages do not add up to 100% as the following emissions are considered as part of the world’s total but not included as part of either the high or low risk emissions: No NDC Submitted (211.83 MMT) and Remaining Emissions of 1536.22 MMT, including

²¹ In our dataset, the total emissions volume of the USA in 2014 is 6389 MMT, or 12% of world. If the USA were moved to the Non-Party set, the coverage share of Party nations could decrease by up to that amount.

international bunker fuel emissions not attributed to individual countries, as well as certain regional emissions not disaggregated in the data (e.g. Monaco, Palestine, San Marino, South Sudan, and Timor-Leste).

Figure 2: Total Share of World Emissions Considered at “High Risk” of Double Counting, by Scenario



As can be seen above, the type and scope of assumptions imposed upon our scenarios greatly influence the results, and the amount of variation in such estimates can be high. This was evident in our study, with the full range of “high-risk” volume estimates ranging from 6.5% to 29.5%. Even despite such uncertainty, even the lower-bounds of high-risk emissions volumes across all scenarios are non-negligible.

Scenario	Description	Base Year Targets		Baseline Scenario Targets		Fixed Level Targets		Intensity/Trajectory Targets		Non-GHG and Action Targets		China			India		TOTAL LOW RISK EMS.	TOTAL HIGH RISK EMS.
		COV	UNCOV	COV	UNCOV	COV	UNCOV	COV	UNCOV	COV	UNCOV	COV	UNCOV	CO2 ems, Power Sect.	CO2 ems, other	Non CO2 ems, all		
Scenario 1A	All targets considered valid, filtered by sector and ghg coverage.	17847.47	113.60	10142.46	885.54	707.26	14.11	1480.33	22.76	1884.54	652.29	3729.65	6599.08	1583.80	1498.03	1704.28	45593.11	3272.10
Scenario 1B	All targets considered valid, filtered by sector and ghg coverage.	17847.47	113.60	10142.46	885.54	707.26	14.11	1480.33	22.76	1884.54	652.29	3729.65	6599.08	1583.80	1498.03	1704.28	37289.75	11575.46
Scenario 2A	Only "stringent" NDC targets considered eligible for coverage, filtered by sector and ghg coverage.	17847.47	113.60	10142.46	885.54	707.26	14.11	1480.33	22.76	1884.54	652.29	3729.65	6599.08	1583.80	1498.03	1704.28	42228.23	6636.97
Scenario 2B	Only "stringent" NDC targets considered eligible for coverage, filtered by sector and ghg coverage.	17847.47	113.60	10142.46	885.54	707.26	14.11	1480.33	22.76	1884.54	652.29	3729.65	6599.08	1583.80	1498.03	1704.28	33924.87	14940.33
															No NDC Submitted	211.83		
															Remaining Emissions	1336.22		
															Total World	50613.26		

Table 6: Results breakdown (MMTCO2e) – Total emissions coverage by NDC Mitigation Target Type, by Scenario, with China and India coverage estimates considered separately for each category.

Note: Cells shaded in green are emissions volumes that are considered as being at low risk of double counting/claiming for each scenario.

Scenario	Description	Base Year Targets		Baseline Scenario Targets		Fixed Level Targets		Intensity/Trajectory Targets		Non-GHG and Action Targets		China			India		TOTAL LOW RISK EMS.	TOTAL HIGH RISK EMS.
		COV	UNCOV	COV	UNCOV	COV	UNCOV	COV	UNCOV	COV	UNCOV	CO2 ems, Power Sect.	CO2 ems, other	Non CO2 ems, all	NDC mentioned sector ems.	Other ems.		
Scenario A	All targets considered valid, filtered by sector and ghg coverage.	35.3%	0.2%	20.0%	1.7%	1.4%	0.0%	2.9%	0.0%	3.7%	1.3%	7.4%	13.0%	3.1%	3.0%	3.4%	90.1%	6.5%
Scenario B	All targets considered valid, filtered by sector and ghg coverage.	35.3%	0.2%	20.0%	1.7%	1.4%	0.0%	2.9%	0.0%	3.7%	1.3%	7.4%	13.0%	3.1%	3.0%	3.4%	73.7%	22.9%
Scenario C	Only "stringent" NDC targets considered eligible for coverage, filtered by sector and ghg coverage.	35.3%	0.2%	20.0%	1.7%	1.4%	0.0%	2.9%	0.0%	3.7%	1.3%	7.4%	13.0%	3.1%	3.0%	3.4%	83.4%	13.1%
Scenario D	Only "stringent" NDC targets considered eligible for coverage, filtered by sector and ghg coverage.	35.3%	0.2%	20.0%	1.7%	1.4%	0.0%	2.9%	0.0%	3.7%	1.3%	7.4%	13.0%	3.1%	3.0%	3.4%	67.0%	29.5%
															No NDC Submitted		211.83	
															Remaining Emissions		1536.22	
															Total		50613.26	

