

Global Overview on Inclusion of Non-CO₂ Emissions in NDCs

Policy Brief

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Overview of non-CO₂ Emissions in NDCs

Policy Brief

Authors

Anna Nilsson, Emily Daly, Frauke Röser

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1 Summary

As the next cycle of NDCs is approaching, with submissions of updated Nationally Determined Contributions (NDCs) expected in early 2025, pressure is mounting to close the ambition gap to keep global warming to 1.5°C. In this context, non-CO₂ emissions are critical. Until now they have generally been given less attention than CO₂ emissions in existing NDCs, despite the fact that they are responsible for about a quarter of global GHG emissions today. The current lack of ambition to reduce non-CO₂ emissions has been found to put the achievement of the Paris Agreement goals at serious risk. This brief focuses on the role of non-CO₂ emissions (methane, nitrous oxide, and fluorinated gases) in the context of NDC ambition, with a specific focus on China.

Non-CO₂ gases have a shorter lifespan than CO₂, but they trap more heat in the atmosphere due to their higher global warming potentials. At the sectoral level, agriculture is the most significant non-CO₂ emitting sector, followed by energy and industrial processes. At the global level, the countries with the largest projected non-CO₂ emissions in 2030 are China, the USA, Russia, India, and Brazil. None of these countries so far, except the USA, has included specific mentions or targets for non-CO₂ emissions in their NDC, and only consider them as part of their overall GHG emissions targets.

While non-CO₂ targets are relatively well covered in overall GHG emission reduction targets of existing NDCs, few parties specify gas-specific targets, let alone quantitative ones. As of November 2023, 20% of NDCs included quantitative methane targets, while 60% included some form of qualitative measure. About 39% of parties included mitigation options for reducing methane and nitrous oxide emissions, but quantitative nitrous oxide reduction targets are largely missing. For hydrofluorocarbons (HFCs), only 27% of NDCs specify mitigation measures, and quantitative targets here are also few.

Despite these gaps, a number of good practice examples can be highlighted. For instance, the NDC of Côte d'Ivoire includes several quantitative emission reduction targets for methane: one overall target and three sector-specific ones. Colombia's NDC includes quantitative targets to mitigate emissions from the agriculture sector, thus targeting nitrous oxide emissions. For fluorinated gases, most NDCs highlight HFCs, but Japan's specifies quantitative targets for the full spectrum of fluorinated gases. In addition, several NDCs - such as those of Canada, Côte d'Ivoire, Mexico, and Türkiye - adopt the targets of the Kigali Amendment directly.

Improved coverage of non-CO₂ gases in NDCs over time has partly been driven by the establishment of international initiatives seeking to enhance ambition. These efforts are increasingly visible in NDCs. Examples of such initiatives are the Global Methane Pledge, the Kigali amendment on HFCs, and the Nitric Acid Climate Action Group. Many parties adopt targets resulting from these initiatives as official targets in their NDCs. Among G20 countries, there is an overwhelmingly high commitment to the Kigali Amendment with only one country (Saudi Arabia) that has not yet signed onto it. Four G20 countries (China, India, Russia, and Türkiye) did not yet become members of the Global Methane Pledge, while the Nitric Acid Climate Action Group has the smallest G20 support with only three (Argentina, Indonesia, and Mexico) signatories.

As for the case of China, its current NDC only covers CO₂, even though non-CO₂ gases make up 18% of total national GHG emissions. Nevertheless, China has indicated that it will include non-CO₂ gases in its updated NDC. And what is more, it has developed policies relevant for non-CO₂ mitigation in recent years, which mainly focus on methane emissions. The Methane Emissions Control Action Plan was announced in 2023 which specifies sector-specific mitigation measures, even though it lacks quantitative mitigation targets. In addition to that, the "Sunnylands statement" on cooperation between China and the USA, which was issued soon after, includes working groups on methane. The Chinese involvement in international initiatives could also have positive impacts on domestic policy on non-CO₂ emissions, such as the Chinese endorsement of the hydrogen sector under the Glasgow Breakthrough Agenda.

The accelerating climate crisis makes the next iteration of NDCs critical to keep the goals of the Paris Agreement within reach. Setting ambitious 2035 targets as well as updated and enhanced 2030 targets will be crucial in light of the shrinking global carbon budget for the 1.5°C limit. There are several ways in which NDC ambition could be enhanced. So far, only one party has signalled that they are intending to increase their ambition with regards to non-CO₂ emissions in their next NDC, but recently updated policies and regulations such as roadmaps or strategies could also indicate that more ambitious updates are to be expected. Beyond the inclusion of non-CO₂ gases in the overall GHG emission reduction target, parties can enhance NDC ambition through the development and inclusion of gas and sector-specific targets, identification and description of mitigation measures linked to those targets, and the estimation of correlated emission reduction contributions.

China together with India are the only two G20 countries that do not include non-CO₂ gases in their current NDCs. Given the large share (30%) of global GHG emissions originating from China, its updated NDC and 2035 targets will greatly impact the future of the global climate. As such, the upcoming round of NDC updates provides an opportunity for China to steer global climate action closer to achieving the goals of the Paris Agreement, and to drive collective ambition globally. China's confirmation to include all GHGs in its next NDC is a welcome step in that direction.

There are several ways in which China could improve ambition, transparency, and clarity of this addition in its updated NDC. Firstly, China could link to sectoral strategies, such as the steel sector decarbonization strategy, to mitigate correlated non-CO₂ emissions. Secondly, it can build on already existing policy, such as the Methane Emissions Control Action Plan. Lastly, China can build on international initiatives, for instance the Kigali Amendment, which it already has ratified.

2 Introduction

By early 2025 parties to the United Nations Framework Convention on Climate Change (UNFCCC) are requested to update their Nationally Determined Contributions (NDCs). The NDCs need to show a progression from previous NDCs communicated by each of the parties in earlier rounds. This should reflect the findings of the Global Stocktake (GST) which concluded in 2023 and revealed a significant global ambition gap for the achievement of the Paris Agreement goals.

As countries are embarking on national processes to reformulate their NDCs, this policy brief focusses on the role of non-CO₂ emissions in the context of NDC ambition updates. The objective of the policy brief is to provide an overview of the role of non-CO₂ emissions for national and global climate goals and how these emissions have been covered so far in countries' current and, where already available, updated NDCs. The briefing paper will also discuss different options for updating NDCs more generally as well as specifically in the context of non-CO₂ emissions. In the light of China potentially expanding its NDC to include all GHGs, this policy brief is targeted at Chinese policymakers with the aim to inform their ongoing NDC updating processes.

