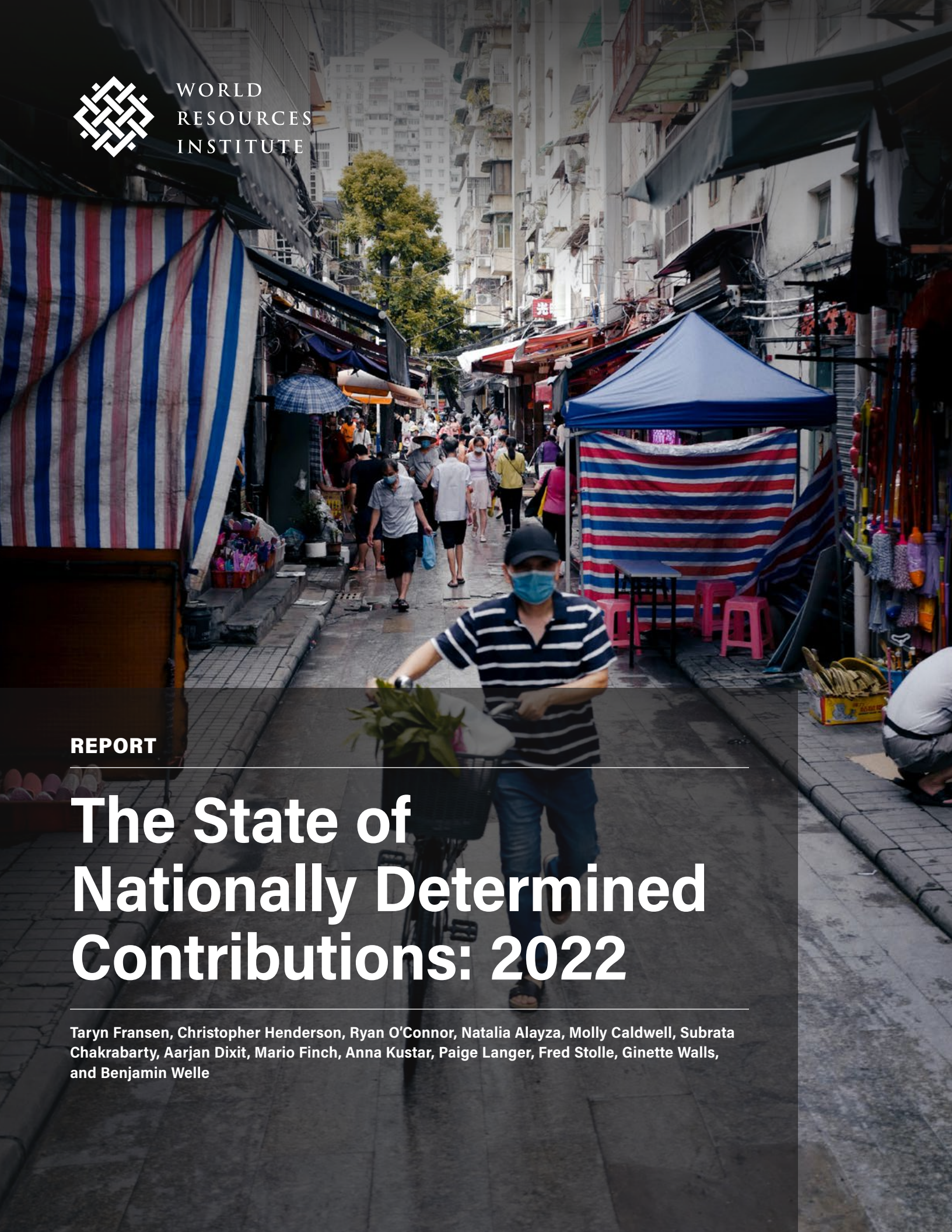

WORLD RESOURCES INSTITUTE

REPORT

The State of Nationally Determined Contributions: 2022

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Foreword

When the Paris Agreement was adopted in 2015, the foundation was incomplete. The nationally determined contributions (NDCs) from each country that underpinned the ambitious goals of the Paris Agreement—limiting climate change to 1.5 degrees C, promoting adaptation and resilience, and channeling funding toward low-carbon development—fell short on all three fronts.

The Paris Agreement intended for NDCs to be made more ambitious over time, establishing a five-year cycle for countries to submit enhanced commitments. Almost seven years have passed since the first round of commitments to the Paris Agreement, and 80% of NDCs have been updated. The question is: where are we now?

In short, the foundation is still emerging. While the Paris Agreement is enhancing global climate ambition, it is not doing so at a pace or scale consistent with achieving its goals. The latest NDCs aim to reduce 2030 emissions by an estimated 5.5 gigatons of carbon dioxide equivalent (GtCO2e) more than the initial NDCs. This is nearly equivalent to eliminating the annual emissions of the United States, and represents a 7% reduction from 2019 levels. To keep the 1.5 degrees C goal within reach, however, countries must reduce emissions by at least 43%.

This independent assessment, which confirms the key findings of UN analysis, draws on WRI's open-source Climate Watch platform. To unveil key observations into how NDCs are evolving, Climate Watch tracks approximately 200 granular indicators and empowers readers to dig into the data to generate their own insights. Together with Climate Watch, State of NDCs offers a new level of transparency and detail to our understanding of Paris Agreement implementation.

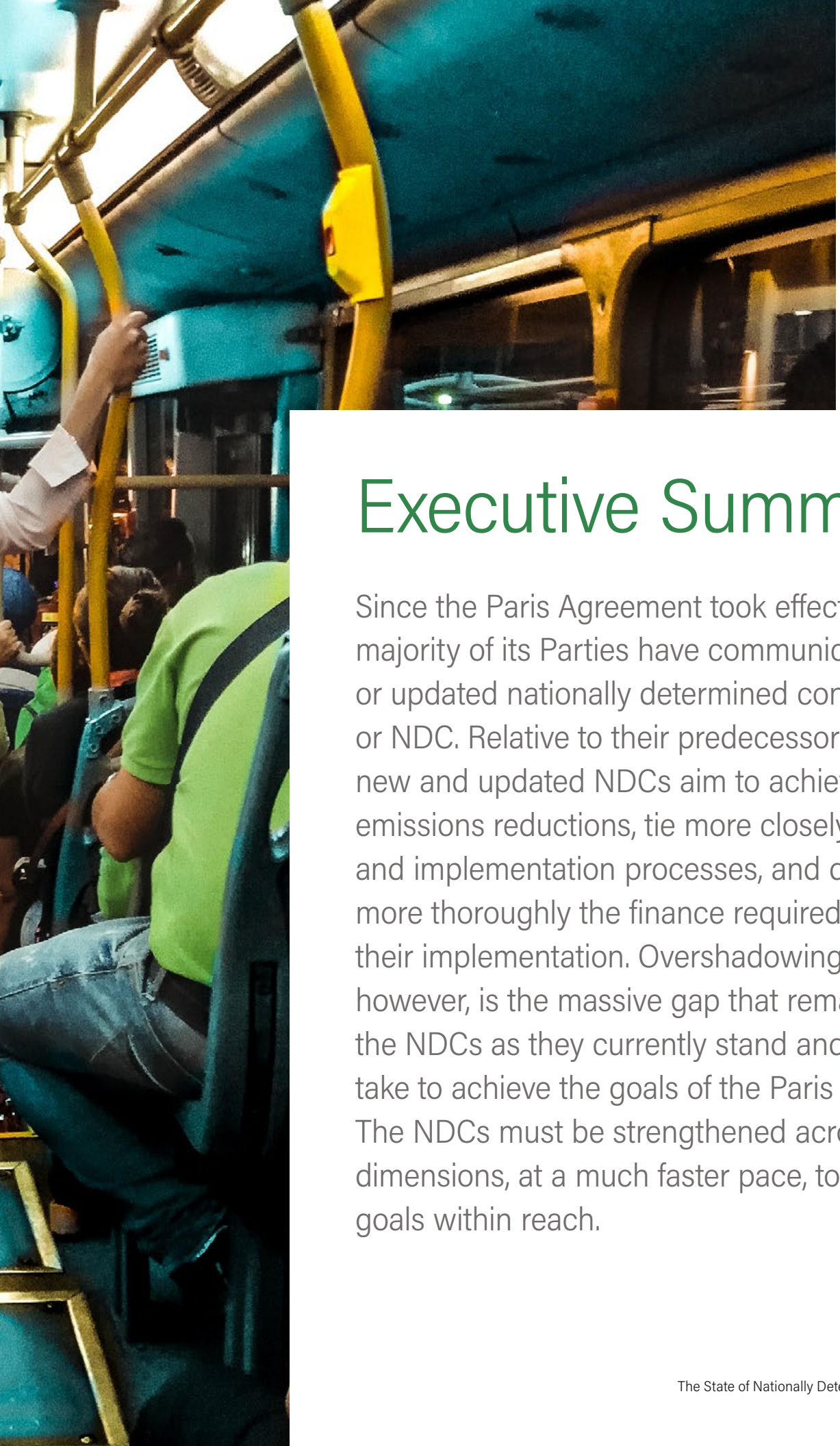
From this report, it is clear countries must do much better at connecting their NDCs to delivering concrete action on the ground. While most NDCs now contain sector-specific policies and measures for mitigation, there are notable gaps in many NDCs, including in key sectors like forests, power and transport. While most NDCs now also include an adaptation component, these can be further aligned with more comprehensive planning documents like National Adaptation Plans to advance implementation.

To support these commitments, there must also be a much greater understanding of the finance needed. Only half of NDCs report climate finance requirements, and these numbers already amount to almost $4.3 trillion, underscoring the need for developed countries to deliver the climate finance they have promised. Finance is a key enabler of climate action, and it must reach the scale of ambition needed.

These findings can steer investment in the next round of NDCs towards more ambition and effective implementation. Funders can provide resources to help countries fill gaps in critical sectors and topics. Meanwhile, researchers can continue to explore what factors motivate countries to increase their ambition and how NDCs can help drive more transformative action.

The next round of NDCs is due in 2025, and countries are also expected to update their NDCs ahead of the COP27 climate summit. We must continue learning from this process to push countries onto the right pathway and complete the foundation underlying the Paris Agreement.

ANI DASGUPTA
President & CEO
World Resources Institute



Executive Summary

Since the Paris Agreement took effect, the vast majority of its Parties have communicated a new or updated nationally determined contribution, or NDC. Relative to their predecessors, these new and updated NDCs aim to achieve deeper emissions reductions, tie more closely to planning and implementation processes, and document more thoroughly the finance required to support their implementation. Overshadowing this progress, however, is the massive gap that remains between the NDCs as they currently stand and what it will take to achieve the goals of the Paris Agreement. The NDCs must be strengthened across all dimensions, at a much faster pace, to keep these goals within reach.

HIGHLIGHTS

- Countries have communicated 139 new or updated nationally determined contributions (NDCs), outlining the actions they intend to take to help mitigate climate change and achieve the Paris Agreement goals.
- Drawing on newly available data from the open-source Climate Watch platform, this report captures a detailed snapshot of the NDCs following the latest updates and examines how they have evolved since the Paris Agreement entered into force.
- The analysis suggests that the Paris Agreement is enhancing global climate ambition—but not at a pace or scale consistent with achieving its goals. The latest NDCs aim to reduce 2030 emissions by an estimated 5.5 gigatons of carbon dioxide equivalent ($GtCO_2e$) more than the initial NDCs.
- Seventy-seven percent of NDCs include greenhouse gas (GHG) reduction targets, and 96 percent include sector-specific mitigation targets and other measures.
- Eighty-six percent of NDCs include an adaptation component, many with improved detail and sectoral coverage. Linking these to instruments such as national adaptation plans is a critical next step.
- Fifty-three percent of NDCs include estimates of climate finance requirements, which total US$4,282 billion: $2,740 billion for mitigation, $1,067 billion for adaptation, and $475 billion unspecified.

BACKGROUND

Under the 2015 Paris Agreement, countries around the world adopted collective goals to pursue efforts to limit climate change to 1.5°C, promote adaptation and resilience, and align financial flows with low-emissions, climate-resilient development. These objectives are to be carried out "in the context of sustainable development and efforts to eradicate poverty," and in a way that reflects "equity and the principle of common but differentiated and respective capabilities, in the light of different national circumstances" (UNFCCC 2015).

NDCs serve as the country-specific building blocks that build towards these collective goals. Article 4 of the Paris Agreement requires each Party to the agreement to prepare and communicate a successive NDC every five years. Parties are required to pursue domestic mitigation (emissions reduction) measures with the aim of achieving the mitigation commitments in their NDCs. In addition, some countries also use NDCs to articulate their adaptation plans and finance requirements.

The decision accompanying the Paris Agreement asked Parties to submit new or updated NDCs by 2020. This was informally extended to 2021 due to the COVID-19 pandemic and related delay of the 26th Conference of the Parties (COP26). Countries with an NDC with a time frame up to 2025 were requested to communicate a new NDC, and countries with an NDC with a time frame up to 2030 were requested to communicate or update an existing NDC.

Countries had communicated 128 new or updated NDCs by December 31, 2021. By September 2022, this figure had risen to 139. It includes updated first NDCs and new second NDCs as well as first NDCs that were communicated after December 31, 2019, and it counts the NDC of the European Union and its 27 Member States as a single entity. In total, the new and updated NDCs represent 165 countries responsible for 91 per cent of global GHG emissions.

These NDCs will form a critical input to the global stocktake. The global stocktake is a process established under Article 14 of the Paris Agreement to periodically take stock of and assess the collective progress towards the implementation of the agreement and its long-term goals. It begins with an information collection and preparation phase, which is to include, inter alia, information on NDCs.

The 2021 Glasgow Climate Pact requests that countries "revisit and strengthen" their 2030 targets to align with the Paris Agreement's temperature goal by the end of 2022. In addition, the pact strengthens the relationship between NDCs and long-term objectives, urging countries to communicate long-term strategies "towards just transitions to net zero emissions by or around midcentury, taking into account different national circumstances," and noting "the importance of aligning" NDCs with these strategies. Finally, it establishes two work programs. One is "to urgently scale up mitigation ambition and implementation" through 2030. The other is the Glasgow–Sharm el-Sheikh work program on the Global Goal on Adaptation (UNFCCC 2021b).

Countries will communicate a successive round of NDCs in 2025. Each successive NDC must represent a progression beyond the Party's previous NDC and reflect its highest possible ambition. In 2025, countries are encouraged "to communicate a nationally determined contribution with an end date of 2035" (UNFCCC 2021a).

ABOUT THIS REPORT

This report aims to serve as a reference document on NDC content and how it has evolved since the Paris Agreement entered into force, to inform the global stocktake and the Glasgow work programs on mitigation ambition and adaptation, and to shape subsequent NDCs. It captures key insights from the Climate Watch platform of the World Resources Institute (WRI) and other data sources, and it raises questions stemming from these data that merit discussion by policymakers, donors, civil society, and researchers.

The report addresses mitigation, adaptation, and finance elements of NDCs. With regard to mitigation, Section 3 examines GHG reduction targets, their impacts, and the sector-specific mitigation measures that countries plan to implement to achieve them. Section 4 analyzes the adaptation elements of NDCs using nine qualitative assessment criteria. Section 5 quantifies the finance requirements that countries communicate in their NDCs—for mitigation, for adaptation, and overall.

The report is based primarily on data from WRI's Climate Watch platform. It examines NDCs communicated through December 31, 2021, except in the Emissions Impact and Finance sections, which use a later cut-off date of September 30, 2022. In addition to Climate Watch, the transport deep dive draws from the Tracker of Climate Strategies for Transport from the German Agency for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit) and the Partnership on Sustainable, Low Carbon Transport. Measures announced but not formally communicated through an NDC are not considered.

Emissions impact

Of the new or updated NDCs, 74 (representing 100 countries[1]) increased mitigation ambition; they would result in demonstrably lower 2030 emissions than each country's previous NDC (Figure ES-1). Of the remainder, 23 would not reduce emissions relative to the initial NDC, and 42 cannot be compared to the previous NDC due to insufficient information. Of the NDCs that increased mitigation ambition, 18 (accounting for 14 percent of global GHG emissions) are still less ambitious than the country's business-as-usual trajectory, suggesting that, in practice, they will not help close the emissions gap despite being nominally better than their predecessors.[2]

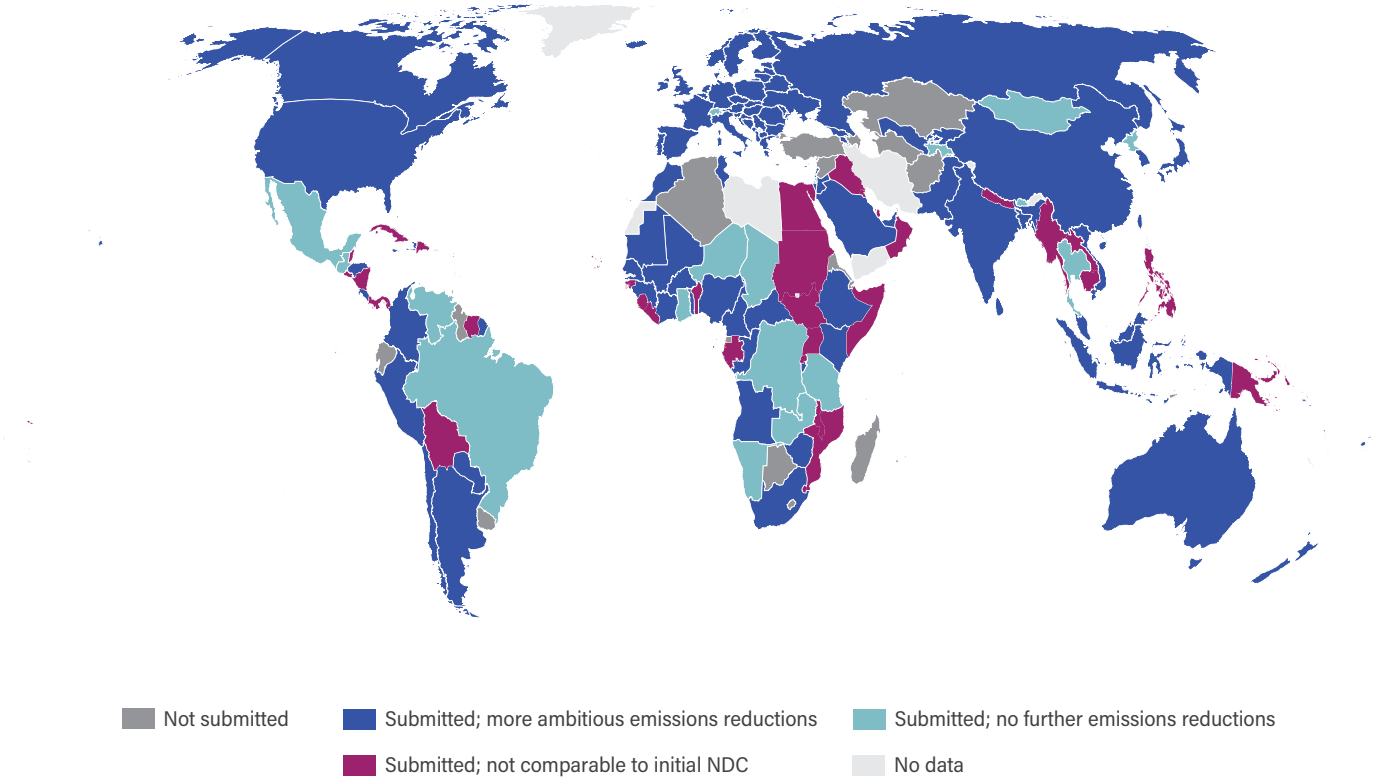
Collectively, the new and updated NDCs will reduce 2030 emissions by an estimated 5.5 $GtCO_2e$ relative to the initial NDCs. This represents a 7 percent reduction from 2019 levels. According to the IPCC (2022b), however, emissions must decline by at least 43 percent from 2019 levels to keep the 1.5°C goal within reach.

Key characteristics of mitigation measures

More countries have set GHG emissions reduction targets than before, and these targets are more likely to be framed as absolute reductions relative to a base year and to cover all sectors and all GHGs. The number of NDCs with GHG emissions reduction targets grew from 128 to 144. Of these targets, the number framed as an absolute reduction relative to a base year grew from 34 to 42. The number with complete sector coverage grew from 54 to 93, and the number with complete gas coverage grew from 20 to 23.

These improvements only modestly increase the share of global GHG emissions covered by GHG targets. GHG targets in the current NDCs cover approximately 2 percent more emissions than the initial NDCs. This can be explained

FIGURE ES-1 | Mitigation Ambition in New and Updated NDCs Relative to Initial NDCs



Note: NDC = nationally determined contribution. Includes NDCs submitted through September 2022.
Source: Authors' analysis based on WRI (2022).

by the fact that the countries expanding the scope and coverage of their targets collectively are responsible for only around 9 percent of global GHG emissions.

In their new and updated NDCs, more countries have included unconditional elements that do not depend on international finance or other factors. Many developing countries designate all or some of their NDC commitments as depending on international finance or other conditions, such as technology transfer or capacity building. Relative to the initial NDCs, however, more countries have included unconditional elements and finance in their new or updated NDCs. The number of NDCs with at least some unconditional element increased from 103 to 123, whereas the number that are completely conditional fell from 50 to 34.

More countries express openness to using international market mechanisms (i.e., Article 6) to achieve their NDCs. The number of NDCs indicating the possibility of employing international market mechanisms has increased from 99 to 120. Countries with NDCs that are now open to these mechanisms, however, account for only 40 percent of global GHG emissions.

The number of NDCs containing a long-term (midcentury) GHG reduction target—in addition to a near-term target—has doubled from 17 in the initial NDCs to 34 currently. Nevertheless, this number pales in comparison to the more than 90 countries that have announced a net-zero target outside their NDCs, suggesting that these ambitious, long-term targets are not yet being fully integrated into countries' near- and midterm plans.

Most new and updated NDCs are more transparent than the initial NDCs, but approximately 16 percent still lack crucial information to quantify emissions. Although the guidelines on clarity, transparency, and understanding adopted at Katowice in 2014 are mandatory only for second

NDCs and beyond, there is evidence that countries are starting to take them on board, with 117 of the new and updated NDCs improving transparency in some capacity. Nevertheless, 20 new and updated NDCs still lack the information necessary to estimate the countries' 2030 emissions.

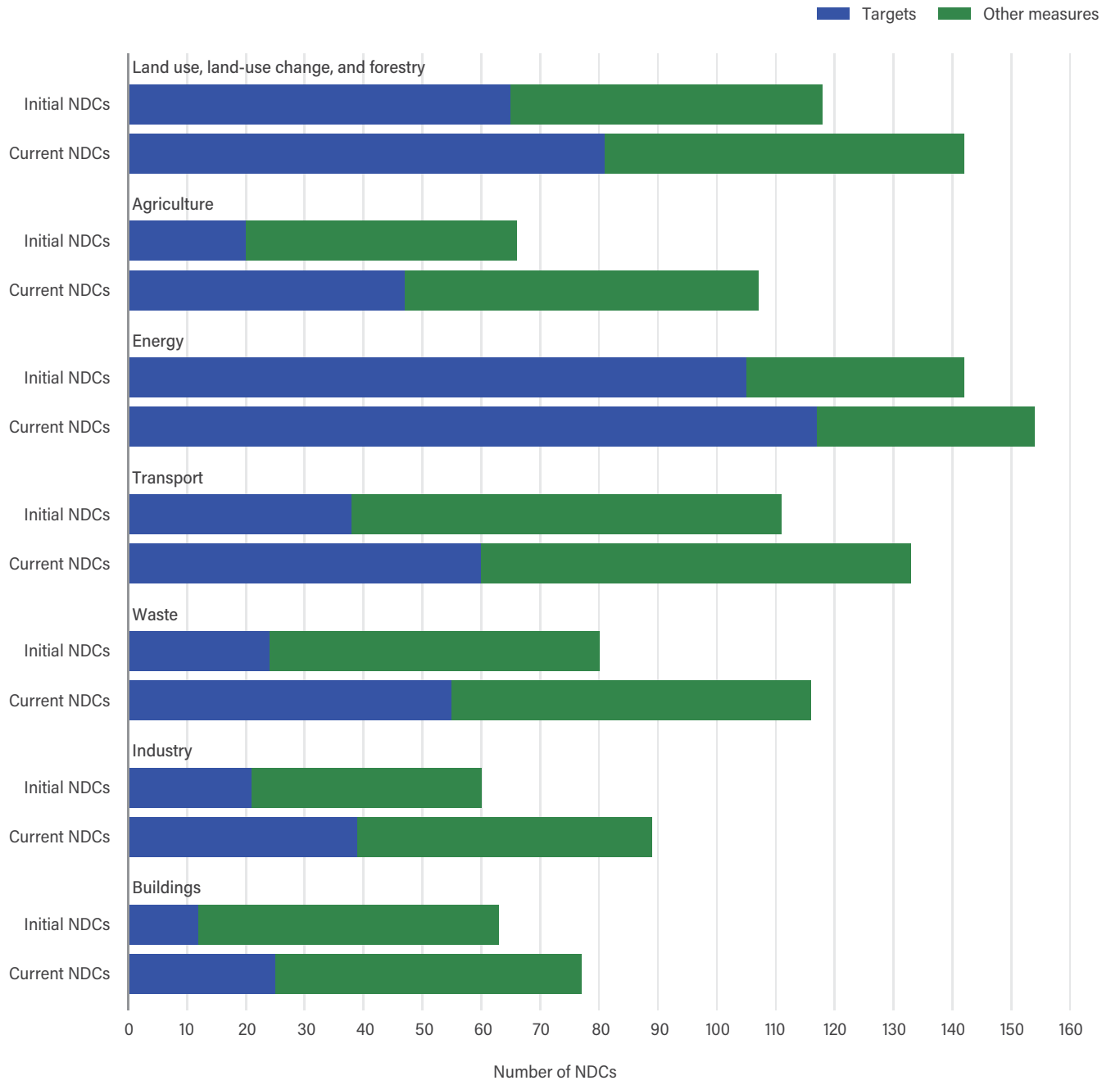
Sector-specific mitigation measures

The number of submissions including sector-specific measures has increased across all sectors from the initial to the current NDCs (Figure ES-2). Sector-specific measures can include sector-specific GHG targets and non-GHG targets (for example, targets to increase renewable energy or reduce deforestation) as well as other types of measures that are not framed as targets. A large majority of NDCs now include measures related to energy (154 NDCs); land use, land-use change, and forestry (LULUCF; 142 NDCs); and transport (133 NDCs). Although fewer NDCs have measures related to agriculture (107 NDCs) and waste (116 NDCs), the number of NDCs tackling these sectors grew significantly from the initial to the current NDCs. Roughly half of current NDCs have measures related to industry and buildings.

Over 20 NDCs included LULUCF sector measures in their new or updated NDCs for the first time, increasing the total number of NDCs with such measures to over 140. However, the specific targets, policies, and actions vary sharply in terms of their quantified metrics and implementation plans. Encouragingly, many countries are including measures related to protection, management, and restoration—all of which are needed to reach the goals of the Paris Agreement. Although these increased LULUCF measures can help improve global ambition, countries with some of the largest land sector emissions have some of the weakest commitments.

Many NDCs promote renewable energy generation, but fewer seek directly to limit fossil fuels. One hundred fifty current NDCs contain measures addressing the power sector. Targets and other measures promoting renewable energy are particularly widespread. Eighty NDCs address solar power, and many others address hydropower, wind energy, waste-to-energy, and other clean generation technologies. On the other hand, only 51 NDCs contain measures related to fossil fuel–fired generation. Only some of these would reduce absolute emissions; others would actually expand generation from fossil sources (particularly natural gas).

FIGURE ES-2 | Sector-Specific Mitigation Measures in Initial and Current NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

New fossil fuel infrastructure is at odds with limiting warming to 1.5°C (IPCC 2022b), and the Glasgow Climate Pact calls on countries to accelerate efforts "towards the phase-down of unabated coal power," with "targeted support to the poorest and most vulnerable" (UNFCCC 2021b).

More countries are committing to electric mobility, but attention to other critical transport measures—such as demand management, modal shift, and freight—lags behind. The number of NDCs including electrification actions more than doubled, from 27 initial NDCs to 68 current NDCs, revealing a rapid surge of global attention, not just in developed nations. However, these actions will need to be coupled with transport demand management and a clean electrical grid to achieve the greatest emissions reductions. NDCs include limited focus on reducing dependence on private motorized transport, increasing the availability and use of public transit, or prioritizing active mobility where possible. Freight is responsible for 40 percent of emissions from the transport sector, but only 19 new and updated NDCs mention freight mitigation actions. More action is needed to address freight emissions or else they will continue to rise with increased global demand.

The next round of NDC updates offers an opportunity for the 119 signatories of the Global Methane Pledge to spell out how they will contribute to the collectively promised 30 percent reduction in methane emissions by 2030. Although most signatories include methane within the scope of their NDCs' top-line GHG reduction target, the extent to which methane will contribute to those targets is typically unclear, and only 15 NDCs include a methane-specific emissions reduction target. Seventy-six signatories include sector-specific measures especially relevant to methane emissions in their NDCs, including 69 in the waste sector, 36 in the agriculture sector, and 47 in the energy sector.

The number of NDCs that explicitly address the concept of a just transition has increased from 1 initial NDC to 32 current NDCs. Grounded in the need to support workers and communities facing negative impacts in the shift away from fossil fuel–based societies, the concept of a just transition has been integrated into climate change negotiations, declarations, and agreements, including the preamble to the Paris Agreement and most recently the Glasgow Climate Pact. The NDCs are beginning to reflect this trend, though the level of detail they provide on just transition is highly uneven.

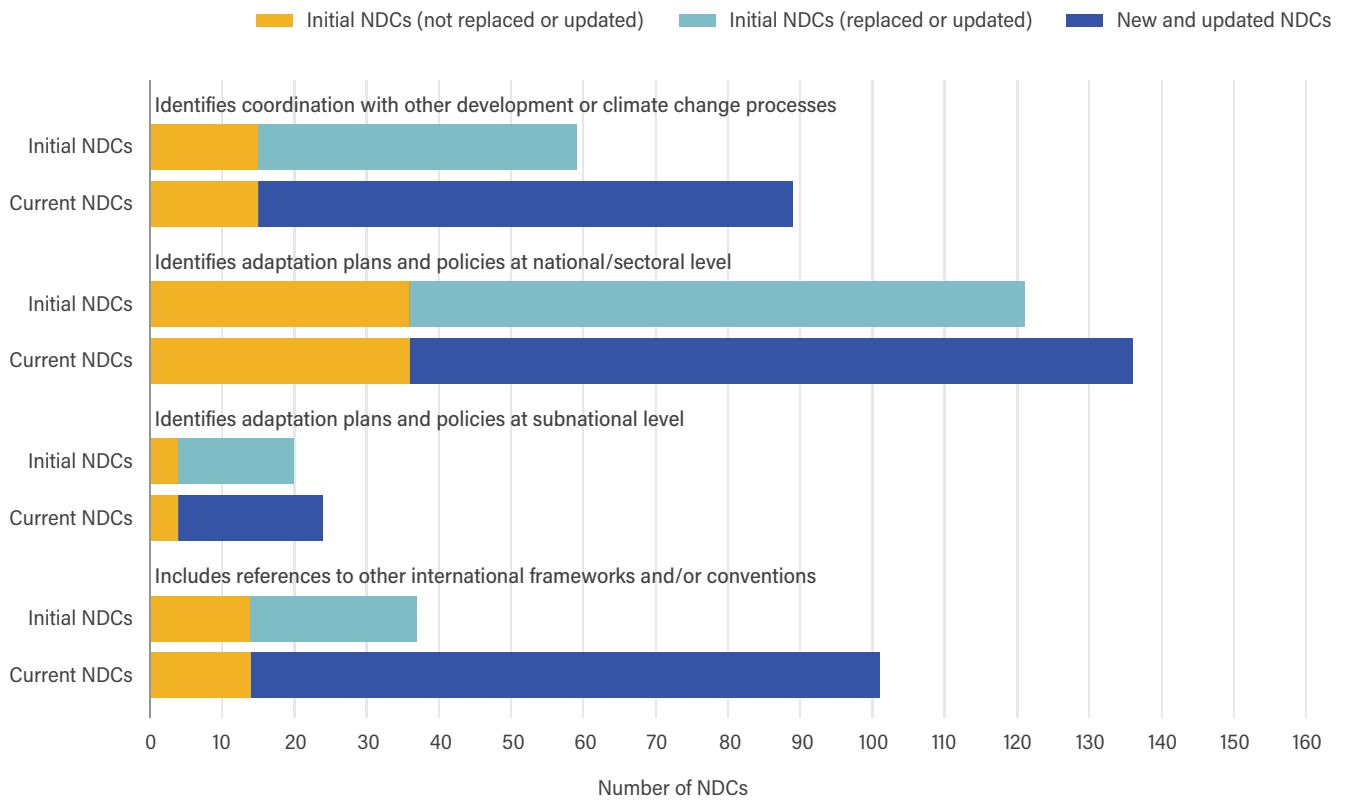
Elements of adaptation planning

An adaptation component is included in 144 current NDCs. Most (139) developing country NDCs include adaptation, but only 5 out of 16 developed country NDCs do. Countries may choose to communicate information on adaptation planning through separate instruments, such as adaptation communications.

The current NDCs demonstrate greater alignment than the initial NDCs with other adaptation plans and processes, including with the national adaptation plan (NAP) process. Of the current NDC adaptation components, 136 reference linkages to national and sectoral plans for adaptation (Figure ES-3). Countries are also demonstrating stronger linkages with ongoing or completed NAPs, which are much more comprehensive documents than NDCs for adaptation planning.

Countries are consistently including information on climate trends and impacts in their NDCs, with 104 current submissions providing this information. These trends are increasingly supported by the latest assessments and national communications, which serve as valuable context for adaptation.

FIGURE ES-3 | References to Other National Plans and International Frameworks



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

Priority adaptation actions and implementation

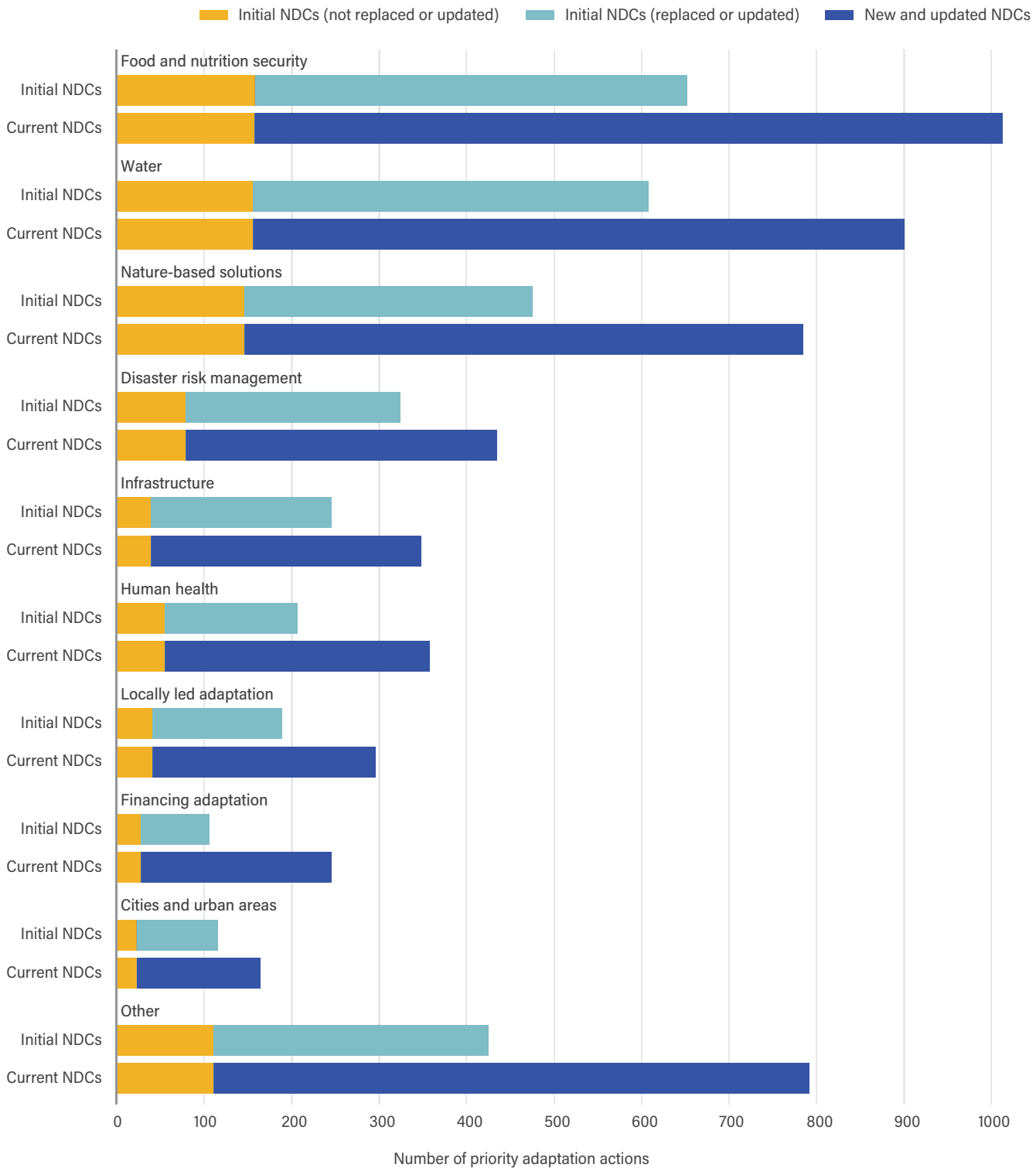
In 122 current NDCs, priority adaptation actions are identified to increase resilience and reduce vulnerability, and these priority actions cover more sectors and systems than the initial NDCs. Collectively, the current NDCs include 4,641 priority adaptation actions, compared to 2,850 actions in the initial NDCs. However, this increase is not uniform across NDCs and includes a high variance in the scope and detail of activities, suggesting that the number of actions alone does not adequately capture quality. Using a framework that identifies critical systems for adaptation based on Bapna et al. (2019), the authors found significantly increased sectoral coverage, with food and nutrition security, water, and nature-based solutions as the three most-prioritized systems in the NDC adaptation components (Figure ES-4).

Although the current NDCs include more priority adaptation actions than the initial submissions, only 1,826 of these priority actions (39 percent) include time frames for action and just 621 (13 percent) list targets or indicators. These additional details should be elaborated on through further action, such as NDC implementation plans or as elements of the NAP process, to ensure that NDC priority adaptation actions are implementation ready.

Only 57 current NDCs include information on monitoring, evaluation, and learning (MEL) for adaptation. Although this number has increased compared to the initial submissions, it represents less than half of total NDCs with adaptation components. Developing countries could benefit from improved guidance and tools on tracking adaptation MEL and linking with national MEL frameworks.

Only 11 current NDCs include references to transformative adaptation, yet 72 include priority adaptation actions with transformative elements. More NDCs are identifying priority actions with transformative elements, including an expansion in scale or systems change as well as innovation, but the lack of direct engagement with transformative adaptation (as defined in Chapter 2 of this report) suggests a gap in understanding of this emerging concept. Countries could benefit from further support to identify transformative adaptation pathways, map the transformative potential of adaptation actions, and link their NDC with long-term strategies.

FIGURE ES-4 | Breakdown of Priority Adaptation Actions in the NDCs Using Adapt Now Critical Systems



Notes: NDC = nationally determined contribution. These numbers exclude instances where sectors appear multiple times for the same adaptation action to avoid duplication for actions that were coded with multiple subsectors of the same category.

Source: Authors' analysis based on WRI (2022).

Equity considerations in adaptation

The current NDC adaptation components focus more on equity considerations than the initial submissions, both in terms of gender responsiveness and inclusion of Indigenous peoples. Seventy-nine current NDCs address gender differences in adaptation needs, and significantly more NDCs now discuss gender equity in participation and benefits than did so in initial NDCs. Countries are also increasingly referencing local and Indigenous knowledge in the current NDCs as well as supporting Indigenous rights and agency.

Losses and Damages from Climate Change

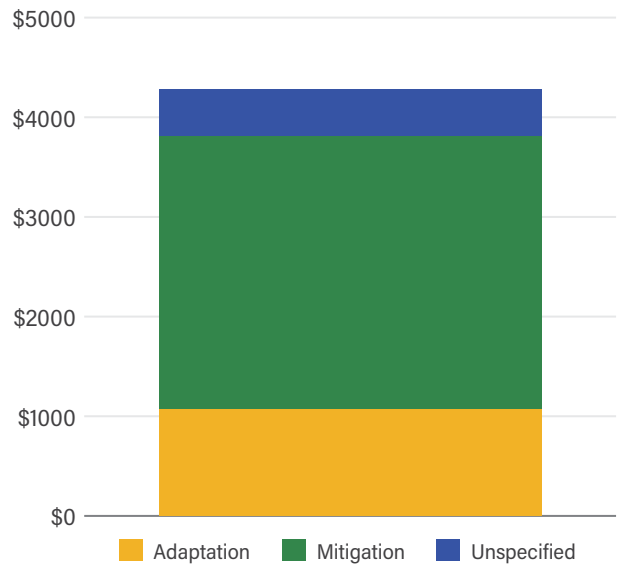
Climate-vulnerable countries are increasingly describing economic losses and damages (L&D) in their NDCs, and most countries are including more references to L&D topics. Sixty current NDCs include descriptions of economic L&D,[3] such as estimated financial costs from climate change impacts or extreme events. This is down from 63 such descriptions in the initial NDCs. But more countries are including information related to slow-onset events, human mobility (including migration, displacement, and planned relocation), and finance and capacity building to address L&D. Small island developing states, which are disproportionately vulnerable to climate change impacts, are the most likely to include information on economic L&D and L&D topics.

Finance

The number of NDCs estimating climate finance requirements has increased from 78 initial NDCs to 89 current NDCs. Countries are not required to report their climate finance requirements. Nevertheless, not only are more countries including NDC finance requirements, but they are also increasingly disaggregating their mitigation and adaptation needs for mitigation and adaptation (as opposed to providing only a lump sum). The number of NDCs reporting mitigation finance requirements increased from 62 to 70, and those reporting adaptation finance requirements from 51 to 62. In addition, the number of countries reporting conditional and unconditional finance has increased from 39 to 51 and from 25 to 39, respectively.

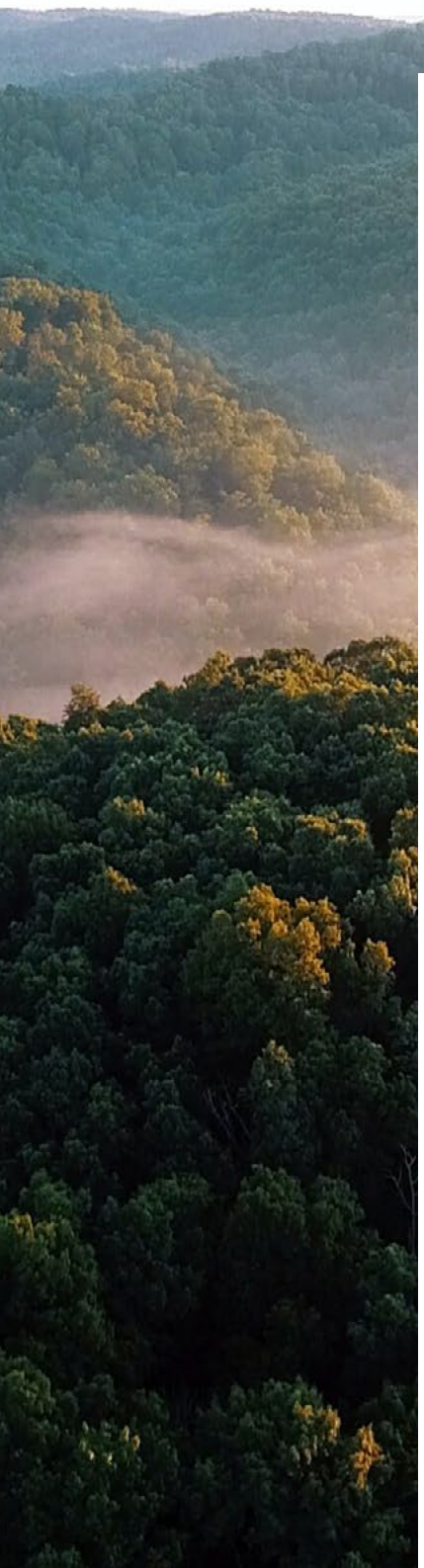
Eighty-nine of the current NDCs report climate finance requirements, which total $4,282 billion, including $2,740 billion for mitigation, $1,067 billion for adaptation, and $475 billion unspecified (Figures ES-5). When countries detail the conditional and unconditional finance requirements, conditional costs are almost three times the amount of unconditional finance reported by countries in their current NDCs. In the case of countries that disaggregated their adaptation and mitigation finance requirements between conditional and unconditional support, conditional finance requirements are between seven and two times the amount of unconditional finance, respectively.

