NET ZERO PARTNERSHIP

NDC 3.0 Guidebook for Industrial Decarbonization

VOLUME 1

JANUARY 2025

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

The Net Zero Partnership for Industrial Decarbonization is a global initiative led by UNIDO that supports developing countries with transitioning towards low-carbon steel, cement and concrete. The project offers tailored policy support, promotes decarbonization solutions, and encourages international collaboration to achieve net zero emissions by 2050.

Version

January 2025

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Recommended Citation

UNIDO (2025) NDC 3.0 Guidebook for Industrial Decarbonization Volume 1. UNIDO Vienna, Austria

Editing, design and layout

Small World Stories

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DEFINITIONS

Based on the Intergovernmental Panel on Climate Change (IPCC) Glossary, the Modalities, procedures and guidelines (MPGs) of the Paris Agreement, as well as the authors' own definitions.

Conference of the Parties (COP) | The supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC). It meets annually to review the implementation of the Convention and agreed climate change instruments. It also provides a forum for the negotiation of new climate change agreements.

Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) | Oversees the implementation of the Paris Agreement and takes decisions to promote its effective implementation. It functions similarly to the COP but is specific to the Paris Agreement's objectives and commitments.

Decarbonization | The process by which countries, individuals or other entities aim to achieve zero fossil carbon existence. The word typically refers to a reduction of the carbon emissions associated with electricity, industry and transport.

Emission scenario | A plausible representation of the future development of emissions of substances that are radiatively active (e.g., greenhouse gases (GHGs), aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socio-economic development, technological change, energy and land use) and their key relationships.

Enhanced transparency framework (ETF) | Central to the design, credibility and operation of the Paris Agreement, aimed at strengthening the transparency and accountability of countries' climate actions. It establishes a common set of guidelines for all countries (while providing flexibility for developing countries that need it) on reporting their GHG emissions, progress toward their Nationally Determined Contributions (NDCs), climate change impacts and adaptation, support provided and mobilised and support needed and received.

Global stocktake | A comprehensive assessment conducted every five years under the Paris Agreement to evaluate global progress in implementing climate actions and meeting the Agreement's long-term goals.

Industrial sector | In the context of this guidance document, the industrial sector refers to economic activities related to the production and processing of goods, including fuel combustion, manufacturing and the use of products such as chemicals, with a focus on identifying and addressing GHG emissions associated with these processes as part of industrial decarbonization efforts within NDCs.

Intergovernmental Panel on Climate Change (IPCC) | The United Nations body for assessing the science related to climate change, analysing the state of scientific, technical and socio-economic knowledge on climate change, its impacts and future risks and options for reducing the rate at which climate change is taking place.

Key category | Key categories are those that are prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of GHGs in terms of the absolute level, the trend, or the uncertainty in emissions and removals.

Low-emission development | A development pathway that minimises greenhouse gas emissions while enhancing the capacity of carbon sinks.

Mitigation (of climate change) | A human intervention to reduce emissions or enhance sinks of GHGs.

Mitigation assessment | The process of evaluating potential policies, measures and strategies to reduce greenhouse gas emissions or enhance carbon sinks. This assessment involves analysing the effectiveness of various mitigation actions across sectors, with the aim of evaluating existing or potential mitigation targets. It also considers current emission sources, their future evolution and the combination of different policies and measures in various emission scenarios.

Mitigation Policies and Measures (PAMs) | All types of actions, measures and policies that reduce emissions or enhance sinks of GHGs.

Mitigation scenario | A plausible description of the future that describes how the (studied) system responds to the implementation of mitigation policies and measures. The MPGs define three scenarios. A "with measures" (WEM),[1] encompasses currently implemented and adopted policies and measures. If provided, a "with additional measures" scenario (WAM) encompasses implemented, adopted and planned policies and measures. If provided, a 'without measures' projection (WOM) excludes all policies and measures implemented, adopted and planned after the year chosen as the starting points for the projection.

Mitigation target | Specific goal or objective to reduce emissions or enhance sinks of GHGs for particular emission sources, sinks, or sectors, covering one or several gases over a defined geographical area and reference period. When these targets encompass all sectors of the economy, they are referred to as economy-wide targets. NDC targets are those outlined in the NDC, which are often mitigation targets.

Modalities, procedures and guidelines (MPGs) | Also known as the ETF's implementation guidelines, the MPGs lay out the reporting requirements for operationalization of the ETF, generally applicable for all Parties, regardless of whether they are developed or developing countries. However, flexibility in meeting the transparency requirements is provided to developing country Parties "that need it in the light of their capacities".

1 In alignment with the terminology used in the Modalities, Procedures, and Guidelines, the acronym for this scenario is WM. However, in this guidebook, the acronym WEM will be used.

Nationally Determined Contribution (NDC) | A climate action plan developed by signatory countries under the Paris Agreement, outlining their intended efforts to reduce national emissions and adapt to the impacts of climate change. Each Party to the Paris Agreement is required to establish an NDC and update it every five years.

NDC scenarios | While not internationally defined, this term is commonly used by many countries to refer to mitigation scenarios aligned with Nationally Determined Contribution (NDC) targets. These scenarios represent emissions pathways that meet the specific targets set in a country's NDC, combining emissions projections with climate action goals.

Net negative emissions | A situation of net negative emissions is achieved when, as result of human activities, more GHGs are removed from the atmosphere than are emitted into it. Where multiple GHGs are involved, the quantification of negative emissions depends on the climate metric chosen to compare emissions of different gases (such as global warming potential, global temperature change potential and others, as well as the chosen time horizon).

Net zero emissions | Net zero emissions are achieved when anthropogenic emissions of GHGs to the atmosphere are balanced by anthropogenic removals over a specified period. Where multiple GHGs are involved, the quantification of net zero emissions depends on the climate metric chosen to compare emissions of different gases (such as global warming potential, global temperature change potential and others, as well as the chosen time horizon).

Paris Agreement | Legally binding international treaty on climate change under the UNFCCC, aiming to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels".

Projection | Estimation of a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Emission projections are the estimation of future GHG emission levels based on current data, historical patterns and assumptions about future conditions. In the MPGs of the Paris Agreement, projections are referred to as "indicative of the impact of mitigation policies and measures in future trends in GHG emissions and removals".

United Nations Framework Convention on Climate Change (UNFCCC) | An international environmental treaty adopted at the Earth Summit in Rio de Janeiro in 1992. Ratified since 1994, its objective is the "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business as Usual
BMWK	German Federal Ministry for Economic Affairs and Climate Action
BTR	Biennial Transparency Report
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP	Conference of the Parties
CTF	Common Tabular Format
ESD	Effort Sharing Decision
ETF	Enhanced Transparency Framework
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GST	Global Stocktake
ICTU	Information to Facilitate Clarity, Transparency and Understanding
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
IRES	International Recommendations for Energy Statistics
IRIS	International Recommendations for Industrial Statistics
LDC	Least Developed Country
MACC	Marginal Abatement Cost Curve
MPGs	Modalities, Procedures and Guidelines
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
NSO	National Statistical Office

NZP-ID	Net Zero Partnership for Industrial Decarbonization
OECD	Organisation for Economic Co-operation and Development
PAMs	Policies and Measures
SIDS	Small Island Developing States
SNA	System of National Accounts
SPACC	State Action Plan on Climate Change
TNA	Technology Needs Assessment
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPOS	United Nations Fundamental Principles of Official Statistics
UNIDO	United Nations Industrial Development Organization
WAM	With Additional Measures
WEM	With Measures
WOM	Without Measures

1.
GENERAL INTRODUCTION

Pouring cement © Envato / stockcentral

1.1. Introduction

Scope and Objectives

Scope

This guide is designed to provide comprehensive support for countries seeking to enhance the ambition and implementation of industrial decarbonization measures within their Nationally Determined Contributions (NDCs). Aligned with the objectives of NDC 3.0, it offers an adaptable framework that identifies key areas for NDC enhancement and outlines a step-by-step approach to updating and strengthening NDCs, specifically in the industrial sector.

Objectives

The primary objective of this guide is to empower countries to raise their level of ambition and commitment toward industrial decarbonization within the framework of their NDCs, contributing to the global effort to achieve the climate goals set by the Paris Agreement. Specifically, this guide seeks to:

- Support countries in identifying areas to enhance their NDC ambition for industrial decarbonization.
- Provide countries and practitioners with a structured approach to strengthen their NDC commitments.

Ultimately, this guide seeks to bridge the ambition and implementation gaps highlighted in the Global Stocktake (GST), ensuring that the NDCs to be submitted in 2025, also known as NDCs 3.0, reflect the highest possible ambition and are aligned with the 1.5°C target of the Paris Agreement.


Liquid steel © Adobe Stock / neirfy

About the NDC 3.0 Guidebook for Industrial Decarbonization

How is the Guide Organized?

This guide is designed to take readers through understanding and enhancing their NDCs for industrial decarbonization. Section 1 introduces the key concepts and definitions to set the stage. Section 2 dives into the three main enhancement areas (Process, Data, and Targets), explaining where and how improvements can be made. Section 3 translates these areas into a step-by-step framework for implementation. The Annexes offer practical tools, including a country assessment checklist and a generic workplan, to help users apply these concepts in practice.

This guide is organized into two main sections. The sections are designed as follows:

- **NDC Industry Decarbonization Enhancement Areas:** What are the key areas for enhancing ambition and commitment in the industrial sector; and how can guidance be provided to support improvements in these areas?
- **NDC Industry Decarbonization Enhancement Approach:** What is the most effective approach for revising the NDC and enhancing ambition in the industry sector; and what specific steps should countries and practitioners take to achieve this?

Each enhancement area is presented within the broader context of the NDC, offering detailed guidance on how to strengthen it, along with information on available support to assist countries in implementing these improvements (Table 1).

Table 1 | Guidance on NDC Enhancement Opportunities

NDC Enhancement Area	Guidebook Section
Strengthening Institutional Mechanisms for Design, Implementation and Tracking • Strengthening institutional arrangements for NDC design, revision and implementation • Strengthening the legal framework to allow a sustainable revision and implementation process • Developing MRV processes to standardise the NDC enhancement process • Enhancing the capacity of stakeholders to participate in MRV systems and enhancement process	**PROCESS**, page 22
Improving Data Accuracy and Consistency • Improving industrial statistics • Developing an integral strategy for the development of national statistics • Establishing and strengthening the legal framework for the compilation of statistics • Improving the data and the methods of the national GHG inventory	**DATA**, page 33
Increasing the Ambition of Targets • Enhancing the scope of the industry in NDC targets • Defining more ambitious GHG emission reductions for industry • Defining a more ambitious timeline • Updating the type of target or indicator for improved tracking and reporting on NDCs	**TARGETS**, page 42

The guide links these enhancement areas to specific steps within the strategy for revising the NDC and increasing ambition in the industrial sector. Using the NDC Industry Decarbonization Enhancement Approach, users can determine which enhancement areas best suit their national context. Together, these two sections provide a cohesive and structured approach to industrial decarbonization within NDCs.

How to Navigate the Guide

To maximise the guide's effectiveness, users should first gain a thorough understanding of the NDC Industrial Decarbonization Enhancement Areas. This foundational knowledge will enable users to identify key opportunities and challenges for enhancing NDC ambition and commitment within the industrial sector.

With this understanding, users can move on to the step-by-step guidance provided in the section, NDC Industrial Decarbonization Enhancement Approach. This section offers a structured process for updating the NDC, guiding users in identifying the most relevant enhancement areas for their national circumstances. Users can then prioritise and implement these areas based on their specific preferences and needs.

By following this progression, users will be equipped with the context and insights they need to effectively revise and elevate ambition in the industrial sector. This ensures a strategic, informed approach to industrial decarbonization, supporting stronger NDC implementation and alignment with broader climate goals.

Who is it for?

This guide is primarily for government officials, policymakers and stakeholders involved in climate policy, particularly those responsible for the design, revision and implementation of NDCs in the industrial sector.

It also serves as a valuable resource for technical experts, industry stakeholders – including industry associations, decision-makers, sector regulators, trade organizations and major industrial operators – financial institutions and development partners supporting industrial decarbonization efforts.

Additionally, anyone seeking to understand the broader context and opportunities related to updating and strengthening NDCs in the industrial sector will find this guide useful.

How does it Complement other NDC Enhancement Tools?

This guide fills a critical gap in sectoral-focused support. While there are several guidance documents available for other sectors, such as energy, transportation, or agriculture, or more general NDC enhancement resources, there is a noticeable absence of comprehensive guidance specific to the industrial sector.

This guide addresses that gap by providing targeted support for updating and strengthening NDCs in the industrial sector. The industrial sector is a key contributor to global emissions. Building on existing knowledge, this guide offers tailored recommendations and approaches to ensure that industrial sectors are adequately represented in NDCs and ultimately reach climate neutrality by 2050.

ENHANCEMENT GUIDANCE TOOLS

General NDC Guidance

- Enhancing NDCs: A Guide to Strengthening National Climate Plans by 2020
- NDC 3.0 Navigator
- NDC Enhancement Tracker
- The National Determined Contributions Tracking Tool
- UNFCCC Resources

Sectoral NDC Guidance

- NDC Enhancement: Opportunities in Agriculture
- Water Interactions to Consider for NDC Enhancement
- NDC Enhancement Opportunities in Transport
- NDC Enhancement Opportunities in the Power Sector
- NDC Enhancement Opportunities in the Forest and Land-use Sector
- Nature-based Solutions for NDCs Pathway Framework
- Nature-based Solutions for NDCs Toolkit

Cross-cutting NDC Guidance

- Enhancing NDCS for Food System: Recommendations for Decision-Makers
- A 1.5°C World Requires a Circular and Low-Carbon Economy
- Enhancing NDCs through Urban Climate Action
- Gender Responsive Indicators: Gender and NDC Planning for Implementation
- Gender Analysis and NDCs: Short Guidance for Government Stakeholders
- Recommendations for Accounting of NDC Mitigation Components

Other NDC Guidance

- Using NDCs to Inform Green Recovery
- Climate Promise Quality Assurance Checklist
- Pocket Guide to NDCs

1.2. The Dynamics of NDC Enhancement and Tracking

Updating NDC Commitments

NDCs are central to the Paris Agreement. They embody each country's commitment to reducing national emissions and adapting to climate change. As outlined in Article 4.2 of the Paris Agreement, countries are required to prepare, communicate and maintain successive NDCs and to implement domestic actions to meet these commitments. Essentially, NDCs serve as countries' self-defined pledges to reducing greenhouse gas (GHG) emissions, aligning with the global goal of limiting temperature rise to 1.5°C. They can also detail adaptation measures, and the financial resources needed to support these efforts. Collectively, these pledges drive global progress toward the long-term goals of the Paris Agreement.

The Paris Agreement establishes a structured cycle of planning, implementation and review for NDCs (Figure 1).

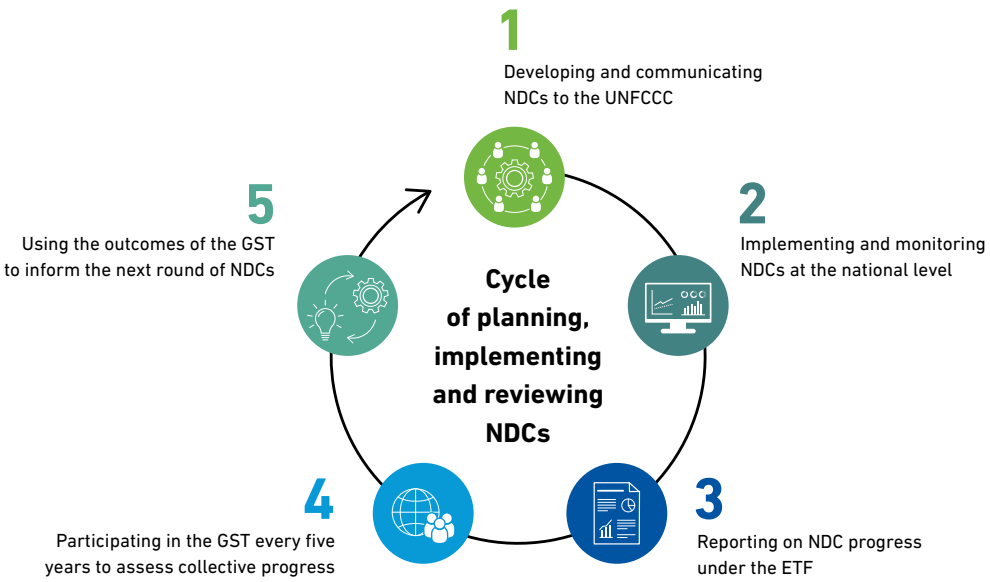


Figure 1 | Cycle of planning, implementation and review for NDCs.

Article 4.9 of the Paris Agreement stipulates that Parties must communicate their NDCs every five years, from 2020 onwards. It also states that common timeframes for NDCs will be considered (Article 4.10), ensuring that countries reassess their ambitions simultaneously. A shorter common timeframe helps synchronise NDC cycles with the Paris Agreement's Global Stocktake (GST). This alignment ensures that NDCs remain current, avoid stagnation and reflect technological and social advances. At COP 26 it was decided that Parties are encouraged to communicate in 2025 a NDC with an end date of 2035, in 2030 a NDC with an end date of 2040 and so forth every five years thereafter.

What are the Critical Elements for NDC Enhancement?

To further explore this, relevant decisions from the Conference of the Parties that provide a foundation for setting and enhancing NDC targets should be examined. Notably, Annex I of Decision 4/CMA.1 provides detailed guidance on the Information to Facilitate Clarity, Transparency and Understanding (ICTU) of NDCs, while Annex II addresses the accounting of NDCs. These provisions outline critical elements for defining NDC commitments, particularly in terms of the structure, scope and methodology of target-setting.

To align with ICTU, NDCs must clearly define targets that reflect national commitments relative to a specific reference indicator. This process involves setting quantifiable information against a defined reference point, establishing a baseline that allows for transparent assessment of progress and ambition. Furthermore, NDC targets should specify timeframes and periods of implementation, ensuring clarity on when emissions reductions are expected. Additionally, the scope and coverage of targets need to be outlined, providing transparency on which sectors and gases are included in the commitment. These elements collectively establish the boundaries for NDC enhancement, forming a framework that includes:

This guide refers to the process of updating NDCs as "NDC enhancement".

To foster increasing ambition, Article 4.3 of the Paris Agreement mandates that each NDC must represent a progression from the previous one, a mechanism referred to as the "ratchet mechanism". This means that every five years, countries are expected to "ratchet up" their efforts to reflect their highest possible ambition. Furthermore, under Article 4.11, countries can enhance their NDCs at any time, provided the changes do not reduce the level of ambition.

Target Metrics: Defining the NDC commitments and the indicators used to measure them.

Target Intensity: Setting the level of emissions reductions in relation to a baseline or reference point, thereby conveying the ambition level of the NDC.

Scope and Coverage: Clearly outlining the sectors, gases, or specific activities included in the target, ensuring a comprehensive approach to emissions reductions.

Timeline: Specifying timeframes and milestones for implementation, which create a structured pathway for achieving NDC goals.

Planning Processes: Detailing the development and implementation steps, including stakeholder engagements, which support the NDC's alignment with national and sectoral priorities.

Methodological Assumptions: Defining the data availability and quality, as well as any underlying assumptions and methodologies used in accounting for emissions.

Monitoring Progress: Tracking and Reporting on NDC Implementation

Following NDC implementation, countries must account for the progress made. This allows Parties to track their own progress and for an evaluation of collective global efforts. Article 13 of the Paris Agreement establishes the Enhanced Transparency Framework (ETF) to build trust and confidence that all countries are contributing their share to the global effort. Under the ETF, all Parties are required to report on several information elements, including data to track progress in implementing and achieving their NDCs under Article 4, as well as information on the GHG inventory.

The reporting requirements for the ETF are defined in the Modalities, Procedures and Guidelines (MPGs), established during COP24 (Decision 18/CMA.1). These MPGs, also known as the ETF's implementation guidelines, outline the reporting requirements for all Parties, both developed and developing. At COP26, Decision 5/CMA.3 was adopted. This provided additional guidance for implementing the MPGs, including the common tabular formats (CTFs) for electronically reporting the information necessary to track progress in implementing and achieving NDCs under Article 4 of the Paris Agreement.

From 2024, Parties are expected to report the different informational elements of the ETF to the United Nations Framework Convention on Climate Change (UNFCCC) every two years. There is an exception for small island developing states (SIDS) and least developed countries (LDCs). They may submit this information at their discretion in the form of a Biennial Transparency Report (BTR), while the GHG inventory report can be reported as a standalone report. In accordance with the MPGs, Parties must submit their first BTR and national inventory report (if submitted separately from the BTR), latest by 31 December 2024. In addition to the information currently reported in the Biennial Update Reports (BURs), Parties must provide information on their NDC implementation progress in the BTRs.

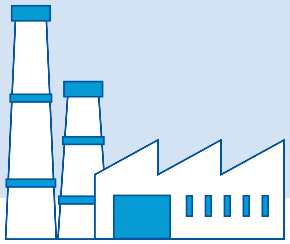
Visit to a cement plant in Kenya © UNIDO / Tomasz Pawelec

1.3. Definition of the Industrial Sector

The industrial sector is defined as those economic activities related to the production and processing of intermediate and final goods. During these industrial processes, emissions can occur at various stages, making it important to account for them following the detailed definitions and principles provided in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (referred to as the 2006 IPCC Guidelines). This ensures a consistent approach to enhancing the ambition and commitment toward industrial decarbonization within the framework of NDCs.

As such, the industrial sector includes all emissions occurring from industrial processes, from the use of GHGs in products and from non-energy uses of fossil fuel carbon. This includes fuel combustion for the manufacturing of goods and the use and processing of products including chemicals in industrial processes and related emissions. In line with the 2006 IPCC Guidelines, countries are required to account for GHG emissions and removals within the national territory and offshore areas over which the country has jurisdiction.

In the context of this guide, the industrial sector encompasses economic activities related to the production and processing of goods, including fuel combustion, manufacturing and the use of products such as chemicals. The focus is on identifying and addressing GHG emissions associated with these processes as part of industrial decarbonization efforts within NDCs.



The industrial sector usually covers emissions and activities categorised under the following 2006 IPCC Guidelines GHG inventory sectors:

- **1A2** Manufacturing Industries and Construction
- **2A** Mineral Industry
- **2B** Chemical Industry
- **2C** Metal Industry
- **2D** Non-Energy Products from Fuels and Solvent Use
- **2E** Electronics Industry
- **2G** Other Product Manufacture and Use
- **2H** Other

For each country, the scope should be defined individually, depending on national circumstances.

Now that the document has laid out the foundational concepts and dynamics of NDC commitments, the next section explores the three core areas for enhancing industrial decarbonization—Process, Data, and Targets. These pillars provide practical tools for raising ambition, improving data accuracy, and strengthening implementation.

Engineer at work © Envato / sarawut20003

2.

NDC INDUSTRIAL DECARBONIZATION ENHANCEMENT AREAS

Cement factory © Envato / bilanol

2.1. Overview

This section offers countries and practitioners detailed guidance on key areas to enhance their NDCs within the industrial sector, helping identify opportunities to raise ambition for industrial decarbonization. Three primary enhancement areas are highlighted (Figure 2).