The paper will first provide an overview of the role and sources of non-CO₂ emissions and why these matter for climate policy. This will be followed by an overview of how countries currently treat such emissions in their NDCs, including a selection of country examples. Lastly, the paper discusses options for NDC enhancement with some concluding remarks and recommendations for Chinese policymakers.

3 Why do non-CO₂ emissions matter?

Non-CO₂ emissions refer to greenhouse gases (GHGs) other than carbon dioxide (CO₂) that contribute to climate change. Although they have shorter lifespans than CO₂, their global warming potentials (GWP) are higher, meaning that they trap more heat in the atmosphere. Non-CO₂ emissions come from a broad range of sectors and sources, as illustrated in Figure 1 and Table 1. Agriculture activities account

for the largest share of non-CO₂ emissions globally, while emissions from industrial processes and the waste sector are projected to grow at the fastest rates between 2015 and 2030, at 76% and 23% respectively.

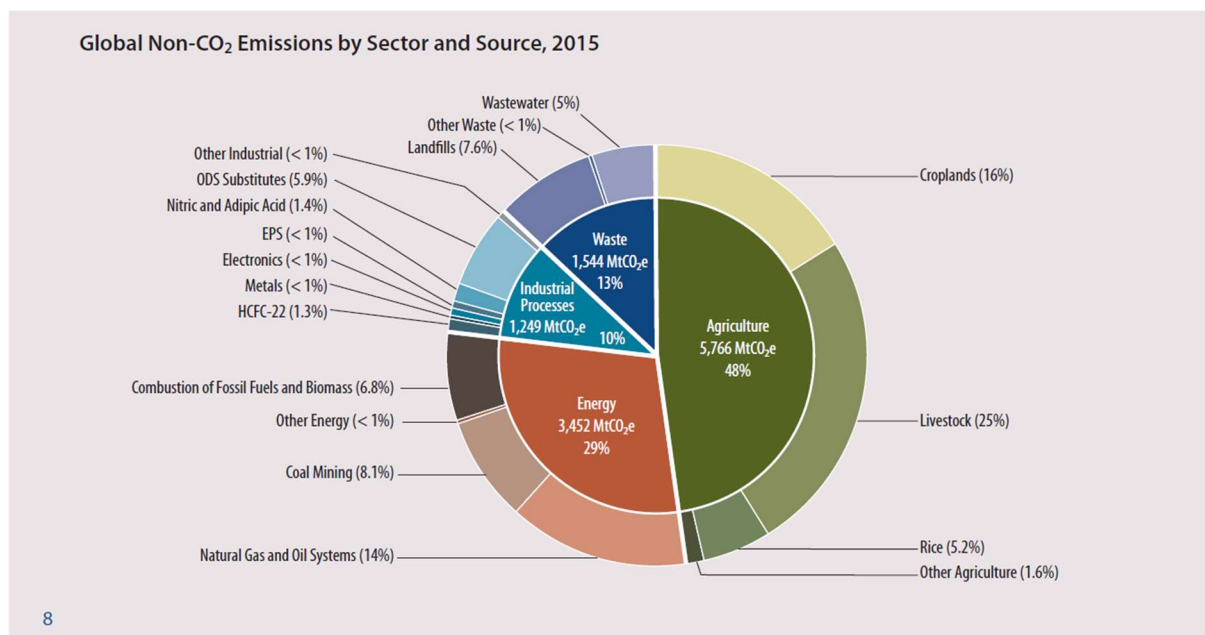


Figure 1. Global non-CO₂ emission by sector and source in 2015 (U.S. EPA, 2019).

While CO₂ emissions remain the primary focus in climate policy, addressing non-CO₂ emissions is essential for achieving global climate goals. Methane (CH₄) and nitrous oxide (N₂O) are the most critical non-CO₂ emissions for climate policy due to their potency and prevalence. Fluorinated gases (F-gases), such as hydrofluorocarbons (HFCs) or perfluorocarbons (PFCs), are less common, but they also have significant impacts due to their high GWP (Figure 2). Beyond the UNFCCC these are controlled by the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (UN, 2016).

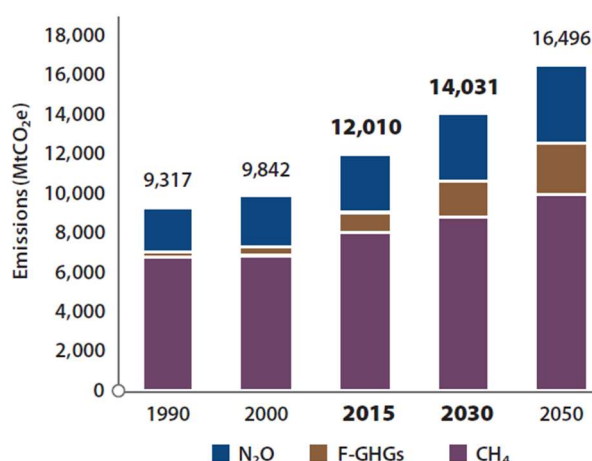


Figure 2. Global non-CO₂ emissions by gas (MtCO₂e) in a BAU scenario (U.S. EPA, 2019).

Among GHGs, methane is particularly significant as the second highest contributor to global warming after CO₂. While CO₂ emissions contributed to about 0.8°C of historical global warming, methane contributed to 0.5°C (Ou *et al.*, 2022), and in 2020 was responsible for about 17% of global GHG emissions (WRI, 2020).

While nitrous oxide exists naturally in the atmosphere, human-induced emissions has increased by 30% over the past 40 years, and today make up 40% of total nitrous oxide emissions (U.S. EPA, 2024).

Nitrous oxide is accountable for roughly 6% of GHG emissions today (Helmholtz Climate Initiative, 2023).

Out of methane, nitrous oxide, and F-gases, F-gases contribute the least to global warming – about 2.4% (WRI, 2020). Nevertheless, HFCs – the most prominent group of F-gases – are growing by more than 10% annually, making them one of the most rapidly growing GHGs (CCAC, 2024).

Table 1. Overview of key sources of non-CO₂ GHG emissions (UNFCCC, 2015).