FIGURE ES-5 | Total Stated Climate Finance Requirements in Current NDCs (US$, billions)



Note: NDC = nationally determined contribution. Includes NDCs submitted through September 2022.

Source: Authors' analysis based on UNFCCC (n.d.).



CHAPTER 1

Introduction

NDCs are the building blocks of the Paris Agreement, yet in their first iteration, they fell far short of delivering on the agreement's collective, global goals. The agreement established a process for countries to improve their NDCs over time, and under this process, a majority of countries have now submitted new or updated NDCs. This report takes stock of the NDCs as they currently address mitigation, adaptation, and finance, and documents how they have evolved over time.

In the Paris Agreement, adopted in 2015, every country in the world agreed to pursue efforts to limit climate change to 1.5°C, increase adaptation capacity and foster climate resilience, and align financial flows with low-emissions, climate-resilient development (UNFCCC 2015). Yet six years in, the Intergovernmental Panel on Climate Change (IPCC) issued a stark warning: The planet has already warmed by 1.1°C, and the impacts of climate change to date are more widespread and severe than previously expected. Risks to people, species, and ecosystems will rise as temperatures increase, leading to irreversible climate impacts and exacerbating inequity and conflict.

Under modeling scenarios that limit warming to 1.5°C, global emissions peak almost immediately. But under countries' current climate plans, they will continue to grow (UNFCCC 2021c). Rapid transformations across all systems—energy, industry, buildings, transport, and land and food systems—are needed to change course. Mitigation finance will need to be three to six times greater to limit warming to below 2°C, to say nothing of 1.5°C (IPCC 2022b). Similarly, public adaptation finance will need to expand five to ten times to meet developing countries' estimated adaptation costs (UNEP 2021a).

Countries around the world must grapple with a joint challenge: to ramp up the ambition of their climate plans, even as they endeavor to hasten delivery of the plans that exist today. The 26th Conference of the Parties (COP26), which met in 2021 in Glasgow, was dubbed "the Ambition COP." Its leadership exhorted countries to strengthen their commitments and—when they were not strengthened enough—COP26 ended with pledges to strengthen them further in the lead-up to COP27. Yet ambitious commitments that are never implemented will neither limit warming nor build resilience. Conversely, COP27 has been dubbed "the Implementation COP,"[4] yet implementation alone, without increased ambition in mitigation and adaptation, will likewise place the Paris Agreement goals out of reach.

The premise of this report is that a robust understanding of existing NDCs and how they have evolved since the initial round is a necessary foundation to strengthen both ambition and implementation.

NATIONALLY DETERMINED CONTRIBUTIONS

To achieve its goals, the Paris Agreement introduces several mechanisms and processes to the international climate change regime.[5] Key among these is a five-year cycle designed to increase the ambition of climate action over time. The starting point for this "ambition mechanism" are Parties' nationally determined contributions (NDCs), which outline their commitments to address climate change.

NDCs are highly diverse in their contents. Although the Paris Agreement creates a "hard obligation" to address mitigation via NDCs (Rajamani 2016), its provisions regarding the role of adaptation, as well as finance and other means of implementation, in NDCs are softer. With regard to adaptation, Parties are invited to submit and periodically update adaptation communications through their NDCs or through any other communication or document, including national adaptation plans (NAPs) or national communications. There are no specific provisions guiding the role of finance in NDCs. In practice, many countries, especially developing countries, communicate adaptation plans as well as finance requirements for both adaptation and mitigation through their NDCs.

Article 4 of the Paris Agreement requires each Party to prepare and communicate a successive NDC every five years. Each successive NDC must represent a progression beyond the Party's current NDC and reflect its highest possible ambition (UNFCCC 2015). The COP decision text that gave effect to the Paris Agreement in 2015 also requested that Parties communicate a new NDC (for those with a 2025 target) or either communicate or update their existing NDC (for those with a 2030 target) by 2020. This process was informally extended beyond 2020 as a result of the COVID-19 pandemic and the associated delay of COP26 to November 2021. A majority of countries communicated new or updated NDCs by COP26. The COP26 decision requests

Parties "revisit and strengthen" their 2030 NDC targets "as necessary to align with the Paris Agreement temperature goal" by the end of 2022 (UNFCCC 2021b).

The Paris Agreement also establishes opportunities to assess collective progress toward achieving the purpose of the agreement and its long-term goals every five years. The first such "global stocktake" will conclude in 2023, ahead of a requirement to communicate the next round of NDCs. The outcome of the stocktake will inform this next round of NDCs by ensuring that Parties have information to enhance the ambition of their NDCs and further collective progress towards the long-term goals.

Each cycle of NDC communication offers Parties the opportunity to assess whether their mitigation contributions reflect their "highest possible ambition" and whether they could do more to contribute to collective efforts to achieve the purpose and long-term goals of the Paris Agreement, "in accordance with equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances," as the agreement stipulates (UNFCCC 2015).

ABOUT THIS REPORT

Objectives and contribution

This report presents a snapshot of the NDCs and sheds light on how they have evolved since their initial incarnation following the adoption of the Paris Agreement. It has three main objectives:

- To serve as a reference document on NDC content
- To serve as a data-driven input to strategic discussions regarding the Glasgow mitigation and adaptation work programs, the Global Goal on Adaptation (GGA), and the first global stocktake
- To inform subsequent NDCs, including the 2025 round, by raising questions stemming from NDC data that merit further exploration by researchers, funders, and policymakers

The report contributes to a growing body of NDC literature that has sought to quantify the impact of NDCs on global emissions (UNEP 2021b; UNFCCC 2021c); draw out lessons on developing countries' NDCs (NDC Partnership 2022; UNDP 2021), including their adaptation components (Dixit et al. 2022); and shed light on the treatment of specific sectors in NDCs (GIZ and SLOCAT 2022; IRENA 2022; WWF-UK 2021). It complements this literature by offering a comprehensive view of the NDCs—across mitigation, adaptation, and finance, covering both developed and developing countries—based primarily on Climate Watch, an open-source, independent data set comprising nearly 200 quantitative and qualitative NDC-related indicators.

Scope

The report covers mitigation, adaptation, and finance elements of NDCs. Chapter 3 addresses greenhouse gas (GHG) reduction targets and the sector-specific mitigation measures countries plan to implement. It includes "deep dives" into several key sectors—namely power; transport; and land use, land-use change, and forestry (LULUCF)—and also into the relationship between NDC content and methane, including the Global Methane Pledge launched at COP26 in Glasgow, and between NDC content and a just transition. Chapter 4 analyzes the adaptation elements of NDCs using nine qualitative assessment criteria: country ownership; alignment with planning exercises and other adaptation plans and policies; use of impact, risk, and vulnerability information; a focus on critical adaptation systems; the presence of additional information for priority actions, such as baselines, time frames, and costs; clarity about monitoring and evaluation approaches; commitments to social inclusion, gender, and equity; references to losses and damages (L&D)[6] from climate change; and evidence of transformative adaptation. It also includes a deep dive into food and nutrition security. The finance chapter analyzes

countries' NDC climate finance requirements, differentiating between adaptation, mitigation, unspecified, and conditional and unconditional finance.

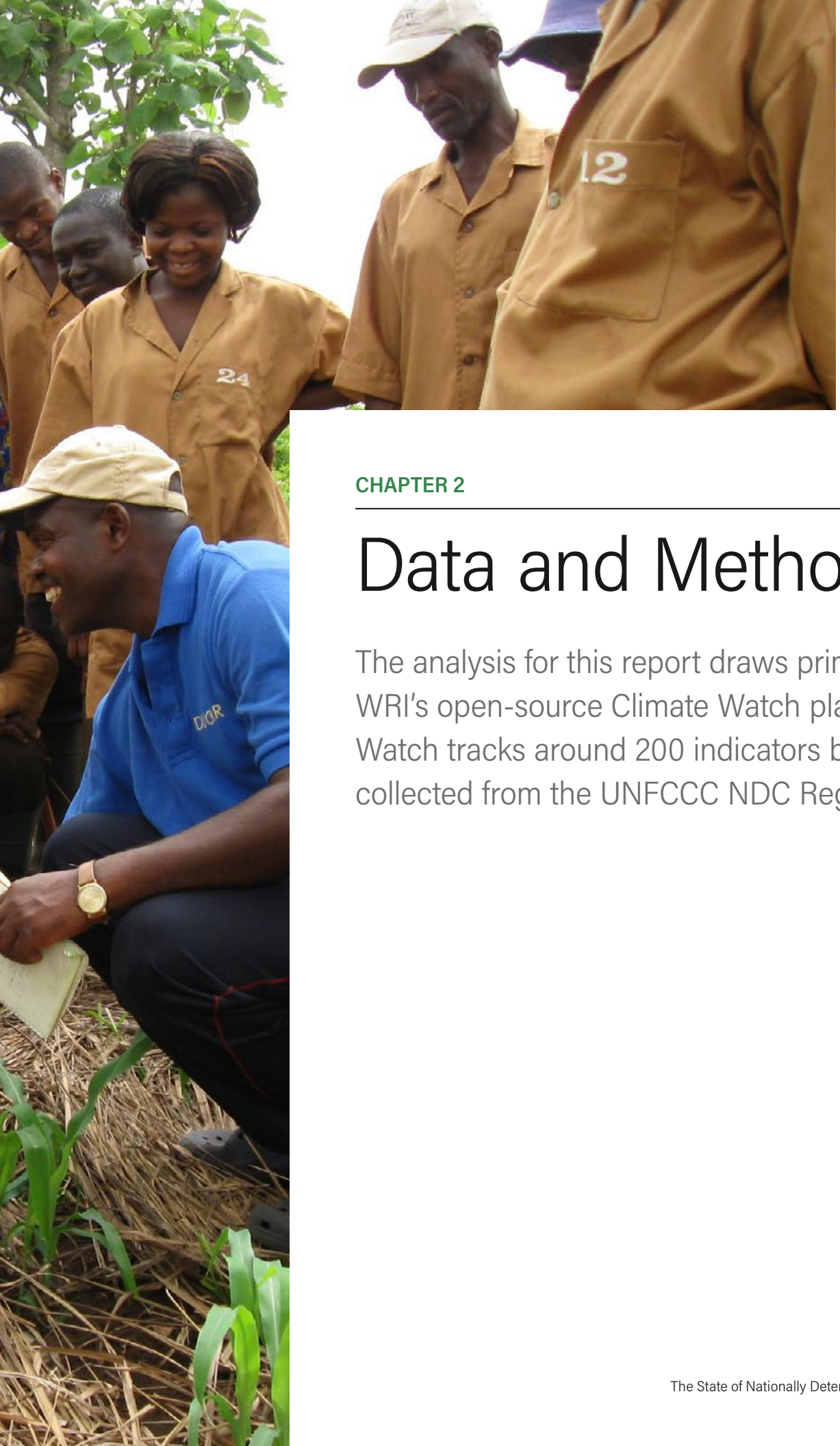
The analysis is based primarily on data from the Climate Watch platform hosted by the World Resources Institute (WRI 2022). In addition to Climate Watch, the transport deep dive draws from the Tracker of Climate Strategies for Transport, collected jointly by the German Agency for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit; GIZ) and the Partnership on Sustainable, Low Carbon Transport (SLOCAT), and the finance analyses (for both mitigation and adaptation) draw from original data collected for this report.

Limitations

From January 1 through September 30, 2022, 18 new and updated NDCs were communicated, of which 11 were from countries that had not previously communicated a new or updated NDC. While the Emissions Impact and Finance chapters consider these latest NDCs, the other chapters—Key Characteristics of Mitigation Measures, Sector-Specific Mitigation Measures, and Adaptation—consider only those NDCs submitted through 2021.

The reliance of this report on an existing data set limits the scope of analysis that can be conducted to questions that can be addressed using the indicators and data points contained in that data set. As a result, our ability to address a number of interesting and relevant questions related to the NDCs is constrained. For example, although issues related to the NDC development process, implementation planning, and equity considerations related to gender and Indigenous issues are relevant to both the mitigation and the adaptation elements of NDCs, Climate Watch contains these indicators only as they pertain to adaptation. Therefore, we do not analyze them for mitigation. Developing a data set that addresses these indicators in the context of mitigation would be a valuable future contribution. Likewise, while Climate Watch maintains a data set on the relationship between NDC content and the Sustainable Development Goals (SDGs), this data set has not yet been updated to reflect the new and updated NDCs, so it has not been included in this analysis.

Countries are not required to report on adaptation or finance requirements in their NDCs; hence, not every NDC includes information on these topics. With regard to finance, some countries' NDCs state that they will estimate their climate finance and support needs through their national strategies, such as climate finance strategies or implementation plans, which were not included in this analysis. In addition, there is no standard methodology for countries to report climate finance requirements. In some cases, countries' reported finance requirements have been presented on different time frames or levels of aggregation. Thus, the report was unable to standardize all country estimates under the same time frame or incorporate all information that may have been presented in other national planning documents. As a result, the estimated aggregate climate finance requirements reported in the NDCs likely underestimate the actual needs, particularly because some countries still need to conduct further needs assessments; some have provided finance costs in documents other than NDCs; and capacity building, technology transfer, and L&D costs are not typically included in climate finance estimates.



CHAPTER 2

Data and Methods

The analysis for this report draws primarily on WRI's open-source Climate Watch platform. Climate Watch tracks around 200 indicators based on data collected from the UNFCCC NDC Registry.

SCOPE OF THE NDCS INCLUDED IN THE ASSESSMENT

One hundred ninety-four Parties have communicated a first NDC under the Paris Agreement.[7] Through September 2022, 166 Parties had communicated an updated first NDC (Parties whose first NDC contained a time frame up to 2030) or a second NDC (Parties whose first NDC contained a time frame up to 2025). Those Parties included the European Union and its 27 Member States, which share a common NDC. Therefore, through September 2022, 167 first NDCs and 139 updated first and second NDCs had been communicated. The Emissions Impact and Finance sections of this report consider all updated first and second NDCs through September 2022. The remaining sections—Key Characteristics of Mitigation Measures, Sector-Specific Mitigation Measures, and Adaptation—use an earlier cut-off date of December 31, 2021, at which point 128 updated first and second NDCs had been communicated.[8]

To analyze how the NDCs have evolved since countries' initial submissions, we categorize NDCs into initial NDCs (each country's most recent submission as of December 31, 2019, excluding updated first NDCs and second NDCs as well as intended NDCs [INDCs] dated subsequent to first NDCs), new and updated NDCs (submissions that updated or replaced an initial NDC between January 1, 2020, and the cut-off date), and current NDCs (submissions effective as of the cut-off date—that is, new or updated NDCs for those countries that had submitted one and initial NDCs for those that had not). Initial NDCs are typically first NDCs but, in select cases, can be INDCs.[9] New and updated NDCs are typically updated first or second NDCs but, in select cases, can be first NDCs. This categorization is based on data from the Climate Watch NDC Enhancement Tracker (WRI 2022)—with minor adjustments to promote consistency with the UNFCCC Synthesis Report (UNFCCC 2021c)—and is further detailed in Appendix A (Table A1).

> One hundred ninety-four Parties have communicated a first NDC under the Paris Agreement

Two minor modifications to this approach apply to Chapter 4. First, in two cases where countries submitted multiple new or updated NDCs, the most recent submission was not considered because the update pertained only to mitigation commitments.[10] Second, because the adaptation data set used for this analysis does not contain INDCs, Chapter 4 excludes the INDCs of five countries from the initial NDC grouping and categorizes their first NDCs as initial NDCs instead. As a result, we consider 139 new and updated NDCs for Emissions Impact and Finance, 128 for Key Characteristics of Mitigation Measures and Sector-Specific Mitigation Measures, and 123 for Adaptation.

Commitments that are not reflected in an NDC submitted to the UNFCCC are not considered in this analysis.

MITIGATION DATA

The data on NDCs used in this report were collected by Climate Watch, an online platform managed by WRI that provides open climate data, visualizations, and resources for use on its NDC Explorer and NDC Enhancement Tracker modules. The high-level data collected on each NDC include information on every country's GHG targets, estimated 2030 emissions, scope and coverage, conditionality, and many other indicators, and the data are gathered directly from countries' NDC documents as found on the UNFCCC NDC Registry or—in the case of 2030 emissions—estimated based on the methodology laid out in Fransen et al. (2021). The data were used to analyze overall trends in NDCs for Chapter 3 of this paper. Data on 2018 global GHG emissions and methane emissions are from Climate Watch's GHG Emissions module, which collects data from the Climate Analysis Indicators Tool, Potsdam Institute for Climate Impact Research, UNFCCC, the Global Carbon Project, and other sources.

Climate Watch collected the data for sector-specific commitments using a methodology adapted from the World Bank's NDC platform. Each measure in an NDC document that is specific to a sector is classified as a sectoral plan, target, policy, or action, and it is categorized as falling under a specific sector and subsector. Sectors include agriculture, buildings, energy, industries, LULUCF, transport, and waste. Climate Watch collected further information, where available, on the emissions reduction potential, costs, and capacity building or technology needs associated with each measure as well as the part of each measure that was conditional or unconditional. More information on the subsectors and indicators used for this analysis can be found in Appendix A.

Data for the transport deep dive comes from the Tracker of Climate Strategies for Transport, collected jointly by GIZ and SLOCAT. This data set was preferred for the transport sector because labels and data filters were already established to streamline data collection. Findings were cross-checked with the Climate Watch NDC Enhancement Tracker to ensure consistency throughout the report.

To identify NDCs that address a just transition, the authors performed a word search within both the Climate Watch NDC Explorer (WRI 2022) and the UNFCCC's NDC registry (UNFCCC n.d.) for the term *just transition* and reviewed the NDCs containing the term.

ADAPTATION DATA

The authors collected and analyzed data for the NDC adaptation components using the methodology developed by Dixit et al. (2022). The data collected for this chapter are available on the Climate Watch platform, and further details on the methodological choices underlying this chapter, and their rationale, can be found in Dixit et al. (2022).

The framework includes elements and indicators for assessing the content of NDCs, with improved consideration of these elements representing increased ambition of the adaptation component. The methodology comprises four sections for analyzing adaptation:

- *Elements of adaptation communications* assesses indicators related to country ownership of NDCs; NDC alignment with planning exercises and other adaptation plans and policies; the use of the latest impact, risk, and vulnerability information; clarity about monitoring and evaluation approaches; and commitments to social inclusion, gender, and equity.
- *Critical systems and sectors in priority adaptation actions* assesses the categories prioritized for adaptation action developed by the Global Commission on Adaptation's *Adapt Now* report (Bapna et al. 2019)—for example, food and nutrition security, water, and nature-based solutions

(NbS)—as well as the presence of additional information, such as baselines, time frames, and costs associated with these actions.

- *Losses and damages* assesses whether L&D and related elements are included in NDCs. The section provides a broad analysis of L&D in the NDCs and is not exclusively limited to components on L&D that are explicitly included in some NDC documents. The assessment framework for this section was developed based on strategic work streams and activities included in the work plan of the UNFCCC's Warsaw International Mechanism on Loss and Damage (WIM Excom 2019).
- *Transformative adaptation* assesses the extent to which the adaptation actions prioritized in NDCs align with "transformative" approaches, such as "actions that seek to create systemic change through an expansion in scale, through innovation, or through a shift in location in response to climate change" based on previous WRI work on transformative adaptation in the food and nutrition security system (Carter et al. 2018; Carter et al. 2021; Ferdinand et al. 2020) and derived from the IPCC's 2014 definition of the term (IPCC 2014). It assesses explicit references to transformative adaptation in the NDCs as well as priority adaptation actions that indicate a significant expansion in scale or address change in the underlying system, include innovation, and include a shift in the location of the adaptation action.

Chapter 4 of this report differs from Dixit et al. (2022) in two ways: first, by analyzing NDC submissions until December 31, 2021 (in contrast to June 30, 2021, in Dixit et al.); and second, by including countries that had not submitted a new or updated NDC by the cutoff date (Dixit et al. included only those countries submitting a new or updated NDC) to get a more comprehensive look at the state of adaptation in the NDCs.

The adaptation data set only includes NDCs that appear on the NDC Registry (UNFCCC n.d.); thus, INDCs were not analyzed in this chapter. For countries that submitted multiple NDC updates in the 2020–21 submission round, new NDCs were only analyzed if they included additional adaptation information.

FINANCE DATA

The Standing Committee on Finance characterizes climate finance as that which "aims at reducing emissions and enhancing sinks of GHGs and aims at reducing vulner-

ability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts" (UNFCCC 2014). For the purpose of this report, climate finance requirements are understood as the costs, investments, or mobilization goals stated by countries to achieve their NDCs.

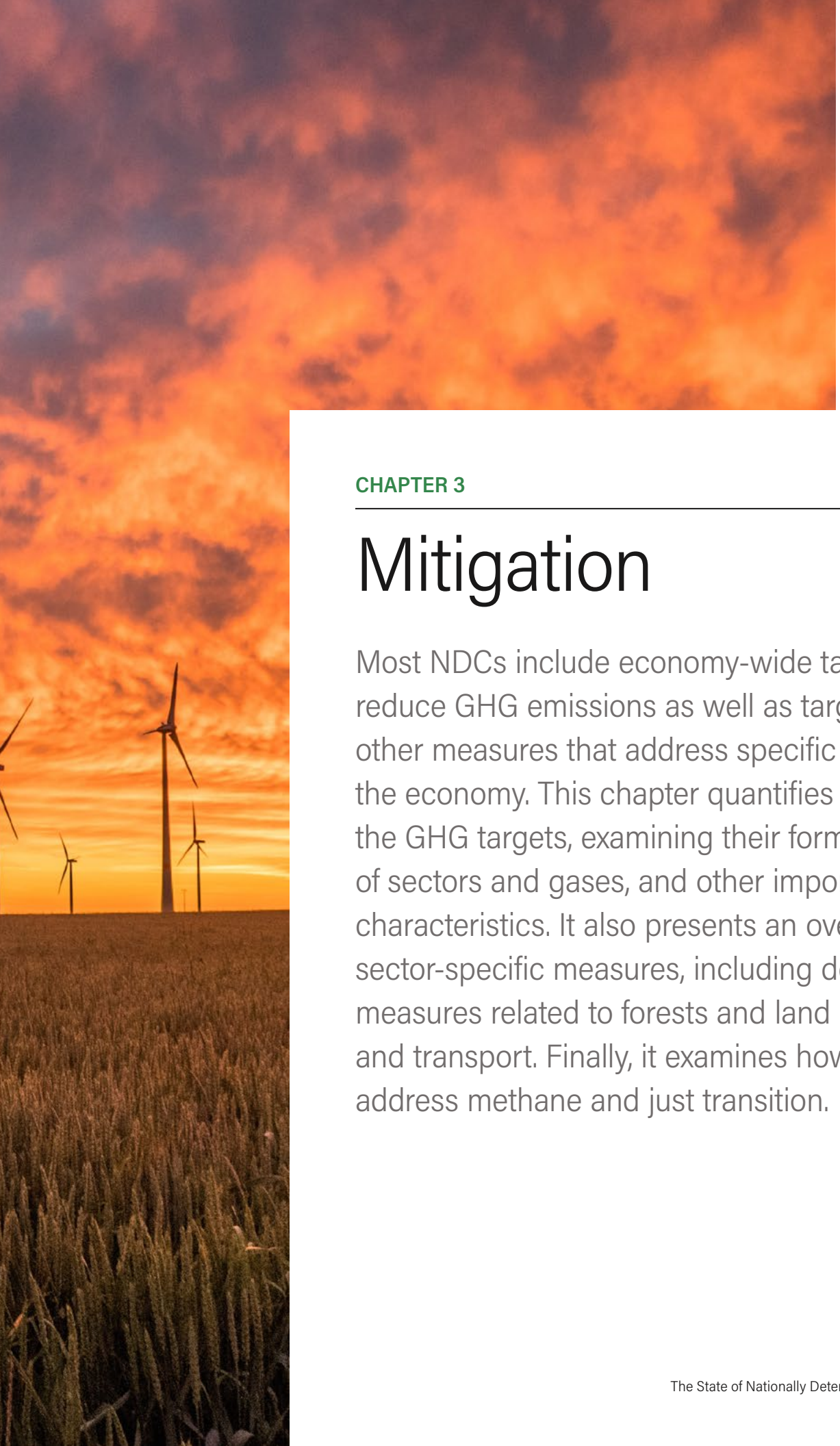
The data found in this chapter is available on Climate Watch (WRI 2022). To create it, the authors extracted and analyzed finance data from countries' NDC documents found in the UNFCCC NDC Registry (UNFCCC n.d).

Climate finance requirements were taken at face value, without analyzing the methodologies countries used to estimate their requirements (which typically are not available within the NDC). In case an NDC included multiple climate finance requirement scenarios, the least conservative (i.e., highest dollar value) scenario was used. Where countries stated that a portion of the total requirements were unconditional, the report assumes the remaining requirements are conditional to international support or vice versa.

Figures that were reported on a disaggregated, project level were summed to provide aggregate figures for mitigation, adaptation, conditional, unconditional, and the other totals presented in this report.

All values are shown in billions of U.S. dollars, and original aggregated values were converted by applying World Bank's official exchange rates as of the year of when the NDC was issued.

This report presents finance requirements on a cumulative rather than annual basis. Finance requirements presented in this report do not intend to fully reflect the finance requirements of all countries since several have stated in their NDCs that they are still working on identifying and refining total climate finance estimates. Some countries have provided cumulative values for specific time frames, typically for roughly 2021–30. Others provided annual estimates. When countries provided yearly need estimates, these were multiplied by the number of years of the NDC timeframe. The analysis also includes a classification of needs that differentiates between mitigation and adaptation and conditional or unconditional finance requirements. If a country did not distinguish between mitigation and adaptation, the aggregate number was classified as unspecified and considered for the total climate finance requirements.



CHAPTER 3

Mitigation

Most NDCs include economy-wide targets to reduce GHG emissions as well as targets and other measures that address specific sectors of the economy. This chapter quantifies the impact of the GHG targets, examining their form, coverage of sectors and gases, and other important characteristics. It also presents an overview of the sector-specific measures, including deep dives on measures related to forests and land use, power, and transport. Finally, it examines how NDCs address methane and just transition.

EMISSIONS IMPACT

Of the 139 new or updated NDCs communicated through September 2022, 74 of them definitively committed to lower 2030 emissions than their predecessors. The remainder either did not reduce emissions relative to their predecessors (23) or contained insufficient information to make this determination (Figure 1). (See Box 1 for further information on clarity, transparency, and understanding in NDCs.)

Collectively, the new and updated NDCs aim to reduce global emissions by an estimated 5.5 gigatons of carbon dioxide equivalent ($GtCO_2e$) relative to the initial NDCs, a 7 percent reduction from 2019 levels. For NDCs that contain both unconditional and conditional elements, this figure considers the unconditional elements only. It also adjusts for "hot air," or target emissions levels that are improbably high relative to modeled baselines. Further methodological details can be found in Appendix A. By contrast, the IPCC (2022b) finds that in pathways consistent with limiting warming to 1.5°C, emissions fall by at least 43 percent from 2019 levels by 2030). Progress in NDCs will need to accelerate dramatically to keep the agreement's objective of limiting warming to 1.5°C within reach.

More than 85 percent of the enhanced emissions reductions in the new and updated NDCs can be attributed to countries increasing the stringency of their existing targets (i.e., switching from a 45 percent to a 55 percent reduction). Other factors include revisions to target reference levels (emissions in a base year or baseline scenario), adoption of new targets by countries that did not previously have targets, and expanding the sector or gas coverage of existing targets.

KEY CHARACTERISTICS OF MITIGATION MEASURES

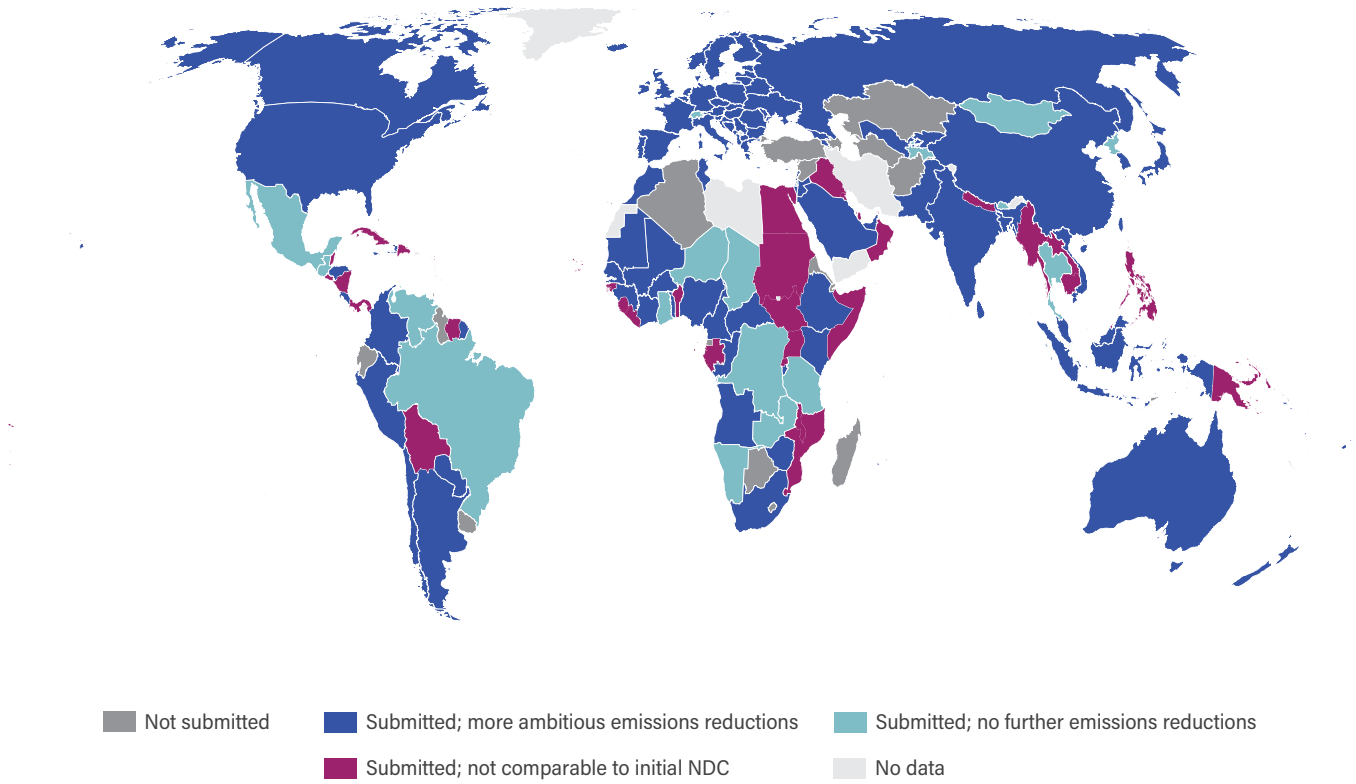
This chapter explores the over-arching mitigation commitments countries made in their NDCs.[11] It examines their form, sector and gas coverage, conditionality, and use of international market mechanisms. Finally, it reviews the use of long-term (post-2030) greenhouse gas targets in NDCs.

BOX 1 | Clarity, Transparency, and Understanding

The Paris Agreement stipulated that in communicating their nationally determined contributions (NDCs), "all Parties shall provide the information necessary for clarity, transparency and understanding."[a] These details were elaborated in the Katowice Climate Package, adopted in 2018.[b] Guidelines governing clarity, transparency, and understanding did not exist when the initial NDCs were put forward, and more than one-third of NDCs lacked the necessary information to quantify their effect on future emissions.[c] Although the Katowice guidelines will be mandatory only for future NDCs, they are "strongly encouraged" for NDCs analyzed in this report. Of these 128 new and updated NDCs, 117 enhanced clarity, transparency, and understanding to some extent.[d] Nevertheless, 20 new and updated NDCs still lack the necessary info to quantify their country's 2030 emissions,[e] leaving significant room for improvement.

Sources: a. UNFCCC 2015; b. UNFCCC 2018; c. Ge and Yuan 2018; d, e. WRI 2022.

FIGURE 1 | Mitigation Ambition in New and Updated NDCs Relative to Initial NDCs



Notes: NDC = nationally determined contribution. Emissions do not sum to 100% due to international sources not captured by national emissions inventories.
Source: Authors' analysis of WRI (2022).

Type of emissions targets and other mitigation contributions

Mitigation commitments in NDCs can take on a variety of forms. These include GHG targets, non-GHG targets, and other measures, such as policies and actions, as described in Box 2. Although the Paris Agreement allows countries to define their own mitigation commitments, it stipulates that developed countries should take the lead by adopting "economy-wide absolute emissions reduction targets" and encourages developing countries to "move over time" to economy-wide emissions targets (UNFCCC 2015).

Although NDCs can include various combinations of mitigation contribution types, we categorize NDCs into three overarching groups: GHG targets (NDCs that contain a GHG target, regardless of whether they also include non-GHG targets and/or other measures), non-GHG targets (NDCs that contain at least one non-GHG target and do not contain a GHG target, regardless of whether they also include other nontarget measures), and actions only (NDCs that contain neither GHG nor non-GHG targets).

Of the initial NDCs, 128 were based on GHG targets, 15 were based on non-GHG targets, and 24 on policies and actions only (with neither GHG nor non-GHG targets). Following the latest round of NDC updates, 144 were based on GHG targets, 14 on non-GHG targets, and 9 on actions only (Figure 2). Because all developed countries already had GHG targets, the increase in GHG targets stems entirely from developing countries. Those countries that have submitted a new or updated NDC reflect a shift towards GHG targets and away from actions only, with 113 of the new and updated NDCs including GHG targets, 12 including non-GHG targets, and only 3 including actions only. Although

BOX 2 | Types of Mitigation Contributions

Figure B2.1 illustrates the different types of mitigation contributions found in nationally determined contributions (NDCs). These types are not mutually exclusive; multiple types may appear in the same NDC.

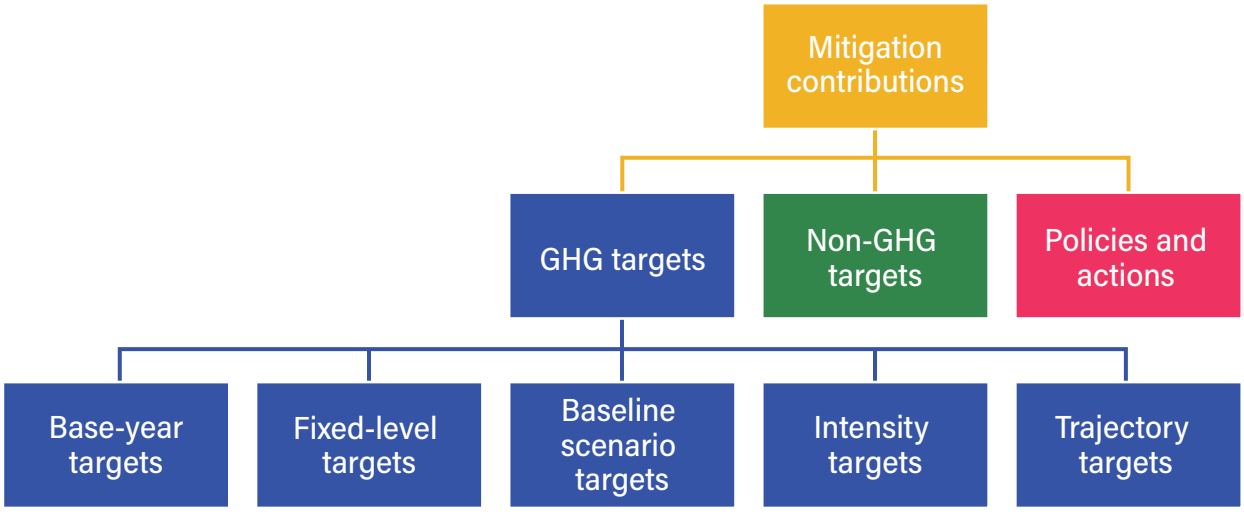
Greenhouse gas (GHG) targets refer to reducing or limiting GHG emissions by a specified amount in a specified timeframe and can take on the following different forms:[a]

- Base-year targets are commitments to reduce, or to control the increase of, emissions by a specified quantity relative to a base year.
- Fixed-level targets are commitments to reduce, or to limit the increase of, emissions to an absolute emissions level in a target year or target period (for example, the carbon budget is a multiyear fixed-level target).
- Baseline scenario targets are commitments to reduce emissions by a specified amount relative to a projected emissions baseline scenario, often characterized as a "business-as-usual" scenario.
- Intensity targets are commitments to reduce emissions intensity (emissions per unit of another variable, such as gross domestic product [GDP] or population).
- Trajectory targets are commitments to reduce, or to limit the increase of, emissions to specified emissions quantities in multiple target years or periods over a long time period and include targets to peak emissions by a given date.

Non-GHG targets are framed in terms of "specific, quantifiable, desired outcomes in energy efficiency, renewable energy, forestry, or other sectors, and that are not expressed in terms of GHG emissions or emissions reductions."[b]

Other measures are typically framed as policies and actions that refer to "Parties' intentions or commitments to implement policies, measures, and projects that will help achieve GHG emissions reductions."[c] For example, an NDC based on policies and actions may state an intent to increase sustainable forest management or promote methane capture, without setting quantitative goals for these actions (which would constitute targets).

FIGURE B2.1 | Types of Mitigation Contributions



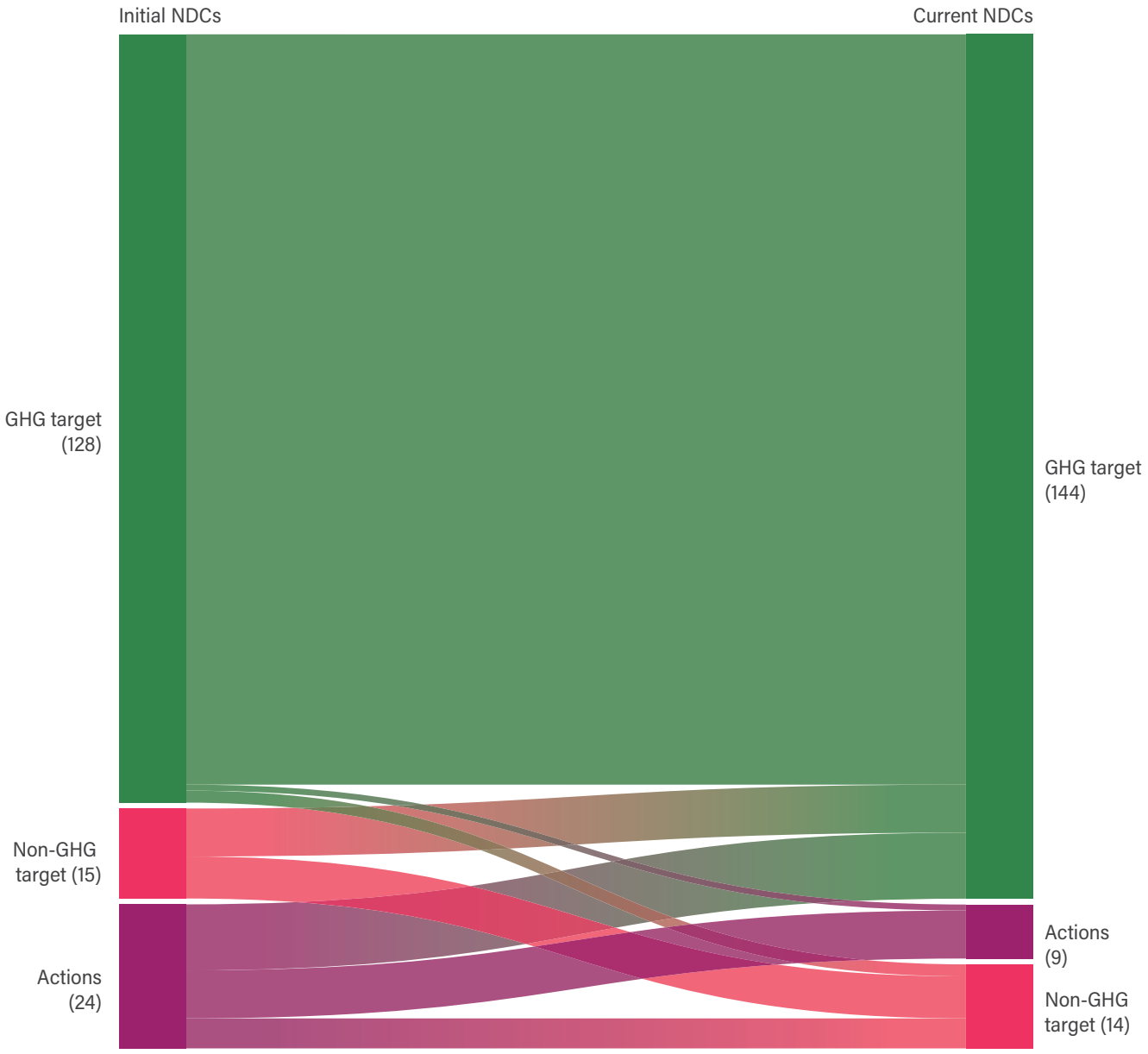
Note: GHG = greenhouse gas.

Sources: a. Fransen et al. 2021; GHG Protocol 2014; Levin et al. 2015; b, c. Fransen et al. 2021.

a significant share of those countries without GHG targets in their previous NDCs adopted such targets in their most recent NDCs, three countries went the opposite direction, dropping the GHG targets in their initial NDCs from their new or updated NDCs.

Most of the largest emitters already had GHG targets prior to the new and updated NDCs, so the impact of the latest round on the share of global emissions covered by GHG targets is relatively small. Ninety-one percent of emissions are now covered by GHG targets, compared to 89 percent previously (Figure 3).

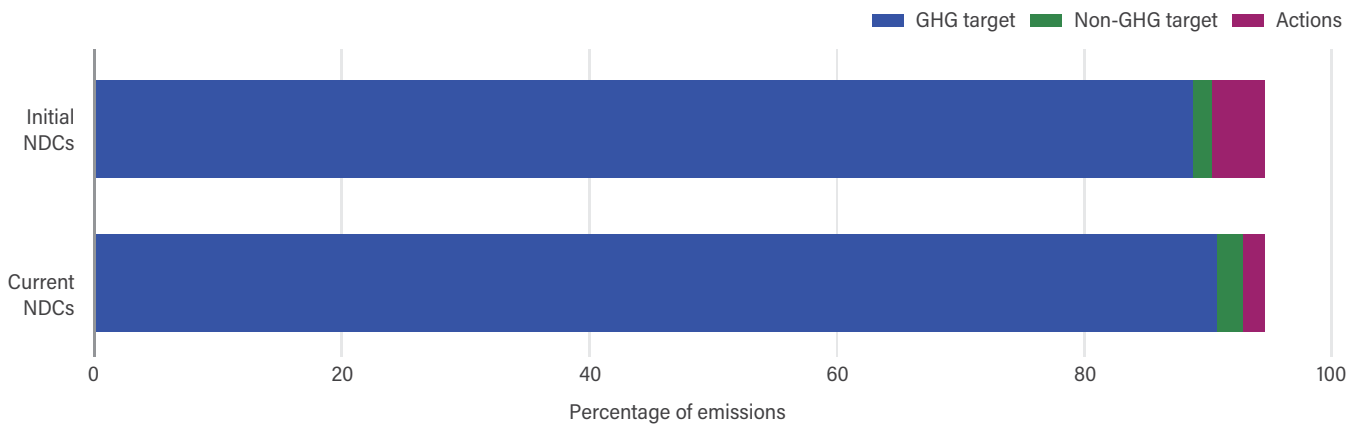
FIGURE 2 | Mitigation Commitments in Initial versus Current NDCs



Notes: GHG = greenhouse gas; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 3 | Share of Global GHG Emissions Covered by Different Mitigation Contribution Types in Initial versus Current NDCs



Note: NDC = nationally determined contribution. Emissions do not sum to 100% due to international sources not captured by national emissions inventories.
Source: Authors' analysis based on WRI (2022).