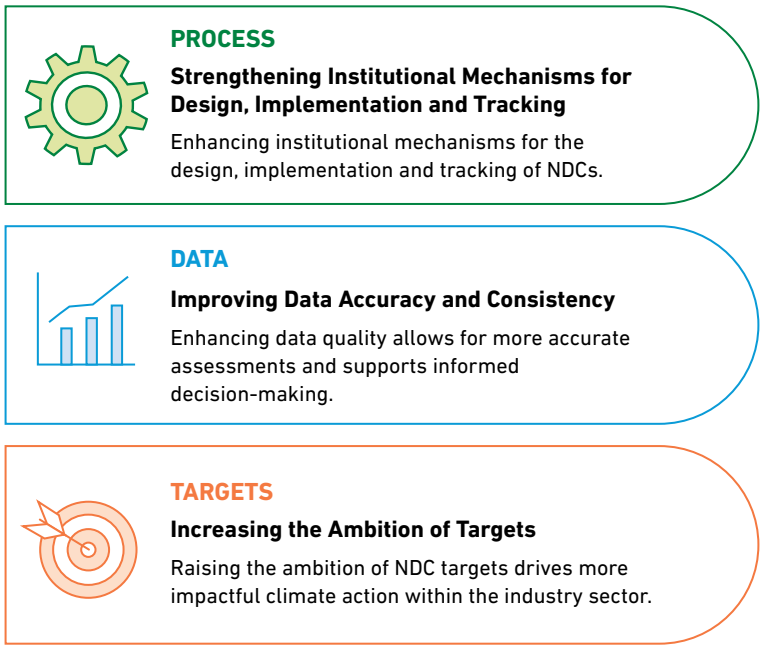


Figure 2 | NDC enhancement areas.

Each enhancement area is structured for easy navigation, with the following elements provided:

What is the NDC Context? This section explains the relevance of each area within the broader context of NDCs, highlighting how it contributes to overall decarbonization goals and supports alignment with the Paris Agreement.

How can this be Enhanced? Here, approaches are outlined to strengthen each area, offering specific ways to improve data, raise targets, or enhance tracking methods, depending on the enhancement focus.

What Resources are Available for Support? This part identifies the types of support available to assist countries in implementing these enhancements, ensuring they have access to the needed guidance and expertise.

PROCESS | Strengthening Institutional Mechanisms for Design, Implementation and Tracking

This NDC enhancement area focuses on improving the NDC process through the institutionalisation of planning and implementation frameworks. It provides a roadmap for countries to establish and formalise a system with clear institutional roles and procedures that support effective NDC planning and enable the scaling up of ambition over time.

What is the NDC Context?

Improving the implementation and tracking of industry sector decarbonization efforts in NDCs the presence and effectiveness of countries' systems or approaches governing the planning and implementation process. These systems are established to organize the NDC implementation process, aligning with the scope, targets and enhancement cycles of NDCs, while providing the necessary structure to effectively design, implement and monitor climate actions.

Robust governance systems ensure that NDCs align with national and sectoral priorities while remaining sustainable over time. They enable cross-sectoral coordination, inclusive stakeholder engagement and continuous improvement of climate actions through monitoring, reporting and verification (MRV). Strengthening these systems is critical to maintaining long-term functionality, adaptability and credibility, thereby enhancing the effectiveness of commitments under the Paris Agreement, including those related to carbon trading under Article 6.

The transparency and accountability mechanisms provided by MRV systems play a crucial role in enabling countries to meet the requirements under Article 6. MRV systems ensure that carbon trading activities, including emissions reductions generated from the voluntary cooperation between countries, are transparent, traceable and verifiable, thus facilitating the cross-border flow of emissions reductions and maintaining the environmental integrity of carbon markets.

Effective governance drives progress by coordinating decision-making, ensuring accountability, engaging stakeholders across various levels of government and society and maintaining political will. Inclusive policy development and stakeholder engagement, from national to subnational, municipal,

Governance

Governance is a process that varies by country, tailored to each nation's unique context. Effective governance is crucial not only for advancing climate action aligned with national priorities but also for meeting the key processes and milestones outlines in the Paris Agreement. Specifically, countries must establish domestic governance frameworks to facilitate the communication of updated NDCs every five years, ensuring that the necessary work and preparations are in place to support this process.

public, private and civil society actors, are vital for achieving buy-in and integrating NDC implementation into broader national policy frameworks. Building this national expertise to reduce dependence on third-party reports is increasingly recognised as essential, highlighting the need for sustained capacity-building.

To support this, countries are encouraged to establish institutional arrangements suited to their context, as outlined in paragraph 4(a) of decision 4/CMA.1, annex I. This includes reporting on these arrangements within their NDCs to ensure transparency regarding planning processes, governance structures and relevant contextual information.

In summary, implementing ambitious industry decarbonization actions requires mainstreaming climate as a cross-cutting policy issue across all sectors and levels of governance. This involves establishing effective and sustainable coordination mechanisms to drive transformative change.

These mechanisms, tailored to national circumstances and institutional contexts, support NDC implementation by:[2]

- Integrating climate policies across government and society.
- Engaging stakeholders to plan and implement policies effectively.
- Ensuring accountability for climate commitments.
- Mapping financing efforts for climate action.
- Resolving conflicts in decision-making processes; and
- Reducing policy duplication and misalignment.

How can this be Enhanced?

Industrial decarbonization planning within the NDC framework should be integrated into existing processes, rather than treated as a separate, standalone effort. It should build on existing planning processes and consider the priorities identified in other national strategies and plans, such as national climate strategies, national development strategies or plans, sectoral strategies or plans and national adaptation plans. This integration ensures that NDC processes complement, rather than duplicate, established systems. Over time–as planning mechanisms mature, stakeholder participation strengthens, data availability improves, and capacities expand–successive NDCs and their implementation should become more streamlined and impactful.

To achieve this, countries must integrate short- and long-term climate action into national and sectoral planning, progressively aligning NDCs with a broader vision of transitioning to industrial decarbonization and a zero-carbon economy. Establishing institutional mechanisms to design, implement and track NDCs is fundamental. This requires assessing existing institutional landscapes to assign clear responsibilities, developing robust processes and implementing capacity-building initiatives to ensure systematic monitoring and tracking of progress.

2 NDC Partnership (2024). Country Coordination Mechanisms–Best Practice Brief.

Establishing an MRV System

To ensure a systematic process, countries should establish a structured approach to plan, implement and track industrial decarbonization under their NDCs. These approaches or systems (in the context of climate change transparency and NDCs) are commonly referred to as MRV systems.

MRV is central to effectively design, implement and track NDCs submitted under the Paris Agreement. The institutionalisation of the NDC enhancement process, by means of a stable MRV mechanism or system, represents one of the key needs of countries. **The lack of such a system often leads to challenges in setting realistic NDC targets and determining progress**. Measurement and monitoring are essential for the following reasons.

- Identifying emissions trends.
- Prioritising areas for GHG reduction efforts.
- Tracking mitigation-related support.
- Evaluating the effectiveness of planned mitigation actions under the NDCs.
- Assessing the impact of received support and monitoring progress in reducing emissions.

Reporting and verification play a critical role in promoting transparency, ensuring good governance, enhancing accountability and establishing the credibility of results, while also building confidence that resources are being used efficiently and effectively.

Australia's National Reporting Scheme

Australia's National Greenhouse and Energy Reporting Scheme is a comprehensive MRV mechanism that mandates companies exceeding a specified threshold to register within the framework and annually report their GHG emissions, energy production and energy consumption. This data informs national policy and programme development as well as how Australia reports internationally. It creates a reliable system for tracking emissions and ensuring the implementation of Australia's NDC.

MRV systems define clear responsibilities assigned to different institutions as well as data compilation processes that are governed by clear procedures and timeframes. Through this formalisation, countries can crucially enhance the ambition and implementation of industrial decarbonization of their NDC as the planning, formulation, implementation and tracking processes are embedded in a systematic approach.

As such, in the climate change arena and specifically in the context of NDC enhancements, MRV systems establish a credible mechanism through which countries develop and report key information on climate action and progress. Key components of an MRV system include:

Institutional Framework: Clearly defined roles and responsibilities across institutions involved in MRV activities related to the design, implementation and tracking of NDCs.

Formal Procedures: Standardised processes for compiling, processing and reporting data required to design, implement and track NDCs.

Quality Control and Assurance: Mechanisms for continuous verification and quality control and assurance of reported information.

Despite their importance, many countries face challenges in establishing robust industry sector MRV systems due to:

Limited Capacities: Gaps in institutional expertise, data collection and planning processes, often leading to dependency on external consultants.

Weak Institutional Frameworks: Insufficient formal arrangements, inadequate authority for national entities and poor inter-institutional cooperation.

Funding Constraints: Insufficient resources to sustain teams, maintain data archives and retain qualified personnel.

Discontinuity: Loss of institutional memory and expertise.

To address these gaps, MRV systems must be designed with a clear scope, defined objectives and assigned responsibilities, supported by formalised procedures with well-defined timeframes and sustainable mechanisms for quality control, assurance and institutional continuity. Achieving this level of formalisation requires several critical elements, as presented in Figure 3.

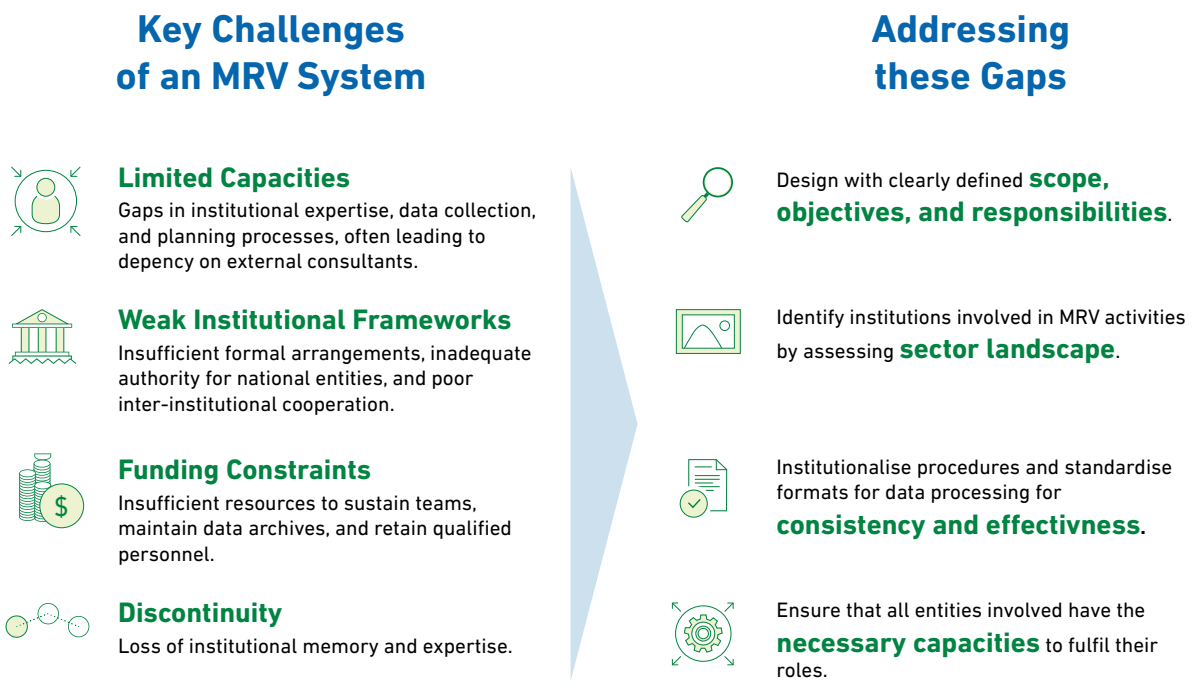


Figure 3 | Key elements to address MRV gaps.

First, the objective and scope of the MRV system must be clearly defined; for example, in the context of the industry sector NDC, the focus would be on designing, implementing and tracking mitigation targets and associated measures in the industry.

Second, the institutions involved in MRV activities must be identified by assessing the industry sector landscape. This helps to determine the entities responsible for driving industrial policy and implementing decarbonization measures.

Third, MRV procedures should be institutionalised, which includes planning the NDC enhancement process, ensuring smooth information flow between institutions and determining the type, frequency and timing of data. Additionally, standardised formats for data processing should be developed for consistency and effectiveness. The institutionalisation of MRV procedures will vary by country, depending on national contexts. For instance, in the Philippines, climate action was institutionalised through the Climate Change Act, which mandated the establishment of the Climate Change Commission. This body is tasked with overseeing the design, implementation and monitoring of NDCs, ensuring effective coordination and accountability throughout the process.

Finally, all entities involved must have the necessary capacities to fulfil their roles and responsibilities within the MRV system, ensuring its effective and sustainable operation over time.

As a starting point, countries should evaluate their existing approaches by considering the questions in Figure 4. For those without established systems, these same questions can serve as a foundation for developing MRV arrangements.

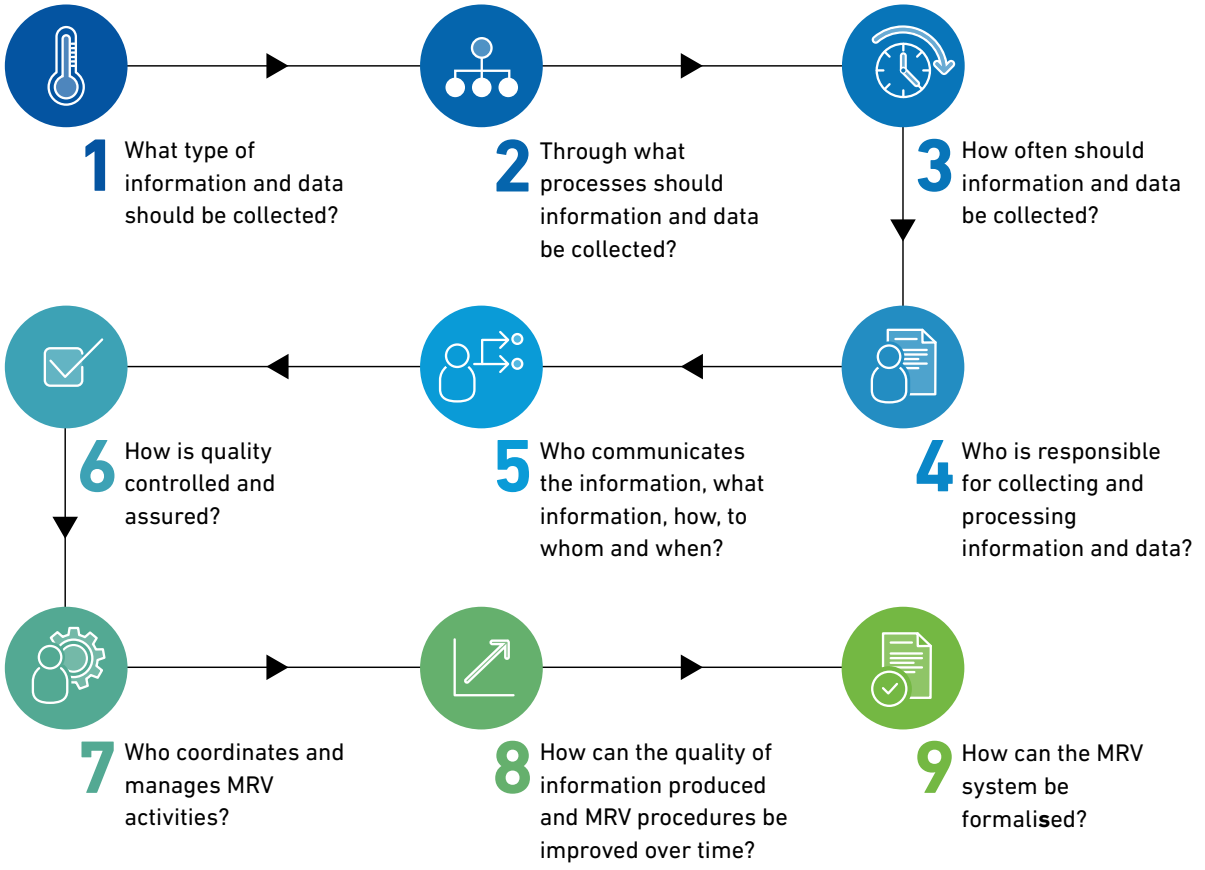


Figure 4 | Key questions for establishing an industrial sector MRV system.

Table 2 offers indicative answers to these questions within the context of NDC enhancement, highlighting how a well-designed MRV system can effectively support the enhancement process.

Table 2 | MRV Improvements for Effective NDC Design, Implementation and Tracking

Question	Answer
1. What type of information and data should be collected?	Data necessary to enhance NDC ambition in line with defined enhancement areas and data required for the implementation and tracking of the NDC.
2. How should information and data be collected?	Data should be collected through a systematic process involving clear roles and responsibilities for stakeholders, standardised methodologies and predefined timelines for data reporting and compilation.
3. How often should information and data be collected?	Information should be collected at least annually to allow for timely tracking of NDC progress as part of the BTR, with updates to the NDC aligned with the enhancement cycle (typically every five years).
4. Who is responsible for collecting and processing information and data?	Those responsible are institutions involved in the design and implementation of the NDC, as defined under the data collection processes. These data requirements inform which institutions should participate.
5. Who communicates the information, what information, how, to whom and when?	Communication flows should be based on institutional arrangements, supported by data-sharing agreements or collaborative mechanisms for effective data compilation.
6. How is quality controlled and assured?	Data quality should be verified both by the institutions producing the data and by those leading NDC design, implementation and tracking efforts.
7. Who coordinates and manages MRV activities?	The lead institution for the industry sector MRV should be determined at the national level.
8. How can the quality of information produced and MRV procedures be improved over time?	Continuous improvement can be achieved through careful planning, by identifying challenges and incorporating lessons learned into MRV procedures.

Question	Answer
9. How can the MRV system be formalised?	The MRV system can be formalised through extensive stakeholder consultations, and by determining the degree of legal formalisation needed to embed the NDC process firmly within national planning frameworks.

Effective MRV systems must be tailored to a country's unique institutional structure and national circumstances. In some countries, a more decentralised approach is adopted.

India's State Action Plans

India has integrated climate action into its national planning through the development of State Action Plans on Climate Change (SAPCCs). Each state government, working with the Ministry of Environment, Forests and Climate Change, is responsible for implementing and monitoring climate actions locally. India has also established a national MRV system that facilitates data collection and reporting, allowing states to track and assess their progress toward achieving national NDC targets. This decentralised approach ensures that climate actions are tailored to local contexts while contributing to broader national objectives.

For sector-specific needs, such as industrial decarbonization, MRV systems should account for the unique characteristics of each sector, while prioritising integration into a centralised framework for consistency and oversight. While sectoral systems may be developed independently, aligning them with a unified MRV system guarantees coherence across NDC processes.

Ultimately, while there is no universal model for MRV systems, their design must align with national conditions, supporting both overarching NDC goals and specific sectoral decarbonization opportunities. **A robust MRV system is essential for setting realistic targets, tracking progress and systematically increasing the ambition of NDCs over time.**

Capacity-building for Effective NDC Design, Implementation and Tracking

Effective governance systems rely heavily on building the capacity of stakeholders, enabling them to manage and sustain NDC design, implementation and tracking processes. A major challenge in setting up MRV systems is often the limited capacity of a country's institutions to formalise and execute the necessary steps for NDC planning and tracking.

This lack of specific knowledge related to NDCs, GHG emissions dynamics and decarbonization in key industry sectors often creates a significant bottleneck. Even when NDCs are formulated accurately, countries must actively implement and monitor them. A well-functioning MRV system depends on the technical capacity and commitment of institutions involved in NDC formulation, implementation and monitoring, particularly in tracking industry-specific emissions reductions.

To address this, countries must focus on substantial capacity-building initiatives that strengthen institutional systems, ensuring continuous monitoring, tracking of progress and consistent enhancement of ambition over time. Therefore, capacity-building must be a central element to ensure stakeholders involved in NDC implementation and tracking are equipped with the necessary skills to operate effective MRV systems. This capacity also enables them to develop enhanced NDC targets based on accurate assessments of implementation progress.

To operate an MRV system effectively, the institutions involved require varying levels of capacity and knowledge depending on their roles and responsibilities. The specific functions required to enhance NDCs and improve tracking capacity help define the scope of technical capacity needed to run the MRV system efficiently. While the following list is not exhaustive, it outlines the baseline skills that institutions involved in NDC processes should possess (Figure 5).

- **Institutions leading the NDC planning and enhancement process**, as well as overseeing implementation, must have a strong understanding of climate change reporting requirements as defined by the Paris Agreement's ETF and MPGs. They should also be familiar with GHG inventory methodologies in line with the 2006 IPCC Guidelines and sector-specific data.
- **Institutions supporting NDC implementation**, tracking and data compilation, such as government agencies in the industry sector, industrial boards, federations and industry plants, must understand the data requirements for tracking NDC progress as it relates to their operations. They should also have a basic understanding of NDC methodology to contribute effectively to the enhancement process.

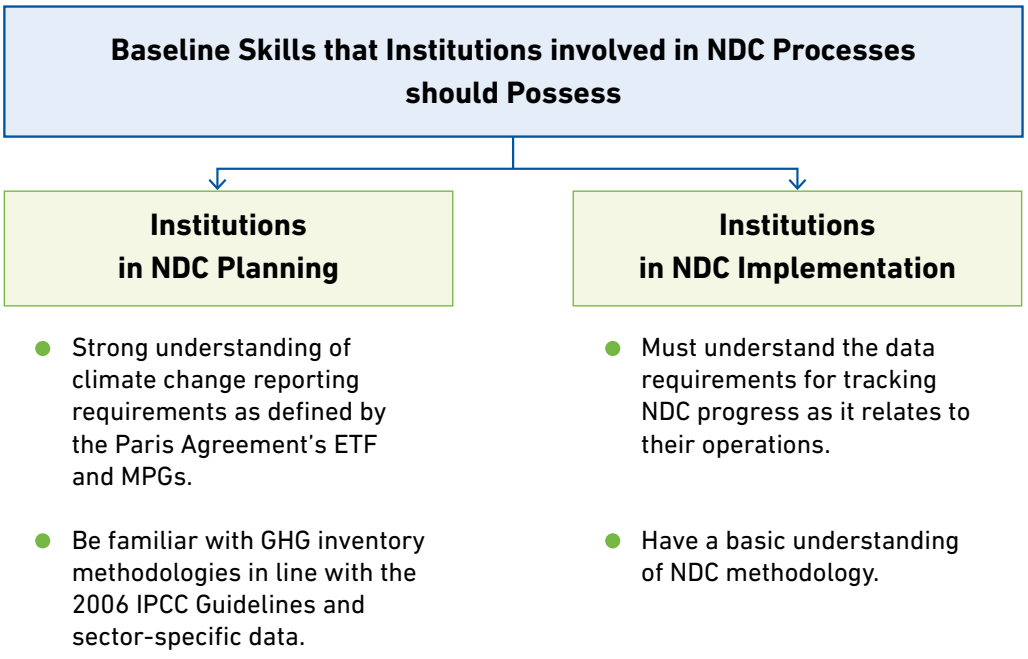


Figure 5 | Baseline skills that institutions involved in NDC processes should possess.

Additionally, reports on NDC progress and enhanced ambition should always include extensive stakeholder engagement to ensure credibility and broad support. It is also recommended to implement a rigorous quality control process, ideally led by a technical working group, to verify the technical aspects of the NDC and ensure accurate progress reporting.

These capacity-building needs can be met through various means. In the first instance, countries can utilise national resources to strengthen the capabilities of key staff in institutions involved in MRV activities. However, international support for enhancing national capacities related to NDC development and tracking is available to most developing countries. Several countries have already implemented capacity-building activities to support the NDC process.