Table 7: Results breakdown (% of world) – Total emissions coverage by NDC Mitigation Target Type, by Scenario, with China and India coverage estimates considered separately for each category.

Note: Cells shaded in green are emissions volumes that are considered as being at low risk of double counting/claiming for each scenario.

Coverage of Emissions Under Parties to Paris

Within Scenarios 1A.N and 2B.N, the potential share of the world’s emissions that are classified as “high risk” of double counting increases even further, to 16% to 38% of total world emissions (Table 8).

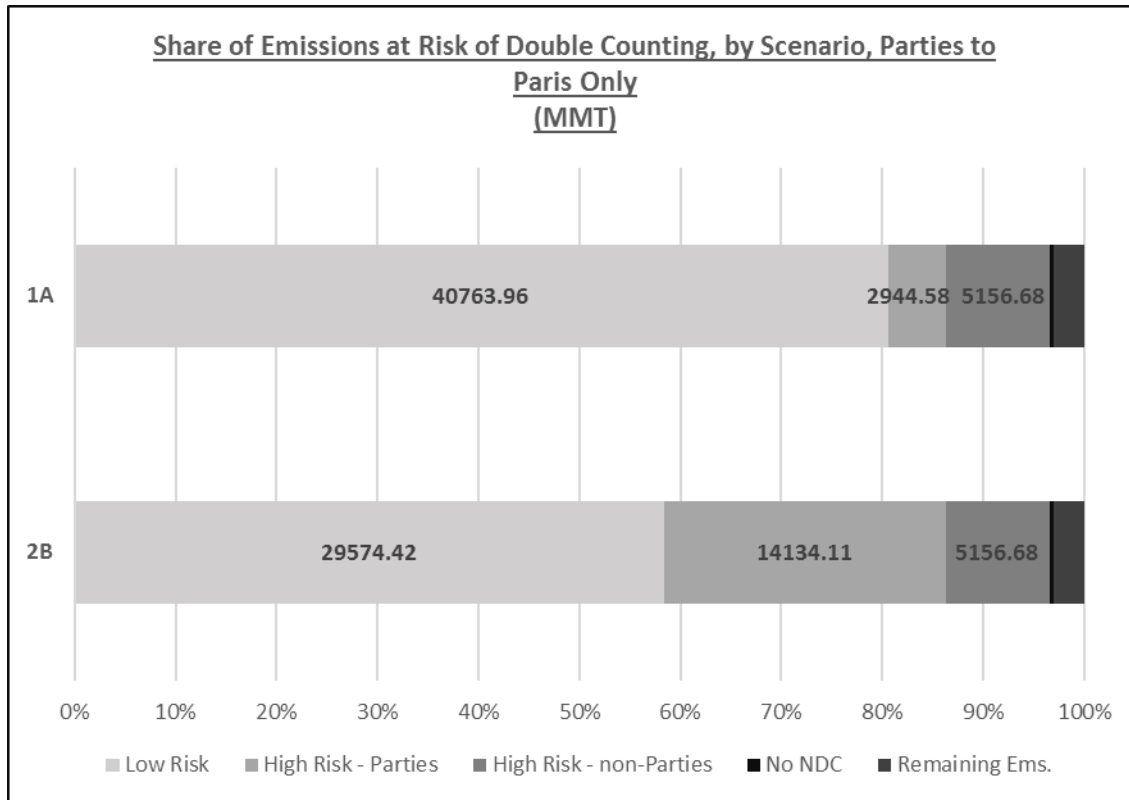
It is important to note, however, that the total volume of emissions generated by non-Party nations is approximately 5,157 MMT, or about 10.2% of world total emissions. For the purposes of this paper, we have assigned this chunk of emissions into the category of “high-risk emissions” (i.e. adding this to the numerator of the “high risk” emissions equation above), as such emissions volumes exist entirely outside the Paris Agreement and thus have fewer procedural and accounting checks on the crediting and transfer on emissions reductions. However, depending on one’s interpretation of risk, this volume of emissions may fall outside of either risk category, reducing the volume of high risk emissions to 6 – 28%. However, the overall volumes of “low risk” emissions in this case would not change, staying at the range of 58.5 – 80.5%, lower than the totals within scenarios 1A to 2B, where nations are not categorized based on ratification status.