The Paris Agreement states that developed countries should adopt GHG targets framed as absolute emissions reductions relative to a historic base year, and all except Turkey have done so in both their initial and their current NDCs. In the new or updated NDCs, a growing number of developing countries have done so as well.

Of the initial NDCs, 34 contained base-year targets, 77 contained baseline-scenario targets, 17 contained other types of GHG targets (e.g., intensity targets, fixed-level targets, etc.), and 39 had no GHG target. In the current NDCs, all types of GHG targets increased modestly, as a greater share of developing countries adopted GHG targets for the first time. Base-year targets increased the most, with 42 NDCs (15 belonging to developed and 27 to developing countries) now having base-year targets (Figure 4). Of those countries adopting a GHG target for the first time in new or updated NDCs, most chose baseline scenario targets, keeping this type the most common target despite the broader shift towards base-year targets. Although eight countries moved from baseline-scenario to base-year targets, three went in the opposite direction, abandoning their base-year targets for baseline-scenario targets.

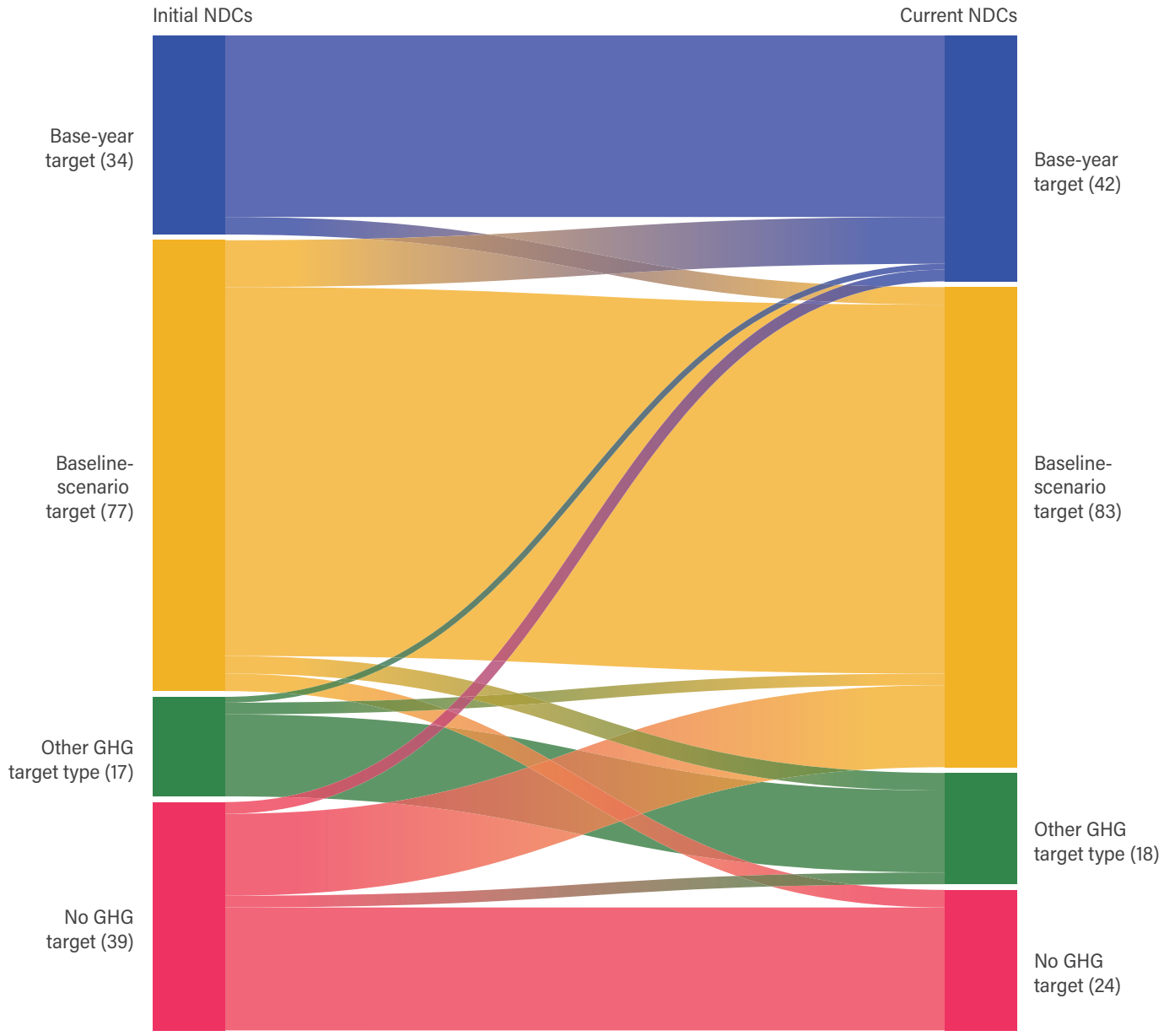
Target coverage

The Paris Agreement requires (for developed countries) or encourages (for others) economy-wide targets. Targets that cover all sectors of the economy—energy, waste, industrial processes and product use, agriculture, and LULUCF—and all relevant GHGs—CO_2, methane (CH_4), hydrofluorocarbons (HFCs), nitrogen trifluoride (NF_3), nitrous oxide (N_2O), perfluorochemicals (PFCs), and sulfur hexafluoride (SF_6)—can help ensure that countries will examine all opportunities to reduce emissions rather than omit some important sources or gases.

Sectoral coverage

Many countries improved their sectoral coverage in their new and updated NDCs. Of the initial NDCs, 54 had GHG targets that covered all sectors, and another 13 had complete sectoral coverage aside from LULUCF. Now 93 cover all sectors, and another 12 cover all but LULUCF. The number of NDCs with incomplete sectoral coverage has fallen from 54 to 35 (Figures 5 and 6). These changes stem nearly exclusively from developing countries. (Among developed countries' NDCs, 14 out of 16 had complete sectoral coverage prior to the updates; now, 15 out of 16 do.)

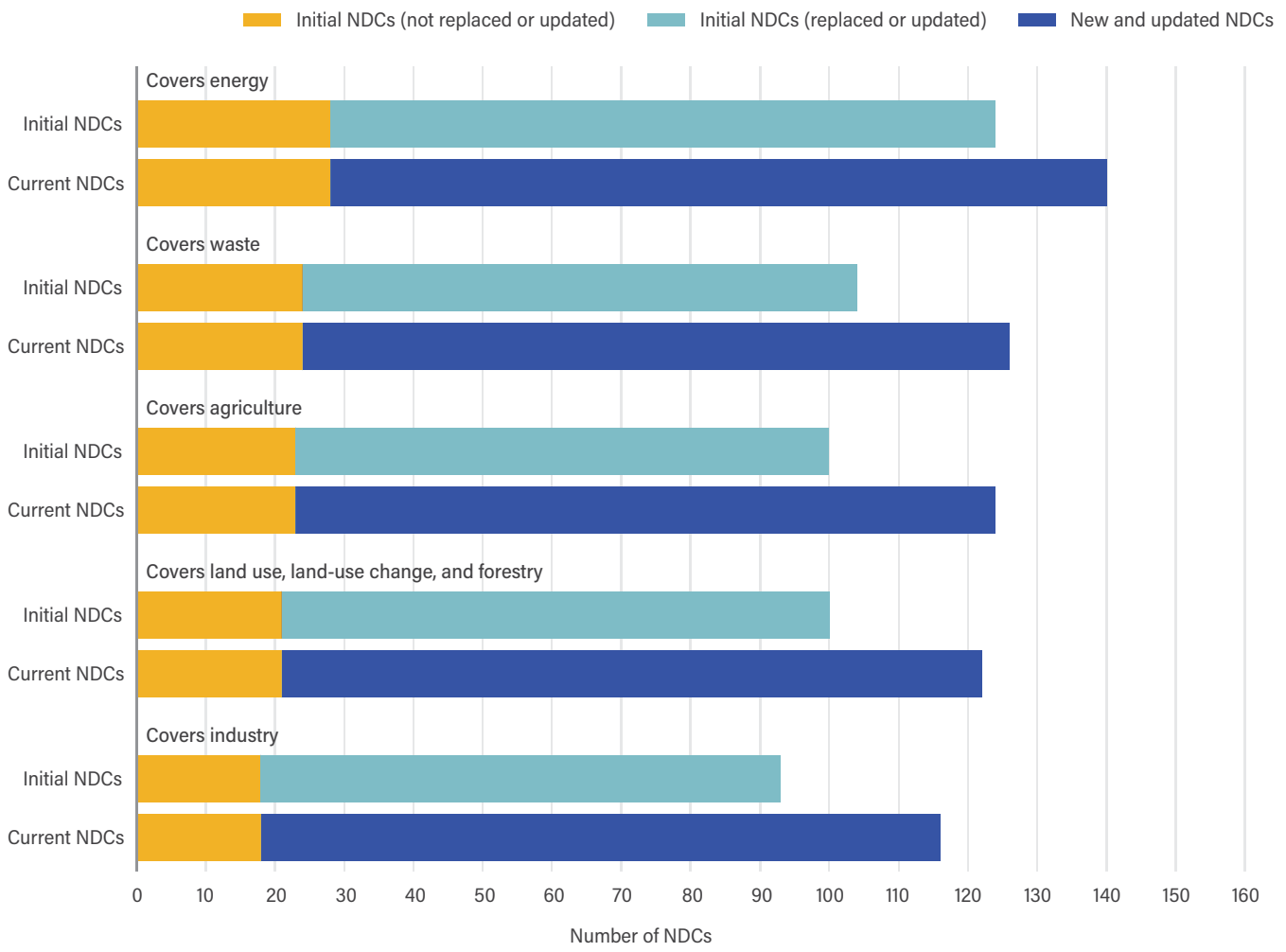
FIGURE 4 | GHG Target Types in Initial versus Current NDCs



Notes: GHG = greenhouse gas; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

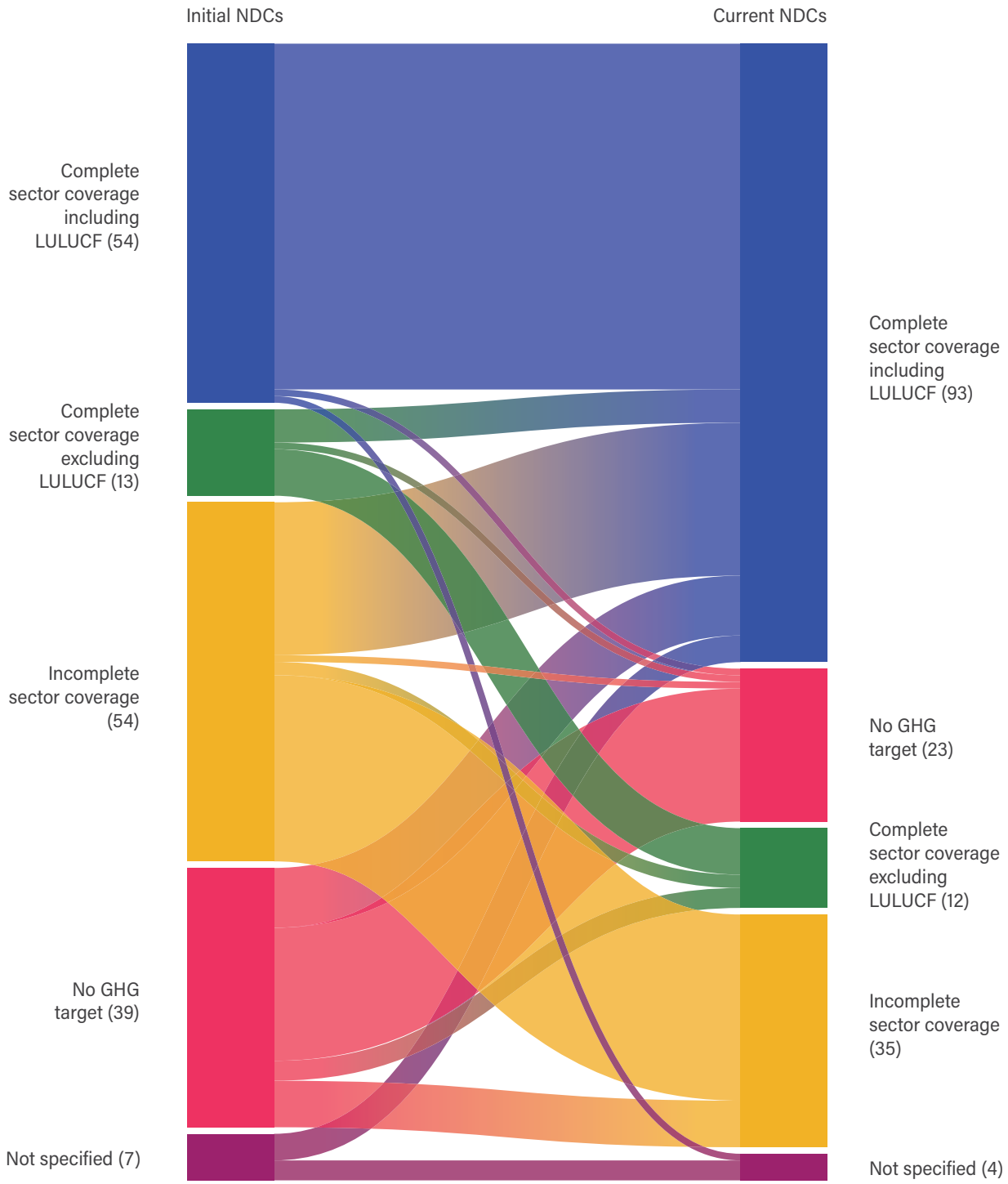
FIGURE 5 | Number of Initial and Current NDCs with GHG Targets Covering Each Sector



Notes: NDC = nationally determined contribution. Does not include NDCs with GHG targets that do not specify sectoral coverage.

Source: Authors' analysis based on WRI (2022).

FIGURE 6 | Sector Coverage of GHG Targets in Initial versus Current NDCs



Note: GHG = greenhouse gas; LULUCF = land use, land-use change, and forestry; NDC = nationally determined contribution.

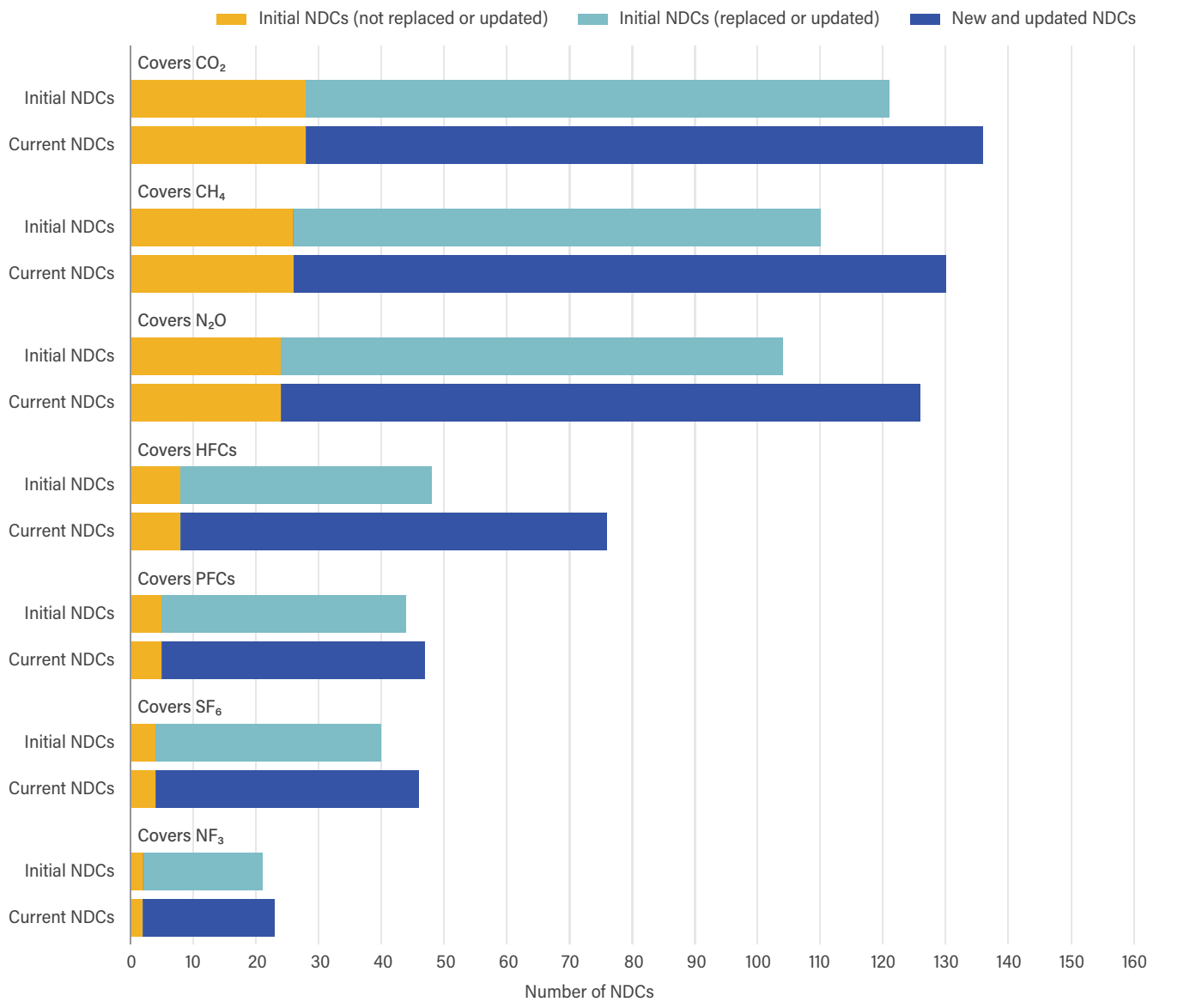
Source: Authors' analysis based on WRI (2022).

GHG coverage

Of the initial NDCs, only 20 had GHG targets that covered all major anthropogenic GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3). (Another 18 had targets that covered all but NF_3.) The current NDCs reflect only modest change, with 23 covering all gases and 14 covering all but NF_3 (Figure 7).

Although 11 countries improved their gas coverage in their NDC updates (not counting those adopting a GHG target for the first time), 12 that initially included all gases, or all except NF_3, backtracked to less complete gas coverage in their new or updated NDC, or they declined to specify

FIGURE 7 | Number of Initial and Current NDCs with GHG Targets Covering Each GHG



Notes: CH_4 = methane; CO_2 = carbon dioxide; HFCs = hydrofluorocarbons; NDC = nationally determined contribution; NF_3 = nitrogen trifluoride; N_2O = nitrous oxide; PFCs = perfluorochemicals; SF_6 = sulfur hexafluoride. Does not include NDCs with greenhouse gas targets that do not specify greenhouse gas coverage.

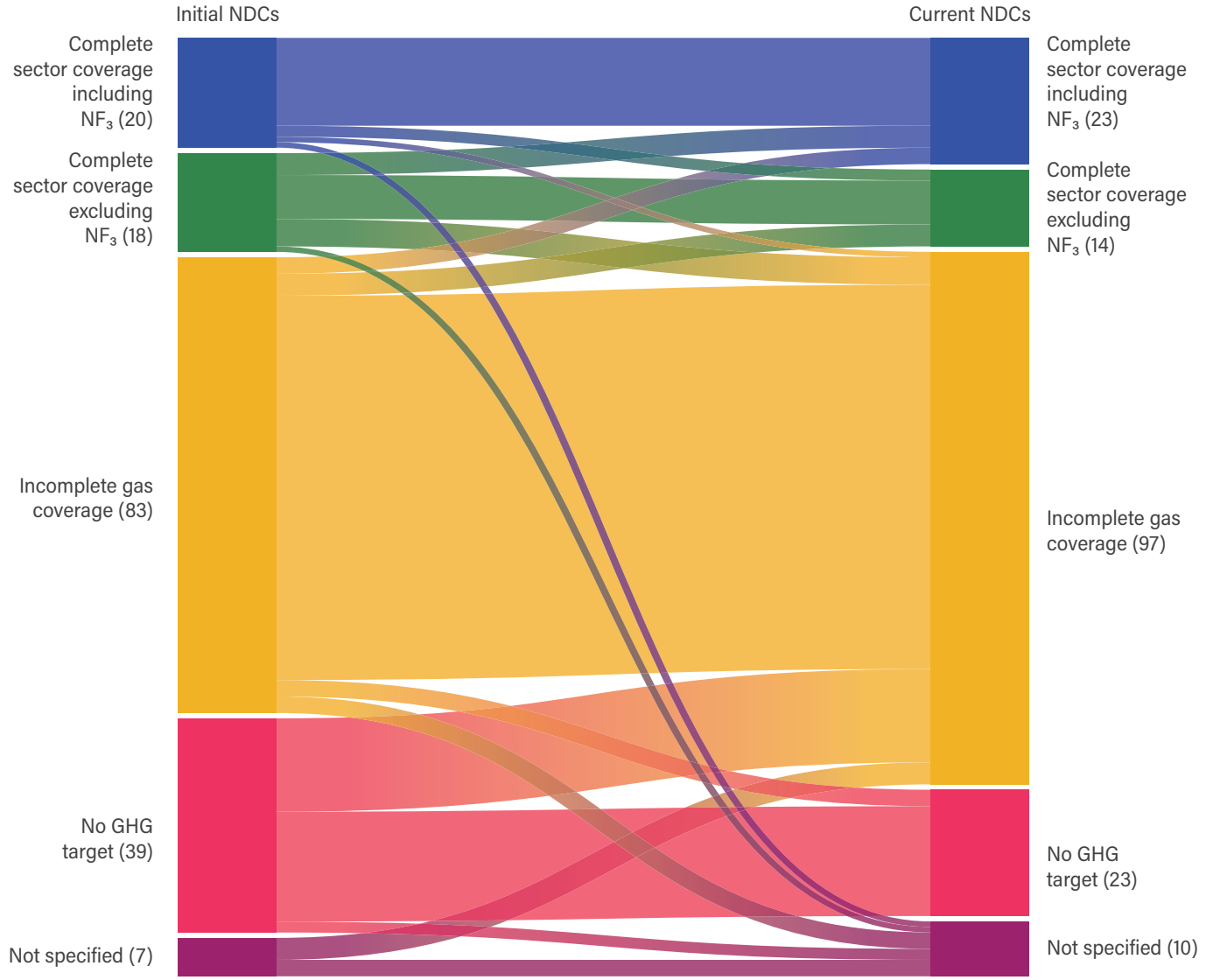
Source: Authors' analysis based on WRI (2022).

which gases they would cover (Figure 8). Once again, most of the changes took place in developing countries. Among developed countries' NDCs, 15 out of 16 had complete gas coverage prior to the updates, and now 14 out of 16 do, with one country that formerly had complete coverage failing to specify coverage in its most recent NDC.

Emissions coverage of GHG targets

When considering changes in both sector and gas coverage, GHG targets in the current NDCs cover approximately 2 percent more global emissions than the initial NDCs. This relatively modest increase can be explained by the fact that the countries expanding the scope and coverage of their targets collectively are responsible for a very small share of global GHG emissions.

FIGURE 8 | GHG Coverage of GHG Targets in Initial versus Current NDCs



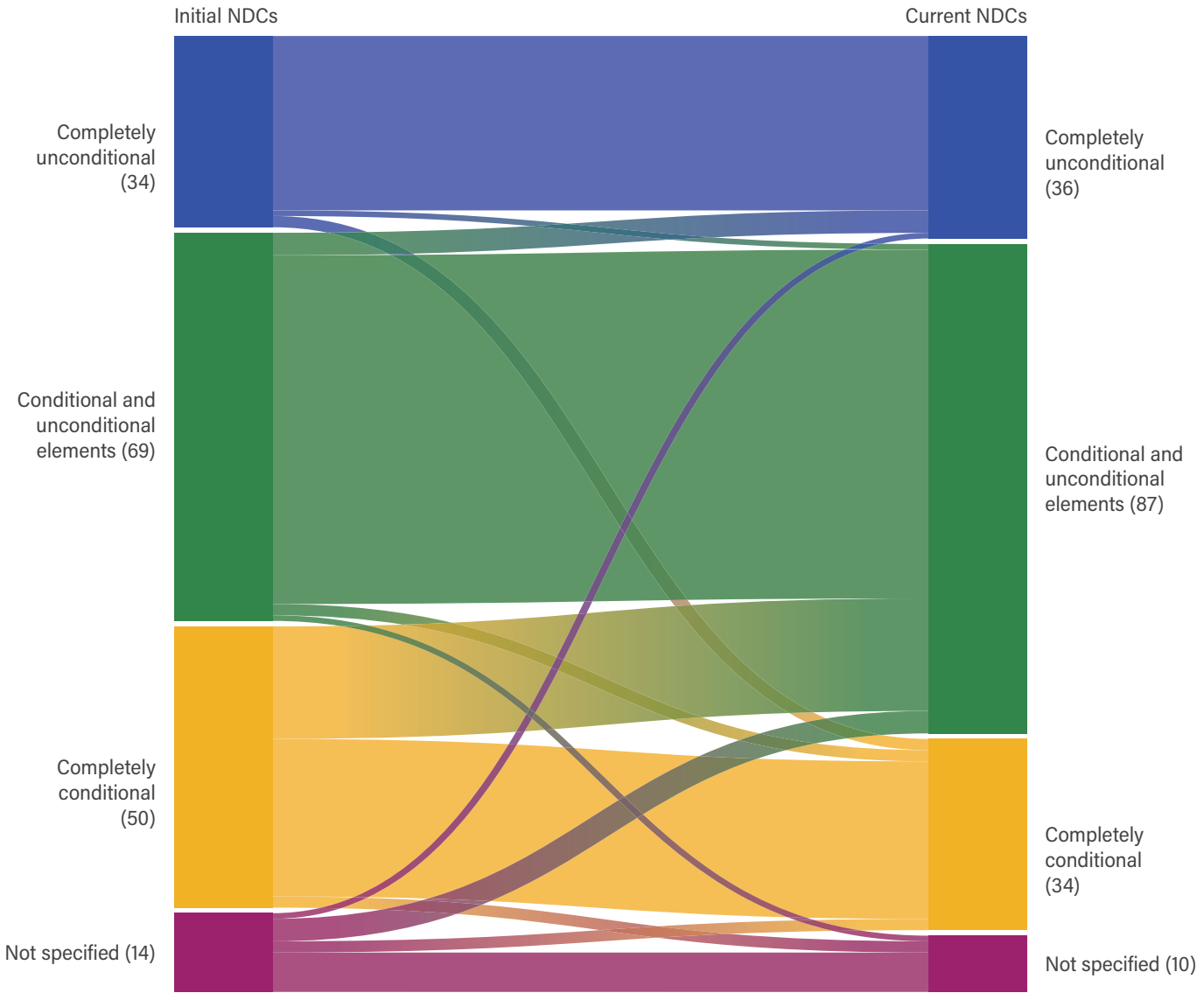
Note: GHG = greenhouse gas; NDC = nationally determined contribution; NF3<set "3" as subscript> = nitrogen trifluoride.

Source: Authors' analysis based on WRI (2022).

Conditionality

Developing countries often commit to mitigation contributions contingent on factors such as international climate finance being provided. The new and updated NDCs reflect a move away from completely conditional NDCs; we see a greater share of countries making commitments that are at least partly unconditional. Thirty-six NDCs are now completely unconditional (up from 34); 87 have a mix of conditional and unconditional (up from 69), and 34 are now conditional only (down from 50) (Figure 9). One small developed country added a new, more ambitious conditional component to its formerly unconditional NDC. In general, however, we observe no clear relationship between changes in conditionality and changes in mitigation ambition.

FIGURE 9 | Conditionality in Initial versus Current NDCs



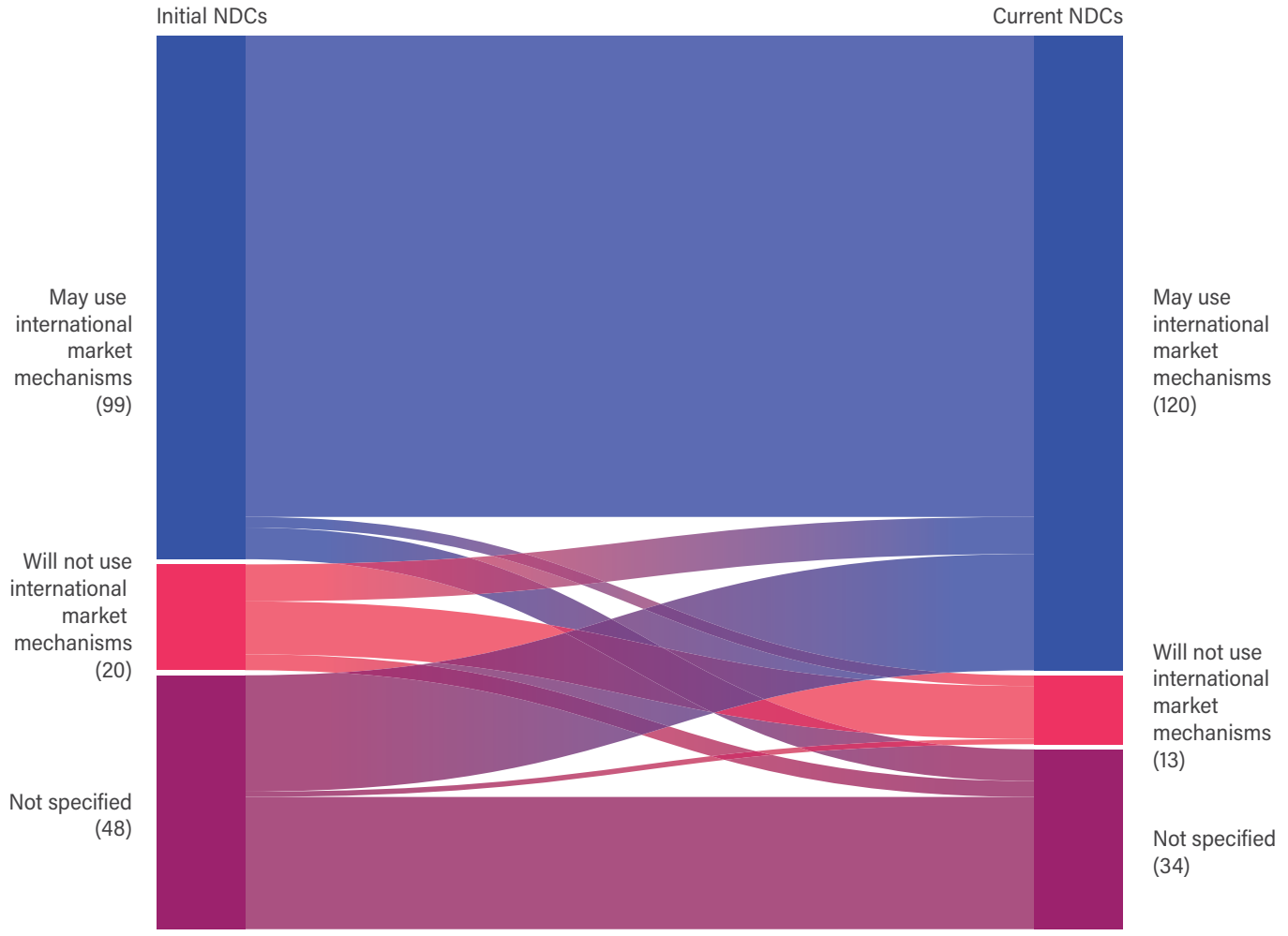
Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

International market mechanisms

Under Article 6 of the Paris Agreement, Parties may elect to cooperate with other Parties to achieve mitigation goals by trading emissions credits or offsets. The rules governing Article 6 were among the last of the Paris Agreement modalities to be finalized, emerging only at COP26 in 2021, after most of the new and updated NDCs had been submitted. Nevertheless, in their latest NDCs, countries increasingly embraced the idea of using international market mechanisms to achieve their NDCs. In the initial round of NDCs, 99 initial NDCs said they might use such mechanisms, 20 said they would not, and 48 did not specify. Of the current NDCs, 120 say it is possible they will use market mechanisms, 13 say they will not, and 34 do not specify (Figure 10). Among the countries that initially ruled out the use of international market mechanisms in their NDCs, 7 countries (2 developed, 5 developing) are now open to it; likewise, 21 developing countries that had not specified a stance on international market mechanisms in their initial NDCs have now done so.

FIGURE 10 | Number of NDCs with Different Plans regarding International Market Mechanisms in Initial versus Current NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

The countries open to using international market mechanisms account for 40 percent of global GHG emissions, in contrast to 28 percent prior to the NDC updates (Figure 11).

Long-term emissions targets

The current NDCs set GHG targets almost exclusively for years up to 2030, and in the next round of NDCs, countries are "encouraged to communicate in 2025 a nationally determined contribution with an end date of 2035." Along with these midterm targets, however, the Paris Agreement calls on countries to develop "long-term, low greenhouse-gas emission development strategies" (UNFCCC 2015), which typically contain a target for reducing GHG emissions by 2050. Because countries' GHG emissions are highly path dependent, achieving long-term reductions in a cost-effective manner depends profoundly on decisions made over the next decade (Iyer et al. 2017), including NDC targets and how they are implemented. Making explicit this relationship, the Glasgow Climate Pact urges countries to communicate long-term strategies "towards just transitions to net zero emissions by or around midcentury, taking into account different national circumstances" and notes "the importance of aligning nationally determined contributions with long-term low greenhouse gas emission development strategies" (UNFCCC 2021b).

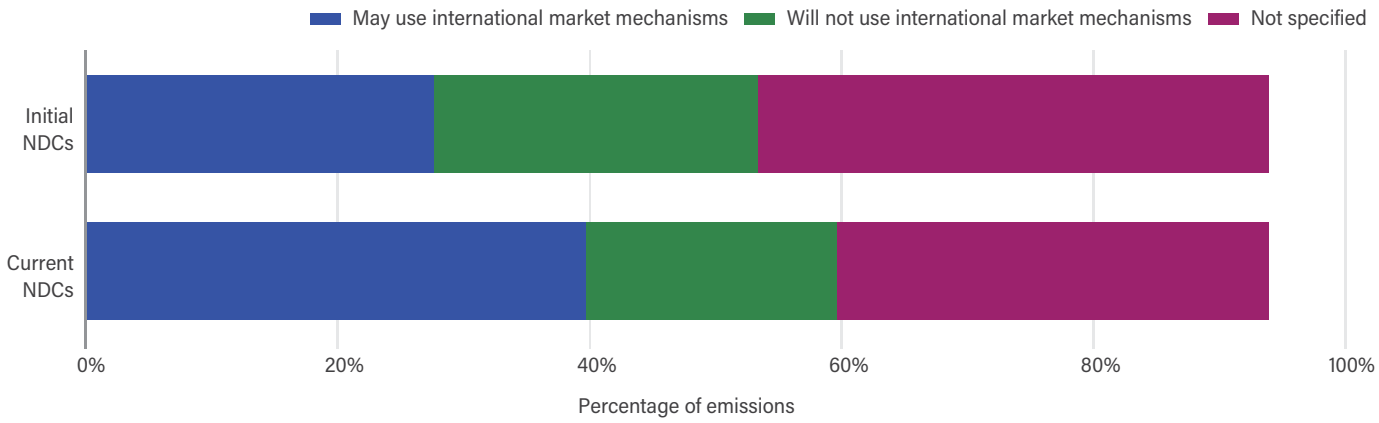
A full analysis of whether countries' NDCs will put them on a path to achieving their long-term targets is beyond the scope of this analysis. We can, however, examine the share of initial and current NDCs that contain such a target. The number of NDCs with long-term targets grew from 17 in the initial NDCs to 34 currently (Figure 12), and the share of global GHG emissions from countries with such a target grew from 15 to 56 percent (Figure 13). In contrast, 96 Parties currently have a net-zero target or another long-term GHG emissions target; the majority of such Parties do not mention this target in their NDCs.

Summary and implications

In terms of form and content, the mitigation elements of the current NDCs are more robust than the initial NDCs. The number of GHG targets representing an absolute reduction from a base year has increased, as has the number of targets covering all sectors and gases. The current NDCs are more transparent and include more unconditional elements and links to long-term targets relative to their predecessors.

The new and updated NDCs demonstrate that the Paris Agreement's "ratchet mechanism" can deliver improved mitigation outcomes, but they call into question whether it can do so at the scale and pace needed. The GHG reduction targets in the new and updated NDCs aim to reduce 2030

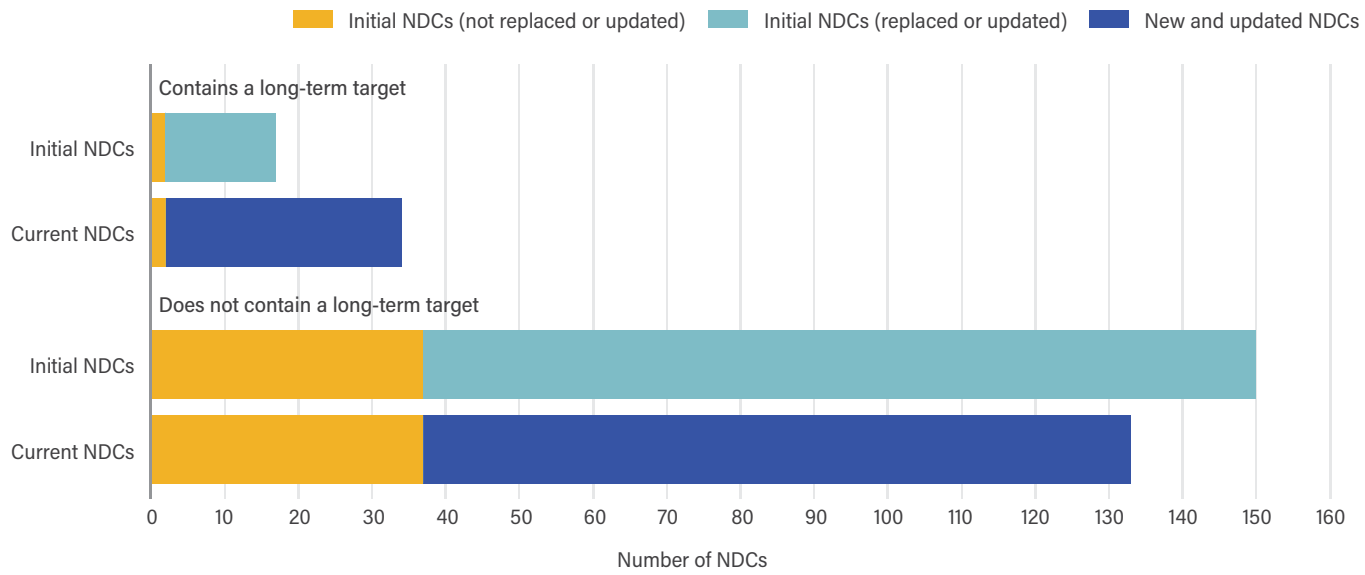
FIGURE 11 | Share of Global GHG Emissions Covered by Countries with Different Intents to Use International Market Mechanisms in Initial versus Current NDCs



Notes: NDC = nationally determined contribution. Emissions do not sum to 100% due to international sources not captured by national emissions inventories.

Source: Authors' analysis based on WRI (2022).

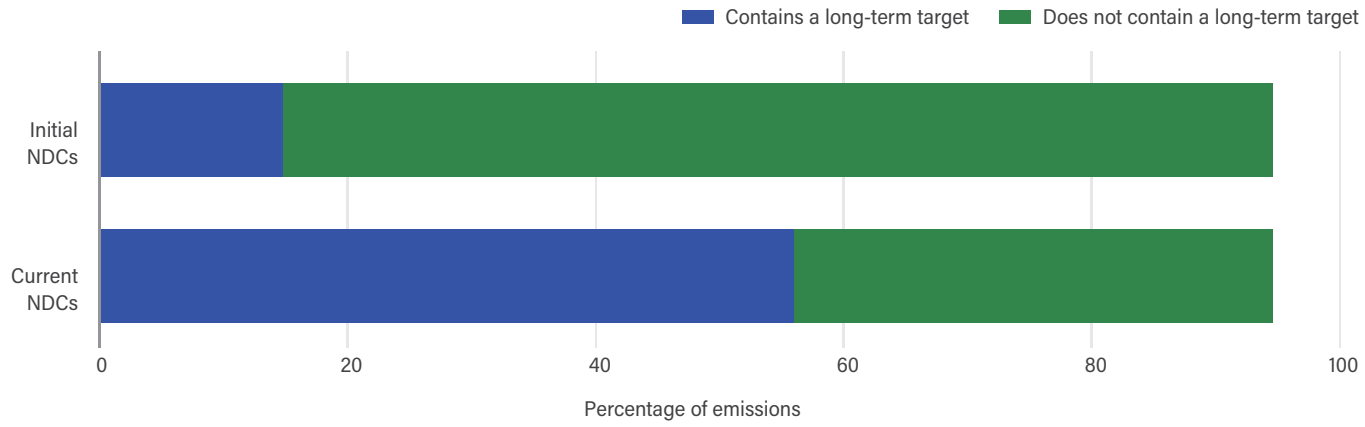
FIGURE 12 | Number of NDCs with and without Long-Term Targets in Initial versus Current NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 13 | Share of Global GHG Emissions Covered by Countries with and without Long-Term Targets in Initial versus Current NDCs



Notes: NDC = nationally determined contribution. Emissions do not sum to 100% due to international sources not captured by national emissions inventories.

Source: Authors' analysis based on WRI (2022).

emissions by 5.5 $GtCO_2e$ relative to the initial NDCs. Yet at the end of 2021, a 28 $GtCO_2e$ emissions gap still stretched between the NDCs and scenarios that limit warming to 1.5°C (UNEP 2021b).

The trends observed here also raise the following questions that deserve further examination in advance of the new NDCs due in 2025:

- *What causes countries to raise their mitigation ambition or—conversely—to backtrack on their GHG targets?* Countries may enhance their ambition as a result of exogenous factors (such as falling technology costs) or endogenous ones (such as improved stakeholder consultations that reveal support for more or more robust mitigation interventions). Although national circumstances vary greatly, some factors—such as technology costs—move in tandem across countries. Yet whereas some countries enhance ambition, others backtrack, and still others do nothing. Backtracking has occurred on target type (for example, moving from a GHG target to a non-GHG target or from a base-year target to a baseline scenario target). Countries have also backtracked on levels of ambition (adopting targets that would result in higher 2030 emissions than under their initial NDCs). In some cases, backtracking on ambition may result from improved data and modeling, which portray a more realistic assessment of a country's plans, rather than an intent to "do less" than before. For instance, a study of 55 developing countries found that 50 had improved the quality of information used to develop their NDCs (NDC Partnership 2022). Still, this does not explain, for example, changes to target type (e.g., base-year targets versus baseline scenario targets). It stands to reason that improved data could result in enhanced ambition, just as it can result in backtracking. A more detailed analysis of which countries change their targets, how target form and ambition relate to one another, and how both relate to sector-specific content could help untangle this issue.
- *Why do developing countries adopting GHG targets for the first time choose baseline scenario targets over other options?* These targets, if anything, make monitoring progress more complex than it would be with base-year targets. And any type of target can reflect the same level of ambition. One possibility is that baseline scenario targets are seen as more flexible than absolute reductions from a base year; if a country were to experience unanticipated

population or economic growth, it could increase its baseline accordingly, creating space for additional emissions within the target. The Paris Agreement, however, provides for adjusting NDCs "with a view to enhancing . . . ambition" (UNFCCC 2015), but not vice versa. Moreover, this dynamic should work both ways: countries with lower-than-anticipated growth could decrease their baselines.

- *What is driving the shift to greater unconditional contributions?* Relative to the previous round of NDCs, have countries developed better data or stronger institutions that would allow for greater confidence in their ability to deliver some degree of mitigation without external support? Does the shift reflect the declining cost of clean energy relative to fossil alternatives? Is there greater political support for countries to invest their own resources? A more detailed examination of any correlation between conditionality and specific measures in NDCs as well as interviews with NDC drafters could shed further light on this trend.
- *Does the greater openness to international market mechanisms reflect greater clarity regarding Article 6 modalities or other factors?* Why do a number of countries still not specify their intent to employ international market mechanisms? Content analysis of countries' positions on Article 6, as well as interviews with those involved in developing the NDCs, may reveal the answer.