- **Vietnam** has developed sector-specific capacity-building programmes to support the implementation of its NDC, particularly focussed on the energy, agriculture and forestry sectors. The Ministry of Natural Resources and Environment of Vietnam has worked with local governments, sectoral agencies and industry stakeholders to provide training on emissions reductions, data collection and tracking NDC progress.
- **Kenya** has integrated capacity-building into its NDC design and implementation process by training government officials, industrial stakeholders and local authorities on climate change mitigation and adaptation strategies. The National Environmental Management Authority works closely with sectoral agencies, offering workshops and seminars on GHG inventories, sector-specific mitigation measures and reporting requirements.

Table 3 provides key "do's and don'ts" for strengthening institutional mechanisms essential for the effective design, implementation and tracking of NDCs. This outlines critical actions and common pitfalls that countries should consider when establishing and refining their institutional frameworks for NDC processes. This is not an exhaustive list and there are additional do's and don'ts that may be relevant in specific contexts. However, the table highlights several important considerations that can guide countries in strengthening their NDC institutional mechanisms.

Table 3 | Do's and Don'ts for Strengthening Institutional Mechanisms for NDC Design, Implementation and Tracking

Category	Do's	Don'ts
Institutional Framework	• Conduct comprehensive assessments to identify gaps and opportunities. • Formalise institutional roles and responsibilities with clear mandates.	• Avoid relying on informal or ad-hoc institutional arrangements. • Avoid overlooking the need for clear, formalised institutional structures.

Category	Do's	Don'ts
Capacity Building	• Provide targeted training for all relevant stakeholders. • Build institutional and technical capacity for sustained NDC enhancement and implementation.	• Avoid assigning responsibilities without ensuring capacity is adequate. • Avoid over-relying on external consultants without transferring knowledge.
Data Management and MRV	• Develop integrated MRV systems with clear processes and responsibilities. • Standardise data collection, verification and reporting mechanisms.	• Avoid inconsistent or poor data management practices. • Avoid cutting corners on quality control and assurance in reporting.
Stakeholder Engagement	• Engage diverse stakeholders, including government, private sector and civil society. • Foster transparency and inclusivity to build trust and ownership.	• Avoid excluding key stakeholders or underestimating their importance in decision-making. • Avoid imposing policies without stakeholder consultation and buy-in.
Integration with Policies	• Align NDC processes with national and sectoral strategies to ensure coherence. • Leverage existing planning processes for efficiency and integration.	• Avoid treating NDCs as stand-alone commitments separate from broader national goals. • Avoid overlooking sector-specific requirements in the integration process.
Sustainability	• Establish mechanisms for long-term institutional memory, such as robust archiving.	• Avoid neglecting long-term funding strategies and institutional continuity.
Legal and Governance	• Enact legal frameworks or agreements to institutionalise NDC implementation processes. • Promote accountability through formal oversight mechanisms.	• Avoid weak legal structures that fail to enforce compliance or ensure accountability. • Avoid undefining institutional responsibilities without enforcement mechanisms.

What Resources are Available for Support?

In addition to the support offered in this guide, there is a wide array of external tools, manuals, studies and guidance documents available to further assist countries.

SUPPORT CHANNELS FOR STRENGTHENING INSTITUTIONAL MECHANISMS

Support Documentation and Guidance

- Handbook on Measurement, Reporting and Verification for Developing Country Parties | Handbook to disseminate relevant information on the MRV framework for developing countries and to demystify associated concepts and elements.
- Handbook on Institutional Arrangements to Support MRV/transparency of Climate Action and Support | For experts and practitioners to improve their national institutional arrangements, which are instrumental to implementing the existing MRV arrangements under the Convention and the ETF under the Paris Agreement in a timely and sustainable manner.
- Implementing Nationally Determined Contributions (NDCs) | Support to countries in implementing their NDCs.
- Reference Manual for the Enhanced Transparency Framework under the Paris Agreement | Useful to Parties when preparing their NDCs; reporting information in their BTRs, including on tracking progress in implementing and achieving the communicated NDCs.
- Institutional Capacities for NDC Implementation | Guidance document to support EMDEs governments with their NDC implementation.
- Country Coordination Mechanisms Best Practice Brief | This brief presents areas of coordination that often play crucial roles in NDC processes, drawing on best practices from across the NDC Partnership.
- CDKN Planning for NDC Implementation: A Quick-Start Guide | Offers guidance on NDC planning and MRV systems.

DATA | Improving Data Accuracy and Consistency

Accurate and consistent data is essential for effectively assessing, planning, and monitoring industrial decarbonization within NDCs. By improving data quality, countries can ensure a reliable foundation for setting and tracking NDC goals in the industry sector.

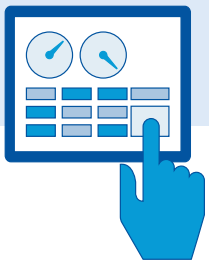
What is the NDC Context?

Data accuracy and consistency are essential to the credibility and effectiveness of an NDC. Reliable data enable a realistic assessment of current emissions, support evidence-based target-setting and allow for precise tracking of progress. Without accurate data, it becomes challenging to establish or verify emissions baselines, monitor progress, or ensure alignment with the global climate goals set out in the Paris Agreement. Ensuring data accuracy and reliability is therefore critical for tracking NDC targets and assessing the impact of mitigation actions effectively.

Data forms the foundation for generating information, which evolves into knowledge and ultimately supports informed decision-making. However, inaccuracies or biases can arise when data do not accurately represent real-world conditions. Given that NDCs follow a "bottom-up" approach, where each Party sets individual objectives and policies, such inaccuracies can significantly hinder the development of evidence-based targets.

Accuracy According to the 2006 IPCC Guidelines for Greenhouse Gas Inventories

Agreement between the true value and the average of repeated measured observations or estimates of a variable. An accurate measurement or prediction lacks bias or, equivalently systematic error.



The importance of data accuracy and consistency is further underscored in the ICTU of NDCs, as outlined in Decision 4/CMA.1. In line with Annex II to this decision, Parties are required to provide information on accounting approaches followed and steps taken to ensuring methodological consistency. The accounting framework relies on relevant and consistent information being included in both the NDC and related reporting mechanism. Specifically, there should be consistency in the information included in the NDC related to the scope and coverage of the sources and sinks of anthropogenic emissions and removals, respectively, including the sources and sinks tracked, the GHG inventory, the IPCC methods applied, the assumptions made, and the data sources consulted.

Improving data accuracy and consistency is therefore crucial to ensure that industry sector NDCs are robust, achievable and verifiable. Strengthening data quality not only underpins reliable NDC targets for industrial decarbonization but also improves underlying data and modelling methodologies, making NDCs more comprehensive, actionable and credible.

How can this be Enhanced?

The key element in improving data accuracy and consistency is a **well-functioning national statistics system**. Statistical systems are a critical foundation at the national level, essential for informed policy-making and strategic planning. The development of a robust national statistical framework is a key requirement for effective climate action, enabling countries to track emissions, set informed reduction targets and monitor the progress of decarbonization efforts across various sectors, especially in industry.

A well-functioning national statistical system supports the integration of energy and industrial data into broader climate strategies, thereby providing the information necessary for aligning industrial performance with national climate goals. At the core, is the system of national accounts (SNA)–encompassing gross domestic product (GDP), sectoral breakdowns and other key economic aggregates–combined with socioeconomic data derived from censuses and surveys. These foundational elements are crucial for constructing a reliable statistical base that reflects both economic activities and their environmental impacts.

Given this critical role, many countries implement strategic plans for developing their national statistics, ensuring the system is built on a solid foundation with a clear legal framework and effective institutional arrangements. This ensures that the data required to support decarbonization and enhance NDCs is accurate, timely and accessible to decision-makers.

Singapore's Public Data Agenda

Singapore's Public Data Agenda established a Government Data Office to oversee the implementation of a comprehensive Data Strategy. This strategy mandates information sharing by default, ensuring core government data is accessible within seven days. Additionally, it introduced an Integrated Data Management Framework as part of the Government's Data Architecture, promoting consistent and efficient data practices across agencies. To strengthen capacity, civil servants are trained in data science and encouraged to integrate data-driven approaches into their work, fostering a culture of evidence-based decision-making.

Singapore city scape © Envato / siraphol

In many cases, typical issues confronting national statistical systems include weak legal mandates, lack of coordinated and uniform standards, gaps in organizational capabilities, deteriorating quality and relevance as well as outdated technology platforms.

Therefore, to effectively support NDC enhancement, national statistical systems need to be robustly supported by legal frameworks, efficient data collection entities, as well as clearly defined compilation and dissemination strategies:

Legal Frameworks: A clear legal framework is crucial to formalise the authority, responsibility and independence of national statistical systems. Legal provisions ensure that data collection agencies operate without interference, prioritise accuracy and transparency and have the authority to collect data across sectors, including energy and industrial activities. This framework should also mandate data sharing across government entities to ensure all relevant sectors contribute data, fostering a unified approach to tracking NDC progress.

Data Collection Entity: The designated entity or entities responsible for data collection play a pivotal role in maintaining data quality and consistency. Typically, a national statistical office (NSO) oversees this, but it may delegate responsibilities to specialised agencies or departments for sector-specific data. Clear guidelines on roles and data-sharing agreements across entities are essential to facilitate coordination and maintain consistency.

Centralised vs. Decentralised Statistical Approaches: Countries may adopt either a centralised or decentralised statistical approach, depending on their institutional structure and data needs. In a centralised model, one agency (e.g., an NSO) collects, compiles and disseminates all necessary data, ensuring uniform data standards and consistency. A decentralised approach, where multiple agencies gather and manage sector-specific data (such as energy, industry and transportation sectors), may offer specialised expertise and detailed insights. This model requires robust coordination mechanisms to ensure alignment in data quality and standards across all sectors.

Compilation and Dissemination Strategies: Effective compilation and dissemination strategies are fundamental to building a transparent and user-friendly statistical system. Data compilation should follow standardised methodologies, enabling comparability over time and consistency with international reporting. Dissemination strategies should prioritise open access to data and clear, understandable presentation formats. Publishing regular reports and updates supports accountability, while establishing secure, accessible data portals ensures stakeholders can easily access, analyse and apply data to inform policy and track NDC progress.

Alignment with international standards, such as the United Nations Fundamental Principles of Official Statistics (UNFPOS), ensures that data is accurate, independent and transparent, supporting the reliability of decarbonization strategies.

Recommendations of the Organisation for Economic Co-operation and Development (OECD) Council on Good Statistical Practice

1. Put in place a clear legal and institutional framework for official statistics (...)
2. Ensure professional independence of National Statistical Authorities. (...)
3. Ensure adequacy of human financial and technical resources available to the National Statistical Authorities (...)
4. Protect the privacy of data providers. (...)
5. Ensure the right to access administrative sources to produce official statistics. (...)
6. Ensure the impartiality, objectivity, and transparency of official statistics (...)
7. Employ sound methodology and commit to professional standards used in the production of official statistics. (...)
8. Commit to the quality of statistical outputs and processes (...)
9. Ensure user-friendly data access and dissemination (...)
10. Commit to international co-operation. (...)
11. Encourage exploring innovative methods as well as new and alternative data sources as inputs for official statistics (...)

To develop a robust national statistical system that supports industrial decarbonization and NDC enhancement, several critical areas need attention. These include energy statistics within national systems, industrial statistics with a decarbonization focus, national statistics for strengthening GHG inventory accuracy and the strategic value of integrated data systems for NDC enhancement. These components provide the backbone for accurately monitoring emissions and energy consumption, enabling essential policies to be formulated for achieving decarbonization targets in the industry sector.

Energy Statistics within National Systems

Energy statistics are indispensable for understanding a country's energy mix, production, consumption and efficiency–all are closely tied to emissions in the industrial sector. Reliable energy data allows high-emission activities to be identified and helps guide the transition to cleaner energy sources. This is particularly crucial for enhancing NDCs. Detailed and accurate energy statistics are needed to model potential emission reductions and assess progress toward decarbonization goals.

Many countries adhere to international frameworks such as the International Recommendations for Energy Statistics (IRES), the Energy Statistics Compilers' Manual developed by the United Nations (UN) or the Energy Statistics Manual, developed by the International Energy Agency (IEA). These guidelines offer a standardised approach to collecting, analysing and disseminating energy data, ensuring it is suitable for both national planning and international reporting under the Paris Agreement.

Mexico's Energy Information System

Mexico has established the Energy Information System, which compiles detailed data on the country's energy production, consumption and efficiency. This system ensures that Mexico has reliable data for modelling emissions reductions in the industrial sector. Mexico aligns its energy statistics with international frameworks, such as the IEA guidelines and uses this data to inform its NDC, which includes reducing emissions from industrial processes. The Energy Information System provides essential data that enables Mexico to track energy consumption patterns and design policies for decarbonization in the industrial sector.

Nevertheless, integrating energy data into broader climate and industrial policies remains a challenge due to the complexity of energy flows and the need to harmonise it with other sectoral data.

Metal wedling © Envato / orcearo

Industrial Statistics for Decarbonization

Industrial statistics are equally critical for understanding the emissions profile of a country's industrial sector, which often represents a significant portion of its total GHG emissions. Robust industrial data systems are needed to monitor energy use, production processes and emissions from key sectors like manufacturing, mining and energy production. These data systems are vital for identifying decarbonization opportunities, tracking progress and evaluating the effectiveness of policies aimed at reducing industrial emissions.

Frameworks like the International Recommendations for Industrial Statistics (IRIS), developed by the UN, guide the collection of industrial data, which is essential for input-output analysis and understanding the links between different sectors of the economy. Given the industrial sector's dependence on energy, the integration of energy and industrial statistics is key to developing comprehensive decarbonization strategies.

Understanding energy intensity in industrial processes is central to this effort, as reducing energy consumption and improving efficiency in energy-intensive industries is a critical path toward meeting NDC targets. Additionally, industrial statistics enable countries to monitor the adoption of low-carbon technologies and track shifts toward cleaner production processes.

National Statistics for GHG Inventory Improvement

National statistics serve as a key data source for GHG inventories. Timely and precise data on industrial activity, energy consumption, production outputs and other key activity metrics are essential for calculating reliable emissions estimates. A well-functioning national statistics system provides the consistency needed to reduce uncertainties in emissions calculations and it enables countries to adopt the higher tier methodologies recommended by the 2006 IPCC Guidelines, which support the use of country-specific data and tailored approaches.

Improving national statistics systems not only enhances the accuracy of GHG inventories but also strengthens the foundation for robust MRV processes essential for NDC implementation. Reliable GHG inventories directly inform the development, refinement and tracking of policies aimed at achieving NDC targets, allowing countries to demonstrate progress transparently to both domestic and international stakeholders, including the UNFCCC. For example, South Africa enhanced its statistical systems in 2016 through the National Greenhouse Gas Emission Reporting Regulations, establishing a unified system for transparent GHG emissions reporting. This system supports the maintenance of a national GHG inventory, ensures compliance with UNFCCC reporting requirements and informs the development and execution of relevant legislation and policies.

The Strategic Importance of Integrated Data Systems for NDC Enhancement

The existence and continuous development of a national statistics system–underpinned by regular surveys, consistent data collection and adherence to international standards–are essential for supporting the enhancement of NDCs. At the same time, the development of a robust energy statistics system, integrated with national accounts, is critical for ensuring comprehensive coverage of energy data that aligns with industrial decarbonization efforts.

By prioritising the integration and continuous improvement of industrial and energy statistics, countries can create a reliable foundation for data-driven decarbonization policies, ensuring that the measures implemented are both effective and aligned with the broader objectives of the Paris Agreement. Through this process, countries can strengthen their NDCs and make tangible progress toward global climate targets.

The combination of a solid legal framework, an effective data collection structure and well-defined compilation and dissemination strategies fosters data systems that support rigorous, transparent and actionable tracking of industrial decarbonization efforts. Governance and coordination across agencies further ensure that cross-cutting data on emissions, energy consumption and industrial output adhere to strict quality standards. Such a comprehensive data infrastructure is vital for making informed decisions and demonstrating progress on climate commitments, enabling countries to meet their NDC targets effectively.

Table 4 provides key "do's and don'ts" for improving data accuracy and consistency. This outlines critical actions and common pitfalls that countries should consider when building reliable and transparent data systems. This is not an exhaustive list and there are additional do's and don'ts that may be relevant in specific contexts. However, the table highlights several important considerations that can guide countries in strengthening their data accuracy and consistency.

Table 4 | Do's and Don'ts for Strengthening Institutional Mechanisms for NDC Design, Implementation and Tracking

Category	Do's	Don'ts
Legal Framework	• Establish clear legal mandates for data collection and sharing. • Ensure the independence and transparency of national statistical systems. • Mandate interagency collaboration for comprehensive data coverage.	• Avoid operating without formal legal provisions for data governance. • Do not allow political interference to compromise data integrity. • Avoid siloed data practices that hinder cross-sectoral integration.
Data Collection Entities	• Designate a lead entity, such as a National Statistical Office (NSO), for coordination. • Develop sector-specific expertise within specialised agencies where needed. • Use standardised methodologies for data collection to ensure consistency.	• Avoid assigning overlapping responsibilities without clear guidelines. • Avoid neglecting training and capacity building for data collection personnel. • Avoid relying on inconsistent or outdated data collection techniques.
Statistical Approaches	• Choose a centralised or decentralised approach based on institutional structure. • Implement robust coordination mechanisms for decentralised systems.	• Avoid uncoordinated approaches that result in data discrepancies across agencies. • Avoid disregarding the need for harmonised standards in decentralised setups.
Compilation and Dissemination	• Adopt standardised methodologies aligned with international guidelines. • Ensure timely dissemination of data via accessible platforms, such as online portals. • Regularly publish reports to enhance transparency and accountability.	• Avoid neglecting international best practices and standards. • Avoid restricting public access to relevant data or delaying dissemination unnecessarily. • Avoid insufficient documentation of methodologies, which can reduce data reliability.

Category	Do's	Don'ts
Training and Capacity Building	• Provide ongoing training for civil servants on data science and management. • Promote data-driven decision-making across government institutions.	• Avoid relying solely on external consultants without knowledge transfer mechanisms. • Avoid underutilising collected data due to a lack of expertise or awareness.
Integration with Climate Goals	• Align data systems with the NDC updating and implementation process and broader climate strategies. • Integrate industrial and energy statistics to enable comprehensive decarbonization analysis.	• Avoid isolating energy or industrial data from overall climate planning. • Avoid fragmented data systems that fail to capture intersectoral relationships.
Technology and Tools	• Invest in modern digital platforms for data collection, management and analysis.	• Avoid relying on outdated technology that hampers efficiency and data quality.

What Resources are Available for Support?

In addition to the support offered in this guide, there is a wide array of external tools, manuals, studies and guidance documents available to further assist countries in this area.

SUPPORT CHANNELS FOR ENHANCING NATIONAL STATISTICS SYSTEMS

Support Documentation and Guidance

- OECD Recommendations on Good Statistical Practice | Offers recommendations for monitoring the statistical systems of OECD member states and candidate countries.
- IMF's Data Quality Assessment Framework (DQAF) | Compares country statistical practices with best practices, including internationally accepted methodologies, to provides a structure for assessing data quality.
- European Statistics Code of Practice | This publication sets the standards for developing, producing and disseminating European statistics.
- UNSTAT Fundamental Principles of Official Statistics (A/RES/68/261 from 29 January 2014) | Provides a set of principles governing official statistics to ensure that national statistical systems can produce appropriate and reliable data, adhering to certain professional and scientific standards.
- United Nations Statistics Division Publications | Offers publications on general statistical data compilations and technical studies on international statistical standards, recommendations and special studies.
- UNIDO Statistics Portal Documents and Publications | Offers reports providing the most recent trends of world manufacturing production.
- Toolkit for Building National GHG Inventory Systems – A Toolkit to support national inventory compilers to build and advance a national GHG inventory system that suits their national context.
- GHG support Unit of the UNFCCC: Energy reviews and inventory reviews – Offers technical support to developing countries in building national GHG inventories to help implement the MRV system and ETF under the Paris Agreement
- 2006 IPCC Guidelines | Provides methodologies for estimating national inventories of anthropogenic emissions by sources and removals by sinks of GHG.
- EMEP/EEA Guidebooks | Offers expert guidance on how to compile an atmospheric emissions inventory to support the reporting of air emissions data.

Capacity-Building Support

- United Nations Statistics Division Capacity Development | Offers a wide variety of capacity-developing activities that support NSOs and the wider national statistical systems.
- World Bank Statistical Capacity Building | Provides tools and processes to improve the quality, timeliness and relevance of national and international statistics.

TARGETS | Increasing the Ambition of Targets

Enhancing the ambition of targets is a key opportunity for building upon previous NDC commitments. As countries update their NDCs, they can define more ambitious targets that reflect their evolving national capabilities and climate goals. This section explores various approaches for increasing the ambition of industry-focused NDCs, guided by the provisions of the Paris Agreement, ICTU and the ETF.

What is the NDC Context?

Countries set mitigation targets based on national circumstances and priorities. Different types of targets are used to represent national mitigation efforts, which, depending on these circumstances, may be based on various metrics.

Common Types of NDC Targets

Because they are defined at the national level, NDCs can come in many forms. Common classifications for the goals set out in NDCs are as follows:

- **Absolute emission reduction or limitation targets relative to a base year:** These targets can be economy-wide or sector-specific, aiming for a decrease, limitation, or in some cases, an increase from a base-year level. Targets may also focus on achieving carbon neutrality. Under the Paris Agreement, developed countries are expected to adopt economy-wide targets, while developing countries are encouraged to work towards them over time.
  Example: a 10 per cent reduction in CO2 emissions from the industrial sector by 2035, relative to 2020 levels.
- **Emission reduction targets below a 'business as usual' (BAU) level:** This target type commits to reducing emissions below projected BAU levels, which may be set across the entire economy or within specific sectors, either for a single year or as a multi-year budget.
  Example: a 10 per cent reduction in GHG emissions from cement production by 2035, compared to BAU emission levels.
- **Intensity targets:** These targets set limits on emissions relative to a unit of output, such as per GDP unit or per capita.
  Example: a 20 per cent reduction in the IPPU sector emission intensity (measured against the total value added for the industry) by 2035, compared to 2005 levels.
- **Peaking targets:** Allowing for emissions to rise to a defined peak before they begin to decline, peaking targets specify either an emissions level or a target year.
  Example: achieving peak emissions for aluminium production by 2030.

- **Policies and actions:** These focus on implementing specific policies or actions to address climate change, such as renewable energy laws or low-carbon urban planning, without necessarily defining a specific GHG reduction target.
  Example: by 2030, Country Z commits to implement an energy efficiency strategy for the industry.
- **Other targets:** These include tracking the mitigation co-benefits of adaptation measures and economic diversification plans, as well as non-GHG targets, like renewable energy shares, forest area increases, or energy efficiency improvements.
  Example: by 2030, Country X commits to ensuring that 20 per cent of the energy consumed in its industrial sector originates from renewable sources, such as solar, wind and biomasss.

Source: UNFCCC Reference Manual for the ETF

Despite this, Article 4, paragraph 4, of the Paris Agreement emphasises that developed country Parties should lead by implementing economy-wide absolute emission reduction targets, while developing country Parties are encouraged to enhance their mitigation efforts over time, ultimately moving towards economy-wide emission reduction or limitation targets considering their national circumstances. This provision underscores that NDC targets should ideally aim for comprehensive coverage, including all emitting sectors, sinks and gases—an economy-wide approach.