Gas	Source
Methane (CH₄)	Agriculture sector, including enteric fermentation, rice, cultivation, and manure management; extraction, distribution and combustion of fossil fuels; industrial processes; and the waste sectors
Nitrous dioxide (N₂O)	Industrial processes, agricultural soils, manure management, and wastewater
Fluorinated gases (F-gases)	Industrial processes, refrigeration and cooling

Other non-CO₂ short-lived pollutants include black carbon, sulphur oxide (SO₂), non-methane volatile compounds (NMVOCs), nitrogen oxides (NO_x) and carbon monoxide (CO) which are co-emitted with CO₂ in the fossil fuel combustion process. The impact of these gases is mainly local, with significant differences largely depending on air pollution control measures. Aside from their contribution to climate change, impacts on human health are a major concern.

In particular in the context of the remaining carbon budget, which describes the total net amount of CO₂ that can still be emitted to keep global warming to 1.5°C or well below 2°C, significantly reducing non-CO₂ emissions is critical. The current lack of ambition to reduce, above all methane and nitrous oxide, emissions have been found to put the achievement of the Paris Agreement goals at serious risk. Globally methane emissions need to be reduced by 51% from 2020 to 2050 and nitrous oxide emissions by 22% to stay within 1.5°C carbon budget limits (Rogelj and Lamboll, 2024).

Non-CO₂ gases make up roughly a quarter of global GHG emissions today, however, shares of non-CO₂ emissions in national portfolios vary significantly by country as a function of the significance of certain sectors and economic activities (e.g., agriculture, energy mix) (Figure 3).

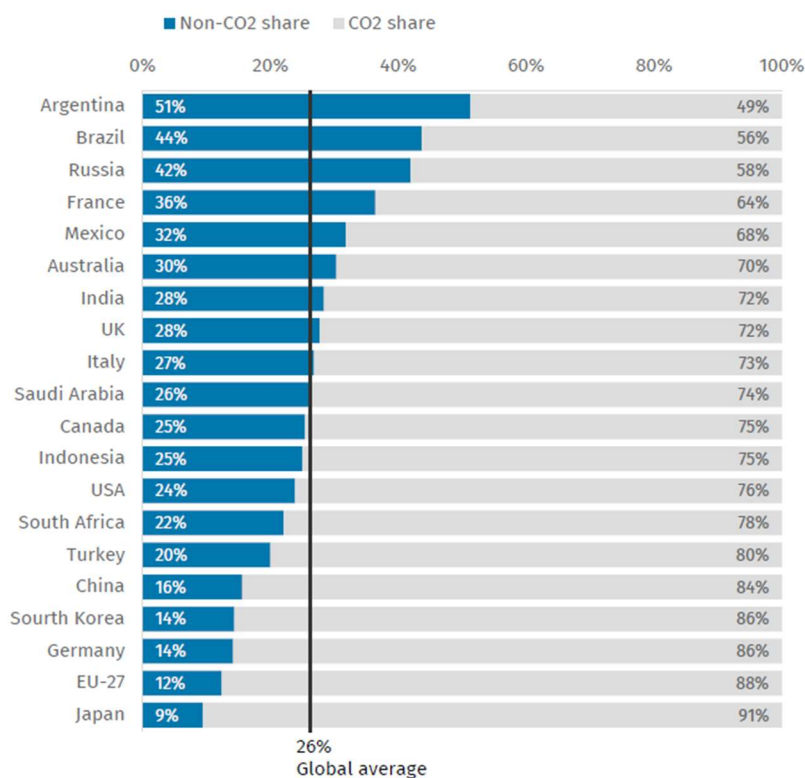


Figure 3. Share of non-CO₂ emissions in G20 countries. Percentage share in 2022 based on AR5 GWP100 values (Rhodium Group, 2023).

In absolute terms, the countries with the largest projected non-CO₂ emissions in 2030 are China, the USA, Russia, India and Brazil (Figure 4). So far, other than the United States, none of these countries has included specific mentions of non-CO₂ emissions in their NDCs, quantitatively or qualitatively, outside of these gases being included in the overall GHG emissions reduction target.

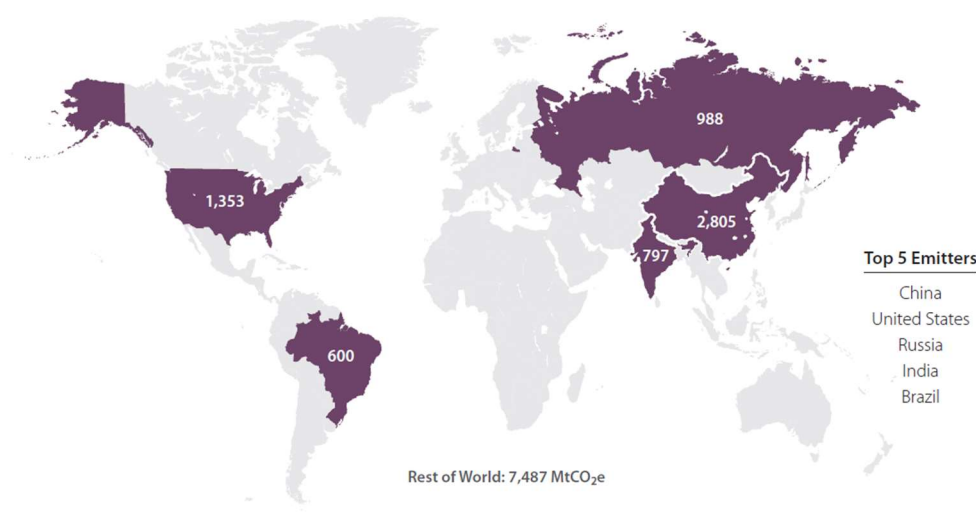


Figure 4. Largest global non-CO₂ emissions in 2030 in MtCO₂e (U.S. EPA, 2019).

In particular in the industry, waste, and energy sectors there is significant technically and financially feasible reduction potential, mainly to reduce F-gases and methane. Reduction potentials of non-CO₂ emissions in agriculture are by comparison very limited (Figure 5). According to the IEA, the low abatement cost of methane emissions from the energy sector could have cut 40% of global methane

emissions from fossil fuel operations in 2030 (IEA, 2024).