SECTOR-SPECIFIC MITIGATION MEASURES

Overview

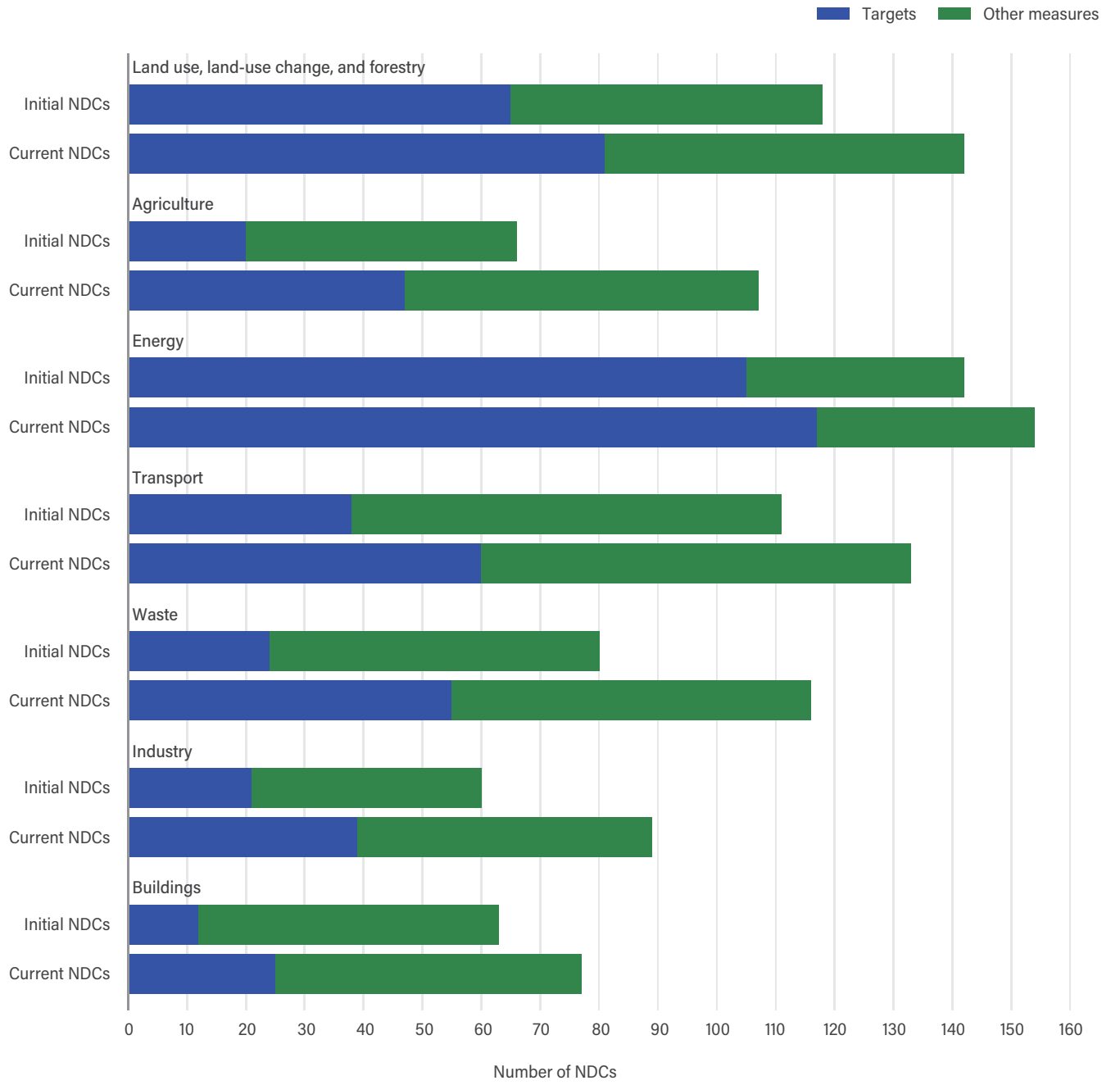
The sector-specific mitigation measures that countries include in their NDCs can provide valuable insight into how countries intend to achieve their targets. The amount of detail that countries provide at the sectoral level varies significantly; whereas some countries include no specific actions or a short list of targets or measures with little context, others provide more detailed information, including the costs of implementation, the expected emissions reduction potential, conditionality, and more. Climate Watch collects these data for its NDC Explorer and Country Profile modules. The data on Climate Watch differ from the latest IPCC inventory sectors because it distinguishes between measures related to agriculture and those related to LULUCF rather than combining them under agriculture, forestry, and other land use (AFOLU). It also includes industry, transport, and buildings as individual sectors separate from energy because they are specific and significant end uses, whereas the measures included under energy largely pertain to power generation, transmission and distribution, and energy efficiency.

In updating their NDCs, many more countries added sector-specific mitigation targets (GHG and non-GHG targets) and other types of mitigation measures (Figure 14).[12] One hundred sixty-one NDCs now contain sector-specific mitigation measures (up from 155 initial NDCs), and of these, 130 contain sector-specific mitigation targets (up from 120 of the initial NDCs). Energy, LULUCF, and Transport measures appear most often. One hundred fifty-four NDCs include energy measures (of which 118 contain targets), 142 NDCs include LULUCF measures (of which 81 contain targets), and 133 NDCs include transport measures (of which 60 contain targets). Measures addressing agriculture, industry, buildings, and waste are less common, but these too have gained traction since the initial round of NDCs. Measures addressing waste are included in 116 current NDCs, agriculture in 107, industry in 89, and buildings in 77.

Looking specifically at targets, we also see increases in the number of NDCs including them for each sector. The steepest rise is in the waste sector, from 24 NDCs to 55. The number of NDCs with targets in the agriculture and buildings sectors more than doubled, and the number in the industry sector nearly doubled as well. More countries already had targets for the energy, LULUCF, and transport sectors in the initial round of NDCs, but the number of NDCs with targets in these sectors rose moderately as well.

Whereas energy and LULUCF targets are prevalent in NDCs across regions, other sectors show significant variation (Table 1). For example, measures targeting the waste sector appear in all South Asian NDCs but in under 60 percent of NDCs from East Asia and the Pacific, Europe and Central Asia, the Middle East and North Africa, and North America. Agriculture and industry show similar variation, and although measures focused on buildings are missing from NDCs across most regions, 75 percent of South Asian NDCs include them.

FIGURE 14 | Number of NDCs Containing Measures and Targets for Each Sector



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

TABLE 1 | Percentage of Countries in Each Region with NDCs Containing Measures for Each Sector

REGION	ENERGY (%)	LULUCF (%)	WASTE (%)	TRANSPORT (%)	AGRICULTURE (%)	INDUSTRY (%)	BUILDINGS (%)
East Asia and Pacific	88	88	59	81	56	38	34
Europe and Central Asia	89	74	59	70	48	48	59
Latin America and the Caribbean	91	82	64	76	64	42	42
Middle East and North Africa	89	67	56	78	50	61	67
North America	100	100	50	100	100	100	50
South Asia	100	100	100	100	88	88	75
Sub-Saharan Africa	96	94	85	81	77	63	35

Notes: LULUCF = land use, land-use change, and forestry; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

The remainder of this chapter delves into greater detail on the types of measures in NDCs that address emissions from the LULUCF, power, and transport sectors, which together account for over 70 percent of global emissions (WRI 2022).

LULUCF sector mitigation measures in NDCs

Governments are increasingly recognizing the important role that LULUCF can play in their mitigation strategies. Forests and other natural ecosystems can pull CO_2 out of the atmosphere and store it in biomass and soil. The LULUCF sector is unique because it is both a source and a sink of GHG emissions. This points to the need and opportunity for NDCs to include restoration and management measures to enhance their natural sinks as well as protection measures to decrease land-based emissions from activities that destroy or degrade forests, peatlands, and other carbon sinks and release carbon into the atmosphere.

In addition to their potential to mitigate climate change, forest protection, restoration, and management also help countries and communities adapt to climate change. For example, mangroves protect coastal lands against rising seas and tidal surges, and inland forests moderate temperature fluctuations and stabilize water supply (GCA 2019). Forests also provide significant additional global and local cooling services beyond their ability to sequester carbon (Lawrence et al. 2022). Thus, deforestation has important consequences for the climate at both global and local scales beyond the release of stored carbon.

Despite the numerous climate, adaptation, and developmental benefits of forests, global trends are not moving in the right direction. Twenty-two percent of global GHG emissions came from AFOLU in 2019, with half of it attributed to emissions from deforestation (IPCC 2022b). Similarly, data from Global Forest Watch show that the tropics (which are some of the most carbon-rich forests) lost 11.1 million hectares (Mha) of tree cover in 2021, with 3.75 Mha of loss occurring within tropical primary forests. Tropical primary forest loss in 2021 resulted in 2.5 $GtCO_2e$ of emissions, equivalent to the annual fossil fuel emissions of India (Weisse and Goldman 2022).

Integrating and strengthening LULUCF sector solutions in NDCs provide an effective opportunity for countries to take advantage of their natural capital. At COP26 in Glasgow, more than 140 countries pledged to halt and reverse deforestation and land degradation by 2030. Global political commitments such as these can be translated into domestic action plans through NDCs. This section analyzes

how NDCs have incorporated various types of LULUCF, measures, followed by a brief discussion of key trends and steps to inform subsequent NDC submissions.

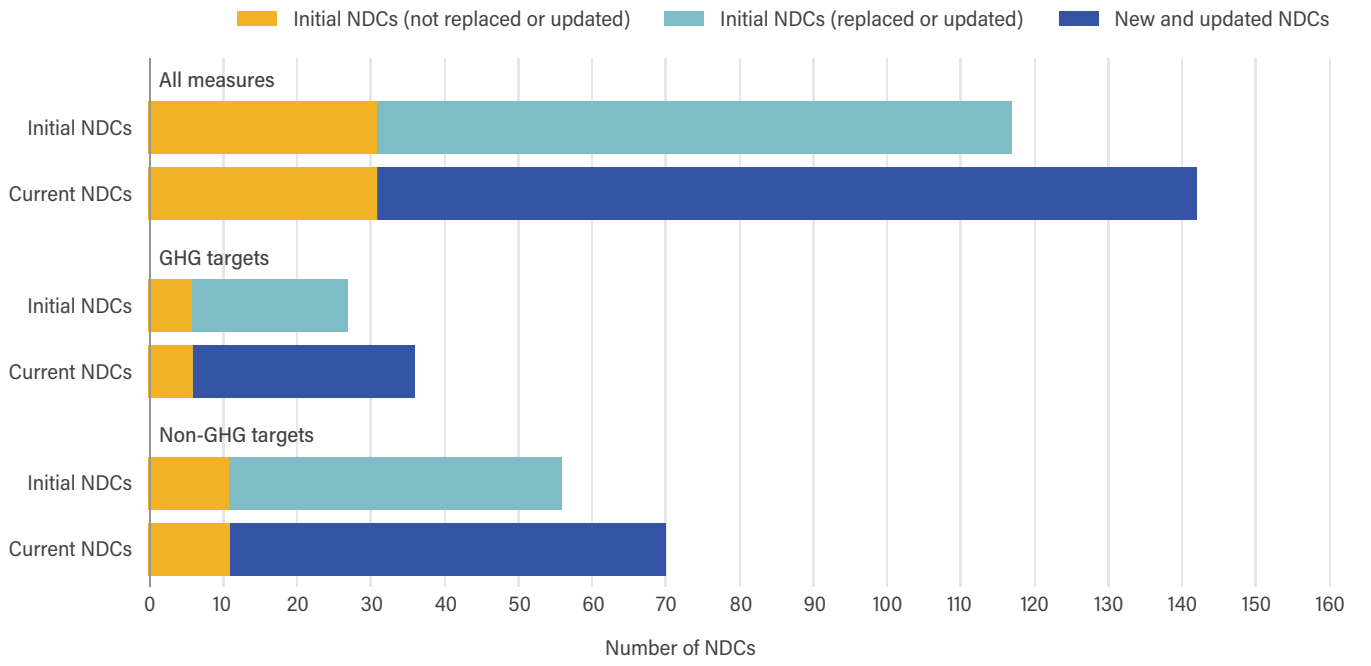
Overview of LULUCF sector measures in the NDCs

Just over 100 initial NDCs included measures on LULUCF, but a majority of the measures lacked specificity and clarity, particularly quantitative targets or strategies for achieving them. The number of current NDCs with LULUCF measures increased to 142, including 27 NDCs that added LULUCF measures for the first time (Figure 15). However, there were three countries that submitted a new or updated NDC but dropped measures in the LULUCF sector. Among current submissions, LULUCF measures varied significantly, with approximately three-fourths of current NDCs strengthening their LULUCF measures, targets, and policies, with the remaining one-fourth remaining stagnant or even reducing ambition (WWF-UK 2021).

Setting specific targets for LULUCF—in terms of GHG emissions or other (non-GHG) quantitative indicators—can signal the need for international financial support and help the global community monitor and track progress. GHG targets for LULUCF can include emissions reductions (e.g., from avoided deforestation) or increased removals (e.g., from restoration). Encouragingly, the number of NDCs with LULUCF-specific GHG targets climbed from 27 initial NDCs to 36 current NDCs. Some countries with large land-use emissions, such as Colombia, quantified targets associated with reducing deforestation. However, 11 countries that included quantified GHG targets in their initial NDC removed them from their updated submissions. Some changed their GHG target to a non-GHG target, and some dropped quantified LULUCF targets altogether.

Examples of non-GHG targets for LULUCF include Armenia's goal to increase forest cover to 12.9 percent of the territory by 2030. The number of NDCs with non-GHG targets for LULUCF rose from 56 in initial submissions to 70 in current NDCs. Despite this progress, only 57 percent of NDCs with LULUCF measures have any type

FIGURE 15 | NDCs Containing LULUCF Targets and Measures



Notes: GHG = greenhouse gas; LULUCF = land use, land-use change, and forestry; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

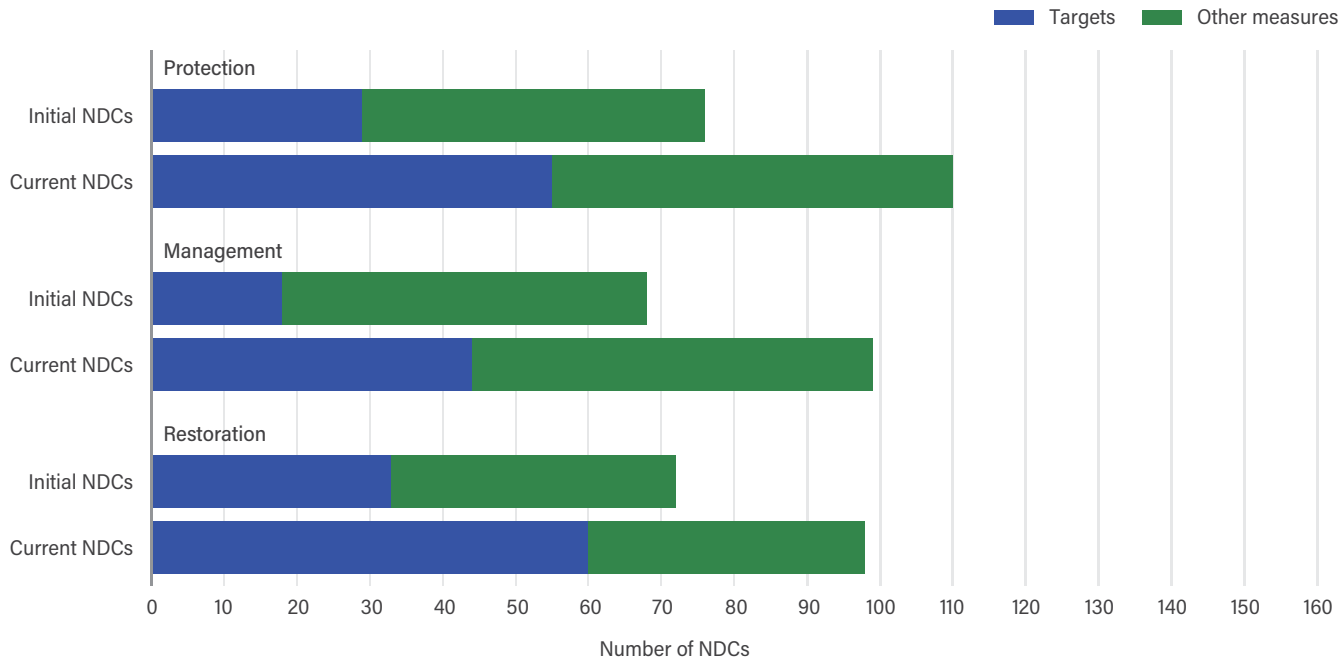
of LULUCF target (GHG or non-GHG). Also lacking are certain types of targets. For example, very few countries include ways to monitor progress on their land or include ways to include Indigenous peoples and local communities in land-based mitigation activities (Box 3).

Types of LULUCF measures in NDCs

Although the commitments countries make vary, most fall into three categories: protect, manage, and restore. All three are important, but to achieve the Paris Agreement goals, countries must commit to protect standing ecosystems. NDCs can employ a natural climate solutions hierarchy focusing on protection measures where needed, then turning to management measures and finally restoration when prioritizing different LULUCF activities (Cook-Patton et al. 2021). These measures could still be tailored to accommodate specific country needs, geographies, or ecological circumstances. To achieve 1.5°C, all three measures can be implemented in parallel, and current NDCs show us they often are.

Seventy-eight current NDCs include measures related to protection, management, and restoration. Current NDCs have also begun to reflect the need for increased protection measures across ecosystems. All three types of measures were equally included in initial NDCs, with 76 calling for conservation of forests, peatlands, grasslands, or wetlands. Management measures appeared in 68, and restoration measures appeared in 72. The numbers have remained relatively even with 110 current NDCs including conservation measures, 99 including management, and 98 including restoration (Figure 16). The comparatively large proportion of protection measures is in line with the need to achieve the mitigation potential of the different categories of LULUCF. In addition to the overall increase in LULUCF measures across protection, management, and restoration, the number of targets nearly doubled within each category. Current NDCs contain 55 protection targets, 44 management targets, and 60 restoration targets that provide concrete goals to help countries achieve their overall mitigation targets. However, 34 countries have set targets in all three subsectors, indicating that there is still significant room for improvement for the majority of NDCs to increase targets in the LULUCF sector.

FIGURE 16 | Protection, Management, and Restoration Measures in NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

PROTECTION MEASURES

Protection measures include activities that focus on conserving existing ecosystems, such as Colombia's target of reducing the deforestation rate to 50,000 hectares a year in 2030. Protection activities are urgently needed because they offer large near-term climate mitigation opportunities with high cobenefits at comparatively low cost. In fact, protection activities are estimated to offer up to 4,245 megatons (Mt) CO_2e/year in 2030, while improved management and restoration are estimated to offer 2,884 MtCO_2e/year and 3,153 MtCO_2e/year, respectively (Cook-Patton et al. 2021; Griscom et al. 2020). REDD+,[13] a specific conservation activity, is one of the most often referenced NDC measures in the LULUCF sector. In total, 48 NDCs include REDD+ measures, 24 more than in initial submissions. This increase is encouraging because the IPCC identified REDD+ as the activity with the largest potential for reducing LULUCF emissions (0.4–5.8 GtCO_2e/year; IPCC 2019).

MANAGEMENT MEASURES

Management measures include activities to reduce emissions in working agricultural and forest lands. Examples include Nepal's target to sustainably manage 50 percent of Tarai and Inner Tarai forests and 25 percent of middle hills and mountain forests. Because improved management measures require minimal changes in land use, they can be relatively cost-effective and implemented alongside commodity production. As with all measures, the specific management activities will vary depending on the country. Countries producing boreal timber can reduce fire risks and emissions by improving forest management practices. These practices include extended rotations or reduced impact logging, which keep trees growing beyond their optimal harvest age and limit damage to surrounding forests, respectively, both increasing carbon storage capacity. The United States has committed to investing in forest management through efforts to reduce the scope and intensity of wildfires. Management activities in agriculture can improve soil health, enhancing productivity. Bolivia's NDC includes steps to increase timber and non-timber production by 40 percent and double food production by 2030 by shifting to integrated management of forest and agricultural systems. Incorporating forests in and around agricultural lands can enhance soil quality and reduce erosion while also sequestering carbon.

RESTORATION MEASURES

Finally, restoration incorporates a combination of afforestation (growing trees in areas that have not been forested before), reforestation (growing forest in areas that have been recently deforested), and integration of trees into the rural agricultural landscapes. An example of restoration is Honduras's target of adding 1.3 Mha of forest. Restoration activities have the potential to offer significant climate mitigation but are third in the hierarchy because failure to first protect land releases large amounts of carbon, which restoration activities

BOX 3 | Indigenous Peoples and Local Communities Are Key to Land Use, Land-Use Change, and Forestry

Indigenous peoples and other local communities (IPLC) are essential stewards of the world's forests. Research shows that IPLC have effectively and sustainably managed their land for generations despite the lack of secure tenure.[a] Although half of all global land is the community land of IPLC, only 10 percent of the world's land is legally recognized as belonging to them. Empowering Indigenous peoples to protect their land is a powerful strategy to conserve forests and the carbon and cultural and biological diversity they contain. Recent research from the Amazon shows that deforestation rates on securely held Indigenous land are 50 percent lower than in areas outside of Indigenous territories.[b] Despite this research, only 30 nationally determined contributions (NDCs; compared to 14 in first submissions) explicitly reference IPLC in relation to the development and implementation of land use, land-use change, and forestry in their NDCs.[c] Though it is encouraging that the number of countries referencing IPLC doubled, it will be important to continue this progress and further integrate IPLC into future NDCs.

Sources: a. Viet 2021; b. WRI and Climate Focus 2022; c. WWF-UK 2021.

cannot recover in the relevant time period (Cook-Patton et al. 2021). With the 2020s recognized as the UN Decade on Ecosystem Restoration, many countries have capitalized on preexisting commitments, such as the 2011 Bonn Challenge, a global goal to restore 350 Mha by 2030. However, a disconnect persists between what some countries have pledged and what they have included in their NDCs, particularly when it comes to quantifying targets. Only 33 Bonn Challenge countries (out of 61) have quantitative restoration targets in current NDCs (Duraisami et al. 2022; IUCN 2020).

Summary and implications

LULUCF sector measures are now included in 142 NDCs. This represents significant progress in utilizing nature to mitigate climate change while also taking advantage of adaptation and development cobenefits. However, just over half of those NDCs (57 percent) have any LULUCF-specific targets and even fewer (25 percent) have LULUCF-specific GHG targets.

Measures related to the protection, management, and restoration of land have all increased since initial NDCs and the number of targets within each subsector nearly doubled. Although this progress is encouraging, the targets are concentrated within a minority of NDCs, primarily ones that make up a small fraction of global emissions.

Few NDCs incorporate financial needs, land rights, and technology in the LULUCF sector. Countries should include detailed information on the amount of financial support needed to implement their NDCs. Policies on the rights of Indigenous peoples and local communities should be further developed and codified, and spatial monitoring technologies should be better incorporated.

Power sector mitigation measures in NDCs

Limiting warming to 1.5°C will have profound implications for both *how* and *how much* power will need to be generated. Scenarios consistent with achieving the 1.5°C goal preclude the construction of new fossil fuel infrastructure (IPCC 2022b). By 2050, almost all (97–99 percent) global electricity will need to be sourced from low- or zero-carbon sources. Power demand will also grow as end uses shift to electricity and countries expand their economies. At the same time, electricity end use could potentially become much more efficient. Therefore, decarbonizing electricity generation and promoting conservation must proceed in tandem and are essential near-term strategies to limit warming. The power sector transition will also require infrastructure resilient to more frequent extreme weather events (IPCC 2022a). This section refers to the power sector and not the entire energy sector, which includes end-use sectors such as transport, buildings, and industry.

Overview of power sector measures in NDCs

Of the current NDCs, 150 contain measures addressing the power sector, up from 141 of the initial NDCs (Figure 17). The number of NDCs containing GHG targets specific to the power sector increased from 24 to 41, and NDCs containing non-GHG targets increased from 93 to 103.

Of the 150 NDCs with power sector measures, 16 belong to Group of Twenty (G20) countries and 11 belong to developed countries. Of the 41 NDCs with power sector GHG targets, none belongs to a G20 country, and only 1 (Norway's) belongs to a developed country. Of the 101 NDCs with power sector non-GHG targets, 9 belong to G20 countries and 5 to developed countries.

The following sections take a closer look into NDC measures related to power generation, including those pertaining to renewable energy, fossil fuels, and power sector efficiency.

Types of power sector measures in NDCs

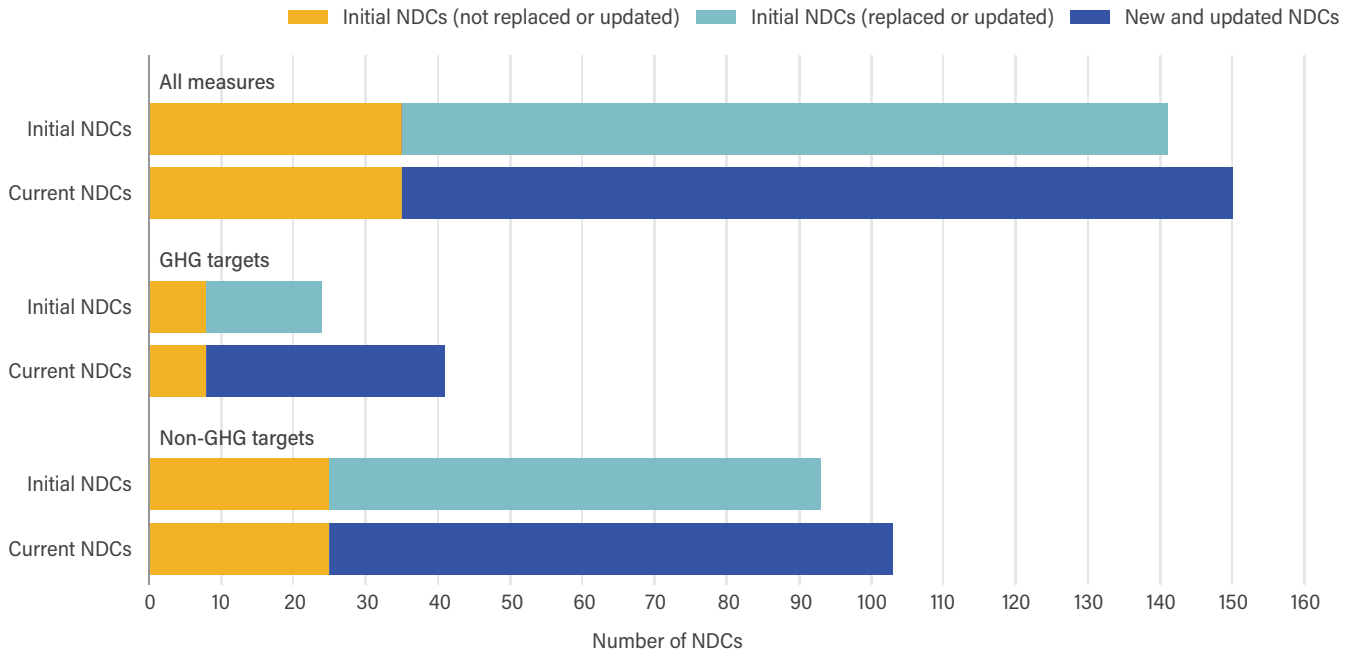
RENEWABLE POWER GENERATION MEASURES IN NDCS

Renewable power generation measures were a popular element of initial NDCs (129 of which contained such measures) and remain so in the current NDCs (136 of which contain such measures; Figure 18). Of the NDCs containing renewable power generation measures, 14 belong to G20 countries and 8 belong to developed countries. Solar generation measures are the most common type of renewable measure, appearing in 80 current NDCs, followed by hydropower (51) and wind (40). Waste-to-energy (in 25 current NDCs), geothermal (in 9 current NDCs), and ocean-based (in 3 current NDCs) measures are rarer.

FOSSIL FUEL–BASED MEASURES IN NDCS

Relative to renewable energy, few NDCs (51, up from 41 initial NDCs) contain measures relating to fossil fuel–based power generation (Figure 19). These measures encompass a wide variety of interventions, some of which would lead to

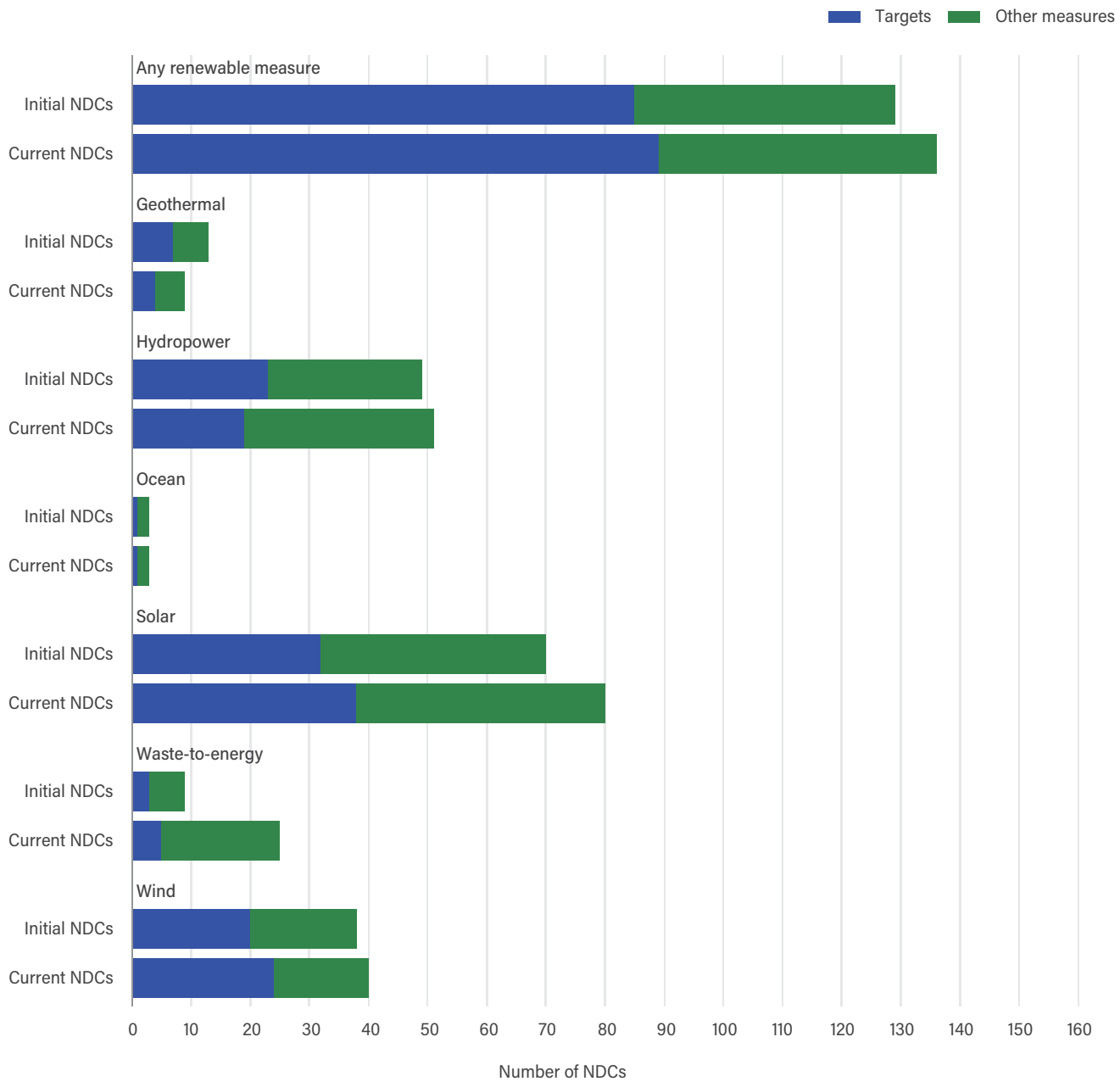
FIGURE 17 | Number of NDCs Containing Targets and Other Measures Addressing the Power Sector



Note: GHG = greenhouse gas; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

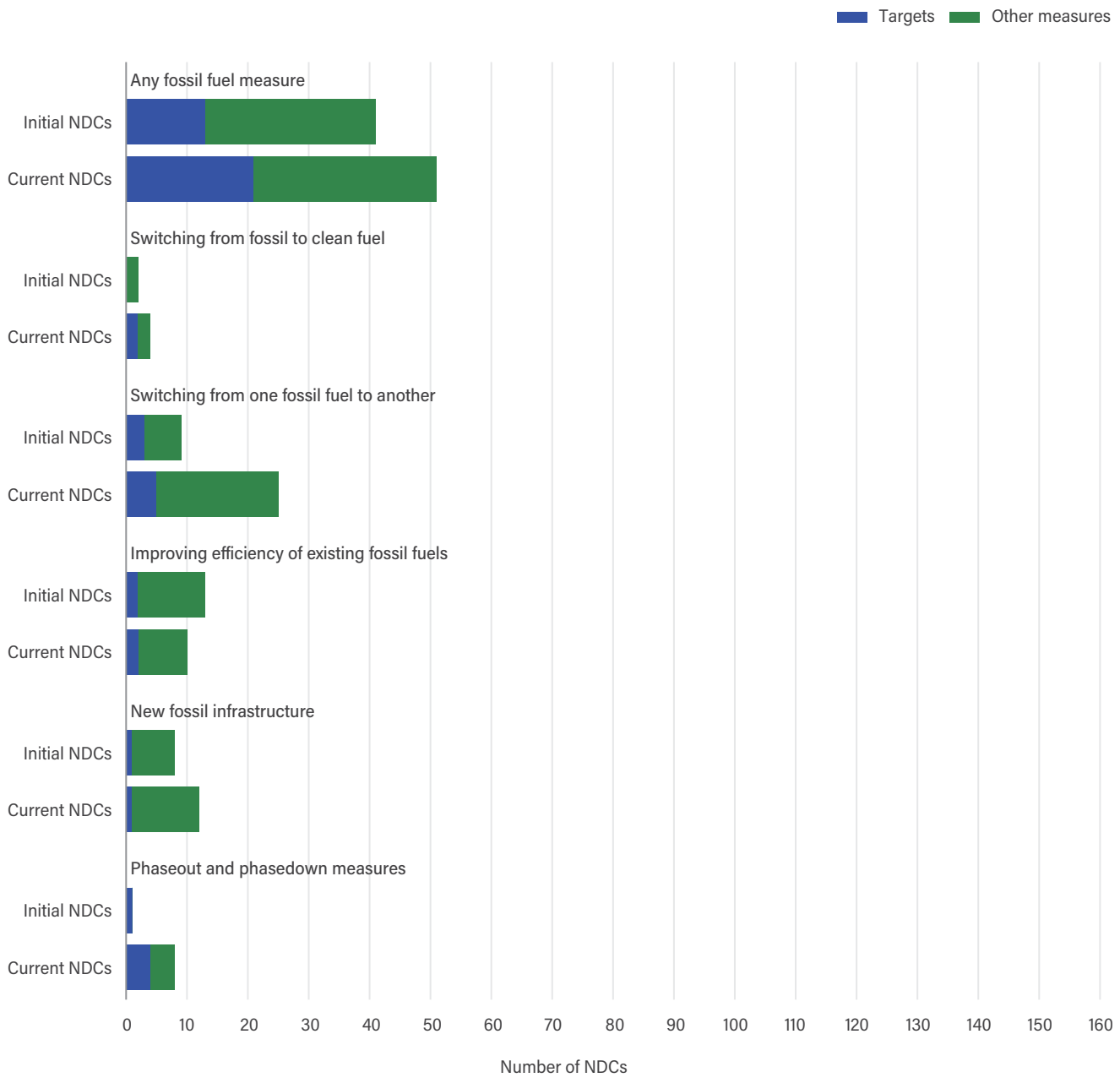
FIGURE 18 | Number of NDCs with Different Types of Renewable Power Generation Measures



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 19 | Number of NDCs with Measures Related to Fossil Fuel–Based Power Generation



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

absolute reductions in GHG emissions (e.g., replacing fossil fuels with zero-carbon fuels) and others that may lead to reductions relative to a hypothetical baseline while increasing absolute emissions (e.g., constructing a new gas-fired plant rather than a new coal-fired plant). NDCs typically do not contain sufficient information to quantify the impact of their measures on emissions. For purposes of this analysis, fossil fuel–based generation measures are categorized as follows:

- Fossil phaseout measures explicitly refer to phasing out or phasing down a fossil fuel or related technology—or contain quantified targets and/or plans to reduce or eliminate the use of a fossil fuel or related technology—by a certain date.
- Measures promoting fuel switching from fossil to clean fuels refer to replacing fossil fuels or fossil-based infrastructure with renewable or zero-carbon counterparts.
- Measures that improve efficiency of existing fossil infrastructure refer to retrofitting or installing new, more efficient technology associated with fossil-based generation.
- Measures promoting fuel switching from one fossil fuel to another refer to replacing existing fossil-based fuel or infrastructure with another fossil-based fuel or infrastructure, such as switching from coal to gas.
- Measures that propose new fossil infrastructure refer to constructing new fossil-based infrastructure, including natural gas plants and ultra-supercritical coal plants.

All subcategories of fossil-based generation measures, except for improving the efficiency of existing fossil infrastructure, have experienced modest increases from the initial to the current NDCs.

In its initial NDC, China said it would improve the efficiency of thermal power plants. Its updated NDC, in contrast, pledges to curb coal-powered projects, strictly limit increases in coal consumption over the 14th Five-Year Plan period, and to phase it down in the 15th Five-Year Plan period. Israel aims to phase out coal-fired power generation by 2026, and South Korea seeks to dramatically phase down coal-fired power generation. A few additional developing countries are also aiming to phase out the use of coal; for example, Mauritius plans to phase out the use of coal completely by 2030, and Pakistan mentions phasing out coal conditionally based on the availability of finance.

Of the 22 NDCs containing measures to switch from one fossil fuel to another and/or to build new fossil infrastructure, all belong to developing countries; 10 belong to least developed countries (LDCs) and/or small island developing states (SIDS), and 3 belong to G20 countries. Japan's initial NDC contained a reference to pursuing higher-efficiency thermal power generation, but its updated NDC does not contain this reference. The representation of LDCs and SIDS in these categories points to the potential need for stronger international support for transitioning to clean power generation.

POWER SUPPLY EFFICIENCY MEASURES IN NDCS

These measures improve power supply-side efficiency by introducing new, more efficient technologies, transmission, and infrastructure, building cogeneration plants, and cutting losses throughout the power grid.[14] Overall, NDCs with power supply-side efficiency measures increased from 43 to 63 from the initial to the current NDCs (Figure 20). Of these, 5 belong to developed countries and 10 to G20 countries.

Summary and implications

The number of NDCs that specifically target the power sector has very marginally increased across the board. It is 6 percent higher than in the first round. The number of GHG and non-GHG targets pertaining to the power sector is also up, though no G20 country has yet adopted GHG targets for the sector.

NDCs remained focused on renewable energy generation. Although solar, hydropower, and wind generation are the most prevalent renewable generation technologies, measures to promote waste-to-energy technologies shot up (more than 100 percent) following the update.

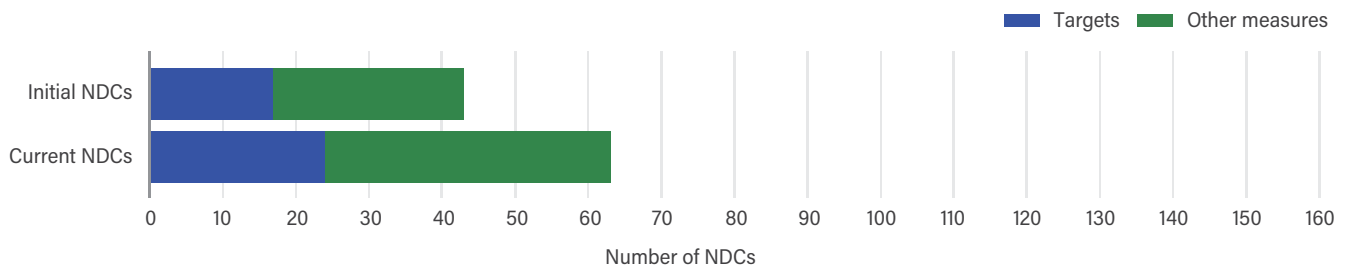
NDCs lack focus on limiting fossil fuel–based power generation and on power generation efficiency. The fossil fuel–based interventions are up 24 percent from the initial round of NDCs. Yet not all of these measures would curb emissions from the sector, and some may increase or lock in future emissions. The Glasgow Climate Pact, which calls on countries to accelerate efforts "towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies," suggests that countries will need to revisit this aspect of their NDCs (UNFCCC 2021b). Likewise, although a few countries do focus on minimizing grid losses and improving efficiency while modernizing grids, these measures may not be sufficient to keep up with the accelerated installation of variable renewable energy. Such efforts are needed to structure the grid in ways that support integration of renewable energy (Chakrabarty et al. 2019).

Transport sector mitigation measures in NDCs

Transport accounts for approximately 16.9 percent of global GHG emissions (8.3 $GtCO_2e$ emissions in 2018; WRI 2022) and is the fastest-growing source of emissions after industry (Ge et al. 2020). The demand for the global transportation of goods and people is surging as economic development, urbanization, and population growth fuel the demand for more cars, travel, and shipping. Under business as usual, these trends are expected to continue, with passenger transport rising between 90 and 160 percent and freight transport growing between 100 and 230 percent by 2030 (ITF 2017). Following this trend to 2050, emissions from the transport sector are estimated to reach a level three to six times higher than in scenarios consistent with the Paris Agreement.

To meet global climate goals, there is an urgent need to rapidly lower passenger transport emissions. Currently, road transport is responsible for 75 percent of CO_2 emissions from the transport sector, and 87 percent of these are from

FIGURE 20 | Number of NDCs with Measures That Address Power Supply Efficiency



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

light-duty vehicles and trucks (SLOCAT 2021a). In a previous working paper, WRI provided guidance for updating NDCs in the transport sector (Fransen, Welle, et al. 2019). These included recommendations to fill previous gaps in existing NDCs by accelerating electrification; amplifying "avoid" and "shift" solutions such as public transport, walking and cycling; and addressing freight emissions.

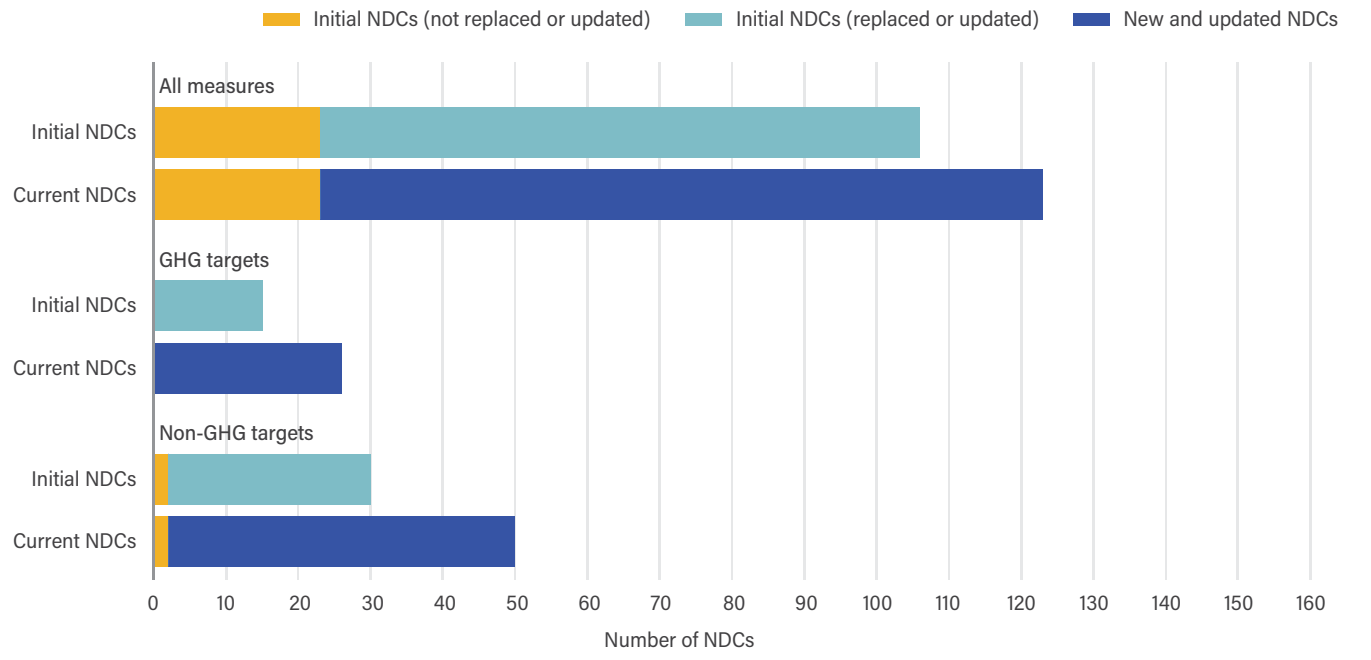
The "avoid-shift-improve" approach tackles the transport challenge holistically by first avoiding unnecessary vehicle travel through strategic planning, shifting to more efficient modes when possible, and improving vehicle and fuel efficiency. Although technological solutions such as electric and fuel-cell vehicles have captured the attention of investors and policymakers alike, achieving full decarbonization of the transport sector cannot be accomplished solely by switching to clean fuels. Without a fundamental shift in transportation demand, there will be 2 billion cars on the roads by 2050, coupled with a 60 percent increase in transport emissions (Dasgupta and Puliti 2022).