To meet ICTU standards, NDCs must define targets that accurately reflect national commitments relative to a specific reference indicator. Setting quantifiable information against a clearly defined reference point provides a baseline for transparent assessment of both ambition and progress. Moreover, NDC targets should specify timeframes and periods of implementation to offer clarity on expected emissions reductions. To ensure transparency, NDCs should also outline the scope and coverage of their targets, making clear which sectors and gases are included in the commitment.

These core components create a boundary for meaningful NDC target enhancement and include:

Target Metrics: Clear NDC indicators for the commitment, enabling consistent tracking and reporting of progress.

Target Intensity: The scale of emissions reductions relative to a baseline or reference point, indicating the ambition level of the target.

Scope and Coverage: Identification of the sectors, gases, or specific activities encompassed by the target, promoting an inclusive approach to emissions reductions.

Timeline: Defined timeframes and milestones for implementation, ensuring a structured pathway toward achieving NDC goals.

In addition to these elements, ICTU requires countries to report how their NDC is fair and ambitious considering national circumstances. This is a critical opportunity for Parties to explicitly highlight how their revised NDC improves upon their previous submission.

Countries are strongly encouraged to use this provision to clearly describe the specific areas of enhancement, such as strengthened targets, expanded scope, or improved timeline. Doing so ensures transparency and demonstrates progress under the Paris Agreement. The following sections provide practical strategies and approaches to support this process.

How can this be Enhanced?

Building on the context for enhancing NDC targets, this guide identifies five key areas for strengthening industry-focused NDCs. Each area highlights specific approaches countries can take to improve their targets, aligning with the global objectives of the Paris Agreement. With many possibilities to enhance NDC targets, this guide presents some of the main alternatives.

Summary of Possibilities for Enhancing NDC Targets

Enhancing the Industrial Sector's Scope in NDC Targets

- Expanding the industrial sectors and subsectors considered in NDC targets.
- Expanding the gases considered in industrial targets.
- Sharing NDC targets between GHG sectors.
- Transitioning to an economy-wide target.

Defining More Ambitious GHG Emission Reductions for the Industrial Sector

- Defining a more stringent level of GHG emissions reductions.
- Setting sector-specific targets that, together, boost the overall GHG reduction impact in the industrial sector.
- Setting industrial targets across decarbonization pillars (energy efficiency, industry electrification, etc.).
- Transition from conditional targets to unconditional ones.
- Changing the target type to increase GHG emission reductions.

Defining More Ambitious Timelines

- Advancing timeline for peak emissoins.
- Advancing timeline for industry specific targets.
- Advancing timeline for reaching carbon neutrality.

Updating the Target Type or Indicator for Improved Tracking and Reporting NDCs

- Updating the indicator used for tracking and reporting each NDC target.

Enhancing the Industrial Sector's Scope in NDC Targets

One of the primary ways to enhance industry targets within NDCs is by broadening the scope to encompass a comprehensive range of industrial activities and all relevant GHGs. Expanding the scope involves considering emissions across diverse industrial sub-sectors, such as manufacturing, cement, steel and chemicals and accounting for various GHGs, including methane, nitrous oxide and other industry-related emissions in addition to CO_2. By doing so, countries can ensure that their NDC targets reflect the full extent of industrial emissions, creating a more inclusive and accurate picture of their decarbonization efforts.

Depending on national circumstances, the enhancement in scope can take different forms and approaches. For example, in its Intended Nationally Determined Contribution, Albania set a target of a 11.5 per cent reduction in CO2 emissions by 2030 compared to the business-as-

usual scenario (BAU) in the energy sector. In its updated NDC, Albania enhanced the scope of its target by adding the Industrial Processes and Product Use (IPPU) sector, to the inventory and moved from CO2 to all GHGs.

Describing NDC Enhancement

Albania utilized the ICTU framework to address the elements required under Decision 4/CMA.1, ensuring clarity, transparency and understanding in its NDC submissoin. In describing how its NDC is considered fair and ambitious, Albania reported the following information: "Albania's updated NDC represents an enhancement of the first NDC, as the scope includes more sectors and gases, and the mitigation target in 2030 is more ambitious (from 11.5 per cent to 20.9 per cent). (...) The updated NDC includes all sectors except PFCs, SF_6 and NF_3 from IPPU, while the first NDC included only energy sector, showing the intent to have a mitigaton target covering all sectors".

By explicitly highlighting how its revised NDC expanded sectoral coverage beyond the original NDC, Albania clearly demonstrated how the target represents an enhancement. This approach effectively communicates progress and ensures alignment with ICTU principles, contributing to the transparency ad ambition of its commitment under the Paris Agreement.

In the case of Grenada, the enhancement of its NDC targets expanded the scope by including the IPPU sector and hydrofluorocarbon (HFC) gases. Grenada committed to reducing its GHG emissions by 40 per cent by 2030 relative to 2010 levels. In describing its updated target, Grenada emphasised that the inclusion of the IPPU sector and F-gases represented new additions to its second NDC, demonstrating a clear enhancement compared to its previous submission. Another example worth highlighting is the addition of non-GHG targets to NDC commitments. A relevant example is Mexico, which added a specific black carbon target in its revised NDC.

The ultimate progression within this enhancement area is the adoption of economy-wide emission reduction targets. Moving from industry-specific targets to economy-wide commitments signifies a high-level of ambition and reflects a holistic approach to emissions reduction. Economy-wide targets integrate emissions reductions across all major sectors, such as industry, energy, transport, agriculture and waste, fostering cross-sectoral coordination that maximises national climate impact. This comprehensive approach allows countries to achieve deeper, more balanced reductions across their economies and ensures that all sectors work towards shared climate goals. This was the case in Brunei, which transitioned from sectoral targets to economy-wide targets in its updated NDC (see box).

Economy-wide Targets in Brunei and Eswatini

Brunei committed to a reduction in GHG emissions by 20 per cent relative to BAU levels by 2030, from an initial target that aimed at achieving a 63 per cent reduction in total energy consumption by 2035. In its updated NDC, Eswatini included IPPU, waste and agriculture, forestry and other land use sectors within an economy-wide target to reduce 5 per cent of its emissions by 2030 compared to the baseline scenario as an unconditional target and 14 per cent as conditional contribution. This was alongside the energy and transport sectors from the initial NDC. Eswatini combined its economy-wide target with sectoral targets for the energy (increasing the share of renewable energy to 50 per cent in the electricity mix by 2030 relative to 2010) and IPPU (reduce GHG emissions by 2030 compared to baseline scenario).

In alignment with the Paris Agreement's long-term goals, the ultimate ambition for many countries is to achieve carbon neutrality by mid-century. For the industrial sector, achieving net-zero emissions will require a combination of deep emissions reductions and removals, leveraging both natural solutions (e.g., reforestation) and technological innovations (e.g., carbon capture and storage (CCS)). This approach underscores the importance of integrating sectoral and economy-wide targets in subsequent NDC enhancements, ensuring that each sector contributes effectively to national carbon neutrality goals.

Defining More Ambitious GHG Emissions Reductions for the Industrial Sector

Increasing ambition in the industrial sector can be achieved by committing to a more stringent level of GHG emissions reductions. Defining these more ambitious targets depends on the type of target selected by each country and generally involves either a higher reduction goal relative to a baseline or a lower emissions peak, or both.

For many countries, this means setting sector-specific targets that collectively increase the total GHG reduction impact within the industrial sector. Countries may choose to establish distinct targets for individual industries, reflecting the unique emissions profiles and decarbonization potential of each. For instance, high-emission industries like cement, aluminium and petrochemicals could be assigned more stringent targets, while smaller or less energy-intensive industries may have differentiated requirements. Alternatively, countries could choose an aggregated target that integrates all industrial activities within a unified, sector-wide goal, providing a cohesive approach to decarbonization. This approach can be taken by industry and by the IPCC sector, contributing towards an economy-wide target. This was the case in Sri Lanka. Sri Lanka committed to an economy-wide target. During implementation, the country shared the effort among sectors, attributing specific emission reductions to different mitigation sectors. Meanwhile, Mexico set an economy-wide emission reduction target against the BAU. The country assessed the potential contribution of each sector related to the economy-wide target, integrating all efforts in one aggregated economy-wide target.

Another pathway for enhancing NDC targets is to establish specific GHG reduction goals across distinct areas within the industry, such as renewable energy integration, energy efficiency improvements and low-carbon fuel transitions. By setting targeted commitments in these areas, countries can achieve progressive emissions reductions across various facets of industrial operations. For instance, renewable energy targets can focus on replacing fossil-based energy sources with alternatives like solar, wind, or biomass, while energy efficiency targets can drive reductions in total energy demand across industrial processes.

Lebanon exemplifies this approach by committing to renewable energy targets alongside its economy-wide emission reduction goals. Lebanon's unconditional targets aim to generate 18 per cent of its electricity demand and 11 per cent of its heat demand from renewable energy sources by 2030, compared to a combined 15 per cent in 2015. Conditionally, Lebanon commits to generating 30 per cent of its electricity demand and 16.5 per cent of its heat demand from renewables by 2030, compared to a combined 20 per cent in 2015. These sectoral targets complement its economy-wide unconditional target to reduce GHG emissions by 20 per cent below its BAU scenario by 2030.

Steel factory © Envato / ImageSourceCur

Another example is the European Union's 2020 Climate and Energy Package, which illustrates the possibility of setting cross-sectoral targets to enhance industrial decarbonization. The package included three distinct goals: a 20 per cent reduction in greenhouse gas emissions from 1990 levels; a 20 per cent improvement in energy efficiency; and generating 20 per cent of the EU's energy from renewable sources such as wind, solar and biomass. This integrated approach allowed the EU to address multiple facets of emissions reduction while fostering innovation across energy and industrial systems.

To establish more ambitious targets, countries can transition from conditional to unconditional commitments. Conditional targets are those dependent on receiving international support, such as financial assistance, capacity building, or technology transfer. By shifting to unconditional targets, even partially, countries signal greater ambition and a stronger commitment to achieving their climate goals independently of external support.

This transition demonstrates a reinforced national effort and contributes meaningfully to the collective goals of the Paris Agreement.

A notable example of this approach is Barbados' revised NDC. The country committed to an unconditional economy-wide reduction in GHG emissions of 35 per cent (relative to its BAU scenario) by 2030. This represents an enhancement in ambition compared to the conditional target set in its INDC, which aimed for a 44 per cent reduction by 2030. Despite the lower percentage reduction, the shift from conditional to unconditional underscores a significant increase in national commitment, as it relies solely on domestic efforts. Mauritius and Namibia made similar transitions, also reinforcing their countries' dedication to taking ownership of their climate goals and advancing independent mitigation efforts.

Defining More Ambitious Timelines

An essential factor in enhancing NDC targets is establishing a more ambitious timeline. This approach involves not only setting emissions reduction goals but also advancing timelines to achieve peak emissions sooner and reach carbon neutrality at an earlier date. Accelerating these timelines can demonstrate a country's dedication to immediate climate action, as well as its commitment to supporting a global pathway consistent with the Paris Agreement.

For countries with rapidly growing economies, this enhancement can mean peaking emissions earlier than previously anticipated, or for countries already near their peak, it can mean achieving net-zero emissions well before mid-century.

Updating the Target Type or the Indicator for Improved Tracking and Reporting on NDCs

As observed from the previous alternatives, some countries choose to change the type of target and its metrics when updating their NDC. Even minor adjustments like this can lead to significant implications for GHG emission reductions and their subsequent tracking. For instance, if a country transitions from a percentage reduction against a BAU scenario to a percentage reduction against an inventory year, this is generally regarded as a reduction in uncertainty and thus an enhancement of the NDC. Inventory-based references are inherently more accurate and reliable than projected BAU scenarios, which rely on assumptions and estimations that can increase uncertainty. Georgia's revised NDC provides a clear example. The country updated its target from commitment-based on a BAU scenario, as defined in its INDC, to an unconditional target of 35 per cent below 1990 levels of total GHG emissions by 2030.

Similarly, countries updating their NDC targets may consider changing the reference inventory year. For example, some countries use 1990 as a baseline, but transitioning to a more recent year, such as 2005, 2010, or 2020, can further reduce uncertainties associated with older data. This approach ensures the targets are based on more relevant and reliable inventory data, aligning closely with current emissions levels and trends.

Establishing GHG Reductions in the European Union

Under the Kyoto Protocol, the EU established its GHG emission reduction targets using 1990 as the baseline year. This approach aligned with historical inventory data and was standard practice among Annex I countries. In subsequent climate commitments, the EU shifted its reference year to 2005, notably in the Effort Sharing Decision (ESD) for the period 2013–2020. The ESD set binding annual GHG emission targets for each EU Member State, aiming for a collective reduction of approximately 10 per cent in total EU emissions by 2020 compared to 2005 levels.

This transition to a 2005 baseline allowed the EU to focus on more recent emission trends and levels, providing a clearer and more immediate framework for measuring progress. By using a more current reference year, the EU could set targets that better reflected recent economic and industrial developments, thereby enhancing the relevance and effectiveness of its emission reduction strategies. This approach also facilitated more accurate tracking and reporting of emissions reductions, as the data from 2005 was reflective of contemporary circumstances compared to 1990 data. This shift exemplifies best practices for setting NDC targets and reducing uncertainty, as it leverages the reporting systems established under the ETF. These systems centralise the GHG inventory, which is continuously updated to reflect the most accurate data available.

When updating targets, it is equally important to consider the indicators used to track progress toward achieving them. Some countries opt for intensity-based targets, such as emissions reductions per unit of GDP or per capita, to reflect priorities aligned with ongoing economic development. While this approach can capture progress in emissions reductions relative to economic growth or population changes, it introduces significant uncertainties and challenges for monitoring and tracking. In such cases, careful construction of the indicator alongside the target is essential.

Tracking indicators must clearly reflect the NDC targets to ensure effective monitoring. Inconsistent or ill-suited indicators can undermine the ability to evaluate progress accurately. Consistent tracking of NDC implementation requires strong and well-constructed metrics that quantify how a specific target is being achieved. When metrics do not adequately align with the targets they are meant to monitor, they must be adapted to ensure relevance and precision.

In the context of NDC enhancements, countries should strive to ensure that the indicators used for tracking progress allow for a comprehensive evaluation of their commitments. Indicators should be designed or revised according to the SMART principles: Specific, Measurable, Achievable, Realistic and Timely (Figure 4). These principles ensure that indicators are actionable and relevant, providing a clear and precise means of assessing progress toward NDC targets and broader decarbonization goals.

Figure 6 | SMART principle for indicators development.

Common Misconceptions and Issues to Consider when Updating NDC Targets

Countries have been setting mitigation targets since the early 1990s, building a foundation of knowledge and experience in GHG emissions reduction through reporting under the UNFCCC and the Kyoto Protocol. However, with the implementation of the Paris Agreement, all countries are now subject to the same level of reporting commitments, irrespective of their prior experience. This sudden shift has created challenges for some countries, leading to the adoption of targets or approaches that may not be realistic, implementable, or easily trackable. The following section highlights common misconceptions and challenges related to defining NDC targets, which could hinder implementation and create additional burdens during BTR submissions or future NDC updates.

One key challenge in NDC is related to the way targets and commitments are communicated. In many cases, countries set vague or broad targets that encompass numerous interrelated components, making their NDC commitments unclear and lacking transparency. ICTU provisions were established to guide countries define clear, transparent and understandable commitments.

Defining Targets Without Following ICTU Provisions

The following is the "NDC language" used by figurative country to define its NDC target (extracted from the Net Zero Appliances NDC Toolkit):

"Country B intends to significantly improve the energy efficiency of new appliances and equipment by 2035. This goal aligns with the UAE Consensus and the Global Renewables and Energy Efficiency Pledge, which target a collective global doubling of the rate of energy efficiency improvement. Appliance energy efficiency policies (i.e.: energy performance standards and labelling policies) have been shown to improve the average rate of energy efficiency improvement by two to three times while making appliances more affordable and less costly to operate. Improved affordability can make critical cooling appliances like fans and air conditioners more accessible to a greater share of the population, improving climate resilience.

Country B will update and expand appliance energy efficiency policies (i.e.: minimum energy performance standards and labelling requirements) for high-energy consuming products - starting with lighting, space cooling equipment, and industrial electric motor-driven systems - and expand government-backed procurement and incentives to accelerate the uptake of more energy-efficient heat pumps and industrial electric motors. Country B aims to phase out all fluorescent lighting by 2027, double the efficiency of new air conditioners by 2030, and set new minimum efficiency requirements of new industrial electric motors at efficiency class IE3 or above. Country B will develop a net-zero roadmap for the appliances sector to identify important milestones and establish systems for tracking progress".

By using this language, Country B is providing a target without following ICTU guidance. As a result, there is no clarity on the country's commitment and there is no information on the reference level or baseline, timeline, methodologies and assumptions, indicators, etc. Instead of using this type of language, countries are recommended to follow the ICTU guidance provided in Annexe 1 of Decision 4/CMA.1 to report NDC targets.

Including Policies and Measures (PAMs) as Targets in NDCs

While it is permissible, this approach can obscure the distinction between objectives and the means to achieve them. The Paris Agreement and its associated decisions generally consider PAMs as tools for implementing efforts to reduce GHG emissions, aligning with the objectives of the UNFCCC. When PAMs are defined as targets, this rationale becomes less distinct, making it challenging to track progress and clearly communicate the level of effort required. It is generally recommended to avoid defining PAMs as NDC objectives.

An additional challenge arises when countries describe all PAMs as analysed, considered, or intended as part of their NDC commitments. While NDCs are primarily meant to communicate commitments, providing a detailed list of all planned measures to achieve the commitments can limit flexibility. Countries may encounter difficulties if they need to replace or modify

PAMs due to feasibility constraints or because better mitigation alternatives have been identified. This approach can also create a burden when reporting progress, as donors often use NDC submissions to identify national priorities. Listing all PAMs could limit opportunities to adjust strategies or explore new solutions. It is important to note that the ICTU provisions do not require countries to report specific PAMs in their NDCs. Instead, they are encouraged to focus on describing assumptions, scenarios and methodologies used to inform targets.

It is good practice to define in the relevant ICTU provision what scenarios have been used and what PAMs have been considered in the approach to inform the NDC, when applicable. However, describing the specific PAMs to be implemented alongside NDC targets is different, as it provides clarity on how the targets will be achieved while maintaining flexibility in execution. PAMs can be further detailed during the implementation phase and reported through subsequent BTRs. A similar issue also arises in NDCs where PAMs, which are not part of the target, are defined as conditional or unconditional, when only targets have this differentiation. This approach reduces the clarity of NDC targets and makes it more difficult to compare commitments between Parties to the Paris Agreement.

Over-defining Targets is another Misconception in NDC Submissions

Adding multiple targets does not necessarily enhance ambition and can lead to unnecessary complexity and reporting burdens. Simple and focused targets are more effective and manageable, ensuring that countries can channel their efforts into meaningful emissions reductions rather than grappling with overly complex commitments.

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Misconception in Reporting PAMs Together with Targets

Below is the "NDC language" used by a figurative country to define its target. Two simplified approaches are defined to analyse a common misconception to report NDC targets:

APPROACH 1

Country C commits to reduce GHG emissions by 2035 by 50 per cent, compared with 2005 levels. To achieve this target, Country B intends to implement the following PAMs:

- An energy efficiency directive targeted at the industrial and the building sectors.
- A renewables strategy that aims at installing 30 GW of renewables by 2030.
- A roadmap to reduce the emissions of F-gases in the industry.

APPROACH 2

Country C commits to reduce GHG emissions by 2035 by 50 per cent, compared with 2005 levels.

Reference year: 2005

Reference indicator: % reduction of GHG emissions compared to 2005, estimated in the natinal emission inventory for all IPCC sectors.

Timeframe: 2031 to 2035.

Scope and coverage: All IPCC sectors and GHGs estimated in the national GHG inventory, estimated in line with 2006 IPCC Guidelines.

Planning processes: the NDC target was defined in a multi-stakeholder process following the methodology and the steps described in this report: [link]

Methodologies and assumptions: For defining the target, country B developed GHG emission scenarios using the MITICA methodology combined with the TIMES software, consistently with 2006 IPCC Guidelines. The scenarios estimated included a BAU scenario, and a mitigation scenario that considered the following PAMs identified by national stakeholders:

- An energy efficiency directive targeted at the industrial and the building sectors.
- A renewables strategy that aims at installing 30 GW of renewables by 2030.
- A roadmap to reduce the emissions of F-gases in the industry.

The result of the scenarios showed that Country C could commit o a 50 per cent reduction by 2035.

In Approach 1, Country C did not follow the ICTU guidance in its reporting. While Country C tried to outline the PAMs considered in defining its target, it mistakenly included these as part of the NDC commitment. In Approach 2, Country C followed ICTU guidance more closely, reporting its target in a simplified way. This example is relevant only when PAMs are not part of the target (since, according to ICTU and the Paris Agreement, PAMs can be considered targets). When PAMs are included as targets, each policy should specify the reference year, indicators, timeframe, scope, coverage, and the methodologies and assumptions used.

Confusion between Mitigation Co-benefits and Co-benefits from Mitigation Actions

A further issue is the confusion between mitigation co-benefits and co-benefits from mitigation actions. The Paris Agreement allows Parties to include the mitigation co-benefits of adaptation actions or economic diversification plans, as specified in Article 4.7.[3] However, this is distinct from the co-benefits that result from the implementation of mitigation actions, such as social or economic benefits. Many countries confuse these concepts, leading to additional reporting burdens and a lack of clarity. The Paris Agreement and its MPGs primarily refer to mitigation co-benefits from adaptation actions, not the secondary benefits of mitigation actions. Differentiating these terms is crucial to avoid misunderstandings and ensure accurate reporting.

Finally, while adaptation is recognised as a critical aspect of climate action under the Paris Agreement, NDCs are primarily focused on mitigation. Many countries attempt to include adaptation within the ICTU provisions of their NDCs, hoping to elevate the visibility of their adaptation priorities. This approach can dilute the clarity of NDC commitments and reporting. The Paris Agreement provides two distinct avenues for addressing adaptation: including mitigation co-benefits from adaptation actions in the NDC or submitting a separate adaptation communication under Article 7.10. A dedicated communication allows countries to focus on adaptation efforts comprehensively, giving them the same priority and visibility as mitigation actions. This approach is generally recommended, as it aligns adaptation efforts with national priorities, while maintaining the integrity and focus of the NDC as a mitigation document.

What Resources are Available for Support?

This document offers guidance on the activities, processes and steps necessary to enhance NDCs through a standardised approach, detailed in section 3. NDC Industrial Decarbonization Enhancement Approach. Additionally, Volume 2 of the NDC 3.0 Guidebook for Industrial Decarbonization (launched by UNIDO in February 2025) contains a curated list of industrial decarbonization measures, along with guidance on supporting mechanisms and overarching frameworks for achieving industrial decarbonization. In addition to these resources, a range of external tools, manuals, studies and guidance documents are available.

3 Article 4.7 of the Paris Agreement: "Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans can contribute to mitigation outcomes under this Article". Further, Article 10 of Decision 4 "Recognizes that each Party with a nationally determined contribution under Article 4 of the Paris Agreement that consists of mitigation co-benefits resulting from its adaptation action and/or economic diversification plans consistent with Article 4, paragraph 7, of the Paris Agreement shall provide the information referred to in annex I as applicable to its nationally determined contribution and as it relates to such mitigation co-benefits".