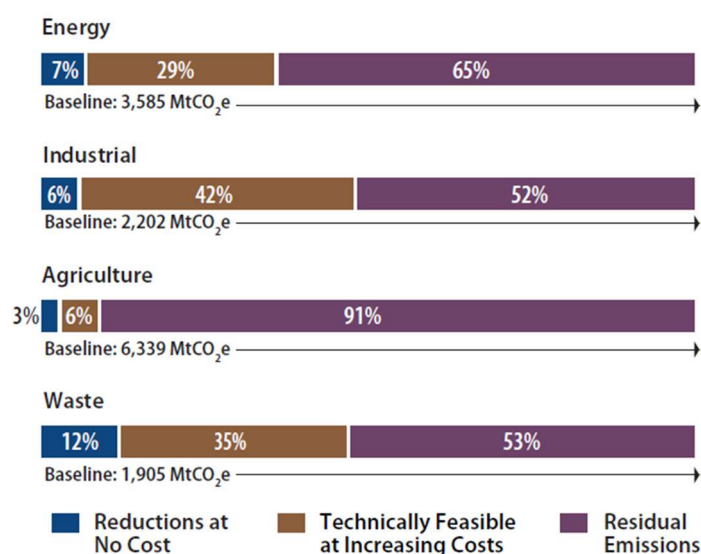


Figure 5. Mitigation potential non-CO₂ emissions by sector globally, 2030 (U.S. EPA, 2019).

Reducing non-CO₂ emissions has important, and often interlinked, climate, environment, health, and economic benefits. Non-CO₂ gases such as methane and HFCs have shorter lifetimes than CO₂ but much higher GWPs, making them highly potent in the short term and continuing to emit them increases the risk of amplifying feedback loops that will lead to even greater warming; black carbon also contributes to heating. Nitrous oxide is less short-lived, but it also increases warming and contributes to ozone depletion. Beyond climate, non-CO₂ gases contribute to toxic air pollution, which causes many health problems and leads to premature deaths and jeopardizes progress towards achieving the Sustainable Development Goals (SDGs). The cumulative impacts on climate and health also carry economic consequences, including higher costs for mitigating climate change in the future, providing healthcare for pollution-related illnesses, and ensuring food security (U.S. EPA, 2019).

4 How are non-CO₂ emissions reflected in current NDCs?

According to the latest UNFCCC NDC Synthesis Report the vast majority of NDCs include methane (91%) and nitrous oxide (89%) emissions in their mitigation targets, with just over half of NDCs covering HFCs (Figure 6). Differences between the first NDCs and most recent updates are minimal. Interestingly, for some gases coverage has slightly reduced (e.g., PFCs). The NDC Synthesis Report brings together information from the 168 latest available NDCs, representing 195 parties to the Paris Agreement. These include 153 updated NDCs as of November 2023 (UNFCCC, 2023).

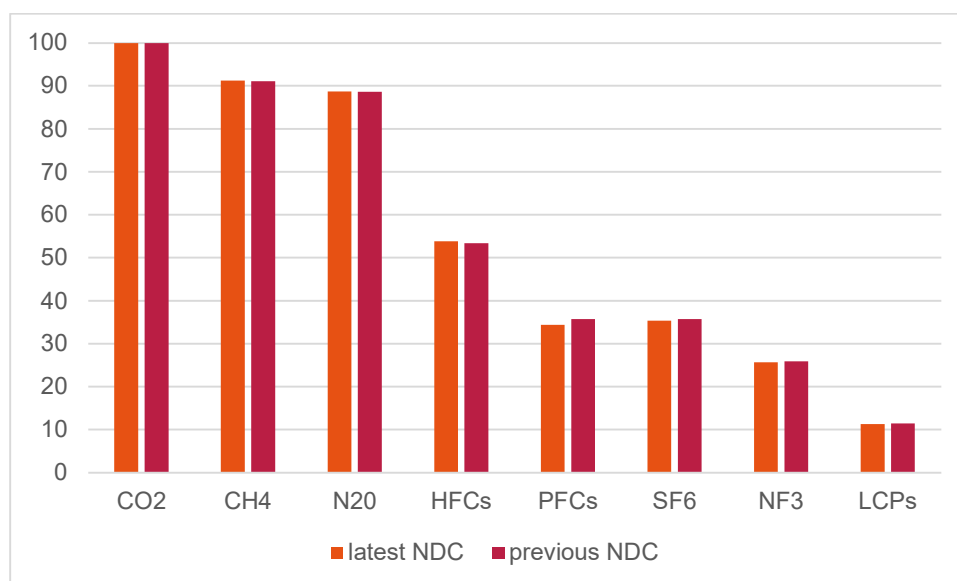


Figure 6. Coverage of non-CO₂ emissions in NDCs (UNFCCC, 2023).

There are several examples of NDCs providing more specific quantitative and/or qualitative inclusion of non-CO₂ gases. In Table 3 some examples are presented with a focus on methane, nitrous oxide, and F-gases.

Overall, the share of NDCs including methane emissions in their overall GHG reduction targets has increased since NDCs were first published almost ten years ago – from 15% in 2016 to 95% in 2023 (CCAC, 2023). Quantitative targets or assessments for methane in NDCs is less common, with a rate of 20% of total NDCs as of November 2023. More countries (over 60%) include some form of qualitative mitigation measure for methane emissions, with the strongest focus on the waste sector, followed by the agriculture and fossil fuels sectors (Table 2). The NDC of Côte d'Ivoire, for instance, includes several quantitative emission reduction targets for methane: one overall target, and three sector-specific ones including for the oil and gas, agriculture, and waste sectors (Table 3). Nigeria is another example of where an overall methane target is complemented with sector-specific ones. Overall, many NDCs are less specific and limit the inclusion of methane to the overall target only, or only provide targets in a specific sector. The need for inclusion of multiple sector-specific targets is of course also dependent on the key sources of methane emissions in the country.

Table 2. Sectoral coverage of measures for the reduction of methane emissions in NDCs as of November 2023.

Sector	Coverage ¹ (% of NDCs)
Waste	51%
Agriculture	36%
Fossil fuels	19%

¹ Clear ambition to address methane emissions with targeted measure(s)

According to the latest NDC Synthesis Report, 39% of parties included mitigation options for reducing methane and nitrous oxide emissions in agriculture. Some NDCs also specifically mention measures to reduce nitrous oxide emissions from the production of nitric acid, i.e., in the production of fertilisers. Examples of this can be found in the NDCs of Jordan, Zimbabwe, and Tunisia. The NDCs of Jordan, and Zimbabwe also include finance needs estimates for their targets, as well as associated emission reduction potentials (Table 3). In terms of quantitative targets, there is a significant focus on fertilisers, given that these are a key source of nitrous oxide emissions. Some targets and measures focus more on the industry sector and thus the production of fertilisers, while others focus more on the agriculture and efficiency measures; Colombia aims to achieve a reduction of 80% of GHG per unit of product in the production of fertilisers while Uruguay aims to reduce the emissions intensity of beef by 36-38% compared to 1990 levels (Table 3).