The most cost-effective means of cutting transport emissions is to avoid the need for motorized travel. This can be achieved by planning cities to bring opportunities closer to residents and by encouraging more efficient, less carbon-intensive modes of movement, such as public transit, walking, and cycling.

Overview of transport sector measures in NDCs

The initial NDCs addressed transport in a limited manner, often with general language that does not set a quantitative target for actions to be taken in the following decade. In the first round, 107 of 169 NDCs included transport sector-specific mitigation measures, ranging from general plans to improve public transport to specific emissions reduction goals through detailed, quantifiable actions. The second round of revisions adds an additional 17 NDCs for a total of 124 current NDCs with references to transport mitigation measures (Figure 21).

FIGURE 21 | Number of NDCs That Include Transport Mitigation Measures

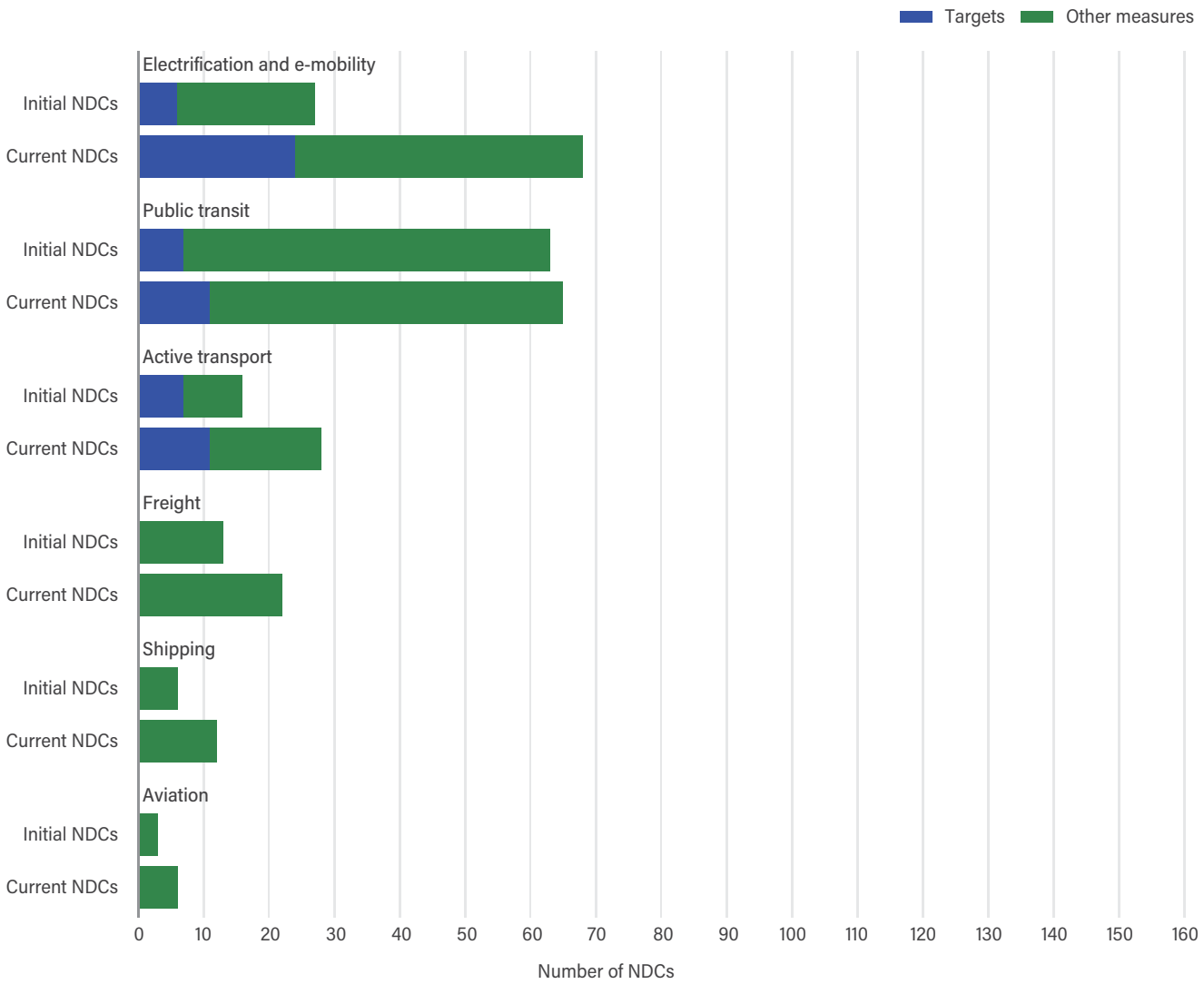


Note: GHG = greenhouse gas; NDC = nationally determined contribution.

Source: Authors' analysis based on GIZ and SLOCAT (2022).

A total of 49 initial NDCs included quantitative targets (including both GHG and non-GHG targets), relating to alternative fuels, electrification, infrastructure improvement, expansion of public transit, and more. Of these 49 NDCs, 8 are from developed countries and 41 are from developing countries. With current NDCs, the number rises to 61 (14 developed and 47 developing, including 7 countries that did not update their NDC document). Few NDCs set emissions reduction targets for the transport sector: only 15 in the initial NDCs did so, including 2 from developed countries, and 26 current NDCs did so, including 8 from developed countries. Many NDCs with emissions targets are those of African countries, which have relatively low emissions from transport, whereas the highest emitters, such as the United States, China, Russia, and the European Union fail to set specific targets for the sector. Significantly more NDCs set non-GHG targets than emissions targets in both rounds of NDCs.

FIGURE 22 | Number of NDCs Containing Different Types of Transport Measures



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on GIZ and SLOCAT (2022).

Types of transport mitigation measures in NDCs

The remainder of this chapter explores the specific types of transport measures that have been included in NDCs (Figure 22).

ELECTRIFICATION MEASURES IN NDCS

In contrast to the initial NDCs, which emphasized the need to invest in public transit, the focus of the new and updated NDCs has shifted to e-mobility.

E-mobility offers many opportunities to reduce emissions, local air pollution, and urban noise. Battery electric vehicles are already becoming popular in a few regions—mainly China, Europe, and the United States—and will rapidly become more affordable with technological advancements. As of 2021, electric vehicles (EVs) made up less than 1 percent of the global stock—or about 16.5 million light-duty vehicles—but are expected to exceed 130 million by 2030 (IEA 2021). The push for EVs is evident from multiple stakeholders, as some manufacturers and policymakers in the European Union have announced plans to phase out the sale of combustion engine cars by 2035 (European Parliament 2022; Motavalli 2021). NDCs reflect this trend as well, though the large majority refer to e-mobility in general terms; and among measures that explicitly mention transport mode, the electrification of buses is the most frequently cited, followed by cars, two and three wheelers, and rail.

But merely replacing internal combustion engine vehicles with battery-powered ones will not achieve the full emissions reduction potential unless they are coupled with a clean power grid. The overhaul of vehicle fleets will also take time, as the average age of cars on roads is 12.1 years in the United States (Carlier 2021) and 11.5 years in the European Union (Carlier 2022). Buses average 9–11 years. Even if all new vehicles sales today were electric, it would take well over a decade for EVs to supplant cars, trucks, and buses with internal combustion engines.

Because of this slow turnover, the level of electrification required to hold the temperature increase to 1.5°C cannot be reached soon enough, unless it is paired with actions that reduce the number of vehicle miles traveled. Public transit offers a way to do this. Even with current energy sources and electricity grid emissions, electric buses and trains release about a third of emissions (per passenger kilometer) as private vehicles (Cazzola and Crist 2020). A recent scenario analysis by the Transformative Urban Mobility Initiative finds that for the world to be on a pathway to 1.5°C, cities may need to double public transport capacity by 2030 (Teske et al. 2021). On a city level, policies such as transport demand management (TDM) can reduce emissions more efficiently and cost-effectively than electrification alone. TDM policies, such as congestion pricing, license plate restrictions, and low-emissions zones can rapidly reduce vehicle travel in urban areas, but transportation alternatives such as bike lanes and convenient public transit must be in place to meet travel demands.

PUBLIC TRANSPORT MEASURES IN NDCS

Although the attention that NDCs pay to public transit remains high, it has plateaued compared to the scope and ambition of targets in other subsectors. Sixty-three initial NDCs had measures relating to public transit improvements and investments (including 13 from developed and 50 from developing countries). That number edged up only to 65 (including 14 from developed and 51 from developing countries) in the current NDCs. These are net figures; 24 NDCs (including 5 from developed countries) that had included public transit in their initial NDC left it out of their new or updated NDC.

But merely replacing internal combustion engine vehicles with battery-powered ones will not achieve the full emissions reduction potential unless they are coupled with a clean power grid

Chile provides a good example of an NDC matched with national policy and implementation, aiming to electrify 100 percent of its public transport buses by 2040. This policy directs the Ministry of Transport and Telecommunications to provide financing to procure electric buses and work with local transport agencies, other ministries, and private partners to get them on the road (World Bank 2020).

ACTIVE MOBILITY MEASURES IN NDCS

Active mobility is one solution that has great potential to reduce emissions in urban areas. It features far more prominently in the current NDCs than in the initial NDCs. About 25–50 percent of trips taken in cities are under five kilometers. By improving walking and cycling infrastructure to make active transport safer and easier, cities can improve the air quality, prevent accidents, alleviate traffic and congestion, and improve health while avoiding unnecessary motorized trips. Eleven initial NDCs included active mobility measures, and that number nearly tripled to 31 NDCs in the current round. Only four NDCs included active mobility measures in both their initial and new or updated submissions.

FREIGHT, SHIPPING, AND AVIATION MEASURES IN NDCS

Although urban transport emissions reduction targets in NDCs have become more specific and focused, gaps remain, including strategies for tackling harder-to-abate emissions from road freight, shipping, and aviation. Road freight repre-

sents 40 percent of transport emissions, and freight emissions are expected to more than triple by 2050 (SLOCAT 2021a). This can be addressed by "shift" and "improve" measures such as transitioning from road to rail transport or improving the fuel efficiency of trucks through optimized routes. Freight transport is more difficult to electrify than light-duty vehicles because of longer trips, heavier weight, and the need for rapid refueling. Only 13 initial NDCs included road freight mitigation measures, and 22 current NDCs mention it. Maritime shipping and other water transport (ferries, fishing boats) are targeted in even fewer measures, with 6 NDCs mentioning lower carbon fuels or green port projects in their initial submission and 12 in current submissions. Green port projects range from electrifying port machinery and vehicles, to expanding hydrogen supply, to increasing efficiency, and upgrading port functions in line with decarbonization.

Aviation is one of the most difficult sectors to abate due to rising passenger and freight demand as well as the difficulty of fuel shifting. The weight of batteries is a huge barrier to electrification. Only seven NDCs mention aviation in either the initial or current of submissions, and all use vague language relating to improving aircraft technology, fuel efficiency, or expanding aviation capacity. Shipping and aviation are unique modes of transport because their trips frequently cross borders and thus require climate actions to go beyond national policies and to be addressed globally. National governments have an opportunity to connect NDCs with the International Maritime Organization and International Civil Aviation Organization to confront these harder-to-abate sectors.

Summary and implications

Current NDCs have more transport sector targets and place more emphasis on electrification as a way to reach them. The number of GHG and non-GHG targets rose sharply from the initial to the current NDCs. However, most transport measures in NDCs lack specificity, accountability, quantitative targets, and ways to track progress. Stronger, more specific targets and plans to implement them will be needed. Electrification has gained significant attention between first and second NDC submissions, signaling a shift in global attitudes, but electrification alone will not be enough to meet climate goals. Further action is needed to reduce the number of vehicle miles traveled, which can be achieved by reducing transport demand, shifting from private vehicles to public transit, and prioritizing active mobility where possible.

All nations can do more to strengthen transport measures in NDCs. Developed countries have significant scope to reduce motorized transport demand and emissions, whereas developing countries that try to halt the growth of the transport sector might also restrict access to jobs and other pathways out of poverty. These countries must instead find ways to decouple growth from transport emissions enough to stabilize and ultimately reduce them. Encouraging development that is more compact, with accessible public transit and active mobility options, and avoiding private vehicle–oriented development altogether is the optimal way forward.

BOX 4 | NDCs and the Global Methane Pledge

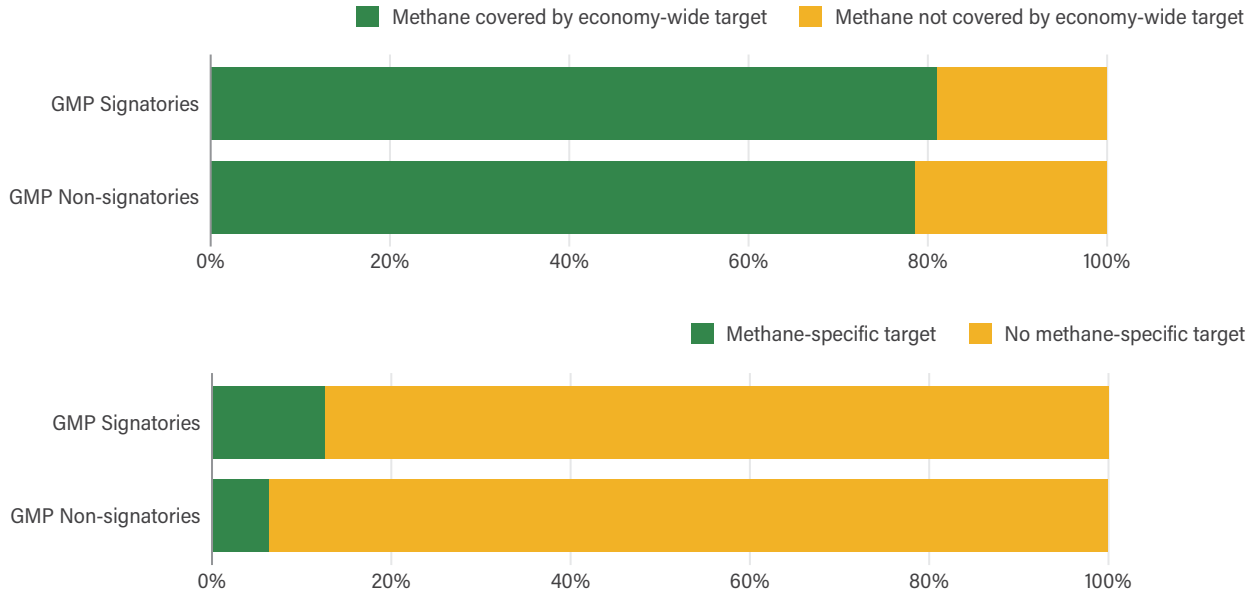
The Global Methane Pledge was launched in 2021 as a partnership between the United States, European Union, and other Parties to the Paris Agreement. Participants joining the pledge agree to take voluntary actions to contribute to a collective effort to reduce global methane emissions by at least 30 percent below 2020 levels by 2030. The specific measures targeted by the pledge focus largely on fossil fuel operations, which account for 36 percent of emissions, but there are additional pathways for reducing methane emissions from agriculture, the largest single source of methane at 42 percent, and waste, the third-largest source at 18 percent.[a]

Methane (CH_4) is a much more potent pollutant than carbon dioxide (CO_2). Over a 100-year time scale, CH_4 is 28 times more potent than CO_2, but averaged over the first 20 years, it is 86 times more potent than CO_2.[b] Around 30 percent of recent warming experienced to date comes from CH_4. Looking ahead, cutting CH_4 emissions by 45 percent can avoid 0.3°C of warming by 2040.[c] Reducing CH_4 emissions also impedes the formation of other secondary gases, such as tropospheric ozone, which can have devastating public health impacts, such as respiratory and other illnesses that cause over 1 million deaths per year; agricultural and ecosystem impacts, including a 15 percent reduction in annual crop yields; and a reduction in the amount of carbon plants can potentially sequester.[d]

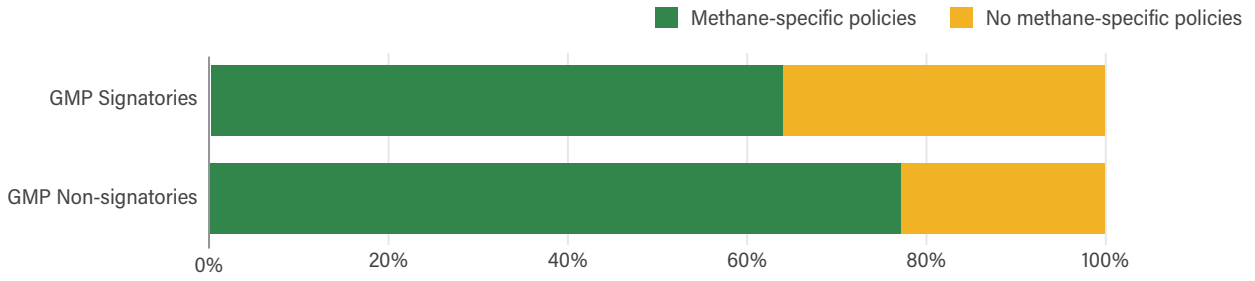
Since the Global Methane Pledge was launched at the 26th Conference of the Parties, 119 countries have endorsed it. (This analysis includes two countries—Kosovo and Libya—that have signed on to the Global Methane Pledge but do not have NDCs.) These signatories represent nearly 75 percent of the global gross domestic product and cover 50 percent of global anthropogenic CH_4 emissions.[e] This box reviews the CH_4-related measures in the latest NDCs submitted by signatories and nonsignatories of the pledge, including incorporating CH_4 into a top-line greenhouse gas (GHG) reduction target, setting a CH_4-specific emissions reduction target, and identifying policies and measures that are likely to reduce CH_4 emissions (see Appendix A for details).

Ninety-six of the 119 pledge signatories included CH_4 within the scope of a top-line GHG reduction target in their NDCs, a somewhat higher share than nonsignatories (Figure B4.1). In a much smaller number of NDCs, countries set emissions targets specifically to reduce CH_4—15 from signatories and 5 from nonsignatories.

FIGURE B4.1 | Percentage of Global Methane Pledge Signatories and Nonsignatories with a Top-Line, NDC GHG Reduction Target That Covers CH_4, with a CH_4-Specific Target, and with CH_4-Relevant Policies in Their NDCs



BOX 4 | NDCs and the Global Methane Pledge (Cont.)

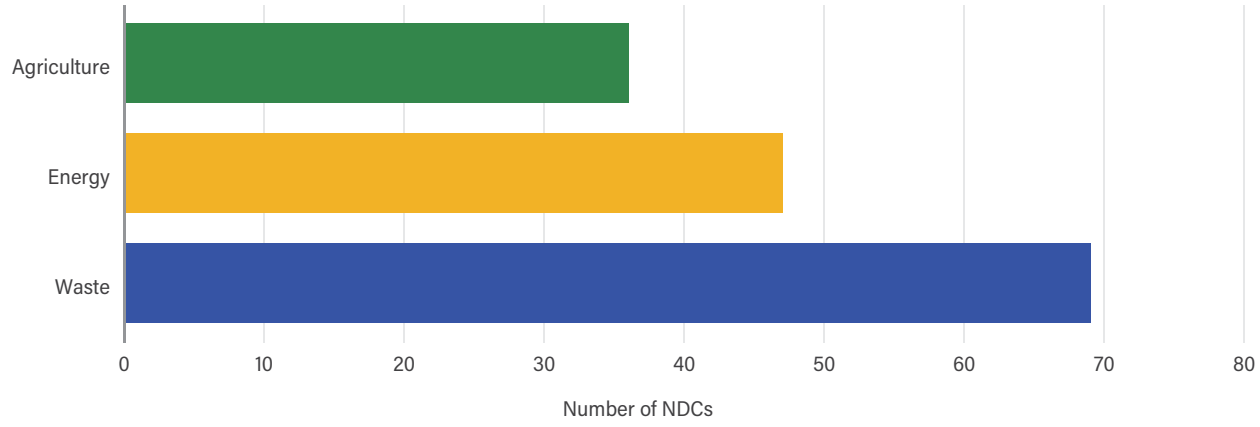


Note: GMP = Global Methane Pledge.

Source: Authors' analysis based on WRI (2022) and CCAC (2022).

Seventy-six signatories included measures in their NDCs that are likely to reduce CH_4 emissions, a lower share than for nonsignatories. These included measures in the agriculture sector (such as those related to livestock, enteric fermentation, or rice cultivation), the energy sector (such as those related to natural gas, waste-to-energy projects, and coal mine CH_4), and the waste sector (including measures related to wastewater, landfills, and general waste reduction strategies; Figure B4.2).

FIGURE B4.2 | Number of GMP Signatories with NDCs Containing CH_4-Specific Policies in the Agriculture, Energy, and Waste Sectors



Notes: GMP = global methane pledge; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

The degree to which implementing the Global Methane Pledge will drive CH_4 reductions beyond those already included in NDCs is an open question. Most signatories already include CH_4 in their top-line GHG targets but do not delineate the fraction of those targets that will be achieved by reducing CH_4. On the other hand, the paucity of CH_4-specific targets and CH_4-specific policies in the agriculture, energy, and waste sectors suggests significant room for improvement among signatories in spelling out how specifically they will contribute to the Global Methane Pledge. Thus, in areas where ambitious CH_4 reductions are not yet factored into countries' top-line NDC targets, there may also be room to strengthen overall NDC mitigation ambition in a way that coincides with this new globally agreed commitment.

Sources: a. CCAC n.d.; b. IPCC 2021; c. CCAC 2022; d. CCAC n.d.; e. Global Methane Pledge n.d.

BOX 5 | NDCs and a Just Transition

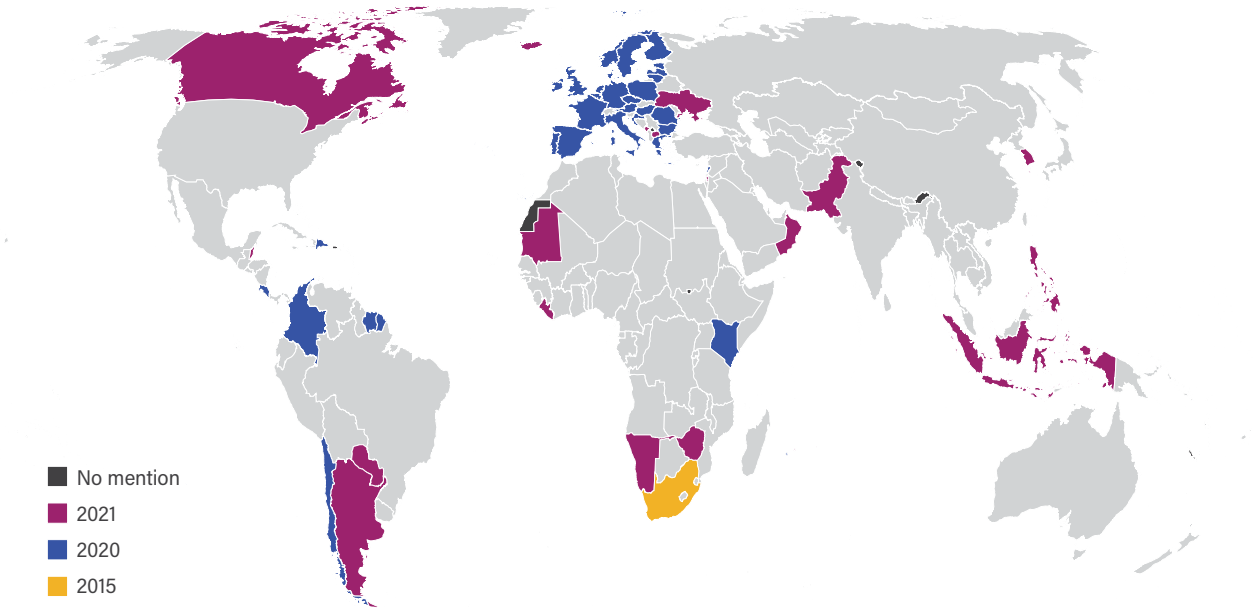
As Parties shift towards implementation of their climate pledges, recognition of the socioeconomic impacts of measures taken to respond to climate change are becoming more evident. A just transition is one way to start addressing these impacts.

There is no one definition of *just transition*. Some interpretations have focused on support for workers and communities whose livelihoods will be compromised as societies shift away from fossil fuels. Broader understandings apply ideas of justice and equity across a broader set of concerns related to climate action that range beyond the energy sector.[a] Just transition often refers both to minimizing the negative effects of the low-carbon transition and ensuring that its benefits and opportunities are equitably shared.

Both the preamble to the Paris Agreement and the Glasgow Climate Pact contain language regarding just transition, and a technical paper with framework defining the concept, process, and outcomes for a just transition emerged from the work program and forum hosted by the United Nations Framework Convention on Climate Change (UNFCCC) on the impacts of response measures.[b] This framework includes the International Labour Organization's decent work agenda and negotiating guidelines for a just transition based on social dialogue between workers, employers, and government and on engagement with other stakeholders, such as communities and civil society organizations.[c] In 2018, the Solidarity and Just Transition Silesia Declaration emerged from the 24th Conference of the Parties (COP24), and during the most recent COP26 in Glasgow, 14 countries and the European Commission pledged support for six just transition pillars, including applying these principles to domestic plans.[d]

As the concept of just transition has increasingly permeated rhetoric and declarations within the UNFCCC and recent COPs, so has it been increasingly addressed in nationally determined contributions (NDCs). Thirty-two NDCs (covering 58 countries, including 27 EU Member States through the European Union's NDC) have included just transition. The analysis for this report only captures explicit use of the term and thus does not include NDCs that mention terms or policies that would be consistent with the concept of just transition.

FIGURE B5.1 | The First Year in Which Countries Mentioned "Just Transition" in Their NDCs



Sources: UNFCCC n.d.; WRI 2022.

BOX 5 | NDCs and a Just Transition (Cont.)

The number of NDCs that explicitly include the term *just transition* has jumped since 2015 (Figure B5.1). South Africa was the only party to include the term in its previous 2015 intended nationally determined contribution (INDC). In 2020, 10 NDCs included references to *just transition*, and in 2021, 22 did, bringing the total to 16 percent of all NDCs. The UNFCCC's most recent synthesis report on NDCs also recognizes this trend, stating that "more Parties provided information on their consideration of social and economic consequences of response measures, and of just transition and/or economic diversification."[e]

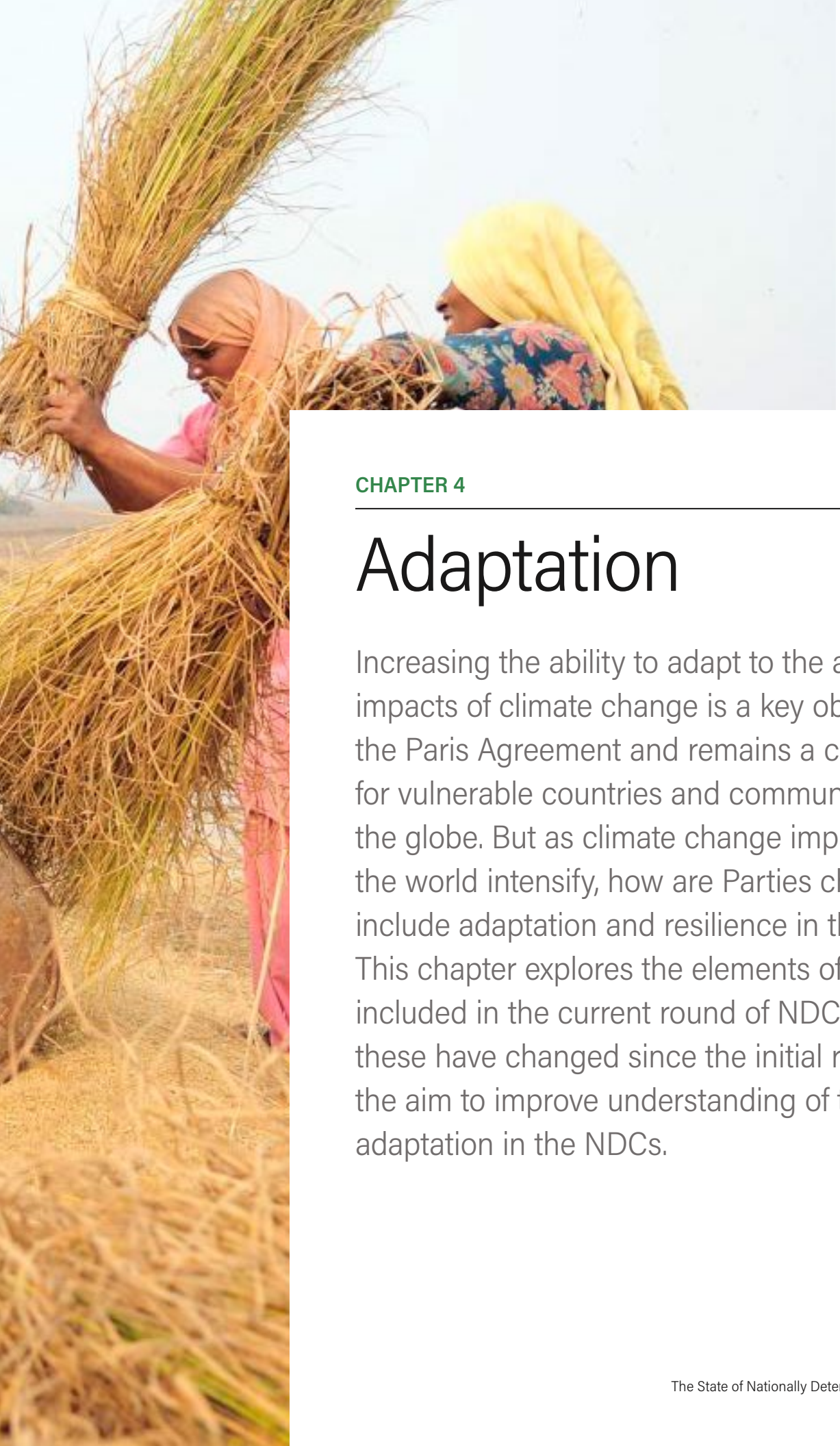
The NDCs treat just transition with varying depth. Some briefly mention the concept. For example, Mauritius notes it is taking into account "a just transition of the workforce" in reference to impacts of mitigation measures.[f] Iceland notes that "integration of just transition and gender equality is fundamental."[g] Other Parties, such as South Africa and Antigua and Barbuda, have more fully incorporated the concept, with paragraphs or dedicated sections on a just transition.[h] South Africa's initial INDC mentioned the term only 3 times, whereas its updated first NDC mentions it 19 times, outlines processes to finalize a just transition plan, and notes the establishment of the Presidential Climate Commission to oversee just transition efforts.[i]

Further research could address the following questions related to incorporating a just transition into NDCs:

- What leads countries to include just transition in their NDC? Is the impetus domestic or international? What is the role of stakeholder engagement?
- How does the treatment of just transition within NDCs intersect with national strategies, plans, and policies?
- Does the inclusion of just transition in NDCs lead to related action in other arenas (other international fora, national policies, bottom-up pressure or calls for accountability from civil society pushing for further action, etc.)?
- Over time, the analysis of NDCs can look into more descriptive aspects, such as the following:
  - Will more Parties incorporate just transition into their NDCs?
  - Will future NDCs delve deeper into the concept, or will its inclusion be fairly limited?
  - Will language remain the same or will some Parties begin using other terms, such as *fair and equitable transition*?
  - Will Parties interpret the term *just transition* narrowly or broadly? Will just transition be expanded into other sectors outside of energy, such as land use or oceans?

Notes: In alphabetical order, this is the full list of the 32 Parties that have explicitly included the term *just transition* in their NDCs: Antigua and Barbuda, Argentina, Belize, Canada, Chile, Colombia, Costa Rica, Dominican Republic, the European Union, Iceland, Indonesia, Kenya, Lebanon, Liberia, Macedonia, Mauritania, Mauritius, Montenegro, Namibia, Nigeria, Norway, Oman, Pakistan, Palestine, Paraguay, the Philippines, South Africa, South Korea, Suriname, Ukraine, United Kingdom, and Zimbabwe.

Sources: a. Pinker 2020; b. UNFCCC 2015, 2020; c. ILO 2015; d. COP24 Presidency 2018; COP26 Presidency 2021; e. UNFCCC 2021c; f. Government of Mauritius 2021; g. Government of Iceland 2021; h. Government of South Africa 2021; Government of Antigua and Barbuda 2021; i. Government of South Africa 2015, 2021.



CHAPTER 4

Adaptation

Increasing the ability to adapt to the adverse impacts of climate change is a key objective of the Paris Agreement and remains a crucial priority for vulnerable countries and communities across the globe. But as climate change impacts around the world intensify, how are Parties choosing to include adaptation and resilience in their NDCs? This chapter explores the elements of adaptation included in the current round of NDCs and how these have changed since the initial round, with the aim to improve understanding of the state of adaptation in the NDCs.

NDCs offer countries the opportunity to voluntarily communicate adaptation needs and priorities in addition to their mitigation targets and measures. There are multiple reasons why countries may choose to include information on adaptation and resilience in their NDCs. First, NDC adaptation components may serve as a country's adaptation communication. An adaptation communication is a separate but related instrument under the Paris Agreement that is designed to convey "priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties" (UNFCCC 2015). Additionally, NDC adaptation components may serve to elevate the outputs of more comprehensive processes that drive adaptation planning, such as the NAP process. NDCs are highly political public-facing documents, and including adaptation components gives countries the opportunity to promote international visibility and attract funding for national adaptation planning (Dixit and O'Connor 2022).

Of the current NDCs, 144 include an adaptation component. Despite being voluntary components in the NDCs, a large majority (86 percent) of Parties to the Paris Agreement have chosen to include them in their current NDC submissions, reflecting a broad desire to elevate adaptation alongside mitigation. However, disaggregating this statistic between developed and developing Parties to the UNFCCC suggests less consensus. Whereas most (139) developing country NDCs have included adaptation in their current NDCs, the majority (11) of developed country NDCs—including the European Union and the United States—have not done so. Developed countries account for just 16 out of 167 current NDCs, and only 5 of these 16 NDCs include adaptation components, so the adaptation NDC analysis in this report pertains almost exclusively to developing Parties. This finding reflects a divide between Parties regarding the role of adaptation in the NDCs: developed countries, which have historically high emissions, frame the NDC as a mitigation-oriented document focused on emissions reduction commitments. Conversely, for many developing countries, many of which contribute minimally to global emissions but face disproportionate threats from climate change impacts, adaptation is the key climate priority of the NDC document.

The number of countries including adaptation components has remained relatively stable between submission rounds, with 144 current NDCs including adaptation compared to 143 in the initial NDCs. Although these figures suggest a static set of countries prioritizing adaptation, this is not necessarily the case. Many countries added adaptation elements for the first time in their new and updated NDCs, including Andorra, Australia, Bosnia and Herzegovina, Iceland, Montenegro, and North Macedonia (UNFCCC n.d.). This suggests that European countries outside the European Union may increasingly see adaptation as an important element in the NDCs. Conversely, countries that had adaptation components in their initial submissions and removed them in their updated submissions include Belarus, Brazil, Grenada, the Marshall Islands, Nauru, and Ukraine. Some of these countries, including Brazil, Grenada, and the Marshall Islands, have communicated additional adaptation information via NAPs and adaptation communications (UNFCCC 2022a, 2022b).

Including adaptation elements in NDCs is voluntary, so there is little concrete guidance—and wide variation—in how these elements are included. Understanding the types of information countries choose to prioritize in their current NDC adaptation components, and how this has changed since the initial submissions, is an important step for increasing adaptation ambition in future rounds of NDC updates.

This section aims to address challenges in assessing adaptation ambition in the NDCs by presenting updated findings using a framework first developed by Dixit et al. (2022).[15] Through nine qualitative assessment criteria, this framework enabled authors to unpack the adaptation components of current NDCs and understand how they have changed compared to the initial NDC submissions. By increasing understanding of improvements and gaps in the new and updated NDC adaptation components, the framework contributes to a growing body of guidance on NDC and adaptation

enhancement (Bapna et al. 2019; Fransen, Sato, et al. 2019; UNFCCC 2015). The nine categories for assessing increased adaptation ambition in the NDCs are as follows:

1. Country ownership
2. Alignment with planning exercises and other adaptation plans and policies
3. Use of latest impact, risk, and vulnerability information
4. Focus on critical adaptation systems as identified in the Global Commission on Adaptation's *Adapt Now* report (Bapna et al. 2019)
5. Presence of additional information for priority actions, such as baselines, time frames, and costs
6. Clarity about monitoring and evaluation approaches
7. Evidence of transformative adaptation[16] in the priority actions
8. Commitments to social inclusion, gender, and equity
9. References to losses and damages from climate change

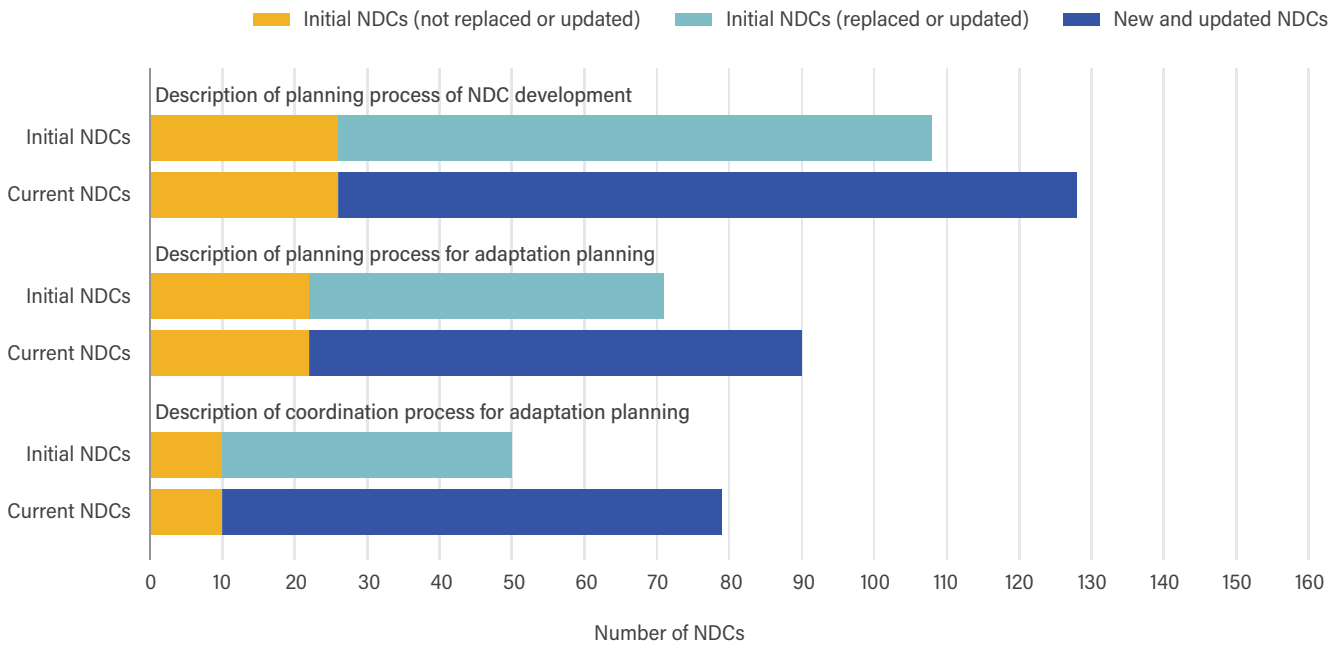
ELEMENTS OF ADAPTATION PLANNING

NDC development and adaptation planning processes

Of the current NDCs, 128 include a description of the NDC development process.[17] Although this type of descriptive information is common in NDCs, the level of detail varies. Some countries include extensive descriptions of stakeholders consulted during the development process, whereas others simply name the lead institution responsible for NDC development. Figure 23 shows the inclusion of planning descriptions in the NDCs.

Of the 144 current NDCs that include an adaptation component, 90 describe adaptation planning. Adaptation planning descriptions in NDCs often include descriptions of the lead agency responsible for adaptation planning (if different from mitigation), the stakeholders consulted, and sometimes information on the NAP process. However, significantly more (19) current NDCs describe the adaptation planning

FIGURE 23 | Description of NDC Development Process and Adaptation Planning



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

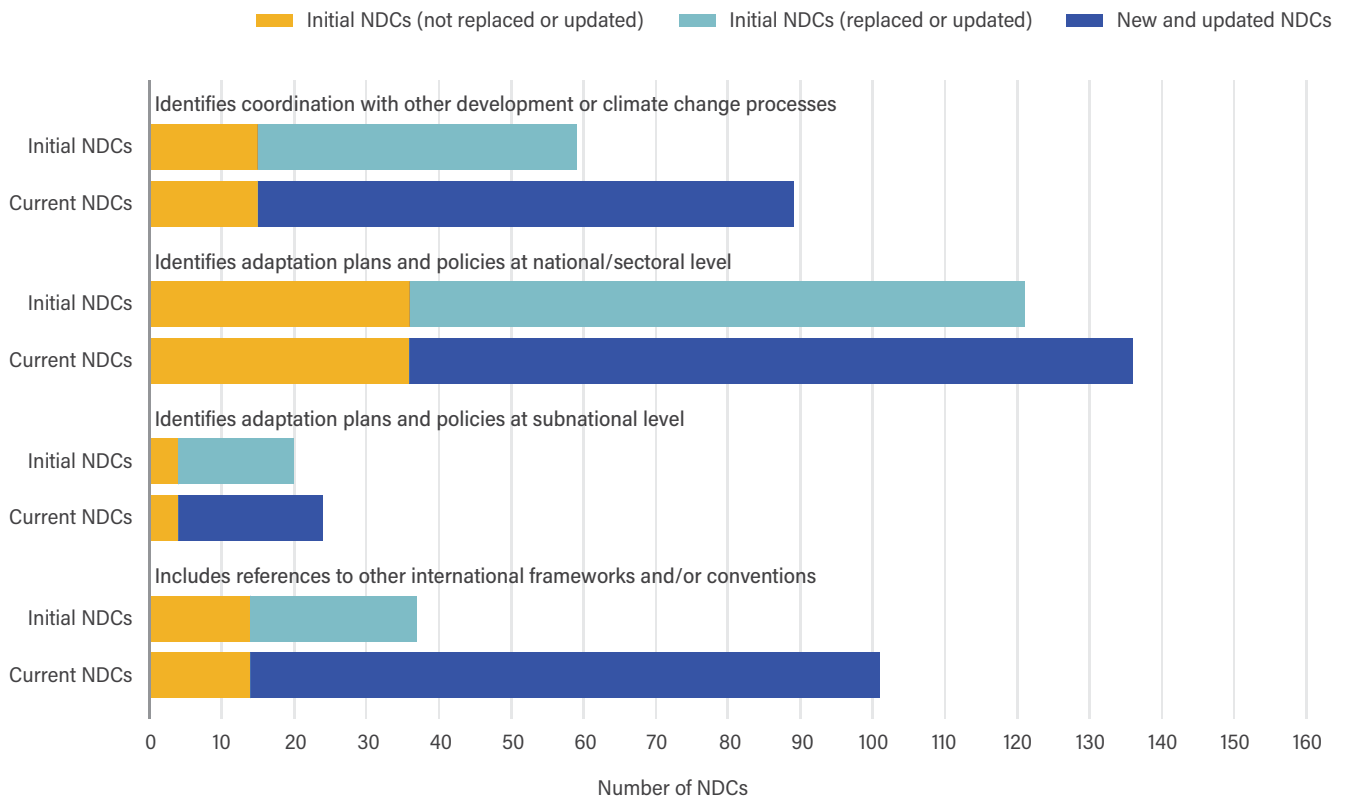
process than in the initial round of submissions. Information on the adaptation coordination process—which may include descriptions of the coordinating institution responsible for implementation as well as coordination across sectors and levels of government—saw an even greater increase, with 29 more NDCs including this information in their new and updated submissions. Papua New Guinea exemplifies these improved descriptions of adaptation planning. Whereas the country's initial NDC included only cursory institutional information, its updated NDC provided robust descriptions of its NAP process, key adaptation stakeholders, and consultation methodology (UNFCCC n.d.).

The current NDCs suggest more robust stakeholder engagement and greater country ownership than the initial submissions. Significantly more current NDCs claim to have conducted stakeholder engagement, particularly with government agencies and the public, compared to the initial submissions (Dixit et al. 2022). Honduras's improved stakeholder engagement includes a broad and socially inclusive consultation process, for instance (UNFCCC n.d.). Additionally, many new and updated NDCs received approval from a cabinet or other high-level political body. Collectively, these factors suggest a greater government ownership than in the initial NDCs.

Alignment with other plans and policies

Compared to the initial NDCs, the current NDCs suggest greater alignment with existing adaptation plans and policies. Current NDCs frequently reference NAPs, national climate change policies, and sectoral plans, and they increasingly connect their NDCs with national development processes (Figure 24). For example, Rwanda prioritized the strategic integration of adaptation and economic development policy during its updated NDC development process, with

FIGURE 24 | References to Other National Plans and International Frameworks



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

key national strategies such as its Vision 2050 and Green Growth and Climate Resilience Strategy reflecting this integration and informing NDC development (Dixit and O'Connor 2022). These linkages suggest that Parties are increasingly prioritizing synergies between adaptation policy and economic development through the NDCs. Additionally, 16 of the 38 countries that had submitted adaptation communications by the end of 2021—primarily countries in Africa and Latin America—designated their updated NDCs as their adaptation communications (UNFCCC 2022a).

The vast majority of current NDCs link the document to national policy, with 136 of them identifying national and sectoral policies relevant to adaptation. On the other hand, only 24 current NDCs included subnational adaptation policies, a modest increase from the initial NDCs. Although subnational adaptation has varying relevance depending on country context, its low and relatively static inclusion suggests that many countries are choosing to prioritize NDCs as instruments to primarily synthesize national and sectoral plans for adaptation. One example of subnational inclusion is Canada, which presents key climate goals and actions for each of its provinces and territories in its updated NDC (UNFCCC n.d.). The communication of regional and local efforts has the potential to improve vertical coherence and provide a more comprehensive synthesis of adaptation policy in the NDCs.

NAPs are crucial complementary instruments to NDCs for adaptation, and aligning NDCs and country NAP processes is key to operationalizing NDC adaptation priorities. The NAP process, whether completed or ongoing, is often an important driver of NDC adaptation components due to its comprehensive nature. Whereas NDCs often represent a high-level snapshot of adaptation planning, NAPs include extensive detail for adaptation needs and actions, enabling countries to identify and address their medium- and long-term adaptation priorities (Hammill et al. 2019). For example, by the end of 2021, the 30 completed NAP documents included an average of 87 adaptation actions, significantly more than appeared in the NDCs, and NAPs often include valuable operational details, such as indicators, and monitoring and evaluation frameworks (NAP-GN 2022). Although the number of completed NAPs[18] is dwarfed by NDC submissions, countries with NAPs may leverage strategic synergies through their NDCs. For example, the NAP that Fiji completed in 2018 comprehensively synthesized existing strategies for adaptation, development, and long-term planning. Fiji's updated NDC builds on this plan by elevating key actions from the NAP to the international level, raising visibility and support for the country's adaptation priorities. For countries at different stages of their NAP process, NDC adaptation components can also inform future outputs, including NAP documents (Dixit and O'Connor 2022).

In addition to national plans and policies, more current NDCs refer to other international conventions and frameworks compared to the initial NDCs. Adaptation and resilience efforts are highly cross cutting and intertwined with a country's development trajectory (Dixit et al. 2022), meaning they often possess relevant linkages to frameworks outside of the UNFCCC, which may ultimately be more pivotal to whether these commitments will actually be implemented. Of the current NDCs, 101 identify international conventions and frameworks in the context of adaptation, and although this number lags slightly behind the number of countries referencing NAPs and policies, it shows a massive increase from only 37 countries with these references in the initial NDC submissions. One of the most common frameworks identified in NDC adaptation components is the SDGs, but countries also commonly reference the Sendai Framework for Disaster Risk Reduction, the Convention on Biological Diversity, the United Nations Convention to Combat Desertification, and the Ramsar Convention. However, integration of international frameworks into the NDCs remains highly variable. Mexico, for example, performs a comprehensive mapping of SDGs as they relate to each of its adaptation actions, but other Parties may make cursory mention of this framework with little detail (UNFCCC n.d.). Further research is needed to determine the degree to which countries integrate other international frameworks into their NDC adaptation components, especially pertaining to the SDGs, and whether and how much this influences implementation.

Information on climate trends, impacts, and vulnerability

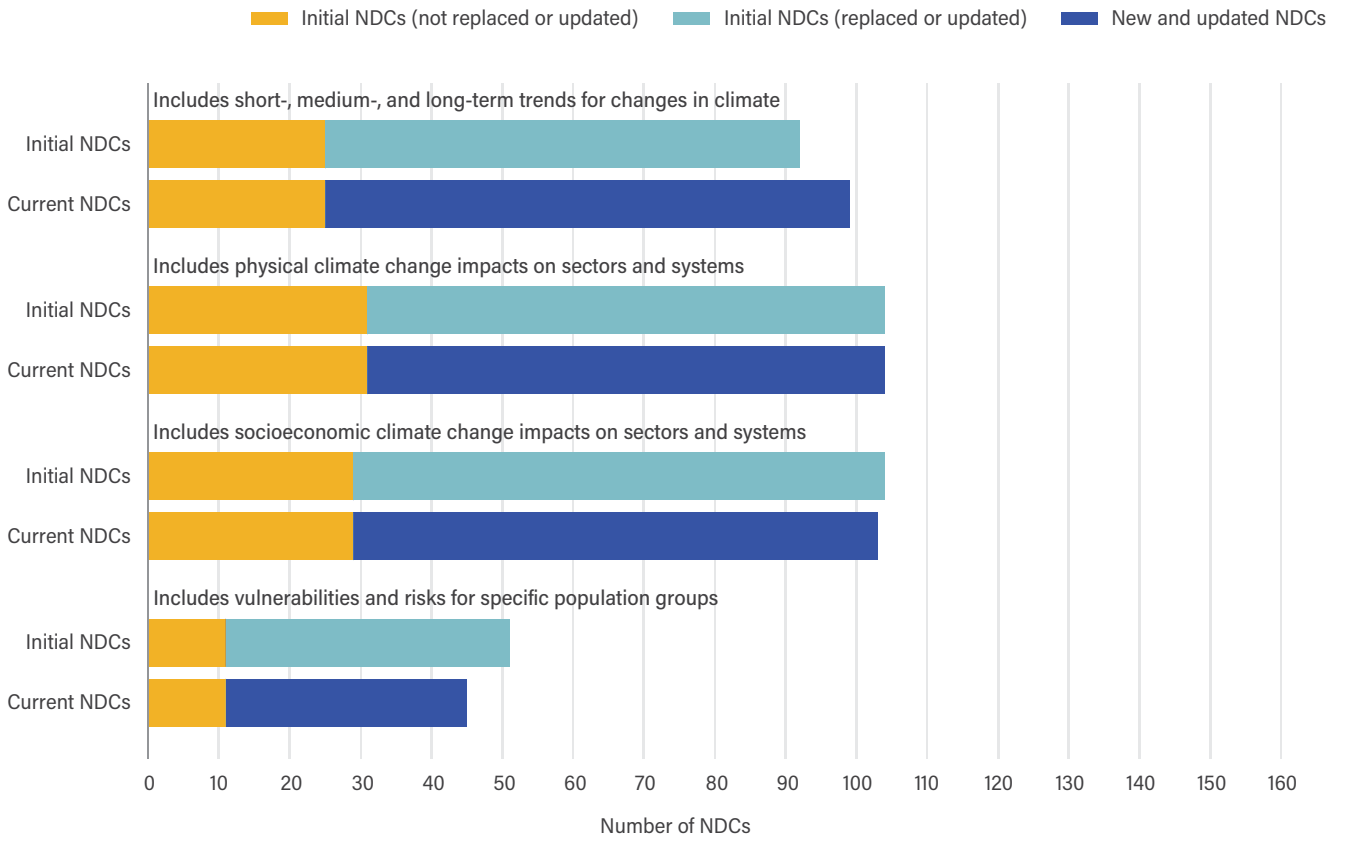
In both rounds of submissions, NDCs consistently provide information on national climate trends and impacts. The number of NDCs that do so has remained high, with around 104 submissions including this type of information in both initial and current NDCs (Figure 25). Climate change trends frequently described in NDCs include changes in tempera-

ture, rainfall patterns, sea level rise, and hydrometeorological events. Additionally, countries cite floods and droughts leading to food and water insecurity as common physical impacts of climate change, and socioeconomic impacts may include disease outbreaks and increased health risks as well as housing and infrastructure damages from extreme events.

Some countries, such as Panama, improved climate change information in an updated NDC. Panama's initial NDC did not communicate any impact or vulnerability information, but its second NDC details short- and long-term climate change trends as well as potential impacts on marine resources, infrastructure, and vulnerable sectors (UNFCCC n.d.). It also identifies Indigenous peoples in Panama as especially vulnerable to climate change, detailing displacement risks following impacts to marine environments. This trend and impact information serves as valuable context for enhancing NDC adaptation components, especially when supported by the latest assessments and national communications (Dixit and O'Connor 2022).

Although information on trends and impacts remains consistently strong, information on the vulnerability of specific population groups lags behind. NDCs are only half as likely to identify specific vulnerable groups as they are to delineate broader information on climate change trends and impacts, and the share that do describe vulnerable groups has declined slightly since the first submissions. An analysis of a subset of updated NDCs found women, the elderly, and children to be the three most frequently identified vulnerable groups in the updated NDCs (Dixit et al. 2022).

FIGURE 25 | Inclusion of Information on Climate Change Trends, Impacts, and Vulnerabilities



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

Summary and implications

The majority of current NDCs (90) describe their adaptation planning process. This information appears more often in the current NDCs than in the initial ones, but less often than descriptions of the NDC development process writ large. The level of detail provided for planning and development—including information related to stakeholder consultations and institutional arrangements—is highly variable across the NDCs.

Current NDCs are better aligned than initial NDCs with national plans and policies for adaptation, especially NAPs. Linkages to national and sectoral adaptation policies, development plans, and international frameworks such as the SDGs are described more often in new and updated NDCs than in initial submissions. But the lack of clear guidance and the resulting variability among NDC adaptation components can lead to inconsistency and misalignment across planning instruments. Countries should develop future NDCs strategically as part of a wider suite of adaptation instruments rather than as standalone documents (Dixit et al. 2022). Additionally, through the Adaptation Committee, the UNFCCC could build on the supplementary guidance already in development, mapping out the information needs of all adaptation instruments and improving clarity on how to link them. Fostering further alignment across instruments could contribute to progress tracking for the GGA, which seeks to enhance adaptive capacity and resilience, reduce vulnerability, and contribute to sustainable development (UNFCCC 2015), and it drew increased attention leading up to COP27 (COP27 Presidency 2022). By producing subsequent NDCs with clear purpose and strong alignment across instruments, Parties could contribute to this goal by creating a strategic through line towards implementation.

Countries consistently include information on climate trends, impacts, and vulnerability in their NDCs. Around 104 NDCs include information on national climate trends as well as physical and socioeconomic impacts in both submission rounds. Information on vulnerabilities for specific population groups is comparatively lacking, however, raising the question of why this gap exists. Possible explanations include gaps in stakeholder consultation or climate risk assessments or a lack of prioritization among countries in reporting this information.

PRIORITY ADAPTATION ACTIONS AND IMPLEMENTATION

Sector-specific adaptation measures

The current NDCs identify a wide range of priority adaptation actions intended for countries to increase resilience and reduce vulnerability across sectors and systems of the adaptation component. These actions are diverse in scope, with some laying out broad descriptions of strategic intent or work programs and others describing detailed sets of activities (Dixit et al. 2022). Adaptation components may communicate vulnerabilities and needs without discussing priority actions, but a consistently high percentage of NDCs (122 out of 143 initial NDCs and 122 out of 144 current NDCs) do prioritize specific adaptation actions. Although the number of NDCs that list adaptation actions is stable, the number of priority actions themselves has nearly doubled. Countries collectively communicated 2,850 adaptation actions in their initial NDCs and 4,641 actions in the current NDCs.

The number of adaptation actions has increased substantially in aggregate, but this increase was not evenly distributed across countries assessed. Whereas 70 countries included more priority actions in their new and updated NDCs compared to the initial NDCs, 33 countries decreased their total adaptation actions in their updated submissions. Only two countries, Antigua and Barbuda and the United Arab Emirates, included the exact same number of actions between submission rounds (although the actions themselves differed). These numbers suggest that a relatively small subset of countries account for the large increase in priority actions seen in the new and updated NDCs. Table 2 provides examples of significant changes in countries' priority adaptation actions.

These numbers alone are not a sufficient indicator of adaptation ambition (Dixit et al. 2022). The level of detail and scope of the actions described in NDCs is also critical—in other words, quality, as well as quantity, matters. For example, although Bhutan's and Saint Lucia's new and updated NDCs describe fewer adaptation actions, they also include a greater focus on their planned or completed NAPs. Actions must also be well targeted to match needs.

TABLE 2 | Top-Ten Country Examples with Significant Changes in Total Number of Priority Adaptation Actions

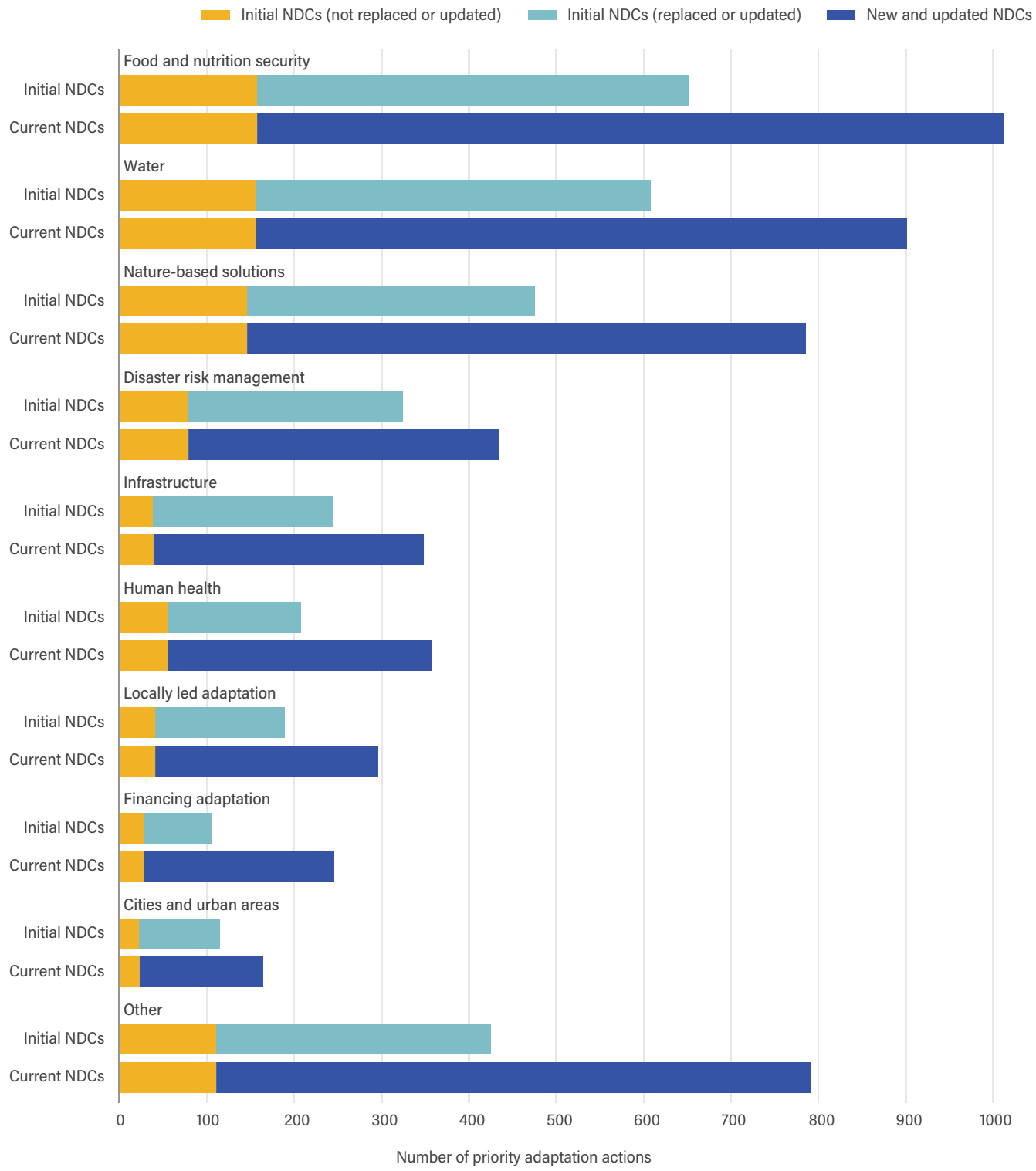
	COUNTRIES	ABSOLUTE CHANGE		COUNTRIES	ABSOLUTE CHANGE
No actions in initial NDC; actions in updated NDC	Albania	+151	**Actions in initial NDC; no actions in updated NDC**	Uganda	-38
	Kyrgyzstan	+52		Gambia	-34
	Chile	+31		Bhutan	-32
	Panama	+23		Guinea-Bissau	-22
	Solomon Islands	+21		Democratic People's Republic of Korea	-22
	Papua New Guinea	+17		Bangladesh	-14
	Monaco	+6		Belarus	-9
	Samoa	+3		Bahrain	-7
	Oman	+2		Marshall Islands	-6
	Andorra	+1		Qatar	-5
Large increase in number of actions between initial and updated NDC	Sri Lanka	+189	**Large decrease in number of actions between initial and updated NDC**	State of Palestine	-48
	Jordan	+113		Benin	-40
	Sierra Leone	+101		Nigeria	-38
	Paraguay	+86		Vanuatu	-32
	Dominican Republic	+76		Zambia	-29
	Indonesia	+74		Angola	-20
	Cambodia	+73		Zimbabwe	-17
	Mozambique	+69		Lao People's Democratic Republic	-13
	Myanmar	+69		Honduras	-12
	Republic of the Congo	+61		Saint Lucia	-12

Notes: NDC = nationally determined contribution. The authors include countries that qualified for multiple categories only once in this in order to highlight a diverse set of NDCs. Andorra references multiple actions originating from a separate planning document in its updated NDC, but these were counted as one action because the NDC does not provide enough detail to categorize separately.

Source: Authors' analysis based on WRI (2022).

The authors conducted a system analysis of adaptation actions in the NDCs using the framework of critical systems from the Global Commission on Adaptation's *Adapt Now* report (Bapna et al. 2019). This showed that countries placed a high priority on food and nutrition security, water, and NbS. Food and nutrition security stands out as the most-prioritized system (Box 6), with over 800 actions in the new and updated NDCs (Figure 26). Many of these actions relate to improving smallholder productivity, helping agricultural producers manage climate risks, and making agriculture interventions climate smart. Water and NbS were also two highly prioritized systems, with over 700 and 600 actions, respectively. Many water actions relate to water governance and financing but also frequently to irrigation, infrastructure, and disaster risk management (i.e., flood prevention). Actions linked to NbS most frequently focus on embedding NbS into adaptation planning and policy, with a relatively small number of actions explicitly targeting increases in NbS investment.

FIGURE 26 | Breakdown of Priority Adaptation Actions in the NDCs Using Adapt Now Critical Systems



Notes: NDC = nationally determined contribution. These numbers exclude instances where sectors appear multiple times for the same adaptation action to avoid duplication for actions that were coded with multiple subsectors of the same category.

Source: Authors' analysis based on WRI (2022).

The three most-prioritized critical systems appear in NDCs across most regions, but for other systems, regional variation is more pronounced (Table 3). For example, the infrastructure system is included by more than 65 percent of countries in two regions, but less than 40 percent of countries do so in the remaining five. Sub-Saharan Africa stands out as the region with the most-comprehensive critical system coverage.

Almost 800 priority adaptation actions in the current NDCs fell outside of the framework of critical systems and were categorized as "other." This category captures a large, highly varied number of adaptation actions, functioning as a catchall for any action that did not fit with the nine other critical systems. By cross-referencing this category with conventional economic sectors categorized by the World Bank (WRI 2022), the authors found that this system captured numerous cross-cutting actions related to capacity building and knowledge transfer, climate services, social development, economy-wide considerations, energy, tourism, and education (Figure 27).

Categorizing the priority adaptation actions by conventional economic sector shows similarities when compared to the critical system framework, with highly prioritized critical systems including water and NbS broken down into multiple sectors. Whereas many of the lower-priority sectors (tourism, education, etc.) aligned with the "other" critical system category, actions in the transport sector aligned strongly with the infrastructure critical system, supporting the findings of previous NDC analysis that adaptation in the transport sector has been largely limited to infrastructure resilience (SLOCAT 2021b). The cross-cutting area category includes a higher number of actions compared to the "other" critical system, and this is primarily due to the sector's more descriptive subcategories, which were applicable to a wide variety of sectoral actions that included cross-cutting elements. Few NDCs include integrated adaptation and mitigation priority measures, although many reference mitigation cobenefits from adaptation actions (Box 8).

This aggregate analysis provides insight into which sectors and systems countries are commonly prioritizing for adaptation, but it remains critical to examine NDC adaptation

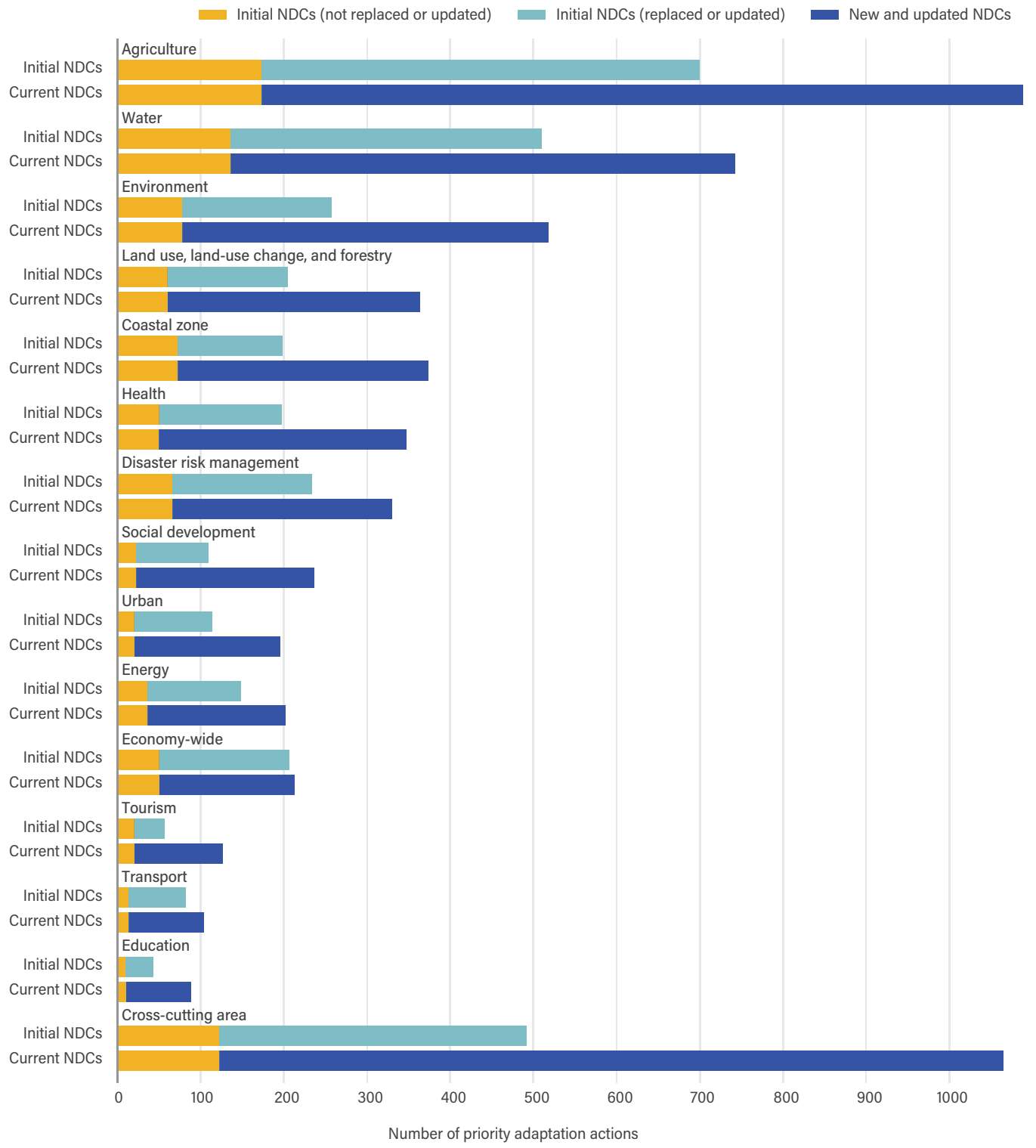
TABLE 3 | Percentage of Countries in Each Region with NDCs Containing Priority Actions for Each Critical System

REGION	FOOD AND NUTRITION SECURITY	NATURE-BASED SOLUTIONS	WATER	CITIES AND URBAN AREAS	INFRASTRUCTURE	DISASTER RISK MANAGEMENT	FINANCING ADAPTATION	HUMAN HEALTH	LOCALLY LED ADAPTATION	OTHER
East Asia and the Pacific	59%	56%	50%	41%	38%	44%	38%	41%	34%	44%
Europe and Central Asia	22%	26%	22%	11%	22%	22%	19%	15%	11%	22%
Latin America and the Caribbean	76%	67%	76%	48%	67%	70%	48%	61%	58%	58%
Middle East and North Africa	56%	56%	61%	44%	33%	56%	17%	50%	33%	56%
North America	50%	50%	0%	0%	0%	0%	0%	0%	50%	0%
South Asia	63%	50%	63%	13%	38%	63%	50%	50%	63%	63%
Sub-Saharan Africa	90%	85%	88%	44%	71%	75%	63%	73%	58%	79%

Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 27 | Breakdown of Priority Adaptation Actions in the NDCs Using Conventional Economic Sectors



Notes: NDC = nationally determined contribution. These numbers avoid double counting for actions that were coded for multiple subsectors of the same category.

Source: Authors' analysis based on WRI (2022).

actions within the larger ecosystem of adaptation planning to assess synergies and gaps with national planning efforts. The Climate Watch platform presents the data used in this assessment in a format conducive to country-level analysis. The aggregate analysis provides insight into which sectors and systems countries are commonly prioritizing for adaptation. Understanding which systems receive the most and least attention in the NDCs could provide insights into possible sectoral gaps for current adaptation activities and influence the development of future rounds of NDCs to improve system coverage of adaptation actions as appropriate.

Additional details for adaptation actions

The current NDCs include more time frames and indicators for priority adaptation actions than the initial NDCs, but this number remains small compared to the total number of actions. Of the 4,641 total priority actions in the current NDCs, 1,826 of them—or 39 percent—include a time frame of action (Figure 28). Even fewer (621 actions, or 13 percent) include measurable targets and indicators.

Monitoring, evaluation, and learning for adaptation activities

More NDCs with adaptation components—but still fewer than half—include information about monitoring, evaluation, and learning (MEL) for their adaptation activities. Only 57 current NDCs include references to MEL approaches for adaptation (Figure 29). The number of current NDCs including specific details for adaptation MEL is even lower, with 40 describing institutional arrangements for MEL, 26 referencing alignment with national MEL systems, and just 13 including metrics or indicators. Although these numbers are all higher compared to the initial NDCs, the increase in each category is relatively minor. Rwanda serves as an example of improved communication around adaptation MEL in its updated NDC. In addition to detailing institutional responsibilities for adaptation MEL, the country links its updated NDC to a comprehensive monitoring, reporting, and verification document, and it commits to reporting adaptation indicators in future biennial transparency reports (Dixit and O'Connor 2022).

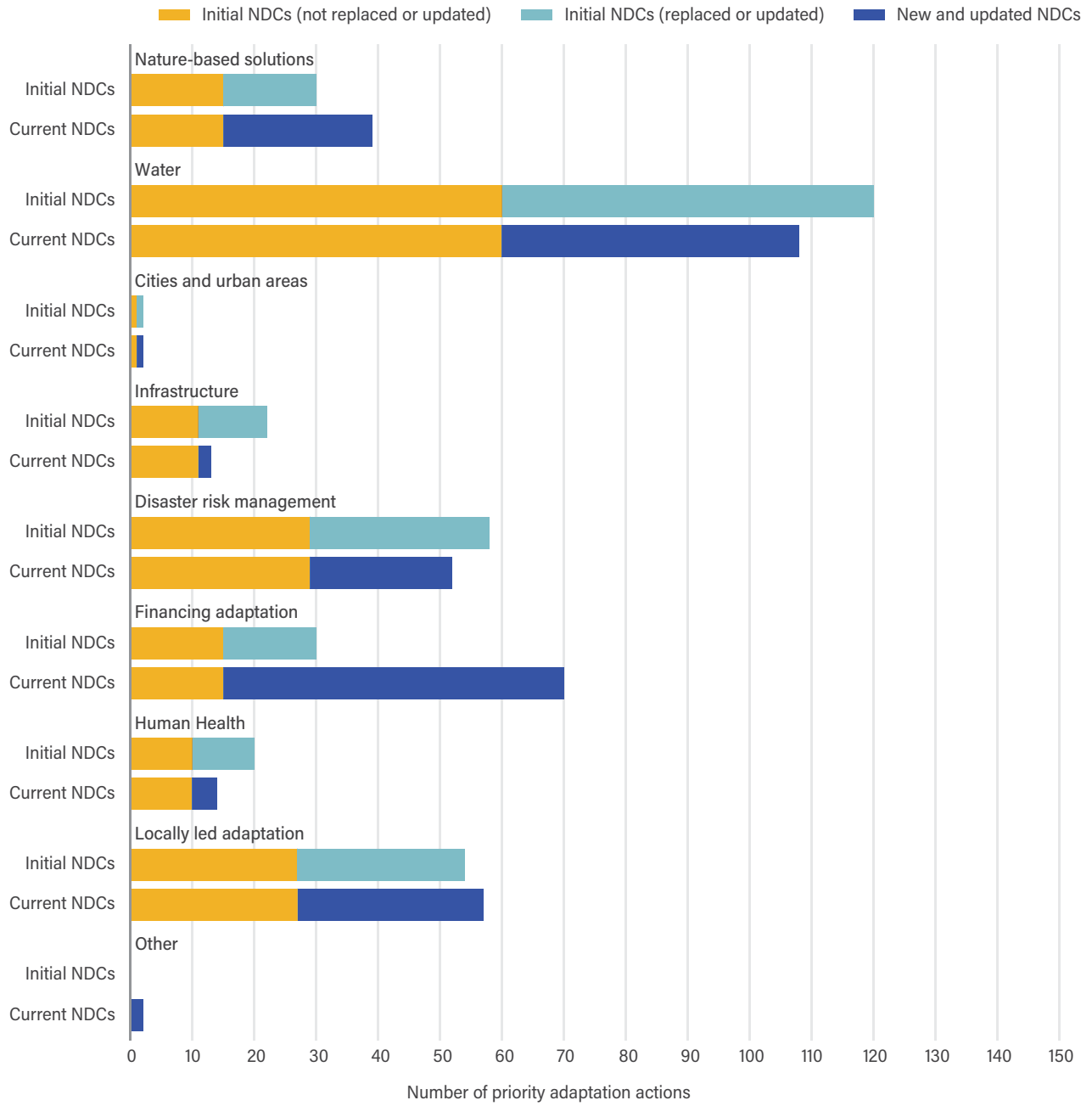
BOX 6 | Food and Nutrition Security

Of the 122 current NDCs that included priority adaptation actions, 109 of them (89 percent) included at least one action related to food and nutrition security. This reflects both the importance of agriculture and food systems and their vulnerability to climate change impacts because climate-induced changes in temperature and rainfall patterns affect natural systems, crop yields, and food security.[a] The authors categorized individual adaptation actions with up to three critical systems to better capture actions that affect multiple critical system categories and linkages between systems. In the current NDCs, many food and nutrition security actions affected other critical systems as well, with the greatest number of these actions relating to water, financing adaptation,[19] nature-based solutions (NbS), and locally led adaptation (Figure B6.1).

The current NDCs include the most food and nutrition actions linked to water, with 66 such actions falling under both critical system categories. These actions reflect well-established linkages between the agriculture and water sectors, particularly irrigation. Additionally, 60 food and nutrition security actions in the current NDCs also fall under the financing adaptation critical system, with 55 of these actions coming from the new and updated NDCs alone. These linkages reflect adaptation activities such as developing contingent finance and insurance schemes for small-scale farmers feeling the effects of climate change impacts. Finally, the NbS and locally led adaptation critical systems both demonstrated moderately high numbers of linkages to food and nutrition security, with 40 and 38 food and nutrition security actions also falling under these systems, respectively. Despite appearing less frequently across the NDCs overall, many locally led adaptation actions linked to food and nutrition security by aiming to leverage local knowledge for agricultural adaptation and build capacities of local producers.

BOX 6 | Food and Nutrition Security (Cont.)

FIGURE B6.1 | Priority Adaptation Actions Related to Food and Nutrition Security That Also Affect Other Critical Systems

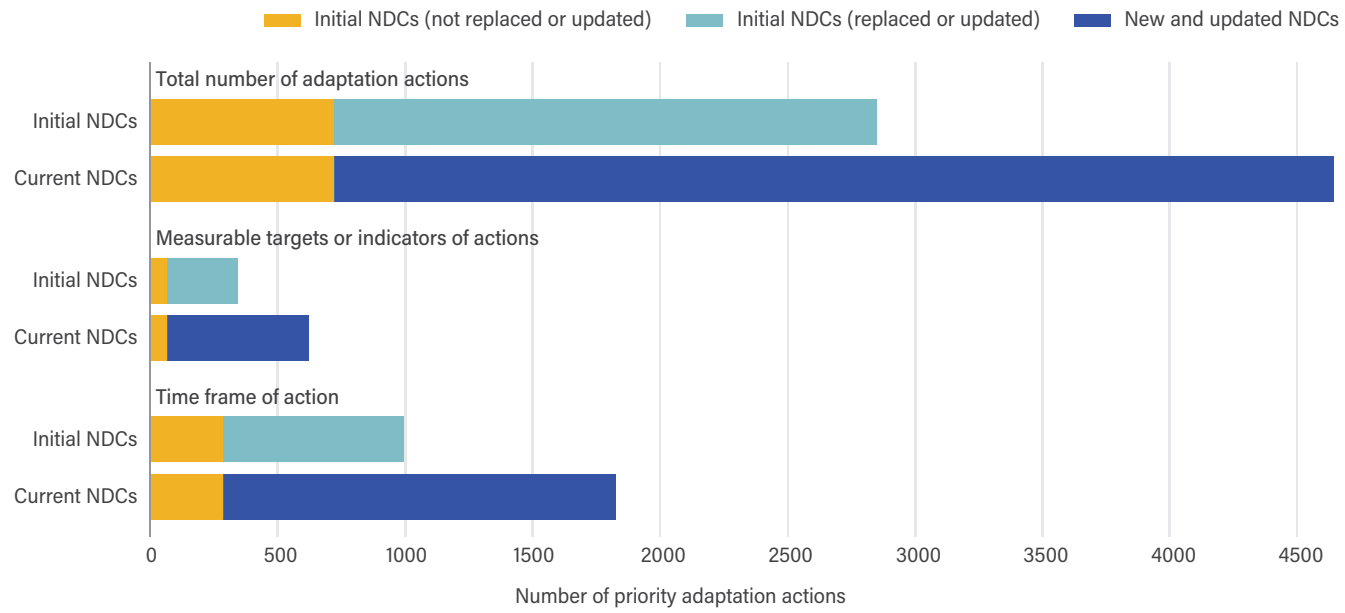


Notes: NDC = nationally determined contribution. These numbers exclude instances where a single sector appears multiple times for the same adaptation action, to avoid duplication for actions that were coded with multiple subsectors of the same category.

Source: Authors' analysis based on WRI (2022).

Source : a. Carter et al. 2021.

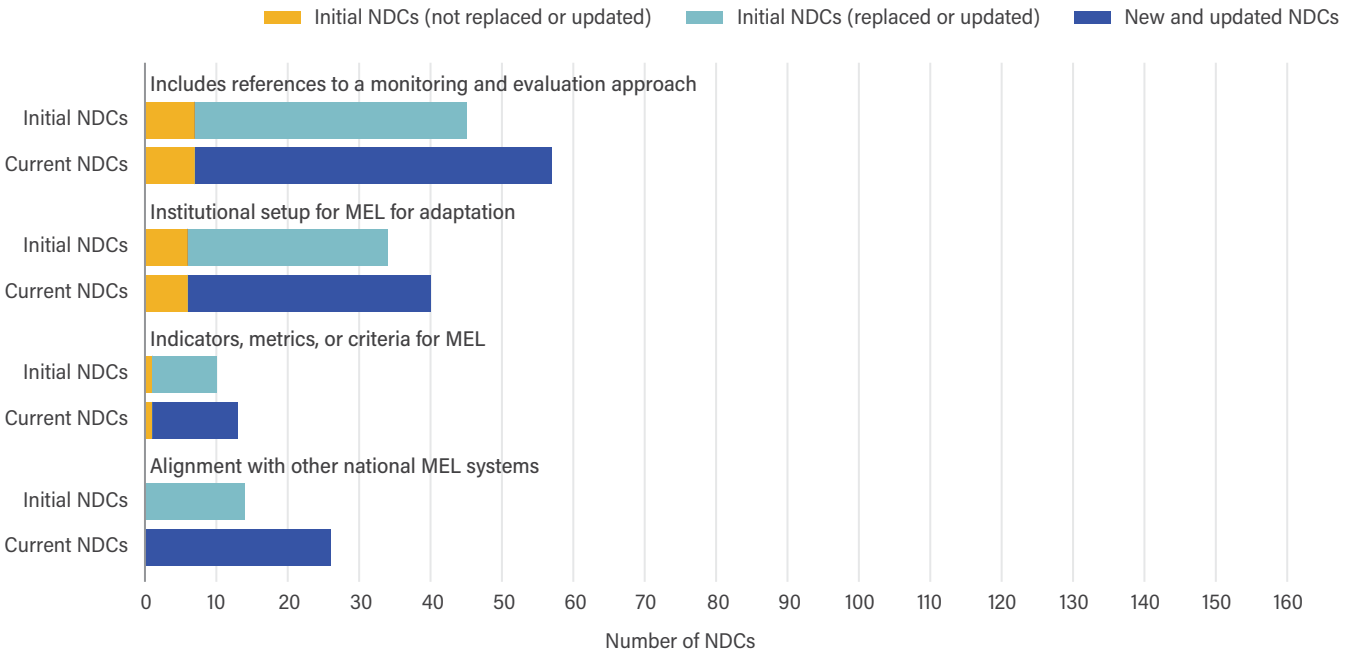
FIGURE 28 | Time Frames and Indicators Identified for Priority Adaptation Actions in the NDCs



Notes: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 29 | NDCs Providing Information on Adaptation MEL



Notes: MEL = monitoring, evaluation, and learning; NDC = nationally determined contribution.

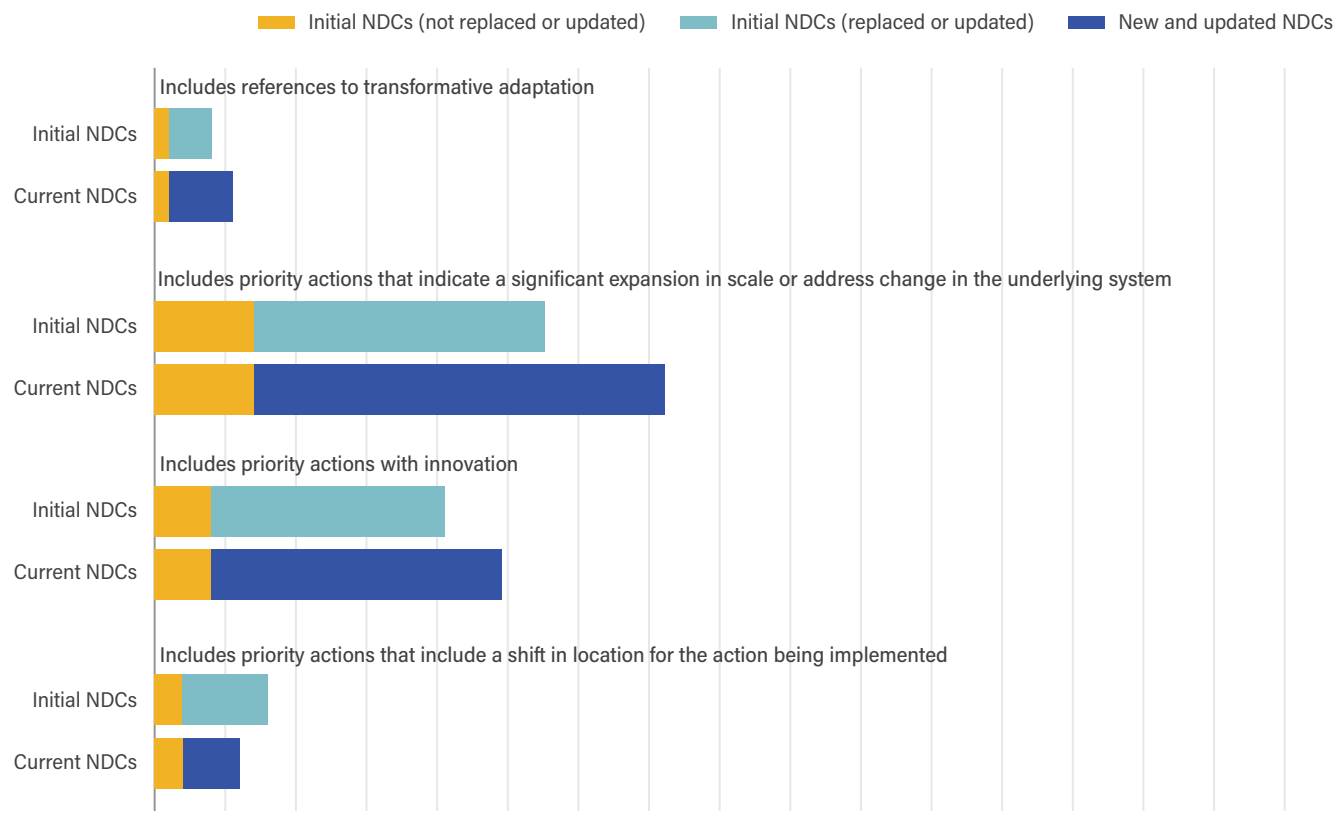
Source: Authors' analysis based on WRI (2022).

Transformative adaptation

The IPCC defines *transformational adaptation* as an approach that "seeks to change the fundamental attributes of systems in response to actual or expected climate and its effects, often at a scale and ambition greater than incremental activities" and notes that for agriculture, the ways in which transformation could be reflected include "through adjustments to cropping systems via new varieties, changing planting times, or using more efficient irrigation" (IPCC 2014). Carter et al. (2018) expanded upon this definition to define *transformative adaptation* in the agricultural sector as an intentional response to climate change impacts that includes a significant expansion or shift in key systems, introduces new methods or technologies at scale, or otherwise fundamentally alters systems (Box 7).

Although this approach is intended to minimize the long-term impacts of climate change, only 11 current NDCs explicitly mentioned the term *transformative adaptation*. The authors also found no evidence that countries were prioritizing measures using long-term adaptation pathways, identifying levers for system shifts, or avoiding maladaptation in the NDCs (Dixit et al. 2022). Figure 30 shows elements of transformative adaptation in the NDCs.

FIGURE 30 | References to Different Elements of Transformative Adaptation in the NDCs



Notes: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

Although few NDCs engage explicitly with this concept, many more include *elements* of transformative adaptation. Seventy-two current NDCs identify priority adaptation actions that involve an expansion in scale or system change, and 49 NDCs include actions with innovation. Only the shift in location category, which received scant attention in the initial round, got slightly less in the current NDCs. Although the increases across most categories are encouraging, it remains difficult to assess elements of transformative adaptation in the NDCs without explicit country engagement with the term; many actions identified in the NDCs lack the detail to fully determine transformative potential. Countries could benefit from increased support in identifying transformative adaptation pathways, mapping the transformative potential of adaptation actions, and linking their NDCs with long-term strategies to overcome this gap (Dixit et al. 2022). Table 4 provides examples of adaptation actions with transformative potential in the NDCs.

BOX 7 | Elements of Transformative Adaptation

To identify elements of transformative adaptation, the authors use the framework from Dixit et al.[a] that the Intergovernmental Panel on Climate Change[b] defines and Carter et al.[c] expands upon. The framework includes four elements: expansion, expansion with system change, innovation, and a shift in location. The following framework guidance is intended to assist in identifying these elements of transformative adaptation in nationally determined contribution adaptation actions:

- *Expansion*: This priority adaptation action includes an expansion over a larger geographic area or an increase in the number of people impacted.
- *Expansion with system change*: The action includes an expansion that requires a change in the overall system that goes beyond incremental adaptation or business-as-usual approaches.
- *Innovation*: The action includes a new application of an approach, technology, or method in a particular region or resource system.
- *Shift in location*: This action includes a change in location for the adaptation activity being implemented, such as shifting from farming to nonfarming livelihoods or relocation of climate-vulnerable communities.

Sources: a. Dixit et al. 2022; b. IPCC 2014; c. Carter et al. 2018.

TABLE 4 | Examples of Transformative Adaptation

COUNTRY	DOCUMENT	PRIORITY ADAPTATION ACTION	TRANSFORMATIVE ELEMENT
Rwanda	First NDC	"Soil conservation and land husbandry . . . Rwanda intends to expand its soil conservation and land husbandry programs through: Installation of land protection structures like radical and progressive terraces where these structures will be installed on 100% of the relevant area by 2030; Development and implementation of an intensive agroforestry program with a target of covering 100% of arable land by 2030" (pp. 5–6)	Expansion
Morocco	Updated NDC	Agriculture: "Extension of irrigation to new agricultural perimeters, covering an area of 60,000 ha, for a total investment of 3.5 billion USD" (p. 23)	Expansion
Mexico	First NDC	Adaptation of strategic infrastructure and productive systems: "Strengthen the diversification of sustainable agriculture by conserving germplasm and native maize species, thermal comfort for livestock, development of agro-ecosystems, through the incorporation of climate criteria in agriculture programs" (p. 8)	Expansion with system change
Cabo Verde	Updated NDC	Agriculture associated measure: "Associate agriculture systematically to livestock in order to cycle soil-regenerating nutrients and enhance conditions for the maintenance of livestock, making it more adapted to the new agro-climato-ecological conditions, especially in what refers to heat and water management, cattle feed and the control diseases" (pp. 36–37)	Expansion with system change
Vietnam	Updated NDC	"[Adaptation actions include] changing the production structure and varieties of plants and animals . . . implementing the programme for aquatic resources protection and development, diversifying cultured species, applying technological measures and cultivation practices of sustainable and organic aquaculture" (p. 18)	Expansion with system change
Nicaragua	Updated NDC	"Modernization of the country's hydro-meteorological services in order to maintain accurate forecasts and early warning systems for effective and efficient responses, which includes modernization of observation, assimilation and forecast systems, access to sensors and technology, as well as the developing skilled human resources" (p. 28)	Innovation
Cambodia	Updated NDC	"Integrating climate change response measures onto the construction design for buildings and for rural housing (use of modern integration of technology)" (p. 120)	Innovation
Ethiopia	First NDC	Drought: "Create biodiversity movement corridors, especially up towards higher terrain, in areas where most of the land is under cultivation. This will minimize biodiversity loss through enabling the re-establishment and movement of plant and animal species and varieties to areas suitable for their survival when temperature rises" (p. 6)	Shift in location
Fiji	Updated NDC	"Relocate highly vulnerable communities, and implement the concept of 'build back better'" (p. 5)	Shift in location

Notes: NDC = nationally determined contribution. A more detailed description of the transformative elements used in this table can be found in Dixit et al. (2022).

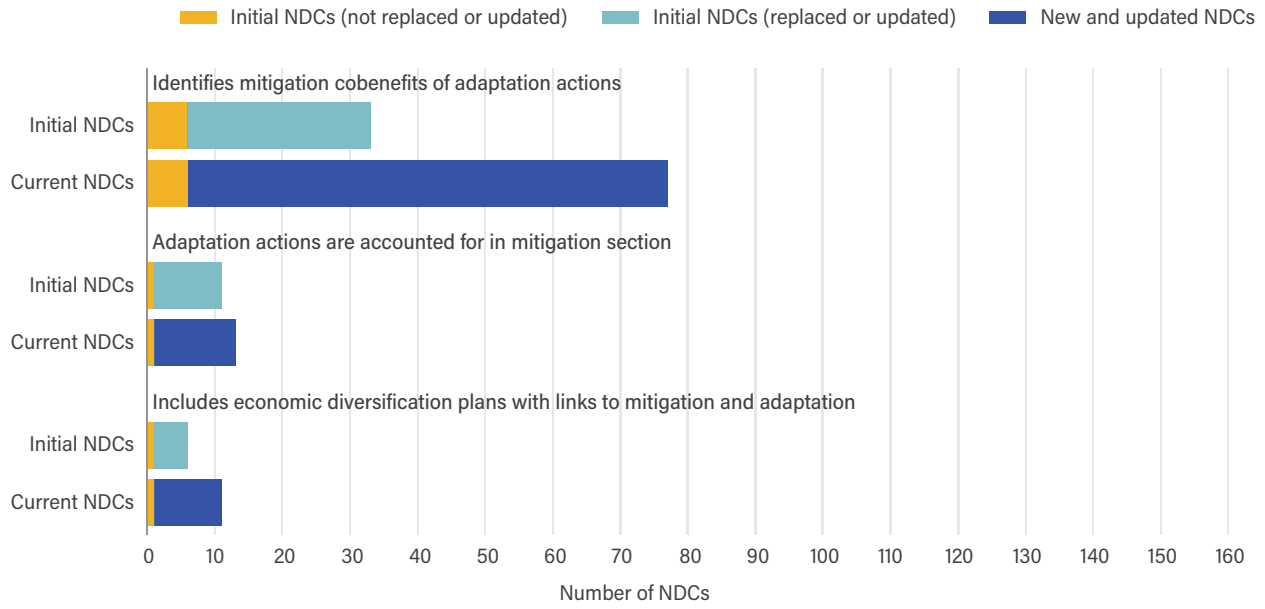
Source: Authors' analysis.

BOX 8 | Adaptation-Mitigation Synergies

Climate-resilient development integrates adaptation and mitigation measures to advance sustainable development. This approach can harness synergies and reduce trade-offs between adaptation and mitigation, but the window for enabling climate-resilient development narrows for many communities as global warming nears 1.5°C.[a] There exists a high potential to integrate adaptation and mitigation in the nationally determined contributions (NDCs), especially in key sectors such as agriculture. But many countries do not include details or explicitly acknowledge adaptation-mitigation synergies in these areas.[b]

Compared to the initial NDCs, the current NDCs include significantly more references to mitigation cobenefits from adaptation actions. Seventy-seven current NDCs identify the emissions reduction potential of their adaptation actions, a number that has more than doubled compared to the initial submissions (Figure B8.1). Although references to mitigation cobenefits have improved substantially, the level of detail surrounding cobenefits remains highly variable. Additionally, these cobenefits are poorly reflected in the mitigation section of current NDCs, suggesting a structural disconnect in NDC development. The teams responsible for developing the adaptation and mitigation components of NDCs are often separate,[c] and though many countries refer to adaptation-mitigation synergies, there is little evidence that these synergies are integrated across NDC components. Finally, a small but increasing number of countries include economic diversification plans in their NDCs. These plans largely pertain to a small subset of oil-rich countries, but they link to both mitigation (reducing dependence on high-emitting industries) and adaptation (diversifying away from climate-vulnerable products), contributing to climate-resilient development.

FIGURE B8.1 | References to Mitigation Cobenefits from Adaptation and Economic Diversification in the NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

BOX 8 | Adaptation-Mitigation Synergies (Cont.)

Mitigation actions in certain subsectors can have significant cobenefits for adaptation as well, especially in the land use, land-use change, and forestry (LULUCF) and agriculture sectors. Although these measures are often listed in NDC documents as mitigation measures, actions in the LULUCF sector related to afforestation, reforestation, reducing deforestation, or the restoration of wetlands, grasslands, and other ecosystems can reduce flood risk in addition to sequestering carbon. Likewise, soil management practices to improve soil carbon sequestration can also reduce the severity of droughts.[d] An Organisation for Economic Co-operation and Development report found that of the Group of Twenty members, 10 mention adaptation-mitigation linkages related to agriculture, forestry, or other land uses, and 19 include some mention of adaptation-mitigation synergies in either their NDC or national adaptation plan. In NDCs, the tables with information to facilitate clarity, transparency, and understanding provide standard details on countries' targets and methodologies and include a field for the mitigation cobenefits of the adaptation actions included in the NDC. However, they do not include a similar field for adaptation benefits resulting from mitigation measures. Given the growing need to understand and harness synergies between countries' adaptation and mitigation efforts, ensuring a more complete documentation of these synergies is something to consider moving forward.

Sources: a. IPCC 2022a; b. Ross et al. 2019; c. Dixit and O'Connor 2022; d. OECD 2021.

Summary and implications

Countries are prioritizing more adaptation actions in their current NDCs compared to their initial submissions, and these measures include greater coverage of critical systems and sectors for adaptation. The current NDCs include significantly more priority adaptation actions than the initial NDCs, but variation in their scope and detail means that their number alone are not indicators of quality. Sectoral coverage for adaptation actions also improved. Food and nutrition security stand out as the highest-priority critical system, with more than 1,000 adaptation actions relating to this system presented across 109 current NDCs. Combining aggregate sectoral data with country-level analysis could provide insights into possible gaps in types of adaptation actions, informing future planning and implementation activities.

Despite increased sectoral coverage, just 39 percent of priority actions include time frames, and only 13 percent include targets or indicators, suggesting that more work is necessary to ensure that these actions are ready for implementation. NDCs themselves are typically not designed for implementation but rather represent a high-level snapshot of goals and intended actions. However, countries should aim to fill the gap between NDC adaptation actions named and the steps needed to implement them. They can do this by developing NDC implementation plans or by integrating NDC actions into their NAP process. A clearly defined enabling environment that includes strong country ownership and inclusive stakeholder engagement is critical for NDC implementation (NDC Partnership 2022). Donors should also consider supporting developing countries to help them elaborate on existing implementation plans and develop country-led indicators aligned with existing national adaptation processes (Dixit et al. 2022). Supporting these plans and associated indicators could contribute to the GGA by advancing adaptation implementation.

Less than half of NDC adaptation components include information on adaptation MEL, suggesting that developing countries could benefit from improved guidance and tools on tracking adaptation MEL and linking with national MEL frameworks. Donors could consider investing in linking national adaptation MEL systems with reporting requirements to the Paris Agreement, and country governments could consider how to include adaptation in their enhanced transparency framework and biennial transparency reports (Dixit et al. 2022). Adaptation MEL is also an important element of the GGA; countries have

demonstrated renewed interest in developing this goal (COP27 Presidency 2022), and enhancing these systems would contribute to the tracking progress.

Adaptation actions show growing potential for transformative adaptation in the current NDCs, despite low explicit direct engagement with this concept. Just 11 current NDCs include explicit references to the term *transformative adaptation*, yet over 70 include priority actions with related elements. This finding raises the question of why such a disconnect exists. Possible explanations include a lack of technical capacity or political will among countries to intentionally structure NDC priority adaptation actions around transformative adaptation approaches. Increased support to identify transformative pathways and link NDCs to long-term strategies could help overcome this gap.

EQUITY CONSIDERATIONS IN ADAPTATION

The current NDCs improve multiple elements of equity[20] compared to the initial submissions, including a significant increase in the integration of gender. Seventy-nine current NDCs describe differentiated adaptation needs between men and women, and more than 50 reference equal distribution of adaptation benefits and equitable participation in decision-making (Figure 31). Fewer (26) current NDCs include commitments to collect sex-disaggregated data for adaptation MEL. The increase compared to the initial NDCs is striking. Few initial NDCs include aspects of gender responsiveness, only two mention equal distribution of adaptation benefits, and none of them commits to collecting sex-disaggregated data. This finding suggests that countries are improving their integration of gender in adaptation and climate change strategies, which is consistent with other recent assessments of current NDCs (CARE 2020; IUCN 2021; NDC Partnership 2020; UNDP 2022). Cambodia stands out as an example of improved gender responsiveness. The country identified gender as a gap in the initial NDC and addressed this in its updated submission through designated gender-related adaptation actions as well as gender targets for all other adaptation actions (Dixit and O'Connor 2022). Plans for monitoring and evaluation are less robust; fewer (26) current NDCs include commitments to collect sex-disaggregated data for adaptation MEL.

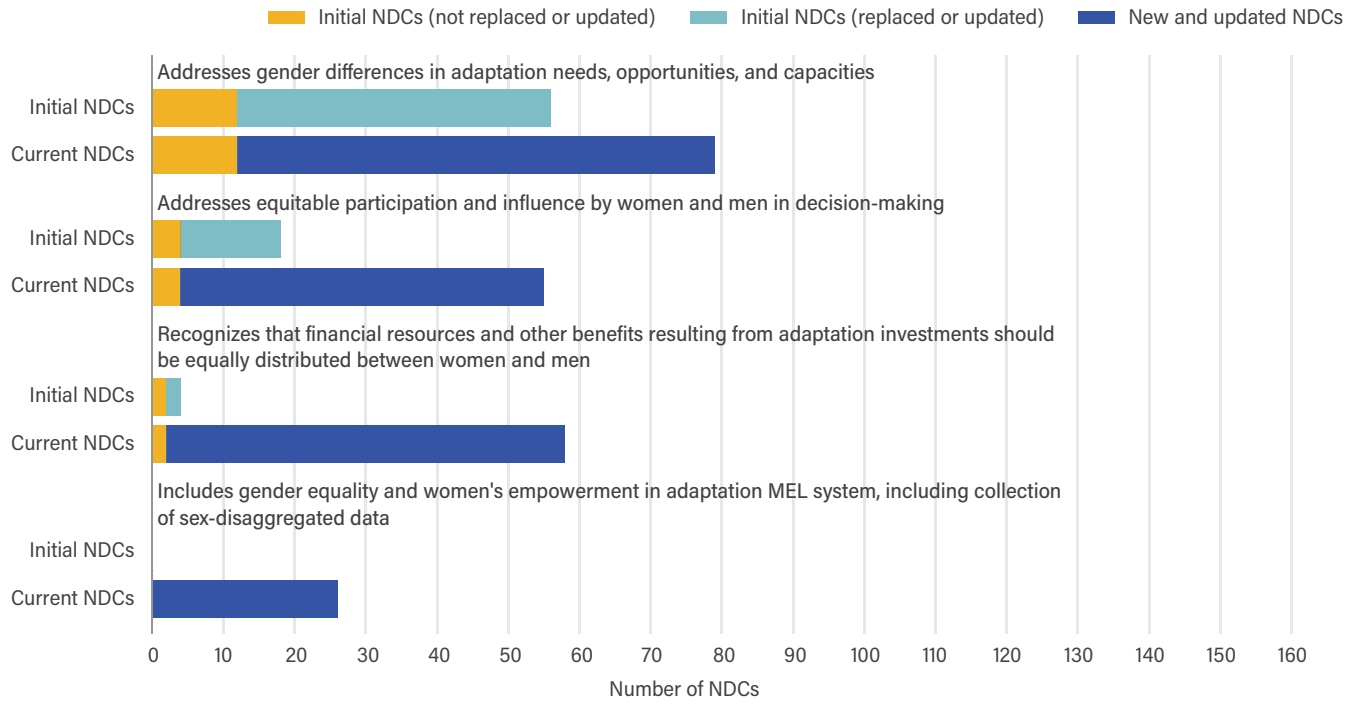
The current NDCs also show a considerable increase in the inclusion of Indigenous peoples' concerns, with a particular focus on local and Indigenous knowledge systems. Forty-eight current NDCs reference local and Indigenous knowledge systems in relation to adaptation, and although this accounts for less than half of the total NDC adaptation components, it represents nearly double the number in initial NDCs (Figure 32). Fewer (35) current NDCs support increased Indigenous rights, but that is up dramatically from initial submissions. References to free, prior, and informed consent for Indigenous peoples remained low in absolute terms as well, but these, too, are far more common than in the initial round. Nicaragua demonstrates improved inclusion of Indigenous peoples in its updated NDC, providing detailed information on all three of the above categories, compared to sparse detail concerning Indigenous communities in its first submission (UNFCCC n.d.).

Summary and implications

Countries are more focused on gender equity in the current NDCs. Very few initial NDCs include any references to equitable participation and benefits from adaptation investments, and none of them reference collection of sex-disaggregated data. These elements are all significantly more prevalent in the new and updated submissions, suggesting broader recognition of the need for gender responsiveness.

Inclusion of Indigenous peoples' concerns is better represented in the current NDCs than in the initial submissions. More cite Indigenous knowledge systems and increased Indigenous rights in their NDCs, although few refer to the need for free, prior, and informed consent for Indigenous peoples. Although these elements of equity have improved in the NDCs, further research is needed for a comprehensive understanding of equity considerations, including issues related to youth engagement and common but differentiated responsibilities.

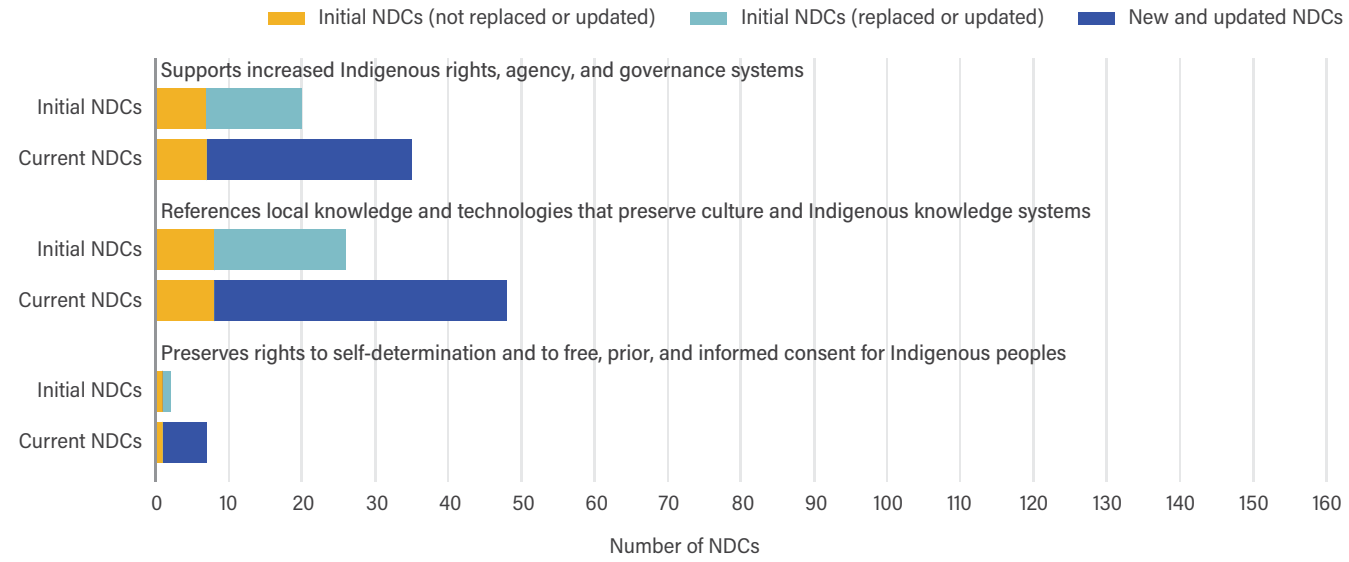
FIGURE 31 | Gender Integration in the NDCs



Notes: MEL = monitoring, evaluation, and learning; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

FIGURE 32 | Inclusion of IPLC in Initial and Current NDCs



Notes: IPLC = Indigenous peoples and local communities; NDC = nationally determined contribution.

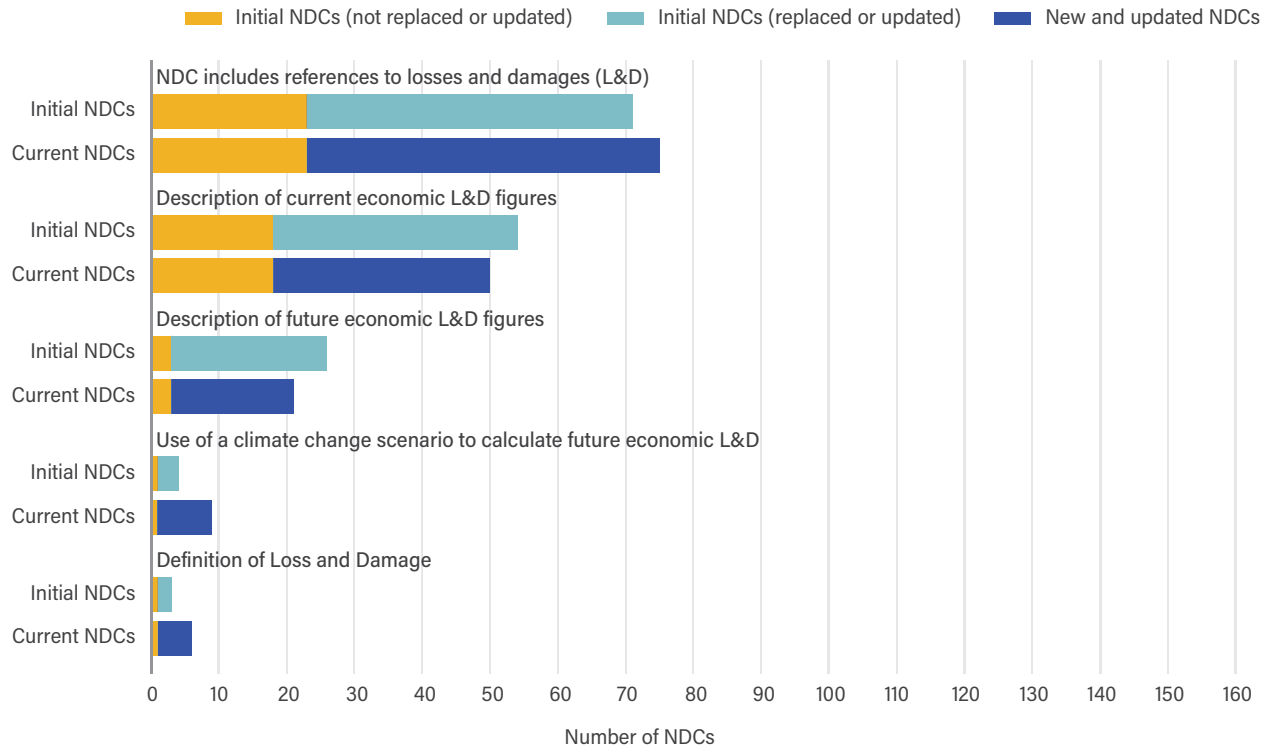
Source: Authors' analysis based on WRI (2022).

BOX 9 | Losses and Damages from Climate Change

Countries appear to have mixed levels of engagement with losses and damages[21] (L&D) from climate change in their current nationally determined contributions (NDCs), and fewer reported on economic L&D than in the first submissions. Slightly under half (75) of current NDCs refer to L&D, only 50 include descriptions of current L&D costs, and just 21 describe future costs. This represents a slight decrease compared to the initial submissions. This finding changes somewhat when looking at the most vulnerable countries. Sixteen out of 50 NDCs describing current L&D costs and 7 out of 21 NDCs with future L&D costs come from small island developing states (SIDS), among the most vulnerable countries to climate change impacts. SIDS are also increasingly including economic L&D costs in their current NDCs, whereas other countries are including them less often, suggesting that the most climate-vulnerable countries continue to value L&D as an element of NDC submissions (Figure B9.1). However, L&D costs included across the NDCs are often snapshots from specific extreme events. Countries rarely provide analysis of broader trends in L&D beyond individual instances, and few mention the use of climate change scenarios for calculating future L&D costs.

Very few countries have included a clear definition of the term *Loss and Damage* in their NDCs. Only six Parties (including two SIDS)—Antigua and Barbuda, Niue, Papua New Guinea, Peru, the State of Palestine, and Vietnam—provide a definition of *Loss and Damage* in their current NDCs; although this has increased compared to the initial NDCs, it represents a small fraction of total submissions. These findings suggest that countries have little experience operationalizing the term in national contexts. Donors could help countries overcome this barrier by supporting improved analysis of national L&D trends; approaches for addressing L&D, including comprehensive risk management; and the use of climate scenarios to calculate economic L&D costs.[a]

FIGURE B9.1 | References to L&D in the NDCs



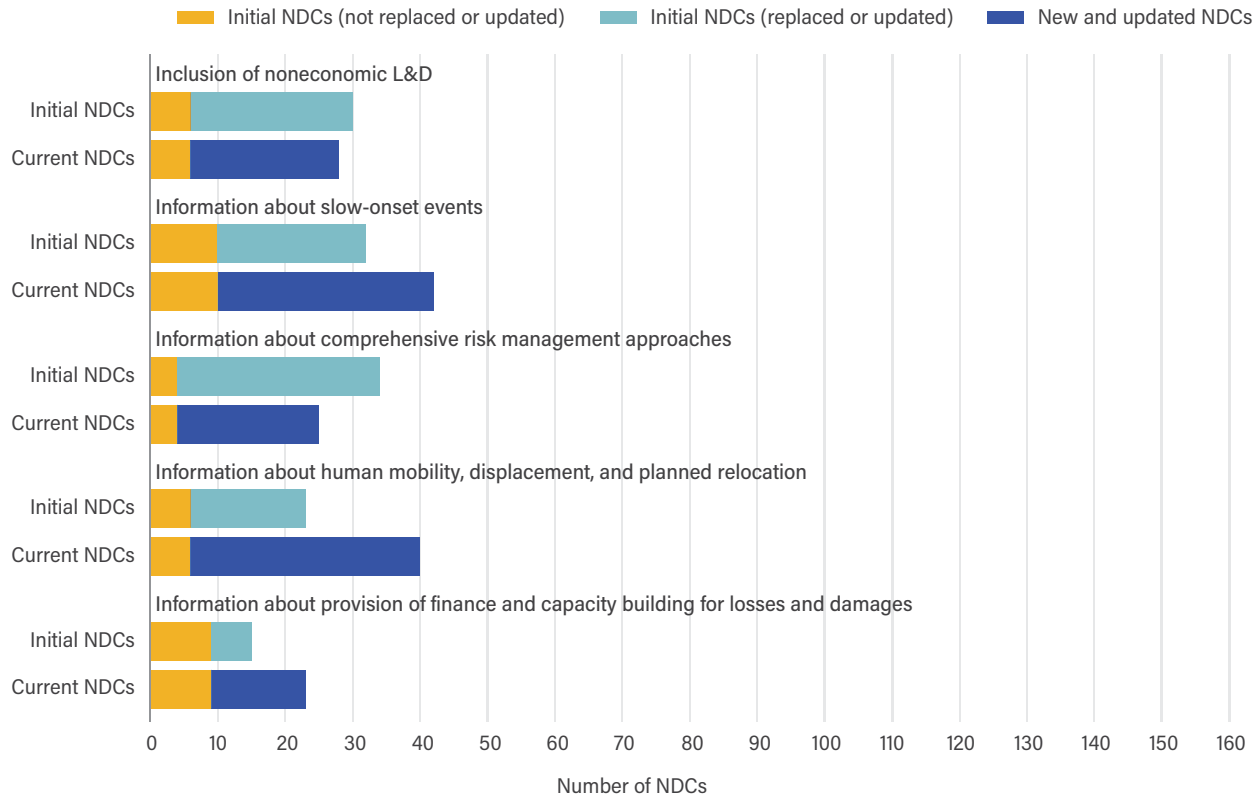
Notes: L&D = losses and damages; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

BOX 9 | Losses and Damages from Climate Change (Cont.)

Trends in economic descriptions of L&D are mixed (with increases in some dimensions of reporting and decreases in others), but the authors found more of the current NDCs including elements of averting, minimizing, and addressing L&D. Countries have increasingly described slow-onset events and human mobility (including migration, displacement, and planned relocation) in their current NDCs as well as finance and capacity building for L&D (Figure B9.2). The most common slow-onset event included is sea level rise, and the current NDCs frequently describe the migration of rural populations to urban centers in response to climatic pressures. The only L&D topic discussed less often in updated NDCs is comprehensive risk management, and this change may be a matter of terminology; countries may include elements of comprehensive risk management without explicitly mentioning the term, making it difficult to reliably identify. SIDS disproportionately include these elements of L&D as well in their current NDCs, with greater increases across all indicators than other countries.

FIGURE B9.2 | References to Different L&D Topics in the NDCs



Notes: L&D = losses and damages; NDC = nationally determined contribution.

Source: Authors' analysis based on WRI (2022).

Note: This report distinguishes between capitalized Loss and Damage to refer to political debates under the United Nations Framework Convention on Climate Change and to countries' climate finance requirements as stated in their NDCs and lowercased losses and damages (L&D) to refer to observed impacts and projected risks from climate change.

Source: a. Dixit et al. 2022.

CHAPTER 5

Finance

Finance underpins the mitigation and adaptation goals articulated in countries' NDCs. NDCs themselves also provide a way for countries to communicate their country-level climate finance requirements and keep them updated. This chapter explores the finance conditions required for countries to meet their targets and the degree of NDC's conditionality on external finance. In addition, it provides an understanding of the challenges, gaps, and where we stand on the finance needed to achieve NDCs.

While global climate finance increased over the last decade, reaching an average of US$632 billion per year in 2019–20, it is still falling far short of meeting global needs. Annual climate finance would need to be nearly seven times larger by 2030—$4.5–$5 trillion per year—to limit warming and adapt to climate change in line with global goals (Buchner et al. 2021). More than 90 percent of climate finance has been directed to mitigation efforts, as opposed to adaptation efforts, yet significantly more is needed to stem warming (IPCC 2022b). Global mitigation investments would need to be three to six times higher in order to limit warming to 2°C (IPCC 2022b).[22] Annual investment needs for renewable energy alone are estimated at $831 billion–$1.9 trillion by 2050, more than twice as much as was invested from 2017 to 2020 (Buchner et al. 2021). With regard to adaptation, estimated developing country annual needs range from $155–$330 billion by 2030 to $280–$500 billion by 2050 (UNEP 2021a), up from the $46 billion of adaptation finance recorded for 2019–20 (Buchner et al. 2021).

At COP26, the Glasgow Climate Pact recognized the importance of adequacy and predictability of adaptation finance and the need to increase it, considering that current funding flows from developed countries are insufficient to help developing countries meet their climate goals. Adaptation investments can carry a high rate of return, with benefit-cost ratios ranging from 2:1 to 10:1, and in some cases even higher, and failing to seize high-return climate adaptation investment opportunities would undermine trillions of dollars in potential growth and prosperity (Bapna et al 2019).

COP decisions provide no mandate or guidance on climate finance requirements, the costs of countries' mitigation or adaptation actions, or other financial details that should be reported in the context of NDCs. Nevertheless, many NDCs do include such information, discussing finance in varying levels of detail. No developed countries have included climate finance requirements in their NDCs, so the analysis that follows is based exclusively on the NDCs of developing countries.

This analysis examines the range of details that countries provide relating to costs, investments, and finance support or needs associated with implementing their NDCs. We refer to these collectively as their *climate finance requirements*. They include requirements

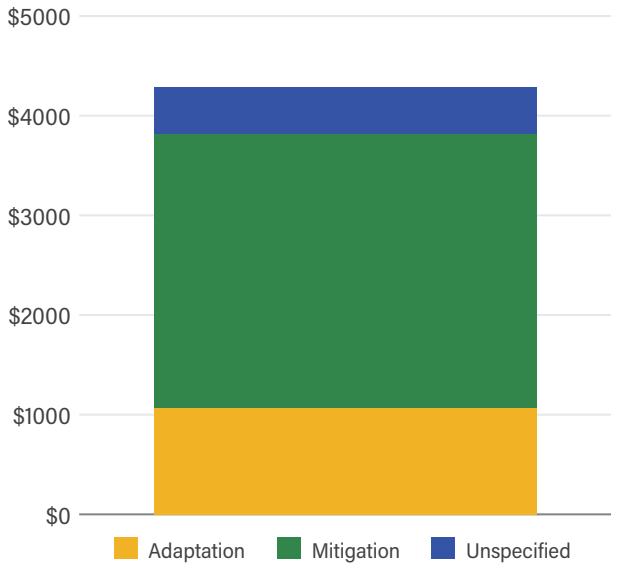
- pertaining to mitigation, to adaptation, and that are not specified as pertaining to either or both, which is classified as *unspecified*;
- pertaining to the conditional and unconditional elements of NDCs, and those that are not specified as pertaining to either;
- that countries plan to meet domestically and internationally, and those that are not specified as domestic or international; and
- that countries plan to meet via public and private finance, and those that are not specified as public or private.

OVERALL FINANCE REQUIREMENTS REPORTED IN NDCS

Eighty-nine of the current NDCs report climate finance requirements in some fashion. Seventy report mitigation requirements, 62 report adaptation requirements, and 14 report finance requirements but do not specify the share of those requirements pertaining to mitigation or adaptation. These reported finance requirements total $4,282 billion, including $2,740 billion for mitigation, $1,067 billion for adaptation, and $475 billion unspecified (Figure 33).

Although total stated climate finance requirements decreased from the initial to the current NDCs (Figure 34), this is caused by two outliers. One country (South Africa) reported a smaller mitigation finance requirement (though a larger adaptation requirement), and another country (China) did not report finance requirements in its updated NDC, as it had done in its initial NDC. Absent these two outliers, stated climate finance requirements increased by a net $1,518 billion from the initial to the current NDCs.

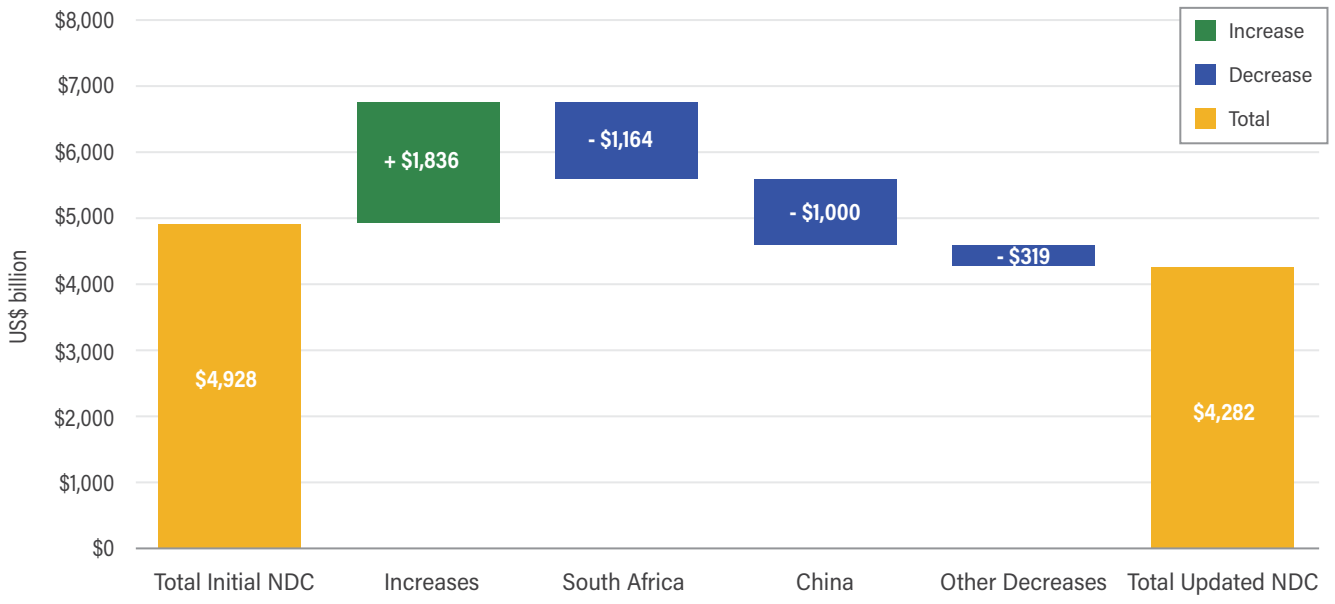
FIGURE 33 | Climate Finance Requirements in Current NDCs



Note: NDC = nationally determined contribution.

Source: Authors' analysis based on UNFCCC (n.d.). Includes NDCs submitted through September 2022.

FIGURE 34 | Change in Stated Total Climate Finance Requirements from the Initial to Current NDCs



Notes: NDC = nationally determined contribution. Decrease means that a country decreased the reported finance requirements in its current NDC relative to its initial NDC or did not report finance requirements in its current NDC but had done so in its initial NDC. This figure excludes South Africa and China's financial requirements. Includes NDCs submitted through September 2022

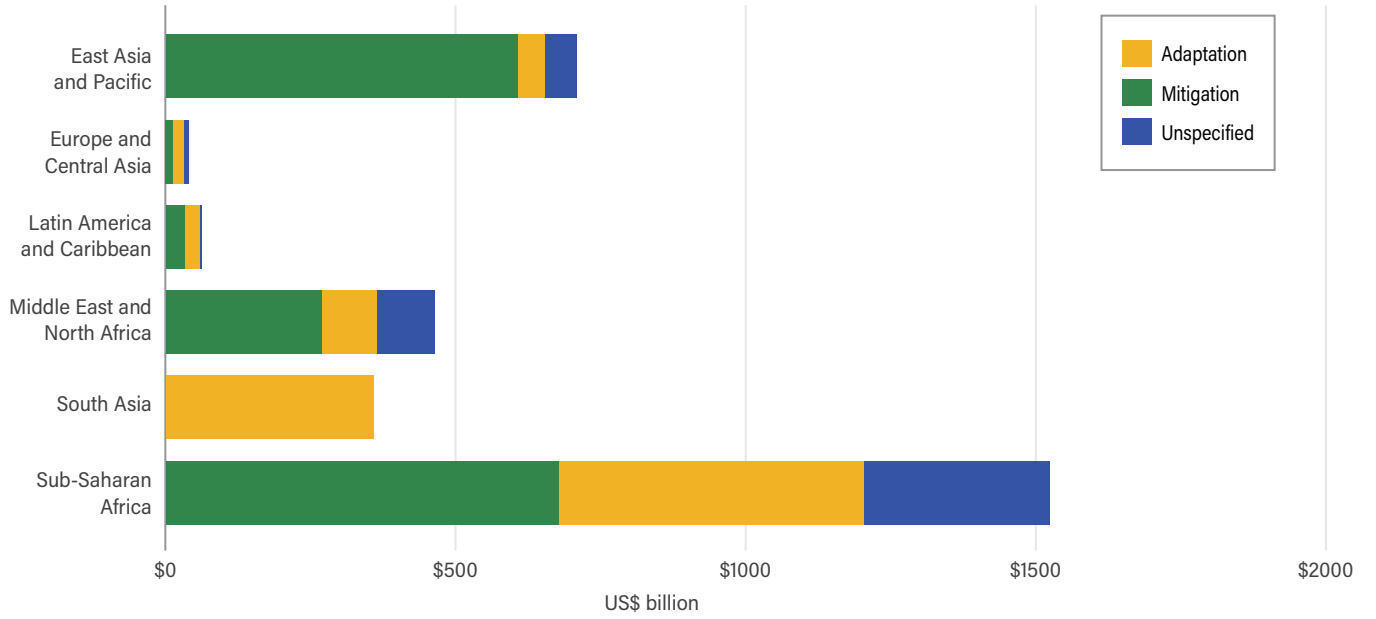
Source: Authors' analysis based on UNFCCC (n.d.)..

Within the total finance requirements, the highest estimate among regional groups comes from Sub-Saharan Africa with an estimate of $1,509 billion, followed by South Asia and East Asia with total finance requirements of $1,503 billion and $707 billion, respectively (Figure 35).

Relatively few NDCs differentiate finance requirements between the unconditional and conditional elements of their NDCs. Thirty-nine current NDCs report unconditional finance requirements (up from 25 initial NDCs), and 51 current NDCs report conditional finance requirements (up from 39 initial NDCs). Of the 62 that communicated adaptation requirements, 82 percent (51 countries) reported conditional elements, and 63 percent (39 countries) reported requirements associated with unconditional elements. Of the 70 that communicated mitigation requirements, only 46 percent (32 countries) reported the requirements of the unconditional elements of their NDCs, and 57 percent (40 countries) reported the amount needed for the conditional elements of their NDCs.

Among countries specifying finance requirements in both initial and new or updated NDCs, countries have increasingly disaggregated their stated costs into mitigation and adaptation. In their first round of NDCs, 12 out of 67 countries had costs that did not specify between mitigation and adaptation; in their updated and second NDCs, only 14 out of 78 had unspecified requirements. This disaggregation is helpful for understanding the focus of country requirements. For example, Cambodia's first NDC stated that the NDC would cost $1.27 billion, but in its updated submission, the total increased and was disaggregated into adaptation and mitigation figures. Cambodia now reports $2.19 billion in adaptation costs, of which $0.50 billion is for conditional adaptation measures and $1.71 billion is for unconditional adaptation measures that will be covered by domestic finance. In addition, it reports $2.21 billion in mitigation finance requirements, of which $2 billion will be funded through domestic efforts and $0.21 billion through international support. Another country that has disaggregated its stated costs is Kenya. In its first NDC, Kenya estimated the total finance requirements at $40 billion. In its updated NDC, Kenya raised that estimate and identified specific costs for adaptation and mitigation. The estimate for adaptation is $43.92 billion and for mitigation, $17.73 billion.

FIGURE 35 | Climate Finance Requirements Reported in Current NDCs by Region



Note: NDC = nationally determined contribution. Includes NDCs submitted through September 2022.

Source: Authors' analysis based on UNFCCC (n.d.).

MITIGATION FINANCE REQUIREMENTS REPORTED IN NDCS

Together, mitigation finance requirements for the 70 current NDCs that include them add up to $2,740 billion. Finance requirements associated with conditional mitigation measures were estimated at $1,105 billion, and the finance requirements associated with unconditional mitigation measures were estimated at $493 billion. The remaining $1,142 billion in reported mitigation requirements were not specified as pertaining to either conditional or unconditional NDC elements.

Among countries specifying mitigation requirements in both initial and new or updated NDCs, the aggregate figure actually fell by 7 percent, mainly because one country (South Africa) decreased the reported mitigation finance requirements by approximately $1,300 billion. On the contrary, excluding this country reveals that stated mitigation finance requirements for the remaining countries have jumped by $1,120 billion, an increase of 72 percent. Two factors explain this increase. First, 18 more countries reported mitigation finance requirements for the first time in their new and updated NDCs. Second, 24 out of 43 countries that had already reported mitigation finance requirements raised these higher in their new or updated NDCs. For example, Mauritania significantly increased its mitigation finance requirements by 2030, from $8.20 billion to $34.26 billion. Other countries have almost doubled their finance requirements: Ethiopia's mitigation finance requirements climbed from $150 billion to $276 billion by 2030. For some countries, such as Bangladesh, mitigation finance requirements shot up sixfold. Bangladesh's estimate increased from $27 billion to $176 billion.

ADAPTATION FINANCE REQUIREMENTS REPORTED IN NDCS

For the 62 current NDCs that include adaptation finance requirements, total adaptation requirements are estimated at $1,067 billion. Finance requirements associated with conditional adaptation measures are estimated at $236 billion, and requirements associated with unconditional adaptation measures are estimated at $36 billion. The remaining $795 billion in adaptation finance requirements are not specified as either conditional or unconditional.

The adaptation finance requirements reported by countries in both initial and new and updated NDCs increased by $327 billion compared to the initial NDCs, an increase of 59 percent. As for adaptation, two factors explain this increase. First, 22 more countries submitted their adaptation finance requirements in the current NDCs than in the initial NDCs. Second, out of a total of 33 countries reporting adaptation finance requirements in both their initial and new or updated NDCs, 21 have increased their totals. For example, Uganda's stated adaptation finance requirements by 2030 went from $2.40 billion in its first NDC to $17.70 billion in its updated submission, a more than seven-fold increase. Pakistan is another country that significantly increased its adaptation finance requirements. Its initial NDC adaptation finance requirements were estimated at $14 billion, which jumped to $140 billion in its updated NDC.

COSTS OF CAPACITY BUILDING AND TECHNOLOGY TRANSFER

In some cases, countries have conditioned the adaptation and mitigation elements of their NDCs not only with regard to climate but also to capacity building and technology transfer. These other means of implementation can also be costed, and some countries have included such costs in their NDCs. Tunisia estimated the costs of capacity building at $0.7 billion, in addition to adaptation and mitigation finance requirements estimated at $2.85 and $14.40, respectively (UNFCCC n.d.) Finally, Madagascar has included $1.75 billion in capacity building and $5.62 billion in technology

development, transfer, and research as a part of its NDC, including technical assistance for climate modeling to support adaptation project development.

SUMMARY AND IMPLICATIONS

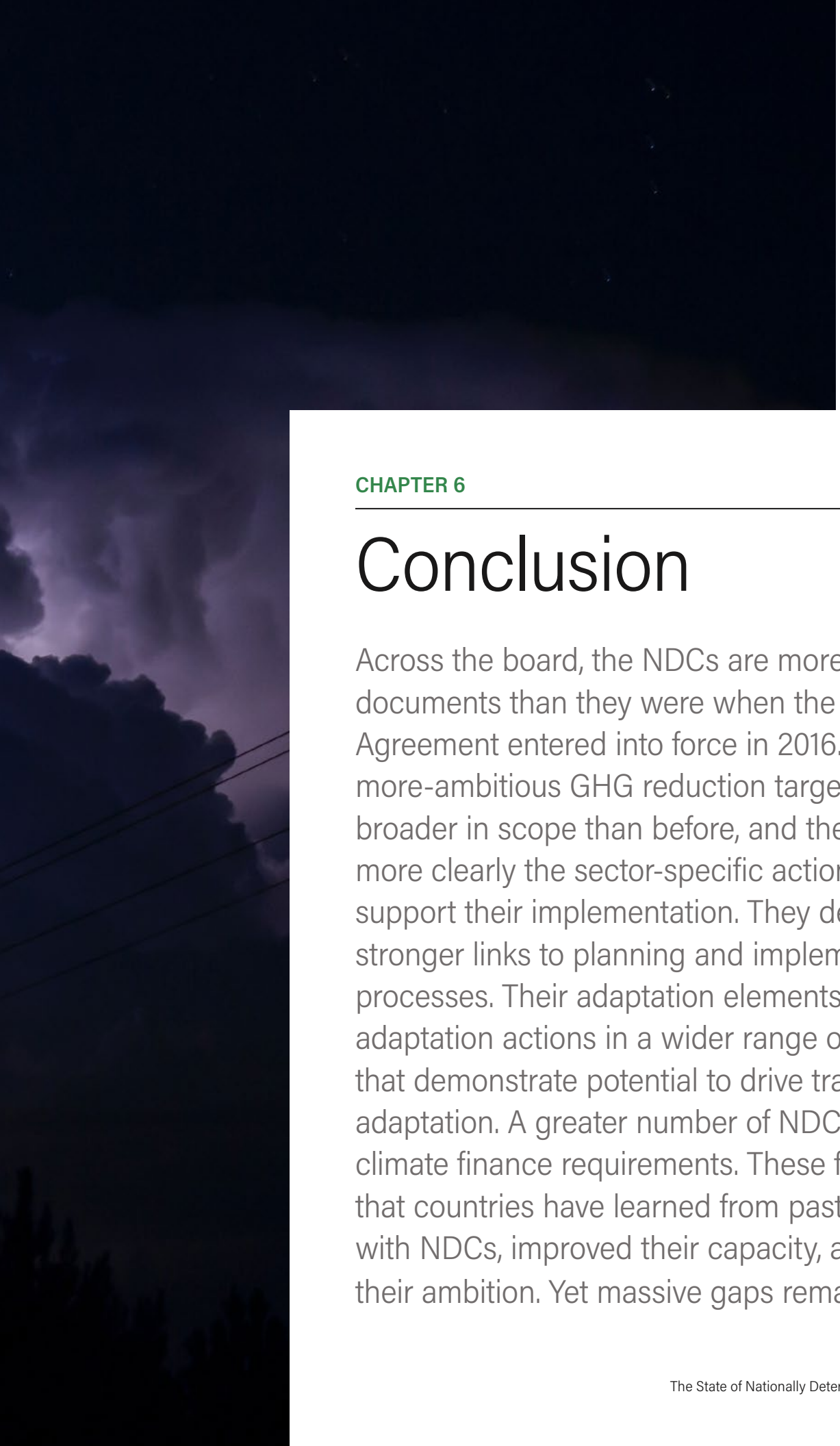
More countries now report climate finance in their NDCs. The number of NDCs that report climate finance requirements increased from 78 initial NDCs to 89 current NDCs. The number of NDCs reporting finance requirements specific to adaptation and mitigation increased from 51 initial NDCs to 62 current NDCs and from 62 initial NDCs to 70 current NDCs, respectively.

The current NDCs report a total of $4,282 billion in climate finance requirements. Adaptation and mitigation finance requirements are estimated at $1,067 billion and $2,740 billion, respectively. Climate finance requirements that are not differentiated between adaptation and mitiga-

tion are classified as unspecified and add up to $475 billion. These climate finance figures do not consider costs that some countries have stated as finance needs, such as capacity building, technology transfer, and, in some cases, L&D.

These findings are constrained by the lack of standardized definitions and methodologies for reporting climate finance requirements through NDCs or other official channels. Countries apply different time frames, levels of approaches, and disaggregation (e.g., project, activity, action, sectoral level) when estimating finance requirements. For instance, some countries identify needs, investments, or costs without explaining the scope of actions planned. Indeed, the fact that including finance in an NDC is voluntary means that many countries do not include it, but this cannot be interpreted as an indication that they have no climate finance requirements. Finance requirement figures in NDCs should therefore be interpreted cautiously. Finance requirements presented in this report do not intend to fully reflect the finance requirements of all countries since several have stated in their NDCs that they are still working on identifying and refining total climate finance estimates. Further research could support the development of a standard methodology to report climate finance requirements that can contribute to having comparable estimates and condense data that could be reported through NDC communications.

In some cases, countries have conditioned the adaptation and mitigation elements of their NDCs not only with regard to finance but also to capacity building and technology transfer



CHAPTER 6

Conclusion

Across the board, the NDCs are more robust documents than they were when the Paris Agreement entered into force in 2016. They contain more-ambitious GHG reduction targets, which are broader in scope than before, and they outline more clearly the sector-specific action that will support their implementation. They demonstrate stronger links to planning and implementation processes. Their adaptation elements include more adaptation actions in a wider range of sectors that demonstrate potential to drive transformative adaptation. A greater number of NDCs report on climate finance requirements. These factors suggest that countries have learned from past experience with NDCs, improved their capacity, and increased their ambition. Yet massive gaps remain.

INCREMENTAL IMPROVEMENT, BUT TRANSFORMATIONAL CHANGE IS NEEDED

The new and updated NDCs begin to reveal both the potential of the Paris "ratchet mechanism" and its limitations. Today's NDCs are both significantly more ambitious than their predecessors and woefully inadequate to avert the climate crisis. If the pace of improvement from 2016 to today continues, the world will not only miss the Paris Agreement goals, but it will miss them by a long shot. For the most part, the new and updated NDCs represent incremental improvement, when what is needed is transformational change.

The NDCs must also be implemented, and the relationship between NDCs and implementation is not yet well understood. Relative to the initial NDCs, the current NDCs are more connected to implementation documents, such as NAPs, and identify many more sectoral measures to support implementation. Yet major gaps in implementation-related elements persist. A majority of sectoral measures identified are vague, lacking concrete, time-bound targets. Information on MEL, which could support improved implementation over time, is scarce. Although NDC transparency has improved, some NDCs still lack information against which progress on implementing emissions targets can be quantified and tracked.

QUESTIONS FOR FURTHER INVESTIGATION

Our analysis brings forward a suite of insights pertaining to the mitigation, adaptation, and finance contents of NDCs. Yet the findings, in some ways, raise as many questions as they answer. The following questions, stemming from our findings, merit further consideration by researchers, funders, policymakers, and others.

What role do NDCs play—and *should* they play—in a country's climate policy landscape? Dixit et al. (2022) argue that "instead of viewing the . . . NDC as a stand-alone or parallel planning document, countries should strengthen its links with other plans and processes." They note that stronger links to more comprehensive planning instruments (for example, NAPs) could help advance implementation, and the NDCs could provide more international visibility (and potentially resources) for climate action. Although there is nothing analogous to NAPs to help design and implement mitigation strategies, and the level of implementation detail that countries provide on the mitigation components of their NDCs varies widely, NDCs often contain references to separate implementation plans that address mitigation. Likewise, the sectoral commitments made at COP26 in Glasgow raise the question of how action to implement these commitments should be reflected in NDCs. Intuitively, integrating NDC development with implementation planning should improve implementation outcomes, yet implementation is constrained by many factors. These include institutional capacity, access to finance, and domestic political economy. Further investigation into the boundaries of an NDC's influence on these factors is merited. Likewise, it will be important to understand the relationship between reporting on progress towards NDCs and advancing their implementation.

How can NDCs help drive transformative action on adaptation and mitigation? Nearly 60 NDCs include priority adaptation actions with transformative elements. Although a similar analysis is not available for mitigation, the relatively modest emissions reductions achieved by the new and updated NDCs, relative to the emissions gap, suggest that they are not yet playing a transformative role for mitigation. Adaptation components require further elaboration in this area as well. Many updated NDCs include adaptation actions with transformative potential, but countries rarely engage with transformation or long-term adaptation pathways directly, suggesting transformative action is not yet mainstreamed in NDC development. How might NDCs advance transformative climate action and how might governments and funders leverage their investments in the NDCs to advance such a vision?

What causes countries to enhance their ambition, and under what circumstances does this result in enhanced implementation? For example, consulting a wider range of stakeholders in NDC development has the potential to

enhance ambition by enabling the identification of a wider range of actions in a wider range of sectors. This same engagement may also improve the likelihood of successful implementation (NDC Partnership 2022). Yet although many countries engaged in such a process, others did not, and the overall emissions impact of expanding sectoral coverage was modest. The question of why some countries choose to undertake such a process or enhance their ambition in other ways but others do not remains open. Also unclear is the extent to which NDC ambition drives implementation and/or implementation drives ambition, and the extent to which both outcomes stem from the same set of underlying factors.

What causes countries to backtrack in the content and form of their NDC commitments? Most countries are strengthening both the form and content of NDC commitments (increasing their scope to cover new sectors and gases, improving the level of sector-specific detail, and adopting more ambitious targets), but some are doing the opposite. They have weakened their GHG mitigation targets, reduced the number of sectors and gases covered by their targets, or eliminated references to sector-specific commitments. This dynamic can be seen in the adaptation components as well, with numerous countries reducing or removing priority adaptation actions from their latest NDC submissions. Why do they do this? Does this necessarily reflect reduced ambition? If so, what causes this? Possibilities include implementation challenges, difficulties accessing finance, or changes to domestic political economy. Could it instead stem from improved data or analysis (for example, baseline projections) or the recognition that the data or analysis necessary to support the original commitment do not exist? Is it linked to the actual or expected availability of international support? These questions are beyond the scope of this report but merit investigation.

What are the methodologies used by countries to estimate climate finance requirements? The number of NDCs reporting climate finance requirements has increased in the latest round of NDCs. Further, more NDCs are disaggregating finance requirements between adaptation and mitigation, conditional and unconditional, rather than providing only aggregate totals or identifying only international finance required. However, NDC communications do not include a reference to the type of methodology applied to estimate

finance requirements, and this prevents a granular analysis on how countries arrived at these estimates and how to compare data generated at different times and in different countries.

NDC AMBITION AND IMPLEMENTATION MUST ACCELERATE

Both NDC ambition and implementation will need to accelerate dramatically over the remainder of this decade—and beyond—to keep the goals of the Paris Agreement within reach. Ideally, the 2023 global stocktake and the GGA will serve as an opportunity to reflect on the findings and questions highlighted by this report, with a view towards extracting actionable lessons from the first round of NDC updates. The next round of NDCs will come due nine months in advance of COP30—that is, in early 2025, if all goes to plan. Countries will therefore shortly need to turn their attention to strengthening their next round of commitments even as they implement the commitments they have already made. Addressing these questions as a community will help ensure that their efforts are well targeted.

Appendix

APPENDIX A: ADDITIONAL DETAILS ON DATA AND METHODS

NDC Submissions Considered

Table A1 provides further detail on the categorization of initial, new and updated, and current NDCs in this report.

TABLE A1 | Submissions Considered in the Initial, New and Updated, and Current NDCs

COUNTRY SUBMISSION STATUS	DOCUMENT CATEGORIZED AS INITIAL NDC	DOCUMENT CATEGORIZED AS NEW AND UPDATED NDC	DOCUMENT CATEGORIZED AS CURRENT NDC
Countries submitting an updated first NDC or second NDC by the cut-off date	First NDC	Updated first NDC or second NDC	Updated first NDC or second NDC
Countries submitting a first NDC and not submitting an updated first NDC or second NDC between December 31, 2019, and the cut-off date	INDC (first NDC for adaptation analysis)	First NDC	First NDC
Countries not submitting any NDC between December 31, 2019, and the cut-off date	First NDC	N/A	First NDC
***n* documents as of the cut-off date**	**167**	**139 (Emissions Impacts and Finance) ; 128 (Key Characteristics of Mitigation Measures and Sector-Specific Mitigation Measures); 123 (Adaptation)**	**167**

Notes: INDC = intended nationally determined contribution; NDC = nationally determined contribution.

Source: Authors based on Climate Watch (2022).

Emissions Targets

Emissions impact

The aggregate impact of the new and updated NDCs on global GHG emissions in 2030 is derived from data collected under the Climate Watch NDC Enhancement Tracker (WRI 2022) based on the methodology outlined in Fransen et al. (2021a). This data set contains each country's 2030 emissions under its previous NDC and, where applicable, under its new or updated NDC. We use these figures to calculate the difference between each country's economy-wide emissions under its initial NDC and under its current NDC.

For most NDCs, this approach generates values comparable to other related analyses, including CAT (2021) and UNEP (2021b). A notable exception is China. There, the Climate Watch data set drew on Yang et al. (2020), which generated a larger difference between China's initial and updated NDC than other international sources, and aligned more closely with He (2020).

We aggregate the 2030 emissions difference for each country into a global emissions difference figure. Aggregate figures exclude "hot air" following the approach outlined in Meinshausen et al. (2022). In this context, "hot air" refers to pledged 2030 emissions that exceed a country's business-as-usual trajectory (defined as the mean SSP5 baseline scenarios in the downscaled dataset provided by Gütschow et al. 2021, adjusted for LULUCF). In other words, these pledges will not, in practice, reduce emissions, even if they are nominally more ambitious than previous pledges. We also use SSP5 baseline figures as a proxy for 2030 emissions for countries whose NDCs do not contain targets or emissions figures.

Other mitigation contribution analysis

Analysis of countries' mitigation contribution type, scope and coverage, conditionality, and stated intent to use international market mechanisms is based on data collected under the Climate Watch NDC Explorer, as follows. The process for translating the raw data collected by Climate Watch to the categories quantified in the report is further detailed in Table A2.

Mitigation contribution type: Each NDC is categorized as being based on a GHG target, a non-GHG target, or actions only.

GHG target type: Each NDC is categorized as containing a base-year target, a baseline scenario target, another type of GHG target (including fixed-level targets, intensity targets, and trajectory targets), or no GHG target.

Sectoral coverage: Each NDC containing a GHG target is categorized as covering all IPCC sectors including LULUCF, all IPCC sectors excluding LULUCF, a subset of IPCC sectors, or as not specifying sectoral coverage. The IPCC sectors are energy, industrial processes and product use (IPPU), waste, agriculture, and LULUCF. Targets covering AFOLU are considered to cover both agriculture and LULUCF.

GHG coverage: Each NDC containing a GHG target is categorized as covering all Kyoto gases (including NF_3), all Kyoto gases (excluding NF_3), a subset of Kyoto gases, or not specifying gas coverage.

Emissions coverage of GHG targets: Emissions coverage is based on 2018 figures from the Climate Watch Historical GHG Emissions module. Emissions from agriculture, energy, IPPU, LULUCF, and waste are considered, as are emissions of CO_2, CH_4, N_2O, and fluorinated (F) gases. (Climate Watch does not

distinguish among F-gases; NDCs covering any F-gas are assigned the corresponding country's full F-gas value. F-gases constitute a small fraction of each country's emissions.) NDCs whose sector coverage is not specified are assumed to cover all sectors; this approach was corroborated by a review of the relevant NDCs. NDCs with no GHG target are assigned an emissions coverage of zero.

Emissions coverage for NDCs with a GHG target are assigned as follows:

- NDCs that cover all gases and all sectors including or excluding LULUCF are assigned the corresponding country's total GHG emissions (including or excluding LULUCF, respectively)
- NDCs that cover all gases and partial sectors are assigned the sum of the corresponding country's total emissions from each covered sector
- NDCs that cover partial gases and all sectors including or excluding LULUCF are assigned the sum of the corresponding country's total emissions from each covered gas (including or excluding LULUCF, respectively)
- NDCs that cover partial gases and partial sectors are assigned the sum of the corresponding country's emissions of each covered gas from each covered sector

Conditionality: Each NDC is categorized as being fully unconditional, fully conditional, partially conditional, or not specified.

Intended use of international market mechanisms: Each NDC is categorized as stating it will or may use international market mechanisms, will not use international market mechanisms, or not specifying an intent to use international market mechanisms.

TABLE A2 | Climate Watch Indicators Used to Analyze Each NDC's Mitigation Contribution, Conditionality, and Market Mechanisms

INDICATOR	DEFINITION	CATEGORICAL VALUES	NOTES
document	Type of document	INDC, first NDC, updated first NDC, second NDC (archived), second NDC, revised first NDC (archived), revised first NDC (interim)	Used to identify which document represents each country's new or updated NDC, its previous NDC, and its current NDC (regardless of whether it has submitted a new or updated NDC)
mitigation_ contribution_ type_label	Label for mitigation contribution type; only applicable to top-line targets	GHG target, GHG target and non-GHG target, non-GHG target only, non-GHG target and actions, actions only	Used as the default value for mitigation contribution type but simplified into three categories: ▪ GHG target: Any NDC with a GHG target is counted under this category, regardless of whether it also includes non-GHG target(s) and/or actions ▪ Non-GHG target: Any NDC that does not have a GHG target but has a non-GHG target is counted under this category, regardless of whether it also includes actions ▪ Actions only: NDCs not counted in either of the other two categories are counted in this category
mitigation_ contribution_ type	Mitigation contribution type; only applicable to top-line targets	N/A	Used to populate mitigation_contribution_type_label where the latter is not provided by Climate Watch
ghg_target_ type_label	Label for type of GHG target	Baseline scenario target, base-year target, fixed-level target, intensity target, trajectory target, multiple target types, no GHG target	This indicator was simplified into four categories: ▪ Base-year target ▪ Baseline scenario target ▪ Other GHG target type (includes fixed-level targets, intensity targets, and trajectory targets) ▪ No GHG target
ghg_target_ type	Type of GHG target	N/A	Used to populate ghg_target_type_label where the latter is not provided by Climate Watch

TABLE A2 | Climate Watch Indicators Used to Analyze Each NDC's Mitigation Contribution, Conditionality, and Market Mechanisms (Cont.)

INDICATOR	DEFINITION	CATEGORICAL VALUES	NOTES
coverage_ sectors_label	Label for sectors covered	All sectors including LULUCF, all sectors excluding LULUCF, partial sectors, not specified	Used as the default value for sectoral coverage
coverage_ sectors_short	Sectors covered	N/A	Used to populate coverage_sectors _label where the latter is not provided by Climate Watch
coverage_ sectors	Sectors covered	N/A	Used to populate coverage_sectors _label where the latter is not provided by Climate Watch
coverage_gas_ label	Label for GHG coverage	Seven Kyoto gases, six Kyoto gases, Kyoto gases and black carbon, partial gases, not specified	Used as the default value for gas coverage
coverage_gas	GHG coverage (chemical notations)	N/A	Used to populate coverage_gas _label where the latter is not provided by Climate Watch
coverage_ghg	GHGs covered (text or quotes from document)	N/A	Used to populate coverage_gas _label where the latter is not provided by Climate Watch
conditionality_ label	Label for conditionality	Unconditional NDC only, conditional NDC and unconditional NDC, conditional NDC only, partially conditional NDC (unspecified mix of domestic/international resources), not specified	Used as the default value for conditionality; simplified into the following categories: ▪ Unconditional NDC only ▪ Conditional NDC only ▪ Conditional NDC and unconditional NDC ▪ Not specified
method_imm_ label	Label for planned use of international market mechanisms	Yes/possible, no, not specified	Used as the default value for intended use of international market mechanisms

Notes: GHG = greenhouse gas; INDC = intended nationally determined contribution; LULUCF = land use, land-use change, and forestry; NDC = intended nationally determined contribution.

Source: Authors based on Climate Watch (2022).

Sector-Specific Mitigation Measures

Overview of sector-specific mitigation measures

For the number of NDCs with measures in each sector in the overview, any NDC with either a sectoral plan, target, policy, or action in Climate Watch's sectoral data was included. See Table A4 for definitions of the different categories of measures. For the number of NDCs with targets in each sector, any NDC with a measure that was classified as a target for that sector was included. For the number of NDCs with measures and targets in the buildings and industry sectors, countries with measures or targets in the energy subsectors "demand-side efficiency: buildings" and "demand-side efficiency: industry" were included (see Table A3 for a list of subsectors).

Forests

Using Climate Watch data, countries were classified as having an LULUCF measure within their NDC if they included either a target, action, policy, or plan related to LULUCF. These measures include subcategories of afforestation, conservation, REDD+, reforestation, sustainable forest management, and sustainable land management. Climate Watch data were also used for classifying the number of NDCs with GHG and non-GHG targets.

To distinguish all targets from GHG targets, the data was filtered using the tags *M_SecTar1* ("Sectoral Targets"), *M_SecTar4* ("Emissions Reduction Potential"), *M_SecTar8* ("Unconditional Target"), and *M_SecTar10* ("Conditional Target"). Once filtered, the response text for each entry was reviewed to determine whether or not the target should be categorized as a GHG target. In instances where countries included a non-GHG target (i.e., 10,000 hectares of restoration) as well as an associated emissions reduction potential but did not specifically include a GHG target they aim to achieve, countries were not classified as having a GHG target. Employing this assumption in the report makes the number of NDCs with GHG targets a conservative estimate. This method was used for both the first NDC submission as well as the new and updated NDCs to compare the number of GHG targets between the two periods.

To categorize measures between protection, management, and restoration, key terms were used to capture the relevant measures. For conservation, the terms *conserve, protect*, and *deforest* were used. For restoration, the terms *plantation, reforest, afforest*, and *rehabilit* were used. And for management, the term *manag* was used. For each of the categories, the terms were cross-referenced with the subsector listed above to ensure appropriate coverage for each category. The subsectors of grasslands, wetlands, and peatlands were used in each instance to include complete coverage of sector measures. After the NDCs were categorized, the response text was reviewed for the countries that were not included in each category to ensure relevant measures were not omitted.

Power

Power sector measures include the subset of energy subsectors pertaining to electricity generation, transmission and distribution, and other power sector measures as noted in Table A3. Energy end-use interventions (i.e., those categorized under the buildings, transport, and industry sectors) are not included.

Targets and measures for the power sector are identified as follows. Targets for the power sector are identified based on the tags *M_SecTar1* ("Sectoral Targets"), *M_SecTar4* ("Emissions Reduction Potential"), *M_SecTar8* ("Unconditional Target"), and *M_SecTar10* ("Conditional Target"). GHG and non-GHG targets are distinguished based on keywords (*CO_2*, *emission*) and manual review. Nontarget measures are identified based on the tags *M_SecAct1, M_SecAct2, M_SecAct9, M_SecAct11, M_SecPol2, M_SecPol3, M_SecPo10, M_SecPol12, M_SecGen3, M_SecGen8,* and *M_SecGen10*.

Measures pertaining to fossil-based power generation are identified based on a combination of keywords (*thermal*, *coal*, *oil*, *natural gas*, or including *gas* while excluding *greenhouse* and *biogas*) and manual review. Fossil-based measures were further categorized based on ResponseText contents into the following categories: fuel switch: fossil to fossil, fuel switch: fossil to clean, improve fossil efficiency, new fossil infrastructure, phase out/down, reduce methane, mixed effects (contains multiple of the aforementioned categories), and unclear. To determine the countries with measures related to phase out/down, keywords such as *phase out, phasing out, eliminate, coal,* and *fossil fuel* were also used in the web version of Climate Watch along with the UNFCCC NDC Registry.

Measures pertaining to renewable power generation are identified by selecting all subsectors related to renewable energy.

Measures pertaining to power generation efficiency are identified by selecting the following subsectors: supply-side efficiency; supply-side efficiency: grid/energy loss reduction; supply-side efficiency: power generation efficiency improvements; supply-side efficiency: cogeneration; and supply-side efficiency: gas-powered combined cycle.

Transport

The transport sector assesses NDC measures related to reducing emissions from personal vehicles, electrification, transport-related infrastructure development, and shifting transport demand to public modes and active mobility (walking, cycling). Data for this section were collected from GIZ and SLOCAT's Tracker of Climate Strategies for Transport and were cross-checked with Climate Watch's NDC Enhancement Tracker to ensure consistency throughout the report. Mitigation areas of action were filtered to relevant documents—"1st NDC," 2nd NDC," "Updated NDC"—to determine which countries have relevant transport measures in their documents.

All categorization for the transport sector, such as NDC measures considered under "electrification," are derived from the categorization of parameters within the data set. The data set uses direct quotes from NDCs to track mitigation measures across avoid-shift-improve actions; therefore, it may be assumed that any missing data indicate that certain countries do not mention transport or transportation within their national documents.

The total number of countries including transport mitigation was determined by counting all countries included in the data set. (The data set excludes countries whose NDCs do not con-

tain transport mitigation measures.) For further classification, countries were counted for each parameter, distinguishing whether they included a measurable, quantitative target or not. Parameters included under electrification include I_Emobility, I_Emobilitycharging, and I_Emobilitypurchase. Emissions reduction measures include I_Altfuels, I_Vehicleimprove, I_Hydrogen, I_Biofuel, I_Efficiencystd, I_Fuelqualimprove, I_Freighteff, I_Vehicleeff, I_Shipeff, and I_ethanol. Public transportation measures include those under S_PublicTransport and S_BRT. Active mobility measures include those categorized as S_Activemobility, S_Cycling, S_Walking, and S_Micromobility. Micromobility is included because it pertains to only Samoa's NDC calling for shared electric micromobility. Lastly, GHG emissions targets are sourced from the "Targets" sheet within the data set and filtered for transport-sector specific targets rather than economy-wide targets.

Methane

The share of Global Methane Pledge signatories and nonsignatories including CH_4 within the scope of an economy-wide GHG reduction target is based on the gas coverage indicators from Climate Watch's NDC Explorer, as detailed in Table A2.

To determine the share of signatories and nonsignatories with CH_4-relevant policies, we identified the subsectors listed in Table A3 that correspond to significant sources of CH_4 emissions. We considered an NDC to contain a CH_4-relevant policy if it contained one or more measures in the following subsectors: livestock; gas field development; gas flaring; gas pipelines; gas processing; gas-to-power; renewable energy: biofuels; renewable energy: recycling/reuse/reduce; waste-to-energy; solid waste; waste: general; and wastewater. We also considered a subset of measures in additional subsectors on the basis of keyword searches and additional assessment. From the agriculture: general subsector, we identified CH_4-relevant measures on the basis of a keyword search for *enteric fermentation, livestock, manure, rice*, and *methane*. From the energy: general subsector, we identified CH_4-relevant measures on the basis of a keyword search for *methane, coal mine,* and *coal mining*. From the gas subsector, after getting results from our keyword search—which included *CH_4, flaring, leakage, fugitive emissions,* and *conservation*—we inspected each measure to determine whether it was likely to reduce emissions from natural gas. We did not consider measures in the gas subsector geared towards increasing gas exploration and production because these would be likely to increase CH_4 emissions.

The measures collected for the subsectors identified in Table A3 were used to determine the total number of NDCs with measures for each sector.

TABLE A3 | Climate Watch Sectors and Subsectors for Mitigation Measures

	SUBSECTORS	NOTES
Agriculture	Agricultural Waste	
	Agriculture: General	Included in methane section; measures related to rice cultivation, manure management, and enteric fermentation
	Climate smart agriculture	
	Fertilizers	
	Fisheries and aquaculture	
	Livestock	Included in methane section
	Soils	
Buildings	Buildings: general	

TABLE A3 | Climate Watch Sectors and Subsectors for Mitigation Measures (Cont.)

	SUBSECTORS	NOTES
Energy	Associated gas	
	CCS	
	Clean cooking and heating	
	Clean cooking and heating: cleaner household fuels	
	Clean cooking and heating: efficient cookstoves	
	Demand-side efficiency	
	Demand-side efficiency: appliances	
	Demand-side efficiency: buildings	Included in count of measures related to buildings sector
	Demand-side efficiency: cities	
	Demand-side efficiency: industries	Included in count of measures related to industry sector
	Demand-side efficiency: tourism	
	Energy: general	Included in power section; measures related to coal mining included in methane section
	Energy efficiency	
	Gas	Included in power section; subset included in methane section, eliminating measures that would increase gas production or consumption (as these would not be expected to reduce methane emissions)
	Gas field development	Included in methane section
	Gas flaring	Included in methane section
	Gas pipelines	Included in methane section
	Gas processing	Included in methane section
	Gas-to-power	Included in power section; included in methane section
	Mini-grids	Included in power section
	Renewable energy	Included in power section
	Renewable energy: biofuels	Included in methane section
	Renewable energy: geothermal	Included in power section
	Renewable energy: hydro	Included in power section
	Renewable energy: ocean	Included in power section
	Renewable energy: off-grid	Included in power section
	Renewable energy: solar	Included in power section
	Renewable energy: solar: off-grid	Included in power section
	Renewable energy: solar: utility scale	Included in power section
	Renewable energy: waste-to-energy	Included in power section
	Renewable energy: wind	Included in power section

TABLE A3 | Climate Watch Sectors and Subsectors for Mitigation Measures (Cont.)

	SUBSECTORS	NOTES
Energy	Supply-side efficiency	Included in power section
	Supply-side efficiency: grid/energy loss reduction	Included in power section
	Supply-side efficiency: power generation efficiency improvement	Included in power section
	Supply-side efficiency: power generation efficiency improvement: cogeneration plants	Included in power section
	Supply-side efficiency: power generation efficiency improvement: fuel switching	Included in power section
	Supply-side efficiency: power generation efficiency improvement: gas-powered combined cycle	Included in power section
	Supply-side efficiency: power generation efficiency improvement: rehabilitation	Included in power section
Industry	Air conditioners and refrigerators	
	Cement	
	Chemicals	
	HFCs	
	Industries: general	
	Iron and steel	
	Paper	
	SLCPs	
LULUCF	Afforestation	
	Conservation	
	Grasslands	
	LULUCF/forestry: general	
	Peatlands	
	REDD+	
	Reforestation	
	Sustainable forest management	
	Sustainable land management	
	Wetlands	

TABLE A3 | Climate Watch Sectors and Subsectors for Mitigation Measures (Cont.)

	SUBSECTORS	NOTES
Transport[a]	Aviation	Included under aviation
	BRT	Included under public transport
	Freight regulation	
	Freight vehicles	Included under freight
	Fuels in freight transport	
	Inland waterways	
	Inter-urban transport	
	Maritime	Included under shipping
	Non-motorized transport	Included under active mobility
	Public transport	Included under public transport
	Rail	Included under public transport
	Road sector	Included under overview
	Suburban rail	
	Transit-oriented development	The creation of compact, walkable, pedestrian-oriented, mixed-use communities centered around high-quality train systems, where people are not dependent on private vehicles for transportation
	Transport: general	
	Transportation fuels	
	Transportation infrastructure	
	Transportation planning	Included under overview
	Urban transport	
	Vehicle fleet	Included under e-mobility
Waste	Recycling, reuse, reduce	Included in methane section
	Solid waste	Included in methane section
	Waste: general	Included in methane section
	Waste-to-energy	Included in methane section
	Wastewater	Included in methane section

Notes: BRT = bus rapid transit; HFC = hydrofluorocarbon; LULUCF = land use, land-use change, and forestry; REDD+ = reducing emissions from deforestation and forest degradation, plus the sustainable management of forest and the conservation and enhancement of forest carbon stocks; SLCP = short-lived climate pollutant.

Climate Watch data were used to determine the number of NDCs with measures in the transport sector for the "Overview of Sector-Specific Measures" section. The Tracker of Climate Strategies for Transport (GIZ and SLOCAT 2022) was used as the primary data set for the transport deep dive. The notes related to the transport subsectors listed above refer to how we compared the two data sets.

Source: Authors based on Climate Watch (2022) and GIZ and SLOCAT (2022).

TABLE A4 | Climate Watch Indicators for Sectoral Mitigation Measures

INDICATOR	INDICATOR NAME	DEFINITION	NOTES
M_SecGen3	Sectoral Plans	Plans are broader than specific policies or projects, such as a general intention to "improve efficiency," "develop renewable energy," etc.	Included under "other measures"
M_SecGen8	Unconditional Part	Unconditional part of sectoral plan	Included under "other measures"
M_SecGen10	Conditional Part	Conditional part of sectoral plan	Included under "other measures"
M_SecTar1	Sectoral Targets	Targets are an intention to achieve a specific result; for example, to reduce greenhouse gas (GHG) emissions to a specific level (a GHG target) or increase energy efficiency or renewable energy to a specific level (a non-GHG target), typically by a certain date	Included under "targets"
M_SecTar8	Unconditional Part	Unconditional part of sectoral target	Included under "targets"
M_SecTar10	Conditional Part	Conditional part of sectoral target	Included under "targets"
M_SecPol2	Existing Sectoral Policies	A policy that is already in effect; policies are larger in scale than projects, typically national legislation or high-level strategy documents	Included under "other measures"
M_SecPol3	Upstream Policies	Policies are larger in scale than projects, typically national legislation or high-level strategy documents	Included under "other measures"
M_SecPol10	Unconditional Part	Unconditional part of sectoral policy	Included under "other measures"
M_SecPol12	Conditional Part	Conditional part of sectoral policy	Included under "other measures"
M_SecAct1	Building on Existing Downstream Actions	A measure to continue or expand a previous action; actions are an intention to implement specific means of achieving GHG reductions, such as specific projects or narrowly defined measures	Included under "other measures"
M_SecAct2	Downstream Actions	Actions are an intention to implement specific means of achieving GHG reductions, such as specific projects or narrowly defined measures	Included under "other measures"
M_SecAct9	Unconditional Part	Unconditional part of sectoral action	Included under "other measures"
M_SecAct11	Conditional Part	Conditional part of sectoral action	Included under "other measures"

Source: Authors based on Climate Watch (2022).

Just Transition

The authors chose to search for explicit use of *"just transition"* within NDCs, as searching for *just transition* sans quotes results in a list of 88 of 197 parties and therefore captured parties that were using *just* and *transition* separately instead of together as a concept. Thus, the use of similar terms or policies that would be consistent with a just transition but are not labeled as such are not included in this analysis.

For NDCs that were not in English, Google Translate was used to translate search results. For NDCs in Spanish, *"transición justa"* was searched for, and for NDCs in French, *"transition juste"* was searched for within the NDCs.

As mentioned in Chapter 2, 3 of the 19 parties whose most recent NDCs were not on Climate Watch had included *just transition* within their NDCs. These were Mauritania, Nigeria, and Pakistan. It is also important to note that although South Africa included the term in its 2015 INDC as well as in its revised first NDC in 2021, it is only counted as one NDC in this analysis.

ABBREVIATIONS

AFOLU	agriculture, forestry, and other land use
CH_4	methane
COP	Conference of the Parties
CO_2e	carbon dioxide equivalent
EV	electric vehicle
F	fluorinated
GGA	Global Goal on Adaptation
GHG	greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
Gt	gigaton
G20	Group of Twenty
HFC	hydrofluorocarbon
INDC	intended nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
IPLC	Indigenous peoples and local communities
IPPU	industrial processes and product use
L&D	losses and damages
LCD	least developed country
LULUCF	land use, land-use change, and forestry
MEL	monitoring, evaluation, and learning
Mha	million hectares
Mt	megaton
NAP	national adaptation plan
NbS	nature-based solutions
NDC	nationally determined contribution
NF_3	nitrogen trifluoride
N_2O	nitrous oxide
PFC	perfluorochemical
REDD+	reducing emissions from deforestation and forest degradation, plus the sustainable management of forest and the conservation and enhancement of forest carbon stocks
SDG	Sustainable Development Goals
SF_6	sulfur hexafluoride
SIDS	small island developing states
SLOCAT	Partnership on Sustainable, Low Carbon Transport
TDM	transport demand management
UNFCCC	United Nations Framework Convention on Climate Change

ENDNOTES

1. The European Union's NDC represents 27 countries and 28 Parties.

2. This determination is made following the method used by Meinshausen et al. (2022).

3. The authors identified current or expected economic costs listed in the NDCs, and incurred by countries as a result of climate change impacts or extreme events, as economic L&D. This information is not standardized across NDC submissions and may be explicitly presented as L&D, or it may be included alongside information on climate change trends and impacts.

4. See, for example, remarks from COP26 president Alok Sharma (paraphrasing COP27 president Sameh Shoukry; COP26 Presidency 2022) and remarks from Rania Al-Mashat, Egypt's minister for international cooperation (Harvey 2022).

5. This section has been adapted from Fransen et al. (2017).

6. This report distinguishes between capitalized Loss and Damage to refer to political debates under the United Nations Framework Convention on Climate Change and to countries' climate finance requirements as stated in their NDCs and lowercased losses and damages (L&D) to refer to observed impacts and projected risks from climate change.

7. At the date of writing, all UNFCCC Parties had joined the Paris Agreement except for Eritrea, Iran, Libya, and Yemen, which had signed but not yet joined.

8. At the date of publication, 12 additional countries—Indonesia, Egypt, Gabon, Dominica, Haiti, Guatemala, Côte d'Ivoire, Bolivia, India, Serbia, Central African Republic, and El Salvador—had submitted new or updated NDCs after December 31, 2021. Australia, Brazil, Sudan, Uganda, United Kingdom, United Arab Emirates, and Vanuatu had submitted second updates. These NDCs are not considered in this analysis, except in the Emissions Impact and Finance chapters. Sudan's most recent submission was initially dated October 5, 2022, and later backdated to September 22, 2022. This latest submission is not considered in the Finance section.

9. INDCs are counted as initial NDCs for five countries: Brunei, Iraq, the Philippines, Russia, and Senegal. These countries submitted first NDCs in 2020 and 2021 that were different from their INDCs. For the same countries, first NDCs are considered as new and updated NDCs.

10. This methodological decision affects the Marshall Islands and Argentina, which submitted second NDCs with adaptation information in 2018 and 2020, respectively. The updates to these documents (submitted in 2020 and 2021, respectively) contained new information relevant only to mitigation commitments, and the decision was made to include the countries' 2018 and 2020 NDCs in the adaptation data set to retain the adaptation information therein, which is considered their latest active NDC adaptation components for the purpose of this analysis.

11. Parts of this section were previously published as an online article, "Making Sense of Countries' Paris Agreement Climate Pledges," by Taryn Fransen (2021).

12. This refers to countries that have specified measures in their NDC documents in each sector rather than the sectoral coverage of their NDC's GHG target. A country may intend to carry out interventions in certain sectors to achieve its GHG target but not include those details in its NDC document.

13. REDD+, a climate mitigation strategy based on results-based payments, stands for "reducing emissions from deforestation and forest degradation, plus the sustainable management of forest and the conservation and enhancement of forest carbon stocks."

14. Measures can potentially be coded as both fossil-generation measures and supply efficiency measures. Of the 173 initial and current supply efficiency measures, 36 are also coded as fossil-generation measures.

15. Whereas the original working paper by Dixit et al. (2022) analyzed 86 countries with updated NDCs submitted by June 2021, this update includes 123 countries that submitted new and updated NDCs by December 2021. By comparing these updated NDCs to the same countries' first NDC submissions in 2015, this section aims to provide a more comprehensive updated analysis of NDC adaptation components using the same framework. Additionally, this section also includes 44 countries that only submitted first NDCs by December 2021 in order to present a more complete picture of NDC adaptation commitments to date. For figures, data from these 44 countries are shown alongside both first and updated NDC data to reflect that these documents simultaneously come from the first round of submissions and represent these countries' current NDCs as well as to preserve the changes found between first and updated NDC submissions.

16. The IPCC defines transformative adaptation as actions "seek[ing] to change the fundamental attributes of systems in response to actual or expected climate and its effects, often at a scale and ambition greater than incremental activities. It includes changes in activities, such as changing livelihoods from cropping to livestock or by migrating to take up a livelihood elsewhere, and also changes in our perceptions and paradigms about the nature of climate change, adaptation, and their relationship to other natural and human systems" (IPCC 2014). The authors used the IPCC framework in tandem with previous WRI work on transformative adaptation in the food and nutrition security critical system to create a working definition of transformative adaptation actions based on the IPCC definition. The authors consider actions to be transformative if they seek to create systemic change through an expansion in scale, address changes in the overall system, include innovation, or include a shift in location in response to climate change (Carter et al. 2018).

17. The authors recognize that the findings related to the NDC development process and stakeholder engagement may have broader implications than for the NDC adaptation component alone. Although these indicators may extend beyond the scope of adaptation, the collection of this data was conducted as part of a methodology for examining NDC adaptation components and therefore should not be applied outside of this context.

18. Completed NAPs only reflect final documents that countries have submitted to the UNFCCC. The NAP process may be ongoing for countries that have not yet submitted a final document.

19. The financing adaptation critical system refers to actions that (i) shift how investment decisions get made, (ii) scale up and deploy public finance more effectively, (iii) scale contingent finance and insurance, and (iv) harness private capital for resilience. The category does not refer to conditional or unconditional costing of adaptation actions or to broad financial needs for the adaptation component—these are captured in separate indicators. More details on this methodology are available in Dixit et al. (2022).

20. The elements of equity analyzed in this section are gender equity and the inclusion of Indigenous people. However, this is not a comprehensive assessment of equity in the NDCs, and the authors recognize the diverse meaning of equity in different contexts. Other elements of equity not included in this analysis, such as youth inclusion and the use of common but differentiated responsibilities, could be the topic of future research.

21. This report distinguishes between capitalized Loss and Damage to refer to political debates under the UNFCCC and to countries' climate finance requirements as stated in their NDCs and lowercased losses and damages (L&D) to refer to observed impacts and projected risks from climate change.

22. The IPCC report does not provide a figure associated with limiting warming to 1.5°C.

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ABOUT WRI

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

OUR CHALLENGE

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

OUR VISION

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

OUR APPROACH

Count It

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

Change It

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

Scale It

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

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