SUPPORT FOR INCREASING THE AMBITION OF TARGETS

Support Documentation and Guidance

- Insights for Designing Mitigation Elements in the Next Round of NDCs (OECD) | This report discusses how countries can prepare enhanced NDCs by leveraging outcomes from the Global Stocktake (GST1) and applying lessons from previous NDC cycles. It highlights the relationship between increased ambition and effective implementation, with insights on aligning national climate policies.
- UNFCCC Reference Manual for the Enhanced Transparency Framework under the Paris Agreement | This Manual provides guidance on the provisions of the ETF, supporting countries in obtaining a good understanding of the background as well as their scope and implications.
- GHG Protocol: Mitigation Goal Standard (World Resources Institute) | This publication offers guidance for designing national and subnational mitigation targets, with a structured approach for assessing and reporting progress. This resource includes methods for emissions modelling to support ambitious goal setting and NDC enhancements.
- Enhancing NDCs: Opportunities in the Power Sector | This report explores how countries can elevate their NDC targets by advancing renewable energy deployment. It offers insights into sector-specific pathways, potential impacts and technology options that align with Paris Agreement goals.
- Transformational Change Methodology | This methodology provides a framework for assessing transformational change in climate action, including guidance on how to design policies that support sustainable NDC implementation across multiple sectors.
- NDC Portal from the UNFCCC | This portal provides a repository of NDC resources from the UNFCCC.
- NDC Synthesis Reports | These reports provide an aggregated analysis of all NDCs submitted to the UNFCCC, offering insight into global progress toward emissions reduction targets. The synthesis highlights trends, identifies areas for enhanced ambition, and evaluates how current NDCs align with the Paris Agreement's long-term goals. This report is invaluable for understanding the collective impact of NDCs and identifying opportunities for improvement.
- Enhancing NDCs by 2020: Resources for Strengthening National Climate Action | This brochure provides strategies for enhancing NDCs across multiple sectors, including energy, transport, forestry and agriculture. It also addresses short-lived climate pollutants and includes an 'Updating National Emissions Projections' section to support target setting.
- Pathways to a Low-Carbon Future: Best Practices for NDC Implementation (UNDP) – This UNDP report compiles case studies and best practices from various countries, illustrating effective strategies for NDC implementation and long-term climate planning, with practical steps for enhancing and operationalizing NDCs.

3.

NDC INDUSTRIAL DECARBONIZATION ENHANCEMENT APPROACH

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3.1. Overview

Building on the three enhancement areas outlined above, this section provides a detailed, step-by-step framework for translating these concepts into actionable NDC commitments. This approach ensures countries can systematically prepare, validate, and implement their strategies for industrial decarbonization. Through this step-by-step framework (Figure 7), users are guided through the key activities, tasks and practices necessary for updating industry sector NDCs.

Each step builds on the previous one, creating a comprehensive and strategic pathway to elevate ambition and improve implementation of industrial decarbonization measures within NDCs.

By following this guidance, practitioners can identify the enhancement areas that best align with their national context, adopt a systematic approach to inform the NDC enhancement process and facilitate the effective implementation of NDC commitments.

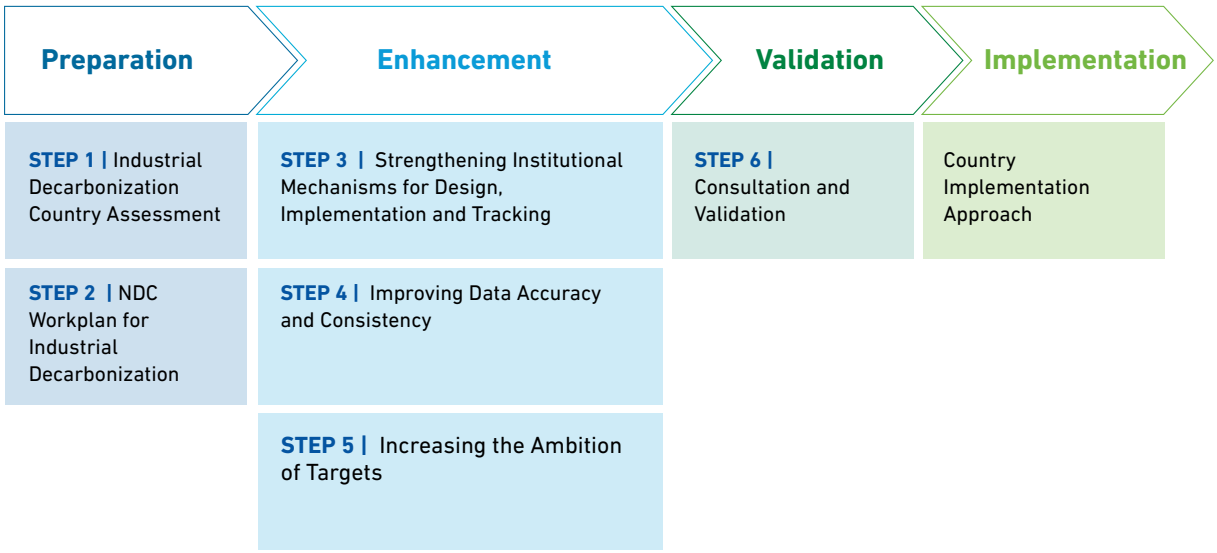

Figure 7 | Step-by-step approach for NDC enhancement.

3.2. Step by Step NDC Enhancement Approach

Preparation

STEP 1 | Industrial Decarbonization Country Assessment

The first step focuses on taking stock of the current situation, which will enable the development of a NDC Workplan for Industrial Decarbonization (hereafter referred to as the Workplan). This Workplan will outline all necessary activities for completing the NDC enhancement process, from the initial evaluation of the current situation to evaluating alternatives for NDC enhancement, socialising and validating proposals and implementing the final enhanced NDC. Since NDCs are grounded in each country's unique context, it is crucial to fully understand the current situation related to key areas of the NDC, particularly in the industry sector.

Strengthening NDC commitments for the industry sector begins with identifying national priorities, needs and gaps, as well as evaluating the country's status in terms of economic development, institutional capacity and overall capabilities. Any intervention aimed at enhancing the NDC must account for these factors to ensure alignment with national circumstances and objectives.

To facilitate the industrial decarbonization country assessment, a comprehensive checklist is provided in Annex 1 | Industrial Decarbonization Country Assessment Checklist. This checklist will assist in reviewing key transparency areas and overarching considerations in national climate change planning for the industry sector. It covers six essential assessment areas (Figure 8).

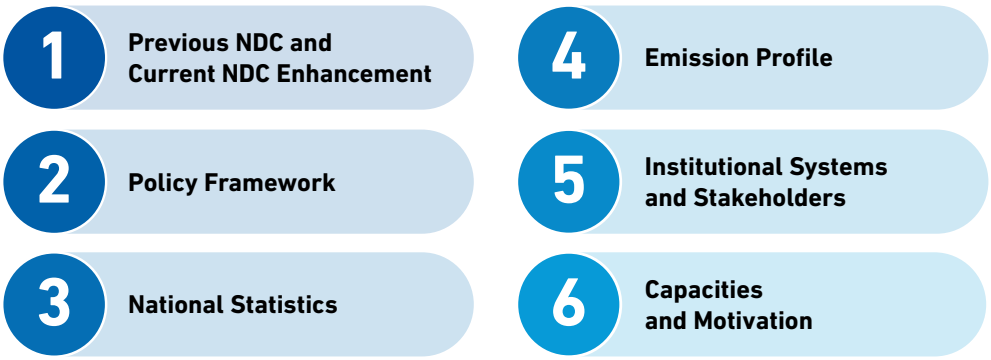

Figure 8 | Industrial decarbonization country assessment areas.

Precise and detailed answers for each checklist element will ensure a comprehensive understanding of the country's current circumstances. Each assessment area is briefly introduced below to underscore its importance in the overall country assessment.

1 Previous NDC and Current NDC Enhancement

This area covers an understanding the previous NDC, including its targets, the institutional structures involved in its formulation and implementation and the methods used to track progress. If the country has already assessed its NDC progress, this provides a valuable starting point for future enhancement efforts.

It is also crucial to ensure that the NDC enhancement for the industry sector aligns with any ongoing national efforts or initiatives for broader NDC enhancement, whether as part of a sector-specific or integrated approach. The Workplan should be closely coordinated with the overall NDC enhancement process being followed at the national level.

2 Policy Framework

This area involves analysing the current policy landscape, including existing regulations, strategies and sectoral priorities related to climate change and the industry sector. It is essential to comprehend the policy framework to conduct a mitigation assessment and identify gaps or opportunities for strengthening industry-specific NDC targets.

3 National Statistics

This section focuses on reviewing the availability and quality of national statistics related to the industry sector. A solid understanding of the current approaches to collection, management and reporting of energy and industry related data, as well as potential areas for improvement, is critical for setting realistic targets and developing strategies under the NDC. The assessment will help identify data gaps and improvements that could strengthen the NDC enhancement process, feeding into the Workplan by outlining key statistical needs and improvements.

4 Emission Profile

It is crucial to understand the country's current emission profile, including key emission sources, trends and future improvements. This area will help determine how emissions in the industry sector are developing, whether new industries are being incentivised and how these trends align with national climate targets. This knowledge is important for setting industry sector-specific targets in the NDC and will inform the Workplan by outlining where mitigation efforts should be concentrated.

5 Institutional Sytems and Stakeholders

This area assesses the organization of the country's institutional framework, identifying the main competences and stakeholders involved in the NDC formulation and implementation. It is critical to understand the roles and responsibilities within the government and relevant institutions to ensure effective coordination and implementation of NDC activities. This assessment feeds into the Workplan by mapping the key players and highlighting institutional strengths and gaps that need to be addressed.

6 Capacities and Motivation

This area examines the technical and institutional capacities, as well as the level of motivation, among stakeholders that currently contribute to the NDC enhancement process or are willing to contribute. This is key for developing a realistic Workplan that accounts for the existing capacity and motivation within the country. It will guide the Workplan by identifying areas where capacity-building efforts are needed and ensuring that the plan is practical and aligned with the country's readiness to enhance its NDC.

The findings from the industrial decarbonization country assessment will serve as the foundation for developing the Workplan. This plan will detail the activities, delivery methods, timelines and responsibilities required for NDC enhancement within the industry sector tailored to the country's national circumstances.

STEP 2 | NDC Workplan for Industrial Decarbonization

The second step involves developing a detailed Workplan, which is essential for guiding the process of enhancing the NDC in the industry sector. This Workplan will outline the specific activities, mode of delivery, timelines and the roles and responsibilities of key stakeholders. The development of the Workplan is informed by the findings of the industrial decarbonization country assessment (see above). The process for the development of the country Workplan follows three key steps (see Figure 9).

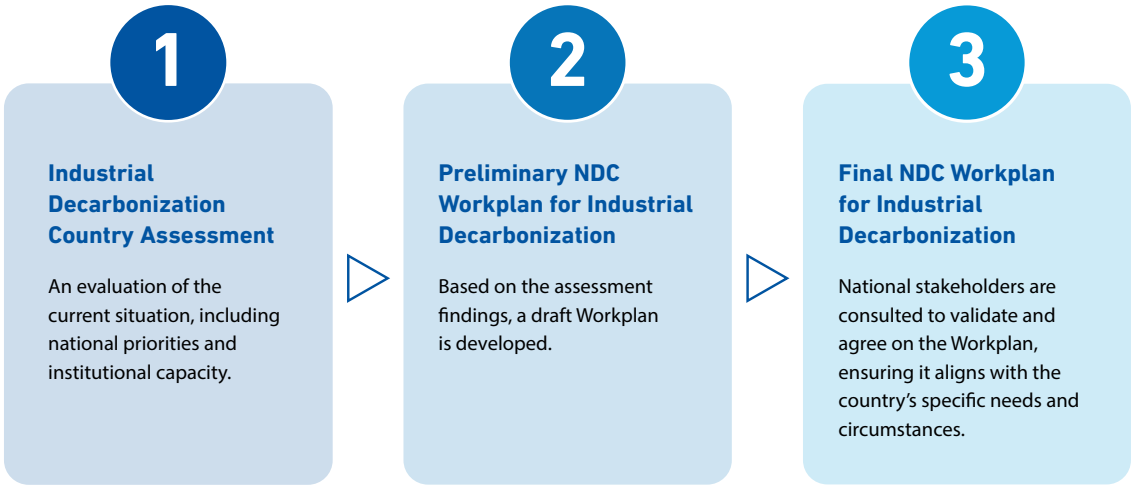

Figure 9 | Three key steps for developing a detailed Workplan.

A clearly defined and structured Workplan will ensure that efforts are well-coordinated, transparent, resulting in achievable and tangible outcomes. The Workplan should outline the following key elements:

Main activities: The Workplan should identify the key activities necessary for the NDC enhancement process. These activities will outline what needs to be done and how it will be accomplished.

Stakeholder responsibilities: The Workplan should identify the main stakeholders involved in the process and define their specific responsibilities. Clearly outlining "who needs to do what" will ensure accountability and facilitate smooth collaboration between national entities, industry representatives and international partners.

Timeline for delivery: The Workplan should provide an estimated timeline for when each activity will be completed. This should include start and end dates for each task, ensuring that the overall process is kept on track and that there is a clear understanding of "how long and when" each activity will be delivered.

Expected results: For each activity, the Workplan should outline the expected outputs or deliverables, answering the question, "what will be delivered?". These expected results will provide a basis for monitoring progress and evaluating the success of the NDC enhancement efforts.

It is a good idea to gain a full understanding of the main areas for NDC enhancement before developing the Workplan. This can be accomplished by thoroughly reviewing the 2. NDC Industrial Decarbonization Enhancement Areas section of this document. For countries with limited resources or capacity, a generic Workplan template is available in Annex 2, offering an example of activities, timelines and stakeholders.

The generic Workplan provides an example of activities and can be customised to fit a country's context. This is important as countries should avoid activities that are irrelevant to their situation as this could result in misleading NDCs and inefficient use of resources. The final Workplan should focus on addressing priority areas and be accompanied by a stakeholder engagement plan, ensuring continuous involvement throughout the project's duration.

Enhancement

This phase is about outlining the activities and approaches needed to increase ambition and implement industrial decarbonization measures within NDCs.

STEP 3 | Strengthening Institutional Mechanisms for Design, Implementation and Tracking

Assessment of the Current Governance Landscape and Institutional Arrangements

Institutional arrangements and governance frameworks are inherently country-specific, shaped by national contexts and priorities. While there is no universal formula for integrating relevant organizations, the focus should be on enabling efficient data flows and engaging decision-makers responsible for implementing climate actions. Institutional arrangements for industrial decarbonization within the framework of their NDCs should build upon existing national structures where feasible.

Alternatively, they may need to be restructured to promote effectiveness, ensuring seamless data flow and access to expertise in preparing NDCs, tracking progress and informing stakeholders. Countries must therefore assess their existing institutional arrangements to identify gaps, overlaps and inefficiencies, establishing mechanisms that foster long-term collaboration among diverse organizations. This process also involves engaging and informing new stakeholders. It may also require that new or amended laws, directives and terms of reference are introduced.

An effective NDC enhancement process related to strengthening institutional mechanisms begins with a comprehensive assessment of the current governance framework and institutional arrangements related to NDC planning, implementation and tracking. This involves analysing the mandates, roles and interactions of various entities involved in NDC preparation and implementation activities, including government agencies, industry sector authorities, industrial private sector actors and civil society organizations. Creating a more streamlined and functional governance framework relies on identifying gaps in capacity, inefficiencies in coordination and overlaps in responsibilities.

The assessment should also examine how well policies and decision-making processes integrate industrial NDC considerations across all levels of governance, from national to subnational authorities. Evaluating these dynamics ensures that institutional structures are aligned with the requirements for enhanced NDC implementation, enabling better coordination, adaptability and responsiveness to emerging challenges. This evaluation forms the foundation for strengthening governance systems to make them more robust, inclusive and capable of delivering on ambitious industrial goals and ambitions.

The assessment can draw on the Annex 1 conducted under Step 1, which reviewed the policy framework, institutional systems and key stakeholders. Leveraging this prior work provides a baseline for identifying areas requiring improvement and ensures that institutional arrangements are well-positioned to support the ambitious implementation of industrial decarbonization measures within NDCs.

Establish Institutional Arrangements

Building on the insights from the governance assessment and once the overarching thematic scope and objectives are defined, the next step is to establish and formalise institutional arrangements that clearly define the roles and responsibilities of all stakeholders involved in NDC processes within the industry sector. This involves assigning mandates to lead institutions for coordinating climate action, while ensuring that sectoral entities have well-defined roles in implementing and tracking industrial decarbonization measures. Establishing inter-agency mechanisms such as committees or working groups fosters collaboration across different government departments, sectors and non-governmental stakeholders.

When designing institutional arrangements, it is important to articulate the overarching goals and targets, and the outputs needed to track them. This helps to identify and prioritise the relevant data, expertise and organizations. It also helps the institutions involved to understand how NDC activities interact with their mandates and other national development priorities.

Institutional arrangements should also promote inclusivity by integrating private sector actors, civil society organizations and subnational entities into the decision-making process. Formalising these arrangements through legal or regulatory frameworks ensures accountability and consistency over time. This step is critical for enhancing cross-sectoral coordination, streamlining decision-making and aligning NDC implementation efforts with broader national and sectoral strategies.

The structure of institutional arrangements should define coherent roles and responsibilities across the involved organizations. A visual representation, such as an organizational chart, shows institutional linkages. This structure reflects the cross-cutting nature of managing the collection, analysis, compilation, reporting and use of data across various aspects of the industry sector. Clarifying these roles and responsibilities helps formalise the function of each organization within the NDC process. The organizational structure can be further detailed in a diagram, linking each entity with a table showing specific roles and responsibilities.

Cement factory plant © Envato / scalatore1959

The Maldives' NDC Coordination Unit

In the Maldives, the Climate Change Department within the Ministry of Environment and Energy coordinates activities related to climate change, in close collaboration with other relevant agencies. The department has established a newly created NDC Coordination Unit responsible for working on NDC implementation with all relevant institutions, both governmental and non-governmental.

A priority for this unit is to take stock of all activities, planned or underway, that contribute to NDC implementation. Additionally, a Climate Change Steering Committee will be formed to ensure high-level support from various ministries, including fisheries, agriculture, tourism, housing and infrastructure. These institutional arrangements for NDC implementation are reflected in a structured way in Figure 10.[4]

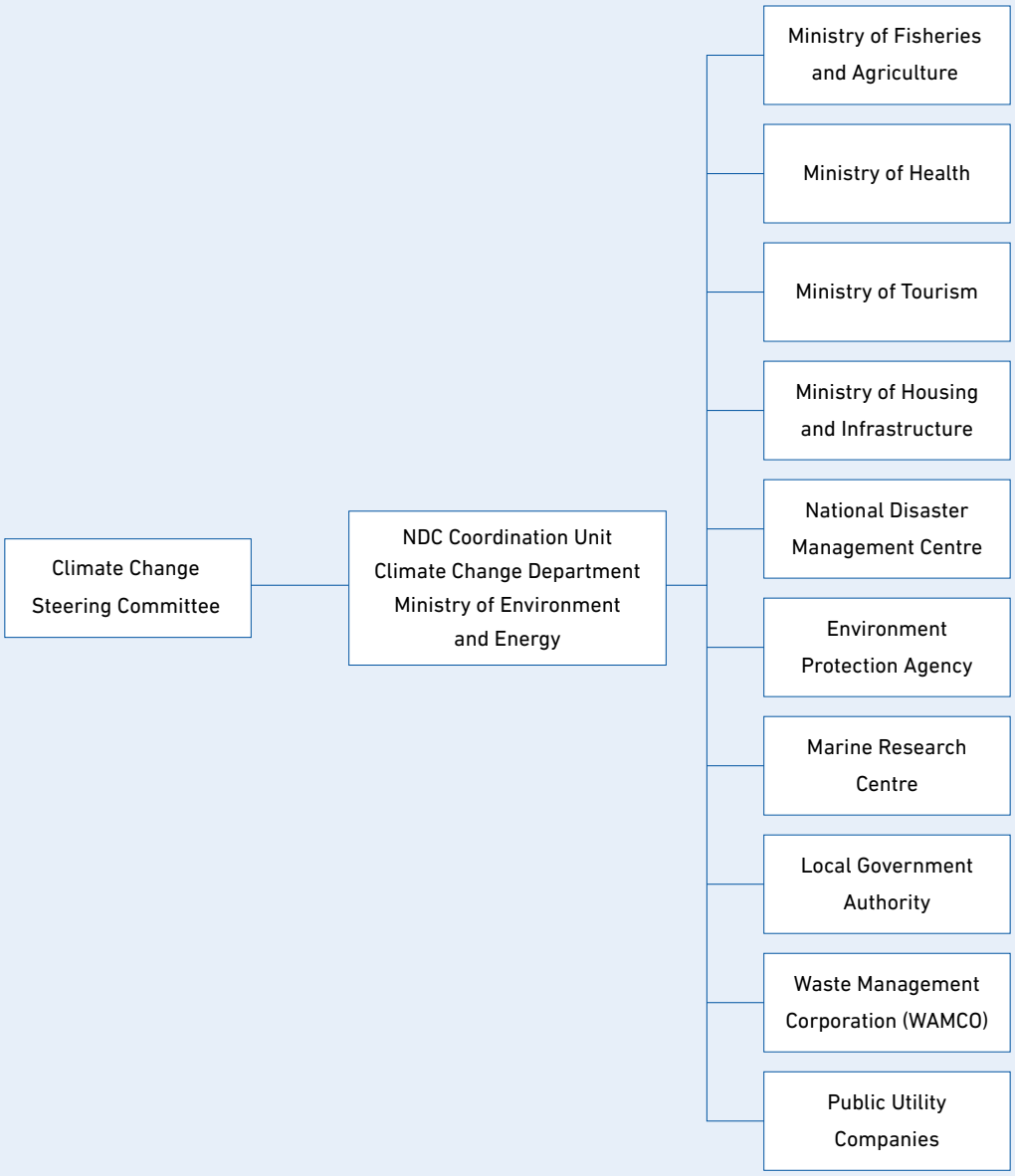

Figure 10 | The Maldives' institutional arrangements for NDC implementation.

4 Maldives's Nationally Determined Contribution (NDC) Implementation Plan, February 2018. Ministry of Environment and Energy Male, Republic of Maldives.

Develop and Formalise the MRV System

Developing and formalising a robust MRV system is critical for establishing a structured approach to planning, implementing and tracking industrial decarbonization within NDCs. The MRV system should be designed to align with the country's specific needs and industrial priorities, beginning with a clear definition of its scope, objectives and key components.

MRV systems serve to systematise and institutionalise climate reporting at the national level, ensuring high-quality and timely reporting that is both sustainable and adaptable over time. These systems are built around three core components: organizational mandates, information flows and tools and systems. Together, these elements create a framework that integrates climate reporting into the regular activities and mandates of key stakeholders. By leveraging existing structures, MRV systems can reduce complexity and enhance the efficiency of institutionalising climate reporting.

Key Components of an MRV System

- **Organizational Mandate:** Clear assignment of roles and responsibilities to institutions and entities involved in data collection, estimation and reporting.
- **Information Flows:** Defined pathways for sharing data and information between stakeholders to support consistent and efficient reporting.
- **Tools and Systems:** Standardized methodologies, templates, and digital systems that facilitate data collection, estimation and reporting, supported by rigorous quality assurance and control processes.