The coverage of fluorinated gases has also increased significantly since the first round of NDCs. As of November 2023, 105 NDCs include HFCs in their overall targets, compared to 51 in 2016 (CCAC, 2023). Fewer countries (27%) specify mitigation measures for HFCs in their NDCs, but specific quantitative targets are increasing. While many countries focus on the reduction of HFCs specifically in their targets, there are also examples of those covering the whole spectrum of fluorinated gases. Japan's NDC includes quantitative targets for HFCs, PFCs, sulphur hexafluoride, and nitrogen trifluoride (Table 3). Also, a considerable number of countries refer to the goals of the Kigali Amendment² with regards to fluorinated gases. Examples include Canada, Côte d'Ivoire, Mexico, and Türkiye.

Table 3. Non-exhaustive overview of NDCs with targets for non-CO₂ gases.

Party	Gas	Type of target ³	Sectoral focus
Canada	Methane	Qualitative: Continental approach with the United States, and the development of a Methane Action Plan	Oil and gas
	Nitrous oxide	Quantitative: Reduction of GHG emissions from fertilisers by 30% below 2020 levels	Industrial processes
	Fluorinated gases	Qualitative: Committed to phasing down HFCs under the Kigali Amendment to the Montreal Protocol	
Colombia	Nitrous oxide	Quantitative: GHG reduction of 80% GHG emissions per unit of product in the production of fertilisers Mitigation of fugitive emissions from the oil and gas sector with a potential mitigation of 0.39-3.24 MtCO ₂ e	Industry (Chemicals), Oil and gas
	Fluorinated gases	Quantitative: GHG emissions from HFCs reduction of 11% compared to BAU scenario	
Côte d'Ivoire	Methane	Quantitative: Reduction of methane emissions by 30% in 2030 compared to reference scenario. Reduce fugitive methane emissions by 50% by 2030 from oil and gas. [Oil and gas] Reduce methane emissions from livestock by 30%. [Agriculture] Recover 46,423 tonnes of methane by 2030, avoid 3,310 tonnes of methane by 2030. [Waste]	Agriculture, waste, oil and gas

² See section 3.1

³ 2030 target if not stated otherwise

	Nitrous oxide	Quantitative: Reduce nitrous oxide emissions from synthetic nitrogen fertilisers by 30%.	Agriculture
	Fluorinated gases	Quantitative: Reduce HFC consumption by 10% in 2029 from to 2021 levels. Qualitative: Prepare a plan to meet requirements of Kigali Amendment.	Industry
Dominica	Methane	Quantitative: Reduction by 78.6% of GHG emissions from the solid waste sector	Waste
	Fluorinated gases	Quantitative: Reduction of HFCs by 10% by 2029, by 30% by 2035, by 50% by 2040, and by 80% by 2045 Qualitative: Development of a measurement, reporting, and verification (MRV) system for HFCs, and the establishment of a phase down plan	
Japan	Methane	Quantitative: Reduction to 26.7 MtCO ₂ e from 30 MtCO ₂ e in 2013	
	Nitrous oxide	Quantitative: Reduction to 17.8 Mt CO ₂ e from 21.4 MtCO ₂ e in 2013	
	Fluorinated gases	Quantitative: Reduction of HFC to 14.5 MtCO ₂ e, PFC (increase) to 4.2 Mt CO ₂ e, sulphur hexafluoride to 2.7MtCO ₂ e, and nitrogen trifluoride to 0.5MtCO ₂ e (decrease) compared to 2013 levels	
Jordan	Nitrous Oxide	Qualitative and quantitative: Specific measure to reduce nitrous oxide emissions from nitric acid production through the installation of a catalyst system, including expected costs and emission reduction estimates	Industrial processes
Mexico	Methane	Quantitative: To utilize 98% of methane emissions from the oil and gas sector by 2025 Qualitative: Concrete actions as part of commitment to the Global Methane Pledge. [Oil and gas] Measures to capture and manage biogas from livestock waste to avoid generation of methane. [Agriculture] Plans to improve waste management, with one benefit being reducing methane emissions. [Waste]	Oil and gas, agriculture, and waste
	Nitrous oxide	Qualitative: Participation in the Nitric Acid Climate Action Group	
	Fluorinated gases	Qualitative: Implementation of a National Cooling Strategy as part of its commitment to the Kigali Amendment	
New Zealand	Methane	Quantitative: Reduction of biogenic methane to 10% below 2017 levels by 2030, and to 24-47% below 2017 levels by 2050	Agriculture, livestock, and waste
	Nitrous oxide	Qualitative: Participation in the Nitric Acid Climate Action Group	
	Fluorinated gases	Qualitative: Compliance with the Kigali Amendment to the Montreal Protocol	

Nigeria	Methane	Quantitative: Approval of National Action Plan to reduce short-lived climate pollutants (SLCPs), including reducing methane emissions by 61%. Joined Global Methane Alliance, committing to absolute methane reduction of at least 45% by 2025 and 60-75% by 2030. 60% reduction of fugitive methane emissions by 2031. [Oil and gas] 10% reduction in methane emissions from organic solid waste through diversion to composting. [Waste]	
	Fluorinated gases	Quantitative: Reduction of more than 80% in HFC consumption by 2047. Qualitative: Approval of National Action Plan to reduce SLCPs, including ratification of Kigali Amendment to Montreal Protocol.	
Türkiye	Methane	Qualitative: Control methane emissions by regulating animal feed rations. Increase recovery rate of methane gas from biodegradable waste.	Agriculture, waste
	Fluorinated gases	Quantitative: Reduction of the consumption of HFCs by 80% in the next 30 years Qualitative: The Kigali Implementation Plan to be adopted as the National Strategy Document for the phasing down of HFCs	
Uruguay	Methane	Quantitative: Reduction of emissions from the production of beef by 35% per unit of product by 2030 compared to 1990 levels, with an additional 2% reduction under conditional measures	
	Nitrous oxide	Quantitative: Reduction of emissions from the production of beef by 36% per unit of product by 2030 compared to 1990 levels, with an additional 2% reduction under conditional measures	
	Fluorinated gases	Quantitative: Reduction by 10% relative to a baseline by 2030, with an additional 5% reduction under conditional measures	

4.1 Global initiatives pushing increased ambition in NDCs for non-CO₂ emissions

The increased coverage of non-CO₂ GHGs in NDCs over time has partly been driven by the establishment of international initiatives seeking to enhance ambition. These efforts are increasingly visible in NDCs.