Table 8: Total Volume of “High Risk” Emissions, if non-Parties are considered at risk of Double Counting

	Total Low-Risk Emissions		Total High-Risk Emissions	
	Millions of tonnes (MMT CO ₂ e/yr)	%* of world’s emissions	Millions of tonnes (MMT CO ₂ e/yr)	% of world’s emissions*
Scenario 1A.N	40,764	80.5%	8,102	16%
Scenario 2B.N	29,574	58.5%	19,291	38%

*Emissions from non-ratifying nations total 5157 MMT (10% of world) and are in this case considered as “high risk” emissions. Percentages do not add up to 100% as the following emissions are considered as part of the world’s total but not included as part of either the high or low risk emissions: No NDC Submitted (211.83 MMT) and Remaining Emissions of 1536.22 MMT, including international bunker fuel emissions not attributed to individual countries, as well as certain regional emissions not disaggregated in the data (e.g. Monaco, Palestine, San Marino, South Sudan, and Timor-Leste).

Figure 3: Share of Emissions at “High Risk” of Double Counting, with non-Parties considered high-risk

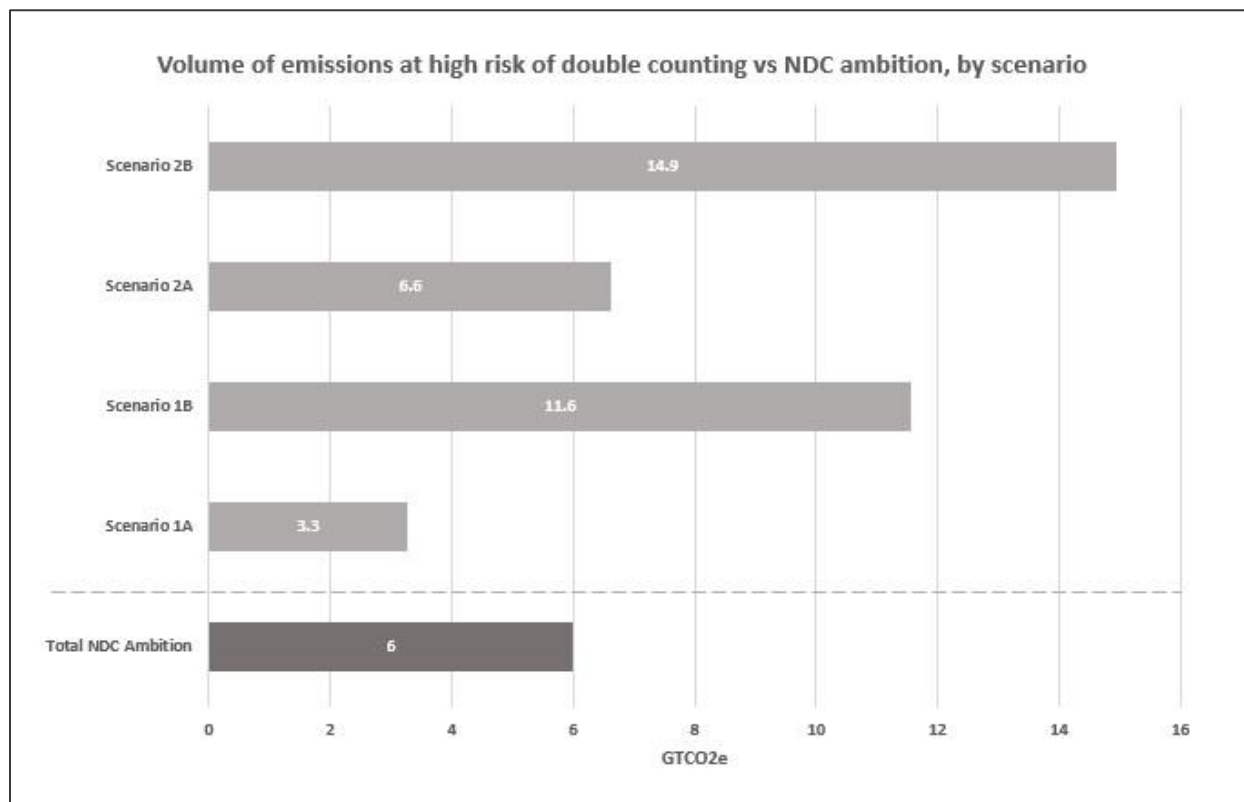


Comparisons Relative to NDC Ambition

It is important to note that nearly all of our predicted emissions volumes at risk of double counting are of a magnitude potentially large enough to meaningfully impact the trajectory of global emissions reduction efforts. To illustrate, the UNEP Emissions Gap report estimates that current NDC ambition shows a decline in yearly GHG emissions by 2030 relative to a “current policy” baseline scenario by approximately 6 GTCO₂e, or 12% of our current world emissions estimates.²² This total is roughly the same as the total emissions considered at high risk of double counting in Scenario 2A, and merely a third of the total at-risk emissions in our most conservative estimate, Scenario 2B.N (which includes non-Parties’ emissions as “high risk”). While the attainment of NDCs and the share of emissions reductions that will be double counted in actuality will be the result of more complex factors that are outside the scope of this study, the fact that the majority of our scenarios have risk estimates that exceed or approach the magnitude of current NDC ambition is notable.

²² “The Emissions Gap Report 2017: A UN Environment Synthesis Report.” UNEP. November 2017. Web. https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf

Figure 4: Simplified visualization of the share of the world’s emissions considered at “high risk” of double compared to projected NDC ambition



Note: Scenario volumes are not intended to show predicted emissions trajectories through 2030, but rather are intended to compare the magnitude of emissions at risk of double counting with the total predicted climate gains from full implementation of both conditional and unconditional NDCs. Median estimates of total annual GHG emissions under “current policy trajectory” and “NDC implementation” scenarios are taken from the UNEP Emissions Gap Report 2017.

These volumes imply that, in the absence of rules that restrict trading based on quality or coverage requirements, every ITMO trade could technically source a credit from a “high risk” emissions reduction except under Scenario 1A. Even in Scenario 1A, however, the total volume of emissions from which reductions could be traded as ITMOs that are at risk of double counting is estimated to be greater than half of total NDC ambition—still a substantial volume. In other words, the supply of high-risk emissions reductions is unlikely to be the limiting factor for how many of the world’s emissions reductions would be double counted in actuality. Rather, the demand for such trades and the accounting rules that apply to them are likelier candidates to constrain the scope of double counting.

Discussion

Ambiguity and variation in the climate goals listed within the world’s Nationally Determined Contributions complicate the process of accounting for efforts to reduce emissions globally. This analysis provides early evidence to suggest that the scale of emissions that could be at risk of double counting is potentially large enough to warrant that Paris Agreement Parties consider adopting guidance to ensure robust accounting of any and all internationally transferred mitigation outcomes, regardless of whether they originate in or outside of NDCs.

Even within nations that have declared economy-wide or absolute GHG mitigation targets, selective greenhouse gas coverage leaves large emissions volumes vulnerable to double counting. For nations with only partial sector coverage or non-GHG mitigation targets, the share of vulnerable emissions is even larger.

Our analysis further highlights the importance of India and China's emissions trajectory and accounting choices. Their NDC targets measure emissions intensity relative to GDP, rather than using an absolute cap. While they are not the only nations to use such target types, this choice of target, paired with the large share of the world's emissions for which they are presently (if not historically) responsible, means that the coverage trajectory and integrity rules ultimately implemented by China and India will have a major influence on the scope and volume of future emissions that are at risk of being double counted.

In all cases, the relative share of emissions reductions that will be vulnerable to double counting in practice will be restricted to those volumes for which there is demand through international markets. Even so, in light of the Paris Agreement's ambitious mitigation goals, and with nearly half of NDCs expressing interest in utilizing market mechanisms, demand for emissions reduction credits is likely to rise in the coming years. In order to ensure the benefits of such trading are fully realized, clear and robust accounting and transparency rules must be agreed upon to avoid double counting of any internationally transferred mitigation outcomes – both for emissions reductions within and outside of NDCs.