Deployment MRV systems requires the implementation of step-by-step manuals, referred to as MRV protocols. These protocols outline the activities to be performed, the entities responsible and the timeframes for completion. They also specify the information that must be shared between institutions and detail the tools, templates and systems required for each task. Collectively, these activities form the MRV cycle: a recurring sequence of tasks designed to comply with specific reporting timeframes and obligations. The MRV cycle operates on a continuous basis, typically aligned with recurring reporting requirements.

Formalizing MRV cycles helps countries meet international reporting standards by providing a standardised and transparent approach to data collection, estimation and reporting. The process is reinforced by rigorous quality checks that adhere to international best practices. Clear delineation of roles and responsibilities, supported by legal and regulatory frameworks, ensures that all stakeholders have well-defined tasks within the MRV system. Legal formalisation also promotes long-term sustainability by embedding the system into national planning and reporting frameworks.

A well-structured MRV system aligns reporting efforts with the overarching goals of industrial decarbonization and NDC tracking, creating a foundation for continuous improvement. Standardisation enables stakeholders to identify actionable improvements and progressively enhance reporting standards. This iterative process strengthens transparency and builds confidence among domestic and international partners, ensuring the MRV system remains a cornerstone of effective climate action.

Workers in metal industry © Envato / FoToArtist_1

Build Institutional and Technical Capacities

These systems require a deep understanding of how to monitor, review and verify industry sector climate data in line with international best practices. Strengthening the technical and institutional capabilities of stakeholders enables them to navigate these complex processes and maintain the quality and integrity of the data used for reporting.

Capacity-building initiatives should target all actors involved in the MRV system, including government agencies, sectoral authorities, industrial stakeholders and civil society organizations. Each actor has distinct responsibilities and must develop specific competencies to execute their roles effectively. Identifying these actors and assessing their capacity-building needs is the first step, followed by determining the training objectives that address their roles and challenges.

The training should focus on developing skills in MRV methodologies, GHG inventory preparation, sector-specific decarbonization strategies and compliance with international reporting requirements and international best practices. To achieve this, capacity-building activities should include diverse formats, such as workshops, online training, practical exercises and tools that standardise and simplify implementation and monitoring efforts. Tailored materials and guidelines ensure consistency and accessibility for all participants.

Building self-reliance by transferring expertise to national institutions (particularly in countries where external consultants have traditionally supported NDC processes) ensures

the long-term sustainability of MRV systems. Developing the technical skills of local actors reduces dependency on external support and fosters institutional ownership of MRV processes.

Ongoing capacity-building efforts must be adaptable to address new challenges as NDC enhancement processes evolve. Regular assessments of stakeholder competencies can help refine training programmes, keeping participants prepared for emerging complexities in NDC planning, implementation and tracking.

These initiatives can also build on the insights from the Annex 1 conducted under Step 1. This assessment identifies existing capacities and motivations, providing a roadmap for targeted capacity development. By leveraging this foundation, countries can focus on priority areas and align their efforts with industrial decarbonization goals within NDCs.

Industrial plant © Envato / wirestock

STEP 4 | Improving Data Accuracy and Consistency

Assess Existing Data Systems

The first step in improving data accuracy and consistency is to evaluate the current state of national data systems, examining the completeness, accuracy and timeliness of the available data. This evaluation should prioritise identifying gaps in data coverage, inefficiencies in the data collection process and areas where data quality needs to be improved.

In addition, a review of existing methodologies, data sources and institutional practices is necessary to ensure they are in line with international standards and best practices. A comprehensive assessment will help pinpoint areas related to industry sector data that require immediate attention. It will also reveal opportunities for integrating new data sources, such as satellite imagery or advanced technologies, to improve the accuracy of industrial decarbonization planning, implementation and tracking.

The assessment should address key questions about the existing data systems. These include if the current industry sector information system is adequate to support the design and tracking of NDC progress. It should also explore which additional data might be necessary to support the analytical and strategic work being conducted at the national level to meet NDC targets. Answering these questions can reveal systemic limitations or data gaps, helping identify their root causes and corrective actions. Ultimately, the information system and industry statistics must be capable of supporting NDC objectives effectively and accurately.

It is also important to understand the data needs of primary users. Regularly assessing their information requirements ensures more timely and effective responses to evolving needs. Conducting a comprehensive stakeholder mapping exercise will identify key national players who can help development the national industry sector information system. It is important to involve them in the strategy development process.

Reviewing existing methodologies and practices against international standards ensures that the national data system aligns with global best practices. Advanced techniques, such as satellite data to monitor industrial emissions or implementing smart meters for real-time energy tracking, can help fill data gaps. For example, remote sensing technology has been successfully used to

Methods and Tools for Data Systems Assessment

Various tools and approaches can be used to assess data systems. Some of these include:

- Data audits
- Stakeholder consultations and surveys
- Gap analysis and data mapping
- Benchmarking against international standards and guidelines
- Reviewing existing metadata and data sources

monitor deforestation and similar approaches could be adapted to track emissions from industrial hotspots.

These tools and methods help identify areas for improvement, ensure that data systems are functioning effectively and support innovative data collection techniques to be integrated, enhancing accuracy and consistency.

The assessment can build on the findings of the Annex 1 conducted under Step 1, which examined national statistics such as national accounts, energy statistics and industrial data. By leveraging this prior work, a baseline is established to identify areas that need improvement to effectively support the ambitious implementation of industrial decarbonization measures within NDCs.

Establish a Legal and Institutional Framework

A robust legal and institutional framework is essential for ensuring data accuracy and consistency. Such a framework should clearly define the roles and responsibilities of all stakeholders involved in data collection, management and dissemination. It should formalise these processes while maintaining the independence of national statistical systems and fostering cross-sectoral collaboration to enhance efficiency and effectiveness.

Key legal provisions must authorize data collection and sharing across sectors (including industry and energy) while establishing mechanisms to ensure accurate, transparent, and accountable reporting. By adopting a strong legal framework, countries can standardise data practices and provide the necessary support for NDC implementation and industrial decarbonization goals.

Many countries have general legislation governing statistical work. While typically not specific to energy or industrial statistics, these frameworks designate the entities responsible for data collection and dissemination, granting them access to primary information sources. This can include mechanisms for mandatory data provision by respondents, access to administrative data and measures to safeguard privacy and confidentiality. It is critical to ensure that respondents are both legally required and incentivised to provide accurate data, with appropriate privacy protections enshrined in the underlying legislation.

Institutional arrangements for collecting and disseminating industrial and energy information vary significantly across countries. For instance, energy data may be managed by the Ministry of Industry, the NSO, or other specialised entities. In many cases, additional stakeholders such as regulators, tax authorities and customs offices contribute to data collection, validation and release. These organizations often gather data for their own operational needs, which can be leveraged to fill gaps and reduce redundancy. Effective institutional coordination is crucial to avoid duplication of efforts and ensure the cost-efficient use of limited resources.

To establish clarity and optimise collaboration, it is essential to understand the stakeholders involved, their roles and interconnections. Mapping these stakeholders provides a visual representation of their relationships, helping to identify potential overlaps or gaps in mandates and responsibilities. For example, such a map may reveal that both the customs office and tax authority collect similar import data, offering an opportunity to streamline processes and enhance data reliability.

By implementing well-defined legal and institutional frameworks supported by stakeholder mapping and coordination, countries can strengthen their data systems to effectively enhance the ambition and implementation of industrial decarbonization measures within their NDCs.

Develop and Strengthen Data Collection Systems

To enhance data accuracy, countries must develop and strengthen comprehensive data collection systems that integrate industry sector-specific data into a unified national framework. NSOs should play a central role in coordinating data collection efforts, while specialised agencies may manage sectoral data. Standardised methodologies for data collection and reporting are crucial to ensure consistency, comparability and alignment with international standards, facilitating cross-sectoral and cross-country analyses.

A robust data collection system must adhere to documented methodologies and standards, supported by clear quality control processes to verify data accuracy and reliability. The primary aim of an industrial statistics programme is to produce comprehensive, accurate and timely information about industrial activity within the economy. This data can be collected through statistical surveys or derived from administrative sources, with most systems employing a combination of both to maximise coverage and efficiency.

Once data needs and priorities are identified, the appropriate data collection strategy should be tailored to the national context. When existing sources do not provide adequate information, surveys can be used. Emerging technologies, such as smart meters, sensors and satellite imagery, offer innovative ways to complement traditional data collection methods, providing real-time and high-precision insights. In cases where direct data collection is not feasible, data modelling may fill gaps, but to ensure accuracy, this approach should be used sparingly and as a last resort.

The methodologies and standards adopted during data collection have a direct impact on the utility and reliability of the information produced. Alignment with international standards ensures compatibility with global datasets and facilitates cross-country comparisons. Additionally, adhering to standardised classifications enhances data integration and reuse, enabling a more cohesive and efficient data ecosystem.

Producing industrial statistics is a multi-stage process encompassing data collection, processing, compilation and dissemination. A core element of this process is quality management, which ensures that data is “fit for use”. Users should have access to sufficient information to confirm that the conceptual frameworks and definitions applied during data collection align with their needs. Moreover, they must be able to assess the accuracy of the data and its suitability for their intended analyses or interpretations.

To systematically monitor and communicate the quality of industrial data, statistical offices should adopt comprehensive quality management practices. These include rigorous validation processes, transparent methodologies and detailed documentation. Regular evaluations using key quality indicators – such as those outlined in Table 5 – help maintain high data standards. These indicators are simple to implement and provide stakeholders with a clear, real-time assessment of the overall quality and reliability of industrial statistics.

Table 5 | Example of key quality indicators of industrial statistics

Quality dimension	Quality measure / indicator
Relevance	R_1 Identification of gaps between key user interests and compiled industrial statistics in terms of concepts, coverage and detail R_2 User satisfaction survey
Accuracy	A_1 Sampling errors of estimates • Coefficient of variation A_2 Non-samplig errors • Unit response rate • Item response rate A_3 Number and average size of revisions of industrial statistics
Timeliness	T_1 Time lag between the end of the reference period and the date of the first release (or the release of final results) of industrial statistics
Methodological soundness	MS_1 Number and rates of divergences from the relevant international statistical standards in concepts and measurement procedures used in the collection / compilation of industrial statistics
Coherence	CO_1 Comparision and joint use of related industrial statistics derived from different sources
Accessibility	AC_1 Number and types of means used for dissemination of industrial statistics AC_2 Industrial statistics data sets made available, by mode of dissemination, as a percentage of total industrial data sets produced

By adhering to these principles, countries can build strong data collection systems that support the accurate tracking of industrial activities, facilitate evidence-based decision-making and advance progress on national and international goals, including NDC objectives and industrial decarbonization efforts.

Build Capacity and Infrastructure

A critical component of improving data accuracy and consistency is investing in the capacity and infrastructure needed to support national data systems. This includes training personnel in data management, statistical analysis and reporting, as well as enhancing technological infrastructure to handle the growing demands of data collection and analysis.

Capacity building should foster a culture of data-driven decision-making within government agencies. For personnel involved in collecting and managing industrial data, specialised training and continuous professional development are essential. These efforts should be tailored to address specific needs identified through comprehensive capacity assessments, such as insights gained from the Annex 1 conducted under Step 1. This assessment provides a clear roadmap for targeted skill development by identifying existing capabilities and areas for improvement.

Leveraging online education platforms can further support staff in familiarising themselves with international methodologies and reporting frameworks, ensuring alignment with global standards and best practices. Such training equips personnel with the expertise needed to handle sector-specific data effectively and contribute to robust and reliable industrial statistics.

Data management spans the entire information chain, from obtaining primary data to preparing final data products for dissemination. The use of digital tools in this process reduces manual errors, enhances efficiency and improves data reliability. Modern technological infrastructure–such as advanced databases, automated processing systems and data integration tools–ensures that data can be stored, processed and accessed efficiently. These systems enable seamless collaboration across agencies, facilitate data sharing and enhance transparency and accountability in industrial decarbonization efforts. Investments in infrastructure should also include systems capable of handling large datasets, integrating data from diverse sources and generating actionable insights. These advancements support robust data analysis and reporting, enabling decision-makers to track progress and identify opportunities for improvement.

By combining targeted capacity-building initiatives with strategic infrastructure upgrades, countries can significantly enhance the quality, reliability and usability of their industrial data systems.

Implement Compilation and Dissemination Strategies

Effective data compilation and dissemination strategies are essential for ensuring the utility and transparency of industrial statistics. Once data is collected and verified, it should be compiled using standardised methods that align with international guidelines, enabling consistent and reliable reporting. This ensures that the data is fit for purpose and comparable across sectors and countries, thereby supporting national and international decision-making processes.

The dissemination of industrial statistics is a critical component of data production and must be tailored to meet the needs of diverse user groups, including policymakers, businesses,

researchers and the public. Understanding the users' requirements is fundamental to designing appropriate dissemination channels and formats. For example, policymakers may need concise and timely summaries, while researchers may require detailed datasets with comprehensive metadata. Regular reviews of data relevance and presentation formats can further improve accessibility and usability.

Statistical authorities should ensure that dissemination practices adhere to three key principles: confidentiality, equality and objectivity. Data collected under legal authority, as stipulated by national statistical acts and regulations, must respect the confidentiality of respondents while providing equitable access to all users. These principles enhance trust in the statistical system and foster broad engagement with the data.

Data should be made publicly accessible through user-friendly platforms, such as statistical office websites or online databases. Dissemination formats can include electronic resources and paper publications, depending on the audience's needs. Press releases, designed for mass media redistribution and more detailed reports for specialised users can also serve as effective dissemination tools. Countries may consider offering both standard datasets and customised tabulations upon request, with appropriate procedures to inform users about the availability of additional data and services.

For users who require a clear understanding of the data's coverage, periodicity, timeliness, quality and methodology, metadata is as important as the data itself. Countries should prioritise the development and dissemination of comprehensive metadata to accompany industrial statistics. Key components of metadata should include details about data sources, integrity, quality assessments, methodologies used and dissemination formats. Deviations from internationally accepted standards should be explicitly noted to ensure transparency. To meet the diverse needs of users, countries might consider offering varying levels of metadata detail, from high-level summaries to in-depth technical descriptions.

By adopting robust compilation and dissemination strategies, supported by accessible metadata, countries can enhance the credibility, transparency and accountability of their industrial statistics. These efforts play a crucial role in strengthening the effectiveness of industrial decarbonization measures and broader NDC implementation, ensuring data serves as a reliable foundation for tracking progress and informing future actions.

Pouring cement © Envato / stockcentral

STEP 5 | Increasing the Ambition of Targets

Assessment of the GHG Emissions Profile and Development Trends

A detailed industry sector assessment of the GHG emissions profile as well as national development trends are required to evaluate the current emissions levels, their sources in the country and their future evolution. This step extends on the industry sector assessment under Step 1, which should scope the overall availability and completeness of a national GHG inventory as well as of national statistics required to make informed evaluations of the future development of the country and the industry sector.

In relation to NDC enhancement, this assessment is required for evaluating the achievement of current emission targets, as well as the possibilities for establishing new targets and enhancing emissions reductions commitments in the future.

Each country's potential for emissions reduction varies depending on its economic structure, with some areas offering more emission reduction potential than others. For example, emissions may be higher in specific industrial sectors or the decarbonization alternatives include new technologies or practices that allow for further emissions reductions. Linked to that, the level of technological readiness of decarbonization alternatives plays an important role in the prioritisation of technologies and practices to be considered.

Areas with higher emissions would generally have a higher potential for reducing emissions. Linking to the common accounting framework for GHG emissions, these are represented in national GHG inventories as key categories, which are those emission sources with more relevance in the national emission profile. It follows, key categories in the GHG inventory should be strongly considered for the adoption of decarbonization measures.

The key sub-steps for an effective situational assessment of the emission profile and the development trends are discussed below.

Figure 11 | The key sub-steps for an effective situational assessment.

1 Review of National Statistics

Countries should conduct a stocktake of the availability and quality of national statistics. This is required to develop an informed projection framework through which future GHG emissions reduction targets can be defined. It is crucial to review the below statistics.

- **Industry statistics and indexes:** data on industry registers detailing the type and the specific operation of industries as well as relevant industry policies are important for an adequate sector assessment.
- **Industrial production and consumption quantities** of different resources and goods are needed to identify adequate decarbonization alternatives.
- **Import and export statistics** related to goods used and produced in the industry.
- **Energy statistics:** data on energy use regarding fuels and electricity in industrial processes are required.
- **Socio-economic statistics:** data on the population, the GDP, industry sector disaggregation of gross and net-value added as well as development projections of these statistics are relevant.
- **The socio-economic pathways** considering different climate change scenarios and development pathways further support the subsequent development of a projection framework.
- **Other statistics and databases.**

Countries should ensure full compliance with all relevant data and statistics, while the central authority responsible for NDC planning and enhancement must ensure proper registration and archiving of the information.

2 GHG Inventory Review

Next to the main statistics, countries should review their national GHG inventories to identify relevant emissions levels, dynamics and trends related to industry sector emissions.

In principle, national GHG inventories provide emission estimates for all GHGs, covering data from 1990 onward and include all categories considered part of the industrial classification. However, some cases countries have started compiling inventories from later starting years. In either case, countries should prioritise using the longest time series available to them.

In this step, countries should begin evaluating existing inventories to obtain emission estimates for all industrial sources at the national level.

Review of the National GHG Inventory

The principles of inventory compilation aim to obtain inventories that are complete, consistent and accurate as explained below.

Completeness: all national emission sources are covered.

Consistency: the time series is estimated using consistent methodologies without methodological breaks.

Accuracy: estimated using appropriate methodology from the 2006 IPCC guidelines and the 2019 refinement, including a higher tier methodology (tier 2/tier3) for key categories of the inventory thereby enhancing the accuracy.

Inventories are sometimes incomplete due to gaps in the coverage of categories, gases, or years or because the time series may be inconsistent. This is often the result of countries still working to establish reliable systems for producing robust estimates. Accuracy can also be a challenge due to data compilation or estimation limitations. As a result, some categories can be over or underestimated.

The ETF review process assesses countries' inventories submitted in the BTRs every two years, focusing on the completeness, consistency and accuracy of the GHG inventories. It also assesses the transparency and comparability of the estimates, which are additional principles aimed at ensuring the clarity of the information. In the reviews, medium- to long-term inventory improvement recommendations are provided to countries. Nevertheless, some countries will have limited inventories.

Although many countries are expected to face challenges with their GHG inventories, they are still required to update their NDCs every five years. For countries lacking robust inventories, a gap-filling approach may be necessary to conduct a thorough mitigation assessment.

As a starting point, the guiding questions as part of STEP 1 | Industrial Decarbonization Country Assessment can be used to review the national inventory. However, a more comprehensive review of the national GHG inventory for the industrial sector should be completed following UNFCCC Guidelines.

Gap-filling Approach for the National GHG Inventory

Depending on the national inventory review findings, different gaps and issues can be identified. In cases where emission sources or gases are not estimated, gap-filling approaches or Tier 1 inventory calculation methods from 2006 IPCC Guidelines can be applied to complete the national inventory. During the review, caution should be used when applying the gap-filling approach, as there are instances where certain emission sources do not occur in the country. In such cases, these categories should be excluded.

The methodologies for gap-filling shall always be in line with IPCC 2006 Guidelines and its 2019 Refinement and follow either sectoral methodologies, or splicing techniques available in Chapter 5, Volume 1 of the 2006 IPCC Guidelines.

A set of guiding questions is provided to help identify cases where gap-filling techniques are necessary.

Criteria for Identifying Cases Requiring Gap-Filling

- Do you have evidence of any emission source not estimated by the inventory?

NOTE | Evidence of a particular emission source not estimated by the inventory can be found in peer-reviewed literature, national statistics or international sources on the occurence of a particular emission source. National stakeholders and experts are the best source of such evidence. When the evidence is not backed up by these sources, it is likely that emission does not occur in the country, or is not applicable.

- Is there any national report on the inventory that describes the reason for not estimating such emission sources? Does the report acknowledge the gap in the inventory?

NOTE | In many cases, gaps are acknowledged and part of the inventory improvement plan. In that case, a gap-filling approach would be recommended.

- Have you found any evident mistakes in the application of emission factors or methodologies from 2006 IPCC Guidelines and its 2019 Refinement?

NOTE | It is good practice, when obvious mistakes are identified in the application of 2006 IPCC methodologies, to consult with the report authors or competent authorities. When big mistakes are identified in the GHG inventory, they can significantly affect the results of the mitigation assessment. It is therefore good practice to confirm the potential error and apply a correction for the mitgation assessment, when needed.

A critical issue for undertaking gap-filling approaches is data availability. One of the main reasons for gaps in national GHG inventories is a lack of data. International sources of information can be used to obtain information. It is critical to confirm with stakeholders that they agree to use the gap-filling approach and international data. In general, UN entities and relevant international organizations such the World Bank or the OECD provide relevant data sources.

Key Data Sources for Gap-filling

- **UN statistics |** UN statistics compile energy balances by country for numerous countries. Energy balances are disaggregated by commodity, energy supply, transformation and end use sector (including energy and manufacturing industries).
- **IEA statistics |** The International Energy Agency provides different statistics for numerous countries. These statistics include energy balances.
- **IRENA country reports and statistics |**
  - Complete Country Report
  - Statistical Profiles
- **World Bank database |** The World Bank compiles the main statistics for most countries. These statistics include economic, demographic and sectoral data (energy statistics and industrial indexes).
- **OECD statistics |** Trusted statistics supporting evidence-based policy
- Other inventories from neighbouring or similar countries. Information on the inventories from other countries can be found in the BTR and national inventory submissions.

What Happens if the Data of the GHG Inventory is Unavailable?

In some countries, inventories may be developed to satisfy a particular report and only the total GHG emissions are available, without any raw data, methodological explanation, or data disaggregation. In such cases, the use of national GHG inventories is not recommended. It is recommended that the mitigation assessment begins with estimating a simplified inventory, using nationally available aggregated data and international sources of data following the 2006 IPCC Guidelines for the sectors and categories considered under industry.

3 Definition of the Projection Framework

After thoroughly assessing the GHG emissions profile and the statistics reflecting the status of the industrial sector, countries should establish a framework for evaluating different emissions scenarios and associated mitigation pathways. These are essential for setting enhanced NDC targets for the next period. These scenarios depend on the evaluation of future conditions, as they are critical in determining which activities can reduce GHG emissions and to what extent.

The Relevance of Projection Frameworks

Countries with extensive plans to expand their economies–particuin particular their industrial sectors–or those anticipating significant shifts toward other sectors, driven by overarching national strategies, will likely see their emissions profile affected. Consequently, when formulating enhanced NDC targets, it is crucial to align with these expected development trajectories to:

12. identify suitable mitigation alternatives, and
13. set realistic targets.

It is important to note that developing projections is not a direct requirement under the ETF of the Paris Agreement.[5] NDC targets can be enhanced by examining the current emissions profile and identifying potential decarbonization measures. However, most countries typically develop projections of various scenarios to account for the future evolution of existing emission sources and to refine their targets. In this context, projection frameworks often use climate scenarios based on the IPCC's Shared Socioeconomic Pathways, which model climate variables based on different socioeconomic development trajectories, leading to more or less severe climate change scenarios.

What is a Projection Framework?

A projection framework is the approach a country uses to define the future evolution of key macroeconomic, demographic and sectoral variables that drive industrial emissions. This framework is crucial for enhancing NDCs as it supports the development of strategies to raise ambition through the implementation of industrial decarbonization measures.