The Global Methane Pledge (GMP) was launched by the European Union and the United States at COP26 in 2021. The collective agreement of the initiative was to reduce global methane emissions by 30% by 2030 compared to 2020 levels. This target has also been adopted in several NDCs; out of the 40 countries that as of November 2023 had included a methane target or assessment in their NDC, 88% are members of the GMP (CCAC, 2019). As of August 2024, 158 countries have pledged to the GMP (Global Methane Pledge, 2023). For methane emissions from waste specifically, the Lowering Organic

Waste Methane Initiative (LOW-Methane) and the GMP Waste Pathway translate global goals to the sub-national level.

The Kigali Amendment to the Montreal Protocol has also received widespread support across the globe. As of July 2024, the number of ratifications to the Kigali Amendment had reached 160 plus the European Union (UN, 2016). By ratifying the Kigali Amendment, countries commit to phase down the use of HFCs, thus cutting the global production and consumption of HFCs by more than 80% over the next 30 years. This is an additional example of global initiatives influencing the ambition and inclusion of non-CO₂ GHGs in NDCs. An overwhelming majority of the countries (90%) which include HFCs in their NDC target have also ratified the Kigali Amendment, while 12 out of 17 countries that include specific HFC targets or mitigation potential assessments also have ratified the Kigali Amendment (CCAC, 2019). Some countries also use the targets of the Kigali Amendment as their official target in their NDC. The Global Cooling Pledge was introduced at COP28 to focus on reducing emissions related to cooling, including phasing down HFCs, while increasing access to sustainable cooling. Countries specifically commit to ratification of the Kigali Amendment as part of the pledge as well as the development of national cooling action plans or other policies that reflect international commitments and feed into the NDCs (Cool Coalition, 2023).

The Nitric Acid Climate Action Group (NACAG), initiated by Germany in 2015, aims to assist countries in reducing nitrous oxide emissions from nitric acid production through technical assistance, capacity building, and financial support. As of August 2024, 23 countries are official members of the NACAG – significantly less than the GMP or the Kigali Amendment. Several of these countries' NDCs include specific measures or targets to reduce nitric acid production or refer to the NACAG.

Among G20 members, there is an overwhelmingly high commitment to the Kigali Amendment, with Saudi Arabia as the only country that has not signed onto it (Table 4). The GMP also has a high level of participation, with four G20 countries (China, India, Russia, and Türkiye) that have not yet become members. In contrast, the NACAG has the smallest number of participants, with only three G20 countries (Argentina, Indonesia, and Mexico) signing on so far. Participation in international initiatives is important and can send a clear signal to the international community that a country is committed to high ambition. They can also serve as a guidance for countries on measures, targets and ambition levels.

Table 4. Overview of G20 countries that are members of international initiatives to reduce non-CO₂ GHGs.

	Global Methane Pledge	Kigali Amendment	Nitric Acid Climate Action Group
Argentina	Yes	Yes	Yes
Australia	Yes	Yes	No
Brazil	Yes	Yes	No
Canada	Yes	Yes	No
China	No	Yes	No
European Union	Yes	Yes	No

France	Yes	Yes	No
Germany	Yes	Yes	No
India	No	Yes	No
Indonesia	Yes	Yes	Yes
Italy	Yes	Yes	No
Japan	Yes	Yes	No
Republic of Korea	Yes	Yes	No
Mexico	Yes	Yes	Yes
Russia	No	Yes	No
Saudi Arabia	Yes	No	No
South Africa	Yes	Yes	No
Türkiye	No	Yes	No
United Kingdom	Yes	Yes	No
United States	Yes	Yes	No

4.2 Coverage of non-CO₂ GHGs in Chinese domestic policy

China's NDC does not cover any GHGs other than CO₂, yet non-CO₂ GHG emissions make up almost 18% of total national GHG emissions (CAT, 2023). In recognition of that, China has in recent years developed national policy targeting the reduction of non-CO₂ GHGs. In November 2023, the Methane Emissions Control Action Plan was announced, including sector specific measures for emission control and priorities for improving the measurement, reporting, and verification (MRV) system. China being the largest methane emitter globally, the plan was much anticipated by the global climate community (Patel, 2023). While the plan does not include any quantitative reduction targets for methane, it does specify sector-specific mitigation measures and qualitative targets, with a focus on the energy, agriculture, and waste sectors (IGSD, 2023). In terms of international initiatives, China, together with India, Russia, and Türkiye, are the only G20 countries which have not yet joined the Global Methane Pledge (CAT, 2023). Soon after the Methane Emissions Control Action Plan was announced, the "Sunnylands statement" on climate cooperation between China and the US was issued, which includes the establishment of working groups focusing on methane, among others (Patel, 2023).

While there are no official policies such as plans or roadmaps for tackling F-gases or nitrous oxide emissions in China, the gases are covered in the Chinese GHG inventory. Nitrous oxide emissions are also to some extent covered under domestic policy and regulations in the agriculture and industry sectors. In addition, China ratified the Kigali Amendment in 2021 and has thus committed to phasing out HFCs by 2045 (UN, 2016).

Given the direct linkage between the reduction of CO₂ emissions and non-CO₂ gases in some cases, China's involvement in other international initiatives could also have an impact on the reduction of non-CO₂ GHG emissions. For instance, its endorsement of the hydrogen sector in the Glasgow Breakthrough Agenda could promote a shift away from coal-based steel production toward hydrogen-based steel production, reducing the demand for coal and thus also coal mine methane

emissions. China has the largest steel sector in the world, which is highly reliant on coal, making it a major emitter of methane emissions caused by coal mining. Recently, however, there have been developments potentially signaling a shift away from coal-based steelmaking; For the first time since China's dual carbon goals were announced in 2020, no new coal-based steelmaking projects were permitted during the first half of 2024 (CREA, 2024). And more recently, as of August 2024, China suspended the permitting of any new steelmaking capacity (Bloomberg News, 2024).

5 What are options to update NDCs to reflect progress?

Parties to the UNFCCC are mandated to provide updated NDCs every five years showing an increase in ambition compared to their previous NDC. In the last cycle 178 countries followed the mandate and updated their NDCs, of which 109 showed an increase in ambition related to the 2030 target (Figure 7). The next round of NDCs is due for submission in 2025, setting targets for 2035. This new cycle is critical if the world wants to keep the 1.5°C temperature limit within reach and avoid complete climate collapse. Considering the rapidly depleting global carbon budget, countries should also significantly update the level of ambition of their 2030 targets. As of September 2024, Panama has submitted an updated NDC in June 2024, and some other countries are expected to do so before COP29 (UNFCCC, 2024).

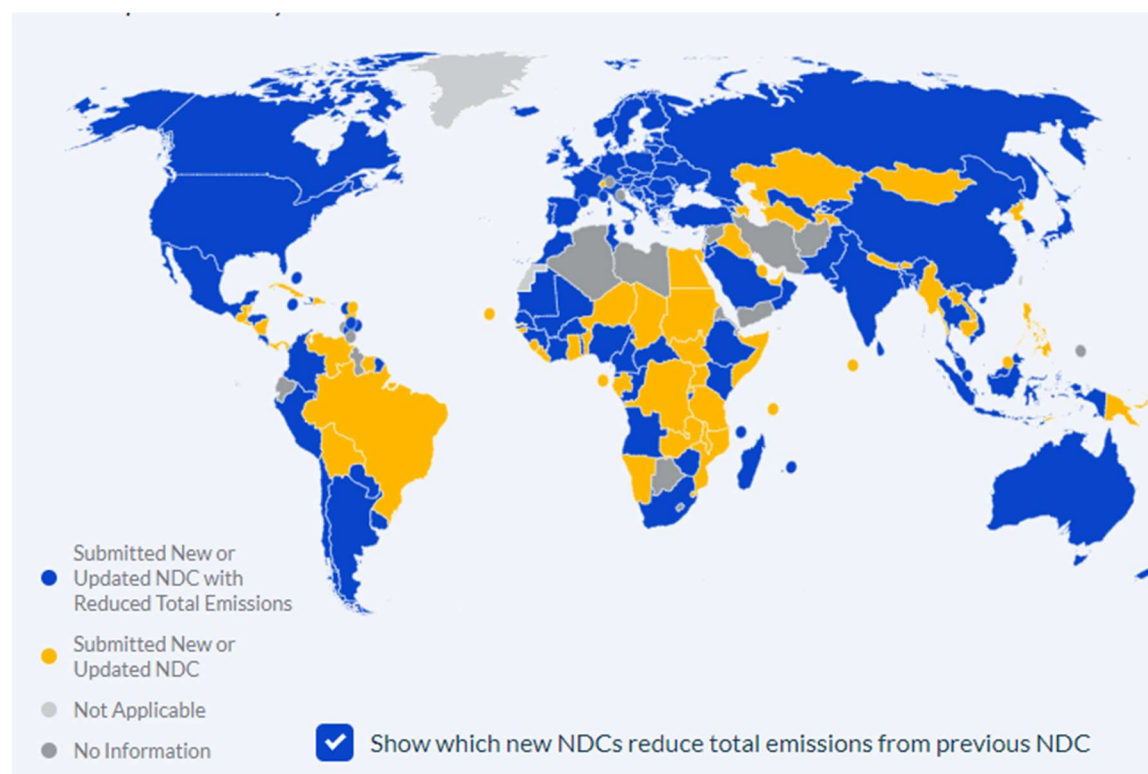


Figure 7. Countries that submitted updated NDCs by Jan 2024 (Climate Watch, 2024).

5.1 General options for updating NDC

There is substantial guidance and analysis available on NDC ambition raising and enhancement (see for example: (WRI, 2019a), (ECBI, 2020), and (WRI, 2019b)). Generally speaking, there are several ways to enhance and present more ambitious NDCs. Ultimately a more ambitious NDC means a commitment to greater quantifiable reduction in GHG emissions. However, countries and observers have also interpreted ambition enhancement in more indirect and softer ways, relating to questions of transparency, inclusiveness of the process or governance structures. In summary the following aspects may be considered to increase the ambition level of an NDC:

- **Target type – moving from relative to absolute emission reductions:** targets can either be qualitative or quantitative; if quantitative, the target can be expressed in relative terms (for example to a baseline or base period), intensity related, or formulated in absolute terms which is the strongest and most ambitious and transparent target type
- **Coverage – gradually increasing coverage to all emission sources:** the NDCs can be enhanced by including all sectors of the economy as well as all GHGs; the coverage aspect can be combined with the target type, i.e., ideally setting an overall absolute economy-wide target which is underpinned by sector or GHG specific targets to improve transparency and accountability
- **Timeline – targets should be timebound and reference specific years;** alignment with long term net zero or 1.5°C aligned pathways represent a high level of ambition; implementation time frames should be communicated
- **Feasibility and implementation:** Outline specific policies, measures, and means of implementation; connect the NDC to policies and legislation within the country
- **Ownership and political anchoring:** More guidance on NDCs and their implementation has been developed since the first submissions, which countries can use to enhance their NDCs; make the process inclusive by engaging a wider range of in-country stakeholders, such as from government ministries, civil society, and indigenous groups, to increase the sense of ownership and promote the anchoring of the NDC in national policy
- **Transparency:** Clearly communicating how updates to the NDC will lead to enhanced ambition, and how targets will be achieved; But also in terms of process, i.e., inclusion of information on reference points for target setting, scope, and other methodological details
- **Adaptation component:** Mapping of gaps, barriers, and emerging needs; Inclusion of updated information on trends, impacts and vulnerabilities

As time is running out, tying updated targets to Paris Agreement compatible pathways is of outmost importance. Developing a more ambitious and decisive policy context through the next iteration of NDC updates can be powerful in attracting climate finance and steering investments to the right places. The current update iteration is also an opportunity to put people at the centre of the transition through job creation, improved public health, and sustainable development.

5.2 Options for non-CO₂ emissions

While only one party has signalled so far that they are intending to increase their ambition related to non-CO₂ GHGs in the next iteration of NDCs, other signs indicate that an increased ambition can be expected by several parties. For instance, recently updated policies and regulations such as roadmaps or strategies are developments that could be reflected in the upcoming NDC iteration. Most such examples are linked to methane emissions, and mostly those related to the oil and gas sector. For instance, Brazil launched its National Zero Methane Program in 2022 (Climate Policy Database, 2022), and announced at COP28 in Dubai that it will develop guidelines on methane emission reduction in its oil and gas sector by the end of 2024 (EU, 2023). Similarly, at COP29, Egypt announced that it intends to develop a methane emission reduction roadmap on the same timeline; the USA also announced new standards to reduce methane emissions from oil and gas. Since the publication of its last NDC, Canada has developed several policies and regulations targeting methane emissions linked to the agriculture as well as oil and gas sectors (Government of Canada, 2021). These examples, in addition to new countries signing on to international initiatives such as the Global Methane Pledge, the Kigali Amendment, and the NACAG spark hope for increased ambition in the next iteration of NDCs.

The majority of NDCs already include non-CO₂ GHGs in their overall GHG emissions reduction targets. However, there are several ways in which ambition can be enhanced and made more transparent when it comes to non-CO₂ GHGs. Some measures to reduce CO₂ emissions also lead to reductions in other,

non-CO₂ GHG emissions. For example, reducing fossil fuel consumption as part of efforts to mitigate CO₂ emissions from combustion also reduces the need to produce fossil fuels in the first place, which has an additional benefit of reducing methane emissions from fossil fuel production. However, several areas are not directly linked to mitigation measures for CO₂ and need specific strategies and measures. In general, there are four key options recommended in the literature for the updating of NDCs for non-CO₂ GHGs (CCAC, 2023):

1. Include non-CO₂ GHGs in the overall mitigation target
2. Develop additional gas- and sector-specific targets
3. Identify and describe mitigation measures linked to the targets
4. Estimate emission reduction contributions for each target

As a first step, including all GHGs in the overall economy wide emission reduction target makes the NDC more ambitious. Nigeria's first NDC included CO₂, methane, and nitrous oxide, while the update includes the addition of HFCs (Government of Nigeria, 2021). Developing quantitative emission reduction targets for specific gases and sectors could further increase transparency and clarity on how the overall target will be met. The process of developing sector- and gas-specific targets can also provide an opportunity to identify the measures needed to support implementation and to better understand the challenge. Developing such targets requires access to appropriate data, for which establishing robust MRV systems is a good first step. Using sector-specific benchmarks and bottom-up pathway analysis can also be useful for quantitative target setting.

Complementing quantitative targets with the development of qualitative measures provides additional clarity on how to achieve the targets. Sectoral strategies or roadmaps can help identify potential gaps and needs such as those related to finance and capacity. A national cooling plan, setting out a strategy on how to make the cooling sector more efficient and reduce emissions, for instance, can provide a roadmap for sustainable cooling and support the reduction of F-gases; similarly, a green hydrogen strategy can guide the shift away from coal-based steel which in turn reduces methane emissions. Türkiye's NDC lists policy and legislation that relate to mitigation for each sector (Government of Türkiye, 2023). The wider inclusion of non-CO₂ GHGs in NDCs should also be supported through linkages to national development objectives and sustainable development goals.

Finally, estimating the emission reduction potential of each target is helpful to understand where the most significant mitigation potentials are. Comparing various scenarios across sectors is also important to identify the risk of potential spill-over effects; for example, switching from oil and coal to natural gas in the power sector can delay the shift to renewables as it locks natural gas infrastructure into the system instead of shifting away from fossil fuels directly. Using natural gas as a "bridging fuel" can also increase fugitive methane emissions.

6 Conclusions and recommendations

As we move into the next iteration of NDCs and set targets for 2035 – which marks the midpoint between the initiation of the NDC process and 2050 – the need for progress is becoming much more urgent. Despite non-CO₂ GHGs being responsible for about a quarter of global GHG emissions (Rhodium Group, 2023), not all countries cover non-CO₂ GHGs in their NDC targets and many lack clarity and transparency on how to reduce them. Setting absolute targets and defining specific measures for achieving non-CO₂ targets will be critical in putting the world on track to meet the objectives of the Paris Agreement.

While few G20 countries include specific targets for non-CO₂ emissions in their NDC, most cover them in their overall emission reduction targets. China, together with India, however, are the only G20 countries that do not include non-CO₂ gases in their current NDCs (Rhodium Group, 2023). Given the

large share (30%) of global GHG emissions originating from China, its updated NDC and 2035 targets will greatly impact the future of the global climate.

The upcoming round of NDC updates provides an opportunity for China to steer global climate action closer to achieving the goals of the Paris Agreement, and to drive collective ambition globally. Non-CO₂ GHGs are responsible for 18% of China's national GHG emissions and their mitigation will thus be a central part of achieving climate neutrality.

China's confirmation to include all GHGs in its next NDC is a first step in that direction (CAT, 2023). As discussed in this paper, there are several ways in which ambition, transparency, and clarity of such inclusion can be improved. While covering all GHGs in the overall economy-wide emissions reductions target officially means inclusion in the NDC, setting additional quantitative and gas-specific targets greatly improves clarity. In particular, setting absolute emission reduction targets for specific gases offers the highest level of ambition. Further specifying measures on how to achieve those targets can both enhance transparency but also supports implementation efforts and helps ground the targets in the national policy context.

There are several ways in which China could integrate non-CO₂ targets in its updated NDC:

- **Linking to sectoral strategies:** China's steel sector is a major emitter of CO₂, mainly due to its high reliance on coal through primary steelmaking. The growing stock of scrap steel in China provides a great opportunity for shifting away from primary steelmaking to secondary steelmaking and thus reducing the need for coal mining. This could significantly reduce coal mine methane emissions. Similarly, non-CO₂ gases can be linked to other sectoral strategies such as cooling and sustainable agriculture roadmaps.
- **Building on existing policy:** China's Methane Emissions Control Action Plan could serve as a basis for including methane emissions in its NDC and be strengthened with absolute emissions reduction targets. Similar plans could be developed for other non-CO₂ gases.
- **Building on international initiatives:** As China has ratified the Kigali Amendment to the Montreal Protocol, its objectives can be further integrated into China's NDC, as several other countries have already done.

There are thus several entry points for China to integrate non-CO₂ gases in its next NDC and doing so in a way that ensures robustness and anchoring to domestic policy, sustainable development, and international commitments.

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**NewClimate – Institute for Climate
Policy and Global Sustainability
gGmbH**

Cologne Office
Waidmarkt 11a
50676 Cologne, Germany

Berlin Office
Schönhauser Allee 10-11
10119 Berlin, Germany

Phone: +49 221 999 83 300
Email: info@newclimate.org
Website: www.newclimate.org