Drivers or Determinants to Consider within the Projection Framework

Industry emissions are driven by anthropogenic activities, particularly industrial activities in the manufacturing and processing industries. These activities, in turn, are influenced by macroeconomic and demographic trends that shape national development and inform industrial policy.

5 In the context of the ETF, the projection framework is translated in assumptions and parameters of projections, used to ease NDC tracking, and reported in CTF Table 11.

The projection framework needs to define the future evolution of these key variables, which influence GHG emissions and illustrate the future economic development of the country. Among these, the main drivers of industrial emissions are the following.

Gross Domestic Production (GDP) and its disaggregation–Gross Value Added–by economic activity: The evolution of GDP (adjusted by inflation) over time arguably is one of the strongest indicators influencing future projections. For the case of industry, the percentage of GDP covered by the industrial sector, or the total gross value added, would be the data required. If this information is available by economic branch, it will help projecting the emissions of certain sources.

Total energy demand and total energy supply (in common energy units, such as terajoules): These are the most common metrics used for energy planning and could be used together with other proxies to define a projections framework for the mitigation assessment.

Industrial indexes: Industrial indexes on activity as a whole and by industry branch, can be used to define the projection framework of the industrial sector.

Population and labour statistics: Even though population development trends are often not directly linked to specific industrial activities, assessing these trends is needed to complete the projection framework, as well as to define the total energy demand and supply of the energy system. Ensuring greater methodological soundness, population trends can also support the evaluation of the consistency of the projection framework.

Land use and future land use availability: The availability of land for different economic activities impacts other land uses and involves changes in emission patterns.

Prices of commodities and overall prices of the economy: Energy and industrial prices in a given market, region, or country can determine the availability of inputs for industrial processes.

Together with the GHG inventory, these drivers– supported by the national statistics–build the projection framework from which mitigation pathways (i.e., GHG scenarios) can be developed. Data on drivers must be compiled and their evolution verified with stakeholders to define a projection framework,[6] which will be used to develop GHG projections as detailed in the following steps.

6 The evolution of some drivers can be extracted from existing planning documents or prospects available at the country level. In some cases, assumptions can be made to define the evolution of some proxies. In the definition of the projection framework, practitioners need to ensure that the evolution of proxies is coherent.

Identification and Prioritisation of Policies and Measures

The term "policies and measures (PAMs)" is widely used in the context of NDC enhancement and reporting under the Paris Agreement.

But what are PAMs?

PAMs are interventions aimed at reducing the future emission levels of a given activity, sector, or country, or at enhancing carbon sinks. The term includes policies, regulations, strategies, actions, projects and every type of intervention that reduces GHG emissions or increases CO2 removals. Countries can implement specific measures alone, or in the form of wider programmes or interventions. Each country can use its own definition of PAMs for reporting and for its NDC enhancement process.

The development of projections and the evaluation of targets often starts by the identification of PAMs that impact GHG sources, now or in the future. It is good practice to set the national definition of PAM before starting to identify them. Furthermore, it is recommended that PAM identification focuses on the emissions that are identified as a key category in the national inventory.

The identification of PAMs builds from those that are being implemented, as well as those adopted for future implementation. This can be followed by PAMs that are being discussed for its future implementation. Further, for planning purposes, the identification of PAMs is expanded to include additional alternatives for reducing emissions. Projections then evaluate the impact of these groups of PAMs on future emission levels, helping to assess feasible GHG emission reduction options and potential targets for the NDC.

To support the identification of PAMs at the country level, Volume 2 of the NDC 3.0 Guidebook for Industrial Decarbonization provides:

- **A list of industrial decarbonization measures**, which are specific interventions to reduce GHG emissions in the industry.
- **A list of overarching frameworks and supporting mechanisms** to operationalise the design and implementation of industrial mitigation actions, exploring different possibilities available and case studies to group and scale up specific GHG emission reduction interventions.

The identification of PAMs is followed by an assessment and prioritisation process (Figure 12).

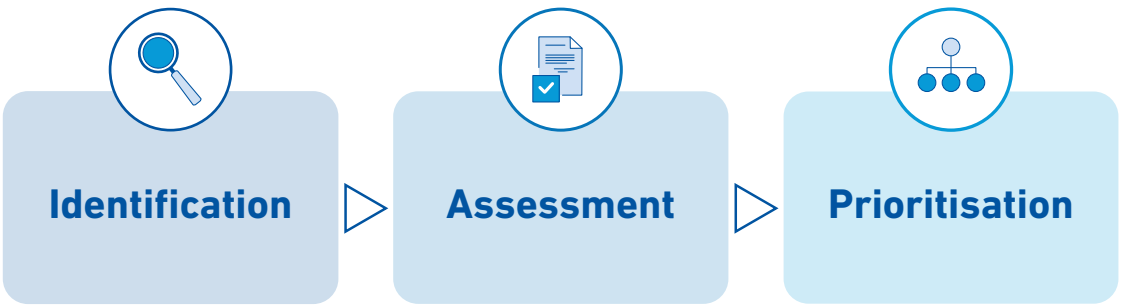

Figure 12 | Summary of steps for prioritising PAMs.

The prioritisation of PAMs is identified as a good practice to shape mitigation scenarios. Under the ETF, mitigation scenarios are defined as without measures (WOM), with measures (WEM) and with additional measures (WAM), considering the effect of different PAMs.

The assessment of PAMs is generally focused on GHG emission impact and costs to provide the basis for the prioritisation. For estimating the GHG impact and costs of PAMs, apart from this guidebook, countries can use several frameworks and tools, within or outside projected scenarios.

The assessment results of PAMs could follow a prioritisation approach before defining mitigation scenarios. The UNEP Guidebooks for conducting Technology Needs Assessments (TNAs) offer a comprehensive overview of best practices for prioritizing measures—though in the case of TNAs, the focus is on prioritizing technologies rather than PAMs.

Figure 13 illustrates the prioritisation process followed for developing TNAs. In this process, prioritisation criteria are first defined, followed by an evaluation (scoring) of each identified mitigation option against these criteria. These criteria can include quantitative factors, such as GHG emissions reduction potential and cost, as well as qualitative variables, such as market readiness or alignment with existing policy frameworks. Each criterion is assigned a weight, enabling the combination of scores within a multi-criteria framework. This approach facilitates the ranking of mitigation options by priority, based on their aggregated scores. Summary of steps for prioritising PAMs.

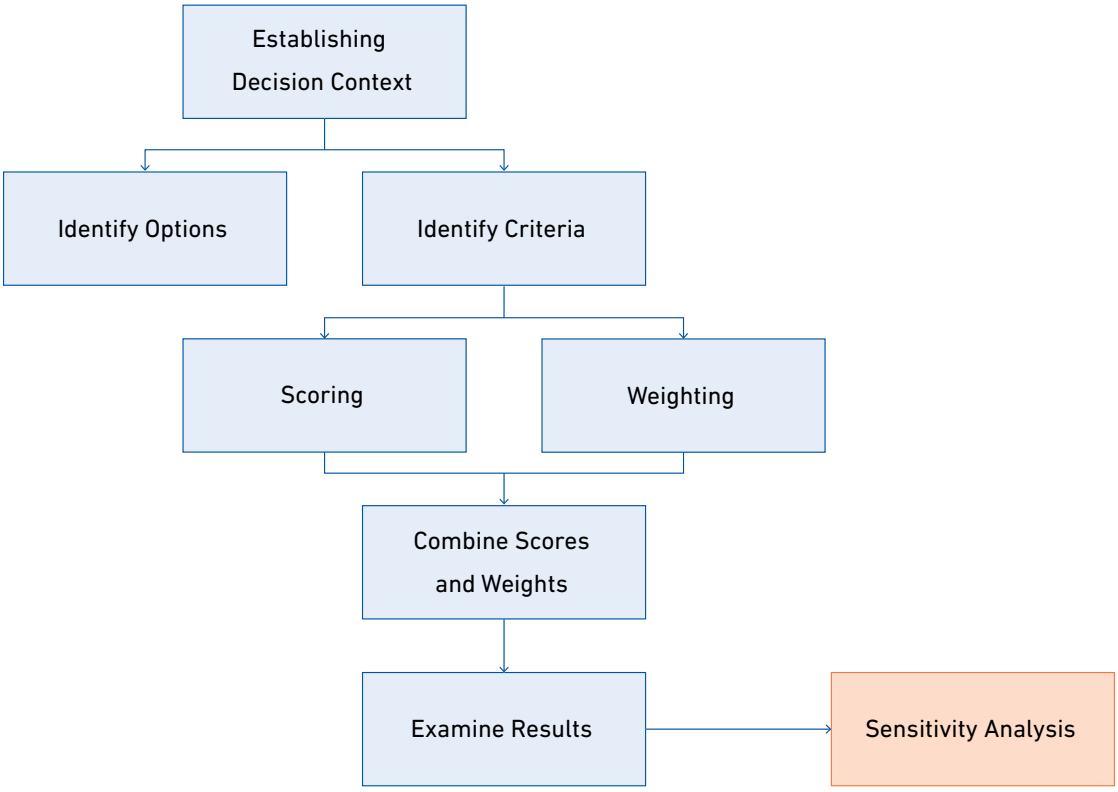

Figure 13 | Prioritisation process in TNAs.

Counties can decide whether to use this approach, any other type of multi-criteria analysis or the framework of Marginal Abatement Cost Curves (MACC) to prioritise PAMs. In all cases, it is good practice to develop the prioritisation process with stakeholders, to capture their criteria for the assessment, as well as their feedback for scoring PAMs, when applicable. The prioritisation process concludes with a ranked list of PAMs, ordered by level of priority. This is a fundamental input needed for designing mitigation scenarios.

EXPLORE MORE

Frameworks for estimating consistent projections and PAMs:

- UNFCCC MITICA Framework
- GHG Protocol–Mitigation Goal Standard
- GACMO tool–Unitary GHG Emission Reductions and MACC by PAM
- Technology Needs Assessment: Guidance

Projection of Future GHG Emissions Scenarios

GHG emissions are projected into the future through GHG emission scenarios (or mitigation scenarios) to help define mitigation targets and track progress towards achieving them.

Developing projections for NDC enhancement depends on assessing the emissions profile and development trends, prioritising PAMs and is essential for defining targets. These elements are closely interconnected and the methodological soundness of the targets for NDC enhancement depends on a thorough application of these steps.

To develop different mitigation scenarios, stakeholders must first agree on a definition. While there is no formal or official definition for developing mitigation scenarios to inform NDC enhancement, it is recommended to the scenarios defined in the MPGs. These scenarios are the WOM scenario, the WEM scenario and the WAM scenario.

What are Projections of Future GHG Emissions Scenarios?

Estimations of future GHG emission levels are based on current data, historical patterns and assumptions about future conditions. In the MPGs of the Paris Agreement, projections are referred to as "indicative of the impact of mitigation PAMs in future trends in GHG emissions and removals".

The purpose of these three distinct scenarios is to illustrate the various pathways a country could take in its efforts to reduce GHG emissions. Figure 14 shows the indicative modelling of future GHG emissions trends based on different levels of PAMs implementation.

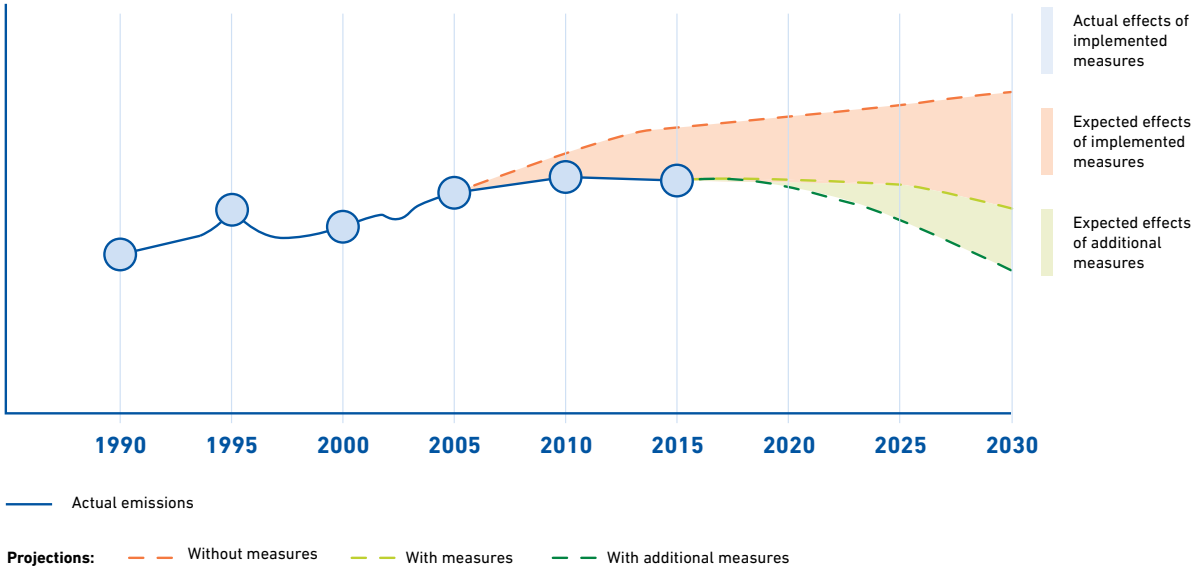

Figure 14 | Hypothetical projections of greenhouse gas emissions and removals under different scenarios.

Numerous countries use other definitions for developing scenarios to inform NDC enhancement. Scenarios such as "NDC scenario", or "Conditional scenario" and "Unconditional scenarios" are used to inform NDC targets. For consistency, regardless of the name used, it is recommended that the only difference between scenarios be the varying consideration of PAMs. In other words, the projections framework should remain the same across all scenarios, with the only distinction being different levels of PAM implementation.

By visualising these scenarios, decision-makers can better understand the potential outcomes associated with different levels of intervention. This aids in strategic planning and investment prioritisation, ensuring that resources are allocated effectively to achieve maximum emissions reduction while considering the associated costs and benefits. It is important to construct these alternative emissions scenarios under different policy considerations, extensive involvement of the industry is required to discuss feasibility and timeline of the prioritised PAMs to link them to the adequate scenarios.

EXPLORE MORE

Frameworks for estimating consistent projections and PAMs:

- UNFCCC MITICA Framework
- TIMES/Markal
- OSeMOSYS
- GEM-E3 model

Definition of Targets

The definition of targets is shaped by all previous steps, particularly the mitigation scenarios generated. These scenarios provide insight into future emission levels under different PAMs. For instance, results from the WEM scenario reflect approximate emission levels after accounting for current PAMs. This scenario can guide the establishment of an unconditional target, representing emissions reductions achievable through the implementation of currently implemented, ongoing and adopted PAMs. Conversely, results from the WAM scenario could inform a conditional target, contingent upon securing international financial support to implement the additional PAMs considered in this scenario. The WAM scenario may also provide directional insights for ongoing GHG mitigation efforts within PAMs currently under discussion.

Practitioners should consider different types of targets to reflect various national priorities and needs. A comprehensive overview of main targets commonly used can be found in the technical handbook for developing country Parties on preparing for implementation of the enhanced transparency framework under the Paris Agreement.

Countries are encouraged to define multiple scenarios to help stakeholders understand the range of potential emission levels. Additionally, assessing uncertainty is crucial for understanding possible variations in results. A practical approach to this is sensitivity analysis, which evaluates how variations in key assumptions or parameters—such as those related to the projection framework, or critical assumptions about drivers or PAMs—affect emission projections.

The timeline for NDC targets and projections should also be considered carefully. Generally, NDC implementation timelines look 10 years beyond the submission date (e.g., a target set in 2025 aims at 2035; a target set in 2030 aims at 2040). It is recommended to estimate projections at least until 2050 for several purposes:

- Planning for future NDC submission cycles: This allows countries to anticipate and gradually increase ambition in line with each NDC cycle, leading ultimately to net-zero emissions by 2050 as outlined in the Paris Agreement's economy-wide emission reduction objectives.
- Aligning with Long-Term Strategies (LTS): Projections extending to 2050 help align NDC efforts with long-term decarbonization strategies, offering a pathway toward sustained low-emission development.

EXPLORE MORE

- The CAT Guide to a Good 2035 Target.
- Quality Assurance Checklist for Revising NDC

Validation

STEP 6 | Consultation and Validation

The validation process of NDCs plays a crucial role in ensuring that the climate commitments outlined in these documents are credible, realistic and aligned with both the national context and international reporting obligations. This process is designed to assess the accuracy of the data, evaluate the ambition of the targets, confirm the feasibility of their implementation and ensure compliance with transparency and reporting standards set under the Paris Agreement.

It is considered good practice to integrate the final validation into the broader series of consultations and stakeholder engagements carried out during the NDC enhancement process. Therefore, it is important to consider validation as a central step in the Workplan developed during Step 2. The validation should be designed as a thorough, structured process that builds upon the inputs gathered from stakeholders and technical assessments. There are several key considerations for NDC validation (Figure 15).

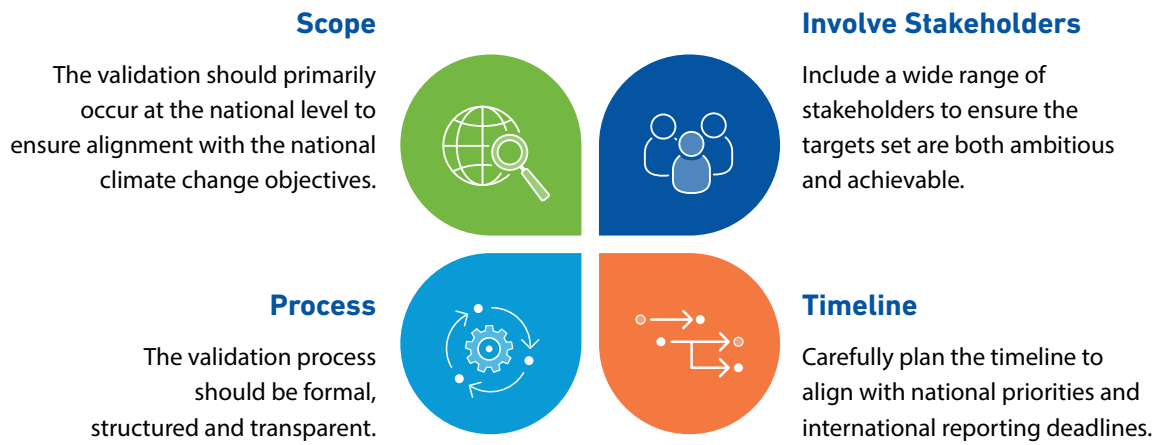

Figure 15 | Key considerations for NDC validation.

Unpacking the Considerations

SCOPE: Given the strategic significance of NDCs as key national documents that outline a country's climate commitments, validation should primarily take place at the national level. While regional or sector-specific validation processes can be helpful, especially in cases where certain NDC targets or measures have sectoral implications, it is imperative that the final validation is carried out nationally. This ensures that all parts of the NDC, including cross-sectoral aspects, are fully aligned with the overarching national climate change objectives.

INVOLVED STAKEHOLDERS: The validation process should involve a broad range of stakeholders to ensure that all relevant perspectives are considered. At the national level, this includes government agencies responsible for policy formulation and implementation. It is also crucial to involve private sector representatives, including industry boards and sector-specific actors, as the decarbonization measures outlined in the NDC are often implemented at the industry or plant level. Engaging with these stakeholders ensures that the targets set are both ambitious and achievable and that the mechanisms for their implementation are clearly defined and supported by the relevant sectors.

PROCESS: The specific validation process varies according to a country's institutional and policymaking practices. Some countries may have a formal validation process carried out by the appropriate government body, while others may require consultation with Indigenous communities, civil society organizations and other local entities. Many countries also make their NDCs publicly available for comment and review, fostering transparency and encouraging public participation. Regardless of the specific process, it is critical that the validation is conducted with a high degree of formality to ensure its credibility and legitimacy. A rigorous, well-structured validation process ensures that all technical, political and social dimensions of the NDC are thoroughly evaluated and that the final commitments enjoy broad support across all levels of government. This process should also explicitly identify the governing body that grants the final national approval for the revised NDC, providing clarity on the official endorsement.

TIMELINE: The timeline for the NDC validation process should be carefully planned to ensure that it aligns with both national priorities and international reporting deadlines. A clear and well-defined timeline helps to ensure that all steps in the validation process are completed thoroughly and in a timely manner, without unnecessary delays. The validation process can take several months, depending on the complexity of the NDC and the extent of stakeholder engagement required.

Additionally, the validation process is closely linked to the subsequent implementation phase of the NDC. It provides a valuable opportunity to prepare key stakeholders for the transition to the implementation phase. This may include discussing and reviewing the necessary institutional arrangements, financial support and capacity-building measures required to successfully implement the NDC. Stakeholders can be sensitised about the operational aspects of the NDC, allowing for smoother transitions from validation to action.

As such, NDC validation is not just a procedural requirement but a fundamental step to ensure that a country's climate commitments are credible, feasible and supported by all relevant stakeholders. By validating the NDC through a structured, formal process and involving a broad range of stakeholders, countries can build consensus, foster ownership and set the stage for effective implementation.

Implementation

Implementing NDCs is a complex, country-specific process requiring strategic planning and adaptation to national contexts. As countries move from the design of their NDCs to tangible action, they must navigate key steps to ensure that climate commitments are effectively translated into policies, programmes and actions. While some of these steps may be universal, others will vary widely according to a country's unique needs, capacity and NDC focus areas. Nonetheless, certain foundational steps are generally applicable to support successful NDC implementation (Figure 16).

Figure 16 | Foundational steps to support successful NDC implementation.

Formalising the NDC implementation process is critical to ensuring comprehensive coverage of all relevant sectors, as well as enabling continuous monitoring and improvement for future enhancement cycles. Formal implementation refers to integrating the NDC process into a well-defined and systematic procedure, which helps countries take a structured approach to NDC execution.

To avoid the challenges of ad-hoc approaches, countries should strive to establish a stable, predictable system for NDC implementation. Such an approach tends to be more cost-effective and reliable compared to processes that lack institutional clarity and defined activities. The NDC implementation phase is closely linked to Enhancement Area 3 of the guide related to improving NDC implementation and tracking. This includes strengthening the institutional arrangements and legal framework for NDC implementation, refining tracking indicators, updating existing systems and considering capacity-building initiatives to enhance the implementation effectiveness.

Moreover, for an NDC to be successfully enhanced and implemented, active engagement from industry sectors is essential. While NDCs are typically driven by national ministries with overarching climate policy mandates, it is the industries within the country that execute the specific decarbonization PAMs. Therefore, it is crucial to involve industry stakeholders in the formulation, implementation and monitoring of the NDC. Setting realistic and feasible decarbonization targets requires drawing on the expertise of these sectors, ensuring that targets are achievable and supported through industry buy-in. This collaborative approach is key to aligning national goals with sector-specific capabilities and fostering long-term success in NDC implementation.

1 Building NDC Awareness and Support

In the early stages of NDC implementation, building awareness and fostering support across all levels of the society within a country are essential. For NDCs to succeed, stakeholders, including government institutions, industry sector ministries, local authorities, industry associations, academia, the media and the public, must not only understand the goals set out in the industry sector of the NDC but also recognise their role in achieving these targets. This entails ensuring that information about the NDCs is clearly communicated and accessible, enabling various groups to see the direct implications for their areas of responsibility or interest.

Effective awareness-building at the national and local levels helps lay the groundwork for coordinated and sustained action. This could involve planning media campaigns to reach a broad audience, aiming to establish a shared understanding of NDC priorities and increase public support for climate action. Government-led consultations with industry sector stakeholders can allow for constructive dialogue around how best to translate high-level goals into specific, implementable actions. Through consultations, countries can also gather valuable feedback on issues such as institutional arrangements, monitoring methods and resource needs.

Countries should also consider the timeline and scope of awareness-raising efforts to ensure momentum and clarity throughout the NDC implementation process. By effectively communicating the expected contributions, challenges and benefits associated with implementing industrial decarbonization measures within their NDCs, countries can foster stronger engagement and accountability, making it easier to align policy, resources and actions. NDC awareness and support not only ensures smoother implementation but also encourages a collaborative approach that can enhance long-term commitment to climate goals.

2 Taking Stock of Current Capacities and Resource Needs

Establishing a strong foundation for effective NDC implementation begins with a thorough assessment of existing capacities and resource needs. As countries move from planning to action, they may need to establish or adapt institutional structures to oversee, coordinate and track progress on climate commitments. This may include designating a lead institution to manage the overall implementation process or creating coordination mechanisms to ensure alignment across relevant ministries, agencies and governance levels. Clear role definition and collaboration between national, regional and local entities can significantly enhance accountability and the success of NDC efforts.

Beyond organizational arrangements, countries must evaluate the human, technical and financial resources within each institution to support their specific roles in NDC implementation. This involves determining whether staff have the necessary skills and

technical expertise required for their activities and identifying where additional capacity-building or financial support is needed. Addressing these gaps early can reduce potential delays and ensure that institutions are fully prepared for NDC tracking, reporting and implementation demands.

Effective data collection and consistent tracking mechanisms are also essential for monitoring NDC progress. Countries should take stock of existing data and technical information to build a robust evidence base for NDC actions, identifying any information gaps early to support a comprehensive, data-driven implementation plan. A gap analysis of data needs helps countries recognise and address any limitations in data availability and reliability, ensuring that their NDC efforts are both evidence-based and adaptable.

Equally critical is the assessment of the legal and regulatory framework underpinning NDC implementation. Regulatory structures should align with NDC objectives, supporting both enforcement and compliance to uphold national climate commitments. By refining legal frameworks, countries can enhance long-term accountability and ensure policy continuity across changing political and administrative contexts.

By identifying potential barriers to NDC implementation, countries can enhance process efficiency and secure broader support. Through a structured approach to assessing capacities, resources and institutional frameworks, countries can build a realistic and well-supported pathway for NDC implementation. This alignment of national resources, policies and legal frameworks provides a resilient foundation for climate action that is both sustainable and responsive to evolving national and international priorities.

3 Developing the NDC Implementation Plan

The NDC implementation plan is a strategic tool designed to guide and support effective NDC implementation. This plan serves as a roadmap, detailing the specific actions, resources and timelines required to achieve the industry sector NDC commitments, while providing a structured framework to ensure that implementation remains on track. Each country's NDC implementation plan will be unique, reflecting its specific goals, challenges and national circumstances.[7]

7 UNDP, UNEP, UNEP DTU and WRI (2020). Implementing Nationally Determined Contributions (NDCs), UNEP DTU Partnership Copenhagen, Denmark.

Elements Reflected in an NDC Implementation Plan

- Clearly identifying actions and measures for implementation.
- Defining roles and responsibilities across relevant bodies, such as coordination teams, ministries and departments.
- Assessing and identifying required resources, including capacity and financial support.
- Specifying timeframes for individual PAMs, with milestones for tracking progress.
- Outlining expected impacts and assessing the feasibility and risks of implementation measures.
- Pinpointing capacity gaps, data needs and potential knowledge gaps.
- Reviewing necessary regulatory and legal frameworks to support implementation.
- Engaging stakeholders across sectors and levels of government as well as outlining the engagement strategy.
- Establishing coordination mechanisms both within and outside of government.
- Specifying the monitoring and reporting process.
- Linking NDC-related actions to broader Sustainable Development Goals (SDGs) for added alignment and impact.

The NDC implementation plan enables central monitoring of progress, helping to identify when adjustments are needed to address evolving needs and challenges. Engaging stakeholders throughout the development of the implementation plan is crucial. Active participation promotes a sense of ownership and ensures broad support from key government bodies and external stakeholders. Holding workshops or consultations provides an opportunity to review the plan's structure, clarify data requirements and align on common goals. Securing endorsement from all involved parties, including political institutions such as parliament, reinforces commitment to the plan's objectives.

The development and implementation of the NDC will vary depending on the nature of the NDC itself, how it was developed and the national context of each country. As a "living" document, the NDC implementation plan should be regularly updated to reflect new information and evolving circumstances. This periodic revision ensures that the plan remains relevant and adaptive to changes in data, priorities and national conditions. Successful NDC implementation not only helps meet current climate goals but also lays the groundwork for preparing the next NDC submission, raising ambition and supporting the broader objectives of the Paris Agreement.

ANNEXES

Industrial plant © Envato / wirestock

Annex 1 | Industrial Decarbonization Country Assessment Checklist

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Previous NDC and Current NDC Enhancement					
Understanding the commitments and targets of the previous NDC	What targets and commitments were included in the previous NDC?	-	The country Workplan will build from existing targets to raise ambition compared to previous commitments.		
Analysing progress tracking	Has the country tracked or assessed its status for achieving its NDC targets?	The status in view of achieving current targets, if available, can provide a broad understanding of possibilities for NDC enhancement.	The country Workplan will build from the status to achieve previous NDC targets to raise ambition compared to previous commitments.		
Scoping industries included in the previous NDC	What industries (which GHG inventory sectors) were considered in the NDC and how?	Understanding to what extent industries were considered in the NDC could help identify areas of enhancement and specific activities in the country Workplan.	Address in the Workplan the potential consideration of all industries in the NDC enhancement.		
Understanding the institutional structures for NDC formulation	What institutional arrangements or structures were used in the formulation of previous NDCs?	Countries often create working groups, committees and similar structures to formulate NDCs.	Agree with national stakeholders what institutional arrangements to use for NDC enhancement in the industry sector. Propose a stakeholder engagement plan together with the country Workplan.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Understanding the institutional structures for NDC implementation	What institutional arrangements or structures were used in the implementation of the NDCs? Are these structures still being used/summoned for NDC implementation?	Countries often create working groups, committees and similar structures to implement NDCs.	Agree with national stakeholders what institutional arrangements to use for NDC enhancement in the industry sector. Propose a stakeholder engagement plan together the country Workplan.		
Understanding the current process for NDC enhancement	Has the country started with the NDC enhancement process? Is there a timeline of activities and an approach to follow for the update?	Understanding the ongoing efforts and plans of the country is required to identify synergies and avoid overlaps, as well as to integrate the industry sector with all national emitting sectors as part of the country NDC.	The Workplan shall be aligned with the NDC enhancement process of the country, if available.		
Policy Framework					
Understanding the policy landscape	What overarching policies exist in the country related to climate change?	Identify main policies regarding climate change and potential objectives regarding mitigation, or with co-benefits in mitigation.	Understanding major overarching policies addressing climate change can ease the identification of priorities and the NDC enhancement process.		
	What are the main policies regarding economic development in the country?	Economic development prospects and existing planning processes can help to understand the future evolution of the industrial emission profile.	Consider the implications for the mitigation assessment. The absence of policies and or prospects on economic development might require additional efforts in defining the framework of mitigation scenarios.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
	Does the country count with any strategy of major policy for planning and regulating the energy supply in the country?	The evolution of the energy demand (associated with fuel combustion emissions in the industry) and energy supply (associated with emissions from the energy industry), is essential to mitigation assessments.	Consider the implications for the mitigation assessment. The absence of policies and or prospects on energy demand and supply might require additional efforts in defining the framework of mitigation scenarios.		
	What are the main policies and strategies related to industrial development?	Industrial development policies can provide insights on incentives and plans for the development of the industry in the country.	Consider potential development of the industry in the work plan associated with the mitigation assessment and future evolution of industrial emissions.		
	What environmental regulations exist at country level regarding industrial emissions?	This is needed to increase the understanding of the current regulations of industrial emissions, linked to environmental pollution.	This could help identify gaps in regulatory frameworks for industrial decarbonization.		
Understanding priorities and needs	Cross-cutting priorities. What cross-cutting priorities are identified by the country and what information is available in the policy documents regarding this?	This is needed to understand the national priorities related to economic development, the Sustainable Development Goals (SDGs) and demographics such as population growth.	Ensuring alignment with the country's overarching development goals, including economic growth and population dynamics, is critical to making the NDC enhancement process relevant and sustainable.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
	Energy sector priorities. What priorities are identified for the energy sector by the country and what information is available in the policy documents regarding this?	Identifying energy sector priorities is essential for understanding the pathways towards decarbonizing energy supply, reducing emissions and ensuring energy security. Assess plans for transitioning to renewables, improving energy efficiency and addressing energy access.	The energy sector is a key contributor to industrial emissions, so aligning industrial decarbonization efforts with energy sector priorities is crucial.		
	Industrial sector priorities. What priorities are identified for the energy sector by the country and what information is available in the policy documents regarding this?	Understanding national industrial priorities helps align mitigation efforts with industrial goals. Review policies that promote energy efficiency, emissions reduction and technological innovation in industry.	Aligning the NDC enhancement with national industrial sector plans ensures that decarbonization strategies are realistic, feasible and integrated into long-term industrial growth plans.		
National Statistics					
Understanding the national accounts	Are national accounts available in the country in relation to economic (GDP, budget, tax revenues), demographic and other data that are relevant to understand the national economic structure and development pathway?	When developing an industry sector NDC it is important to understand the national economic structure and development to assess where decarbonization efforts are to be prioritised.	Economic and demographic data are required to develop future emissions scenarios that in turn allow for defining the most effective decarbonization pathway in line with the national development.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Understanding energy statistics	Are energy statistics (for instance energy balances) available in the country and would you consider them accurate?	Energy statistics are essential to conduct an effective mitigation assessment for the energy sector emissions categories and to support the development of accurate GHG inventories as well as to evaluate the impact of potential decarbonization measures.	The NDC enhancement process will require energy statistics on renewable energy, the national energy mix and fuel use and technologies in industries to make informed choices on decarbonization pathways.		
Understanding industrial statistics	Are industry statistics (for instance energy balances) available in the country and would you consider them accurate?	Industry statistics are essential to conduct an effective mitigation assessment of industry sector emissions categories and to support the development of accurate GHG inventories as well as to evaluate the impact of potential decarbonization measures.	The NDC enhancement process will require industry sector statistics on fuel use and other products that are being used in different industrial processes, in order to make informed choices on decarbonization pathways.		
Emission Profile					
Understanding composition, status and prospects of the national industrial sector	Is there information on the composition of the industry sector, the different industrial branches and their projected development trajectories?	To evaluate the national emissions profile, it is paramount to have a good understanding of the industry sector make up as well as its development trajectory to be able to make assumptions on the future emissions that are aligned with the country's development path.	For the enhancement process, it is important to know which industries contribute to which sectoral emissions and moreover how these are expected to evolve. On the second point, it needs to be known for example if a plant plans to cease operations or if a sector is planning to expand int eh future as this knowledge will influence the prioritisation of decarbonization options.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Understanding energy industries	How is electricity and heat generated in the country, what is the energy mix and what type of plants and fuels are being used?	Electricity and heat production commonly is one of the largest sources of emissions in countries, therefore information on the generation process is needed. In virtually all countries there are emissions in this sector.	To assess the current and future emissions levels, the emissions profile of the energy industries needs to be understood. Moreover, the identification and prioritisation of decarbonization measures need to respond to the current circumstances in the sector.		
Understanding manufacturing industries and construction	What industries in the countries have relevant operations that require the use of fuels, and which fuels are used?	Manufacturing industries and construction have substantial emissions in countries in which the industrial sector is large and where fossil fuel use is very prevalent, therefore it is important to obtain quality information on the fuel use in the sector.	To assess the current and future emissions levels, the energy emissions profile of the manufacturing industries needs to be understood. Moreover, the identification and prioritisation of decarbonization measures need to respond to the current circumstances in the sector.		
Understanding waste	Are there industrial plants with on-site solid waste and wastewater treatment? – Generally, this happens in waste generating industries in countries with certain level of environmental regulation.	Countries with small industrial sectors generally manage solid waste and wastewater using the common residential management systems (solid waste treatment plants and wastewater management sites). In this case, policies and practices are led by other, non-industry related stakeholders and therefore waste is not recommended for a deeper assessment.	If yes, the work plan and assessment should consider industrial waste emissions and the potential consideration of policies, strategies, or practices to reduce GHG emissions. If not, coordinate efforts with national environmental agencies and waste operators to assess the potential to include integral policies, strategies and practices that could include the industry.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Understanding the national GHG Inventory	Is there an inventory available estimated following 2006 IPCC Guidelines?	Inventories estimated following old versions of the IPCC Guidelines shall be recalculated entirely due to major methodological differences.	Inventory shall be recalculated using 2006 IPCC Guidelines for its use in mitigation assessments. Raw data, if available, used can be utilised for estimating a tier 1 in major inventory categories.		
	Does the inventory cover, at least the year t-3 (t being the current year)?	Inventories which are not sufficiently updated in terms of years cannot be directly used for doing mitigation assessments and/or projections as there might be relevant changes in the most updated historical years.	In the case the inventory is available, estimated following 2006 IPCC Guidelines, but it is old (less than t-3), calculate up to t-1 using the splicing technique surrogate data, using relevant statistics.		
	What Global Warming potentials are used in the inventory calculation?	The mitigation assessment (inventory and projections) and the evaluation of PAMs should use the same GWP to avoid consistency issues. The use of the Global warming potentials from AR5 is required for BTR submission. However, the use of a specific AR for GWP is not mandatory for the NDC update (the use of AR5 is recommended).	Ensure consistency in the use of GWP for the different parts (inventory, projections, PAMs assessment). If inventories are calculated with old GWP, recalculate if data is available.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
	Are there categories considered as industry (Table 1, section A3), not being estimated, or reported as "NE", "NA" or "IE"?	The review should identify potential sources not being estimated by the inventory, either by not reporting or by reporting notation keys which are not sufficiently justified.	If there are evidence of occurrence and the justification for reporting a notation key is not in line with 2006 IPCC Guidelines, confirm with national stakeholders and recalculate the emission source following 2006 IPCC Guidelines for the mitigation assessment.		
	Are there categories considered as industry (Table 1, section A3) reported as "NO", but there are evidence of this categories occurring in the country?	Review all the emission sources reported as "NO" and look for evidence online of the potential occurrence in the country. Check official sources and well-recognised international sources (IEA, OECD, World Bank and similar).	If there are evidence of occurrence for sources reported as "no", confirm with national stakeholders and recalculate for the mitigation assessment.		
Understanding any existing recommendations from BTR reviews	Do you have the results from previous BTR reviews and how do these relate to the NDC enhancement process?	As BTRs are reviewed every two years in line with the biennial submission, any input and recommendations of the TERT need to be considered to ensure adequate the NDC enhancement.	In line with the recommendations from the TERT, although they will not comment on the target or appropriateness) and rather on the completeness and clarity of the information provided, the enhancement process needs to reflect this.		
Institutional Systems and Stakeholders					
Understanding existing institutional structure for NDC processes	Does the country have a structured system coordinating NDC processes?	It is critical to structure the roles and responsibilities within the government and relevant institutions to ensure effective coordination and implementation of NDC activities.	The enhancement process will require an effective coordination of the activities, extensive data sharing and collaboration on setting targets and determining decarbonization measures.		

Component	Question	Elaboration/clarification	Implications for the Enhancement Process	Country Description	Related Documents/ Links
Understanding the coverage of the industrial sector	Are stakeholders identified and engaged from the main industrial branches?	To ensure adequate coverage of the industrial sector, all main branches must be covered, and stakeholders be engaged.	Involvement of a wide range of industry branches will be needed to enhance the NDC with meaningful decarbonization actions.		
Monitoring and tracking	Are mechanisms in place to track progress on NDC formulation and implementation processes?	Institutional systems with effective monitoring mechanisms are important to ensure the NDC enhancement and subsequent implementation process is tracked against its objectives.	Monitoring is relevant to oversee the enhancement process and to track NDC implementation over time.		
Capacities and Motivation					
Understanding stakeholder capacities	How would you assess the technical capacity of stakeholder who either have or intend to participate in the NDC enhancement process?	To implement an effective NDC enhancement process, it is necessary that stakeholders have a good understanding of how NDCs work and how the targets are defined.	Without a working understanding, the NDC enhancement is likely to not generate the stakeholder buy-in it needs. Capacity-building needs should be identified to prepare stakeholders for the enhancement process.		
Understanding stakeholder motivation	How would you assess the motivation of stakeholder who either have or intend to participate in the NDC enhancement process?	Linked to the capacity, the motivation of stakeholders to engage in the NDC enhancement process is critical for success.	Along each step of the process, stakeholder engagement is required both in relation to the provision of data and information for analysis and formulation and for the subsequent implementation.		

Annex 2 | Generic NDC Workplan for Industrial Decarbonization

NDC Workplan for Industrial Decarbonization	
General introduction	
Country Name	*[Insert name of the relevant country]*
Context	*[Brief description of the national circumstances, including key challenges, opportunities and the importance of NDC enhancement]*
Objectives	
Main Objective	To enhance the ambition and implementation of industrial decarbonization measures in the NDC by strengthening institutional mechanisms for design, implementation and tracking, improving data accuracy and consistency as well as setting more ambitious targets.
Specific Objectives	• To strengthen institutional mechanisms by enhancing institutional governance and MRV systems to ensure transparency and accountability in the planning and implementation of industrial decarbonization measures. • To improve national statistics systems by enhancing the capacity for reliable data collection, management and reporting of energy and industry-related data to ensure effective monitoring and decision-making. • To define more ambitious and evidence-based targets by setting ambitious and achievable sector-specific targets for the decarbonization of the industrial sector based on evidence-based mitigation assessments and international best practices.

NDC Workplan for Industrial Decarbonization	
Activities and Outputs	

Activities	**Activity 1. Strengthen Institutional Mechanisms**
	• Assess the existing governance landscape and institutional arrangements:
	  • Review current institutional structures and the MRV system related to the industry sector.
	  • Identify weaknesses or gaps in governance and reporting mechanisms.
	• Engage stakeholders in consultations on institutional roles:
	  • Organize consultations with government agencies, industries and civil society to discuss roles and responsibilities in industrial decarbonization efforts.
	• Implement enhancements to the MRV system:
	  • Develop improvements to institutional capacity and strengthening the MRV systems for industry sector NDC planning, implementation and tracking.
	• Validate enhancements with national stakeholders:
	  • Present the enhancements to national stakeholders for validation.
	• Undertake capacity-building for a self-sustaining system:
	  • Conduct capacity-building workshops and events on the MRV system.

	Activity 2. Improve National Statistics Systems
	• Assess current national statistics:
	  • Review the existing national statistics systems related to energy and industry data.
	  • Identify data gaps and inconsistencies that affect the accuracy of emission tracking.
	• Consult with data providers and national statistical offices:
	  • Engage with national statistical agencies, industry representatives and other key data providers to understand data flows and current challenges in data management.
	• Implement improvements in data collection and processing:
	  • Develop recommendations for enhancing data collection methodologies, improving accuracy and filling data gaps in the industrial sector.
	  • Implement data collection improvements, management and reporting of energy and industry-related data.
	• Validate improvements with national stakeholders:
	  • Present the improvements to relevant stakeholders for validation.
	• Undertake capacity-building for a self-sustaining system:
	  • Conduct capacity-building workshops and events on data collection processes and protocols.

NDC Workplan for Industrial Decarbonization	

	Activity 3. Definition of Ambitious, Evidence-Based Targets
	• Conduct modelling and mitigation assessments:
	  • Assess emissions in the industrial sector.
	  • Develop emission-reduction scenarios based on national circumstances.
	  • Identify sector-specific mitigation options.
	• Consult stakeholders to ensure sectoral alignment:
	  • Organize workshops with industry leaders, policymakers and relevant stakeholders to discuss potential mitigation options.
	  • Gather feedback on proposed measures and sector-specific needs.
	• Propose industry-specific targets:
	  • Develop ambitious, yet achievable, decarbonization targets for the industrial sector based on the mitigation assessment.
	  • Ensure alignment with overall national emission reduction targets and global commitments under the Paris Agreement.
	• Validate targets with national institutions:
	  • Present proposed targets to national institutions for validation.
	  • Secure government endorsement for industry-specific targets.

Outputs	**Output 1. Strengthened Institutional Mechanism** • Assessment report on existing governance landscape and institutional arrangements. • Proposals for institutional and MRV system enhancements. • Stakeholder engagement reports and validated recommendations. • Report on implemented enhancements for strengthening institutional capacity and MRV systems. • Capacity-building workshop reports including roadmap for continuous training.
	Output 2. Improved National Statistics Systems • Assessment report on current national statistics for the industrial sector. • Proposal for improved data collection and management system including standardised collection templates and protocols. • Stakeholder consultation and validation reports of proposed improvements. • Report on implemented improvements to the national statistics systems. • Capacity-building workshop reports including roadmap for continuous training.
	Output 3. Definition of Ambitious, Evidence-Based Targets • Report on mitigation assessment and prioritised PAMs. • Proposal of industry-specific decarbonization targets. • Stakeholder consultation reports and feedback. • Validated targets endorsed by national institutions.

NDC Workplan for Industrial Decarbonization

Stakeholders and Responsibilities

Key Stakeholders	*[List the main stakeholders involved in the NDC enhancement process]*
Responsibilities	*[Describe the specific roles and responsibilities of each key stakeholder listed]*

Timeline

Activity	Sub-activity	Output	Months																					
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	21	23	24
Activity 1. Strengthen Institutional Mechanisms	Assess the existing governance landscape and institutional arrangements	Assessment report on existing institutional and MRV systems																								
	Engage stakeholders in consultations on institutional roles	Stakeholder engagement report																								
	Implement enhancements to MRV systems	Proposals for institutional and MRV system enhancements																								
	Validate enhancements with national stakeholders	Report on implemented enhancements for strengthening institutional capacity and MRV systems																								
	Undertake capacity-building for a self-sustaining system	Capacity-building workshop reports including roadmap for continuous training																								

NDC Workplan for Industrial Decarbonization																								
Activity	**Sub-activity**	**Output**	**Months**																					
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**21**	**23**	**24**
Activity 2. Improve National Statistics Systems	Assess current national statistics	Assessment report on current national statistics for the industrial sector																						
	Consult with data providers and national statistical offices	Stakeholder consultation report																						
	Implement improvements in data collection and processing	Proposal for improved data collection and management system including standardised collection templates and protocols.																						
	Validate improvements with national stakeholders	Stakeholder validation report and report on implemented improvements to the national statistics systems																						
	Undertake capacity-building for a self-sustaining system	Capacity-building workshop reports including roadmap for continuous training																						

NDC Workplan for Industrial Decarbonization																								
Activity	**Sub-activity**	**Output**	**Months**																					
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**21**	**23**	**24**
Activity 3. Definition of Ambitious, Evidence-Based Targets	Conduct modelling and mitigation assessments	Report on mitigation assessment and prioritised PAMs																								
	Consult stakeholders to ensure sectoral alignment	Stakeholder consultation reports and feedback																								
	Propose industry-specific targets	Industry-specific decarboniza-tion targets																								
	Validate targets with national institutions	Validated targets endorsed by national institutions																								

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Supported by:

Federal Ministry for Economic Affairs and Climate Action

INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag