GENERAL GUIDANCE DOCUMENT ON REPORTING AND TRACKING UNDER THE ETF, INCLUDING RECOMMENDATIONS ON QUANTIFICATION OF NDC INDICATORS FOR MITIGATION AND TABULAR FORMAT FOR DATA COLLECTION

CENTRAL ASIA REGIONAL CENTRE FOR CLIMATE ACTION TRANSPARENCY (RECATH)

June 2024

DISCLAIMER

PREPARED UNDER

The Initiative for Climate Action Transparency (ICAT), supported by Austria, Canada, Germany, Italy, the Children's Investment Fund Foundation and the ClimateWorks Foundation.

CHILDREN'S INVESTMENT FUND FOUNDATION

MINISTERO DELLA TRANSIZIONE ECOLOGICA

climateworks FOUNDATION

Supported by: Federal Foreign Office on the basis of a decision by the German Bundestag

IKI INTERNATIONAL CLIMATE INITIATIVE

Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, Innovation and Technology

Environment and Climate Change Canada | Environnement et Changement climatique Canada

The ICAT Secretariat is managed and supported by the United Nations Office for Project Services (UNOPS)

UNOPS

June 2024

Writing		
	Name, Function	*Organism*
Main writer	Houssem BELHOUANE, Head of IMPACTE Unit	Citepa

Verification		
	Name, Position	*Date*
Final approval	*Julien Vincent, Manager*	

Reference CITEPA 2082 | ReCATH

Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique (CITEPA)

42, rue de Paradis – 75010 PARIS – Tel. 01 44 83 68 83 – Fax 01 40 22 04 83
www.citepa.org | infos@citepa.org

I/R

Abbreviations and acronyms

2006 IPCC Guidelines	2006 IPCC Guidelines for National Greenhouse Gas Inventories
2019 Refinement to the 2006 IPCC Guidelines	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
BTR	biennial transparency report
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CO2 eq	carbon dioxide equivalent
COP	Conference of the Parties
CTF	common tabular format
ERT	expert review team
ETF	enhanced transparency framework (under the Paris Agreement)
GDP	gross domestic product
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
ITMO	internationally transferred mitigation outcome
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LULUCF	land use, land-use change and forestry
MPGs	modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, set out in the annex to decision 18/CMA.1
MRV	measurement, reporting and verification
NA	not applicable
NDC	nationally determined contribution
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
TER	technical expert review
TERT	technical expert review team

TABLE OF CONTENT

List of figures

1. The Paris Agreement and the enhanced transparency framework

Aiming to strengthen the global response to the threat of climate change, Parties adopted the Paris Agreement in 2015. In aiming to enhance the implementation of the Convention, one of the primary goals of the Paris Agreement, as set out in its Article 2, is to hold the global average temperature increase 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 in order to significantly reduce the risks of climate change. The goals embedded in the Paris Agreement also aim to increase countries' abilities to adapt to the adverse impacts of climate change and foster low GHG emission development pathways, making financial flows consistent with such pathways (see Figure below).

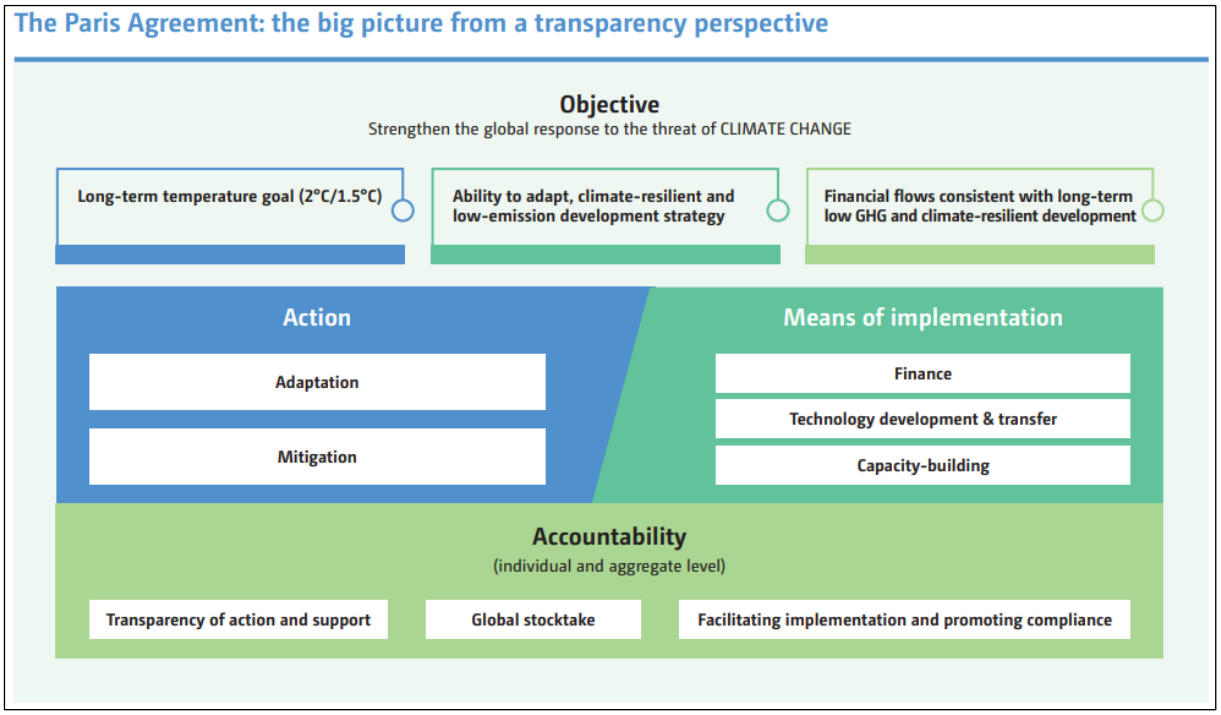


Figure 1. Key elements of the Paris Agreement (source :[13])

To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

Implementation of the Paris Agreement requires economic and social transformation, based on the best available science. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. With this in view, the Paris Agreement establishes a binding commitment for all Parties to prepare, communicate and maintain a **Nationally Determined Contribution (NDC)** and to pursue domestic mitigation measures to achieve the objectives of their NDCs. It is also required that Parties communicate their NDCs every five years and present the information necessary for clarity, transparency and understanding.

To better frame the efforts towards the long-term goal, the Paris Agreement also invites countries to formulate and submit by 2020 long-**term low greenhouse gas emission development strategies (LT-LEDS)**. LT-LEDS provide the long-term horizon to the NDCs. Unlike NDCs, they are not mandatory. Nevertheless, they place the NDCs into the context of countries' long-term planning and development priorities, providing a vision and direction for future development.

Furthermore, the Paris Agreement establishes, through its Article 13, **an enhanced transparency framework (ETF)** for action and support designed to build trust and confidence and to promote effective implementation. Under this framework, all Parties are required to regularly provide

information on greenhouse gas emissions and removals and information necessary to track progress made in implementing and achieving their nationally determined contributions (NDCs). In addition, the framework covers information related to climate change impacts and adaptation and information on financial, technology and capacity-building support to developing countries.

The transparency framework is regarded by many as the 'backbone' of the Paris Agreement because it ensures that information is made available regularly on the progress made towards the goals of the Paris Agreement. The framework also aims at building mutual trust among Parties.

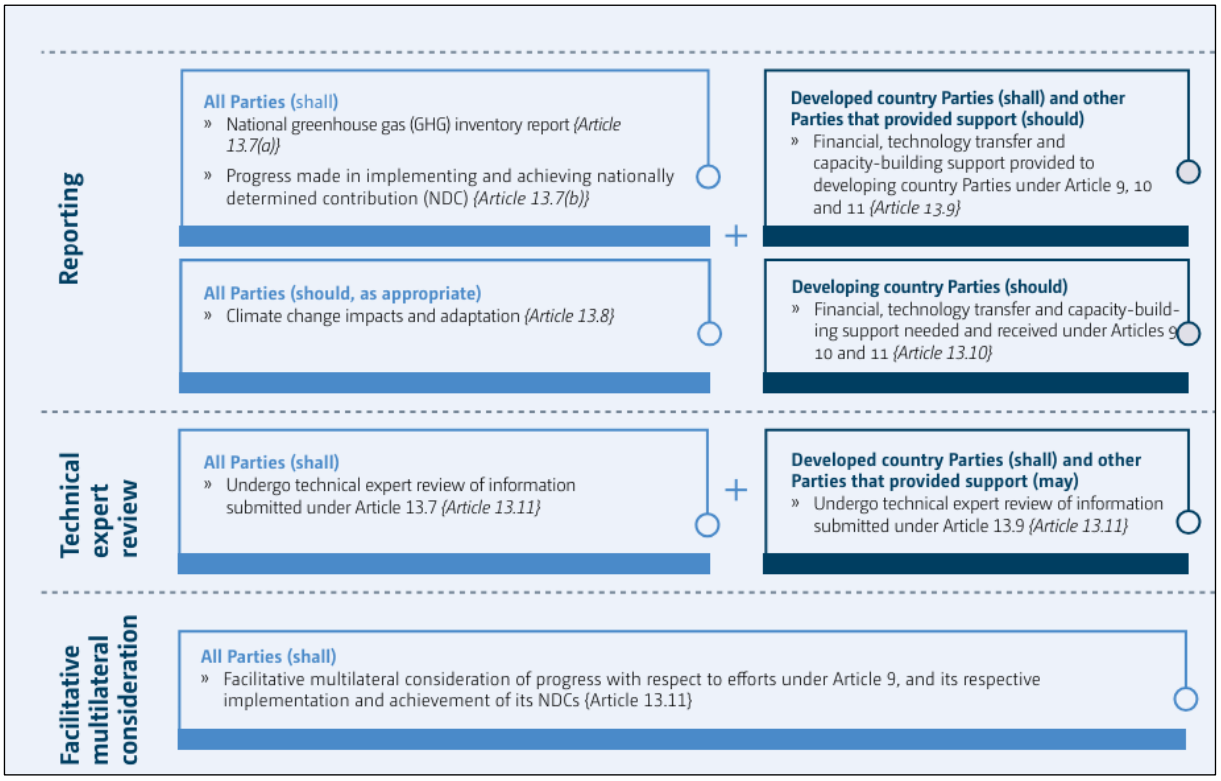


Figure 2. Enhanced transparency framework for action and support established by Article 13 of the Paris Agreement (source:[6])

Information provided in biennial transparency reports is subject to a technical expert review and to the facilitative multilateral consideration of progress. The committee which was established under Article 15 of the Paris Agreement may be involved in case of inconsistencies in the information provided. The outcomes of these processes can then be used by the Parties to improve their reporting. In addition, the information collected under the transparency framework helps Parties in the review of their individual progress towards the goals of the Paris Agreement and in increasing their ambition.

The information gathered through the ETF will feed into the **Global stocktake** which will assess the collective progress towards the long-term climate goals. This will lead to recommendations for countries to set more ambitious plans in the next round.

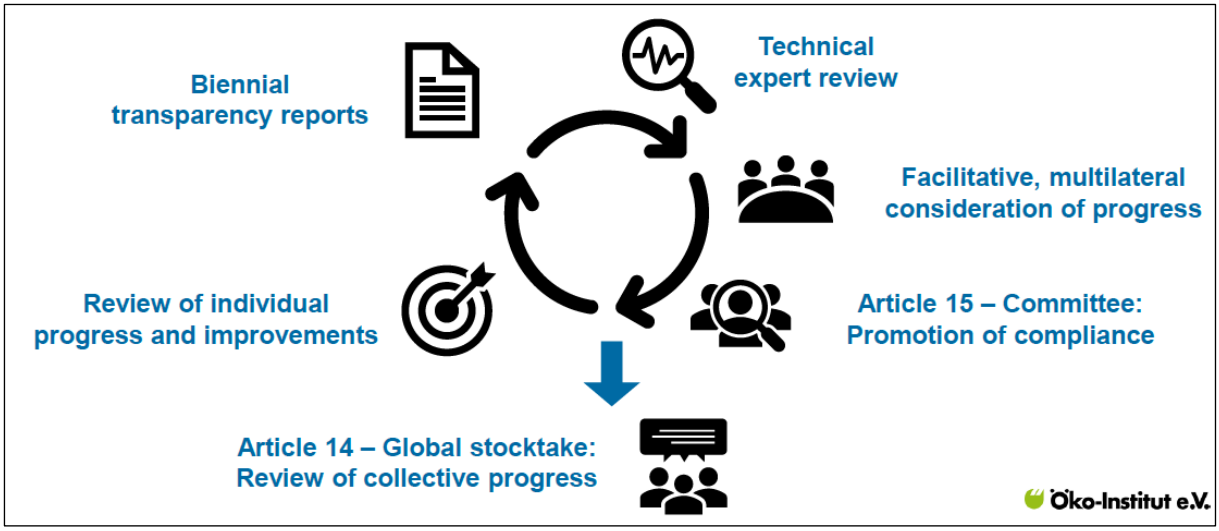


Figure 3. The cycle of improved reporting over time and enhanced ambition (source :[17])

2. Core elements of the ETF

While Article 13 of the Paris Agreement laid out the main elements of the transparency framework, more specific guidelines were agreed later, in COP 24 and COP 26. The Katowice climate package (COP24) adopted the rules to operationalize the ETF, referred to as the modalities, procedures and guidelines (MPGs) for the transparency framework for action and support (annex to decision 18/CMA.1). The MPGs lay out the information to be provided in the reports under the transparency framework and the modalities for the technical expert review and the facilitative, multilateral consideration of progress.

The remaining details to allow countries to fully implement the ETF, including the development of the common reporting tables and formats for reporting information, outlines of the reports, and the training programme for experts were finalized in Glasgow, 2021 in the 'guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement' (decision 5/CMA.3, 'transparency guidance' in short).

The transparency guidance adopted in Glasgow offers additional provisions for various elements of the MPGs. For the national inventory report, it includes common reporting tables and an outline; for tracking progress and support information, it provides common tabular formats. Additionally, it outlines a training programme and a framework for the technical expert review. The biennial transparency report outline comprehensively covers all aspects of action and support.

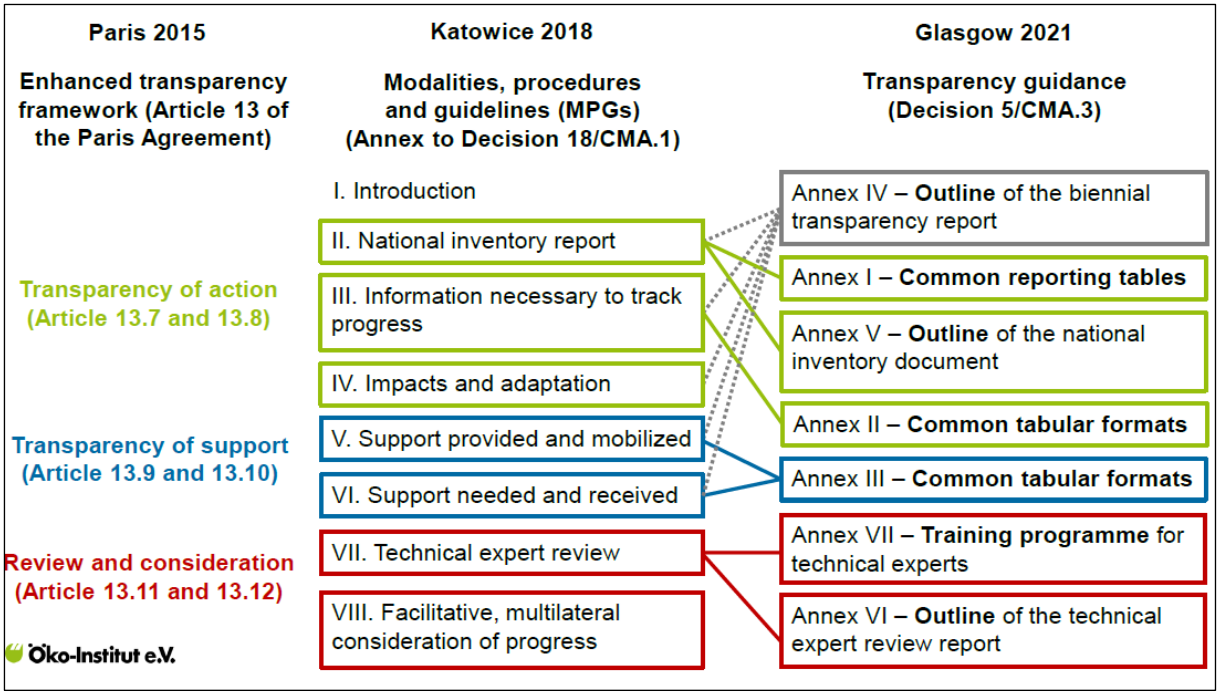


Figure 4. Interlinkages between elements of Article 13 of the Paris Agreement, chapters of the MPGs, and elements of the transparency guidance (source :[17])

3. Reporting obligations for parties to the Convention and the Paris Agreement

The ETF builds on and enhances the MRV arrangements under the Convention. For the Parties to the Paris Agreement, the MPGs of the ETF supersede the MRV system under the Convention, with the BTR replacing the Biennial Report (BR) and the Biennial Update Report (BUR). Developed country Parties to the Paris Agreement must submit their final Biennial Reports no later than 31 December 2022, while developing country Parties must submit their final Biennial Updated Reports by 31 December 2024. All Parties must submit their first BTR no later than 31 December 2024; LDCs and SIDS may submit at their discretion. However, both developing and developed country Parties to the Convention and the Paris Agreement must continue to submit an NC, while developed country Parties to the Convention and the Paris Agreement must submit an annual GHG inventory. In addition, developing country Parties may voluntarily submit with the BTR a technical annex containing the results of the implementation of REDD+ activities in the context of results-based payments.

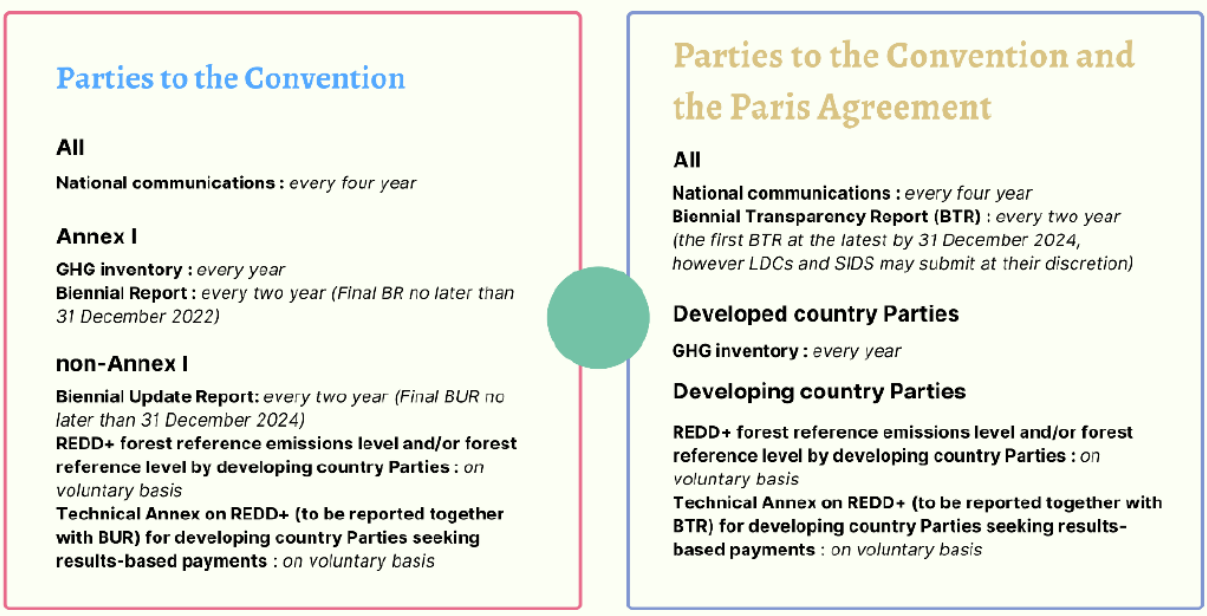


Figure 5. Reporting obligations for parties to the Convention and the Paris Agreement (source :[22])

Parties to the Convention that are not Parties to the Paris Agreement will remain subject to reporting obligations under Articles 4 and 12 of the Convention, and existing MRV arrangements under the Convention will continue to apply. The Annex I Parties will continue to submit annual GHG inventory report and Biennial Reports while non-Annex I Parties submit Biennial Update Reports. To enhance comparability of the information, they may choose to apply the MPGs in place of the relevant reporting guidance under the Convention in reporting their NCs and annual GHG inventories.

4. Overview of the BTR

Every two years, no later than December 2024, all Parties to the Paris Agreement must submit a BTR containing specific national information on their implementation of the Paris Agreement. The exceptions are Small Island Developing States and Least Developed Countries, which may submit this information at their own discretion. The BTR is a core component of the ETF and one of its main functions is to promote reporting transparency. It is the main way for Parties to transparently communicate information on their participation and contribution to national, regional and global efforts to mitigate and adapt to climate change under the Paris Agreement.

It is also where developed countries shall and other countries that provide support should report on the financial, capacity-building and technology development and transfer support that they have provided and mobilized. Further, through the BTR, developing countries should communicate their respective needs and the support that they have received.

the BTR contains a number of items of information that shall (mandatory) or should (non-mandatory) be submitted and contains both textual information and data in tabular format in CRTs (for GHG inventory information) and CTF (for tracking progress in implementing and achieving the NDC and reporting information on finance, technology development and transfer and capacity-building).

These are:

- the NIR of anthropogenic emissions by sources and removals by sinks of greenhouse gases, which may be submitted as a stand-alone report or as a component of the BTR
- Information necessary to track progress made in implementing and achieving Nationally Determined Contributions under Article 4 of the Paris Agreement (shall)
- Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement (should)

- Information on financial, technology development and transfer and capacity building support needed and received under Articles 9-11 of the Paris Agreement (should, for developing countries)
- Information on financial, technology development and transfer and capacity building support provided and mobilized under Articles 9-11 of the Paris Agreement (shall, but only for developed countries. Should for other countries providing support)

Moreover, another report can form part of the BTR submission: the Adaptation Communication (AC), which can be submitted as part of the BTR. In this case, it should be clearly identifiable in the BTR as such. The Adaptation Communication can also be submitted through other channels, such as NDCs and NCs. Therefore, countries are encouraged to number their submitted Adaptation Communications sequentially.

Figure below shows the information to be provided by Parties in the BTR and the corresponding chapters of the MPGs that guide the reporting of that information.

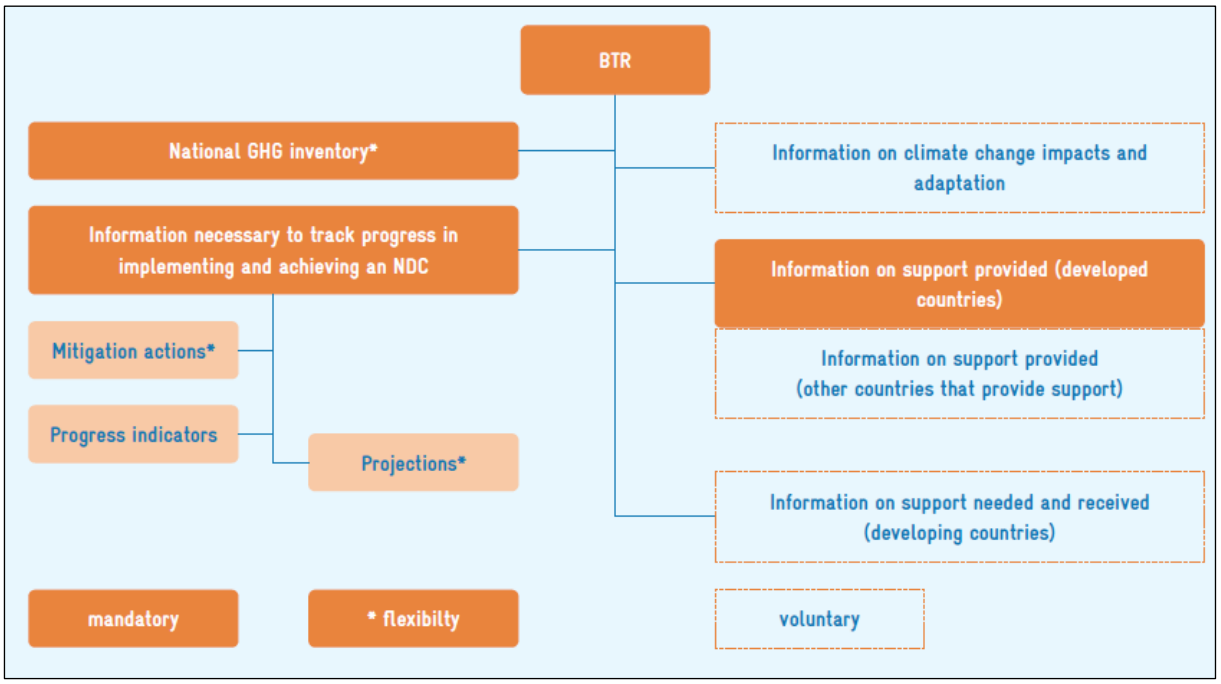


Figure 6. Key elements of the Biennial Transparency Report (source :[14])

Parties to the Paris Agreement must submit an NIR of anthropogenic GHG emissions by sources and removals by sinks. The national inventory report may be submitted either as a stand-alone report or as part of the BTR. The NIR comprises a national inventory document and CRTs for the electronic reporting of information specified in the MPGs (chapter II of annex to 18/CMA.1).

Parties are encouraged to prepare their BTRs and NID in accordance with the outlines contained in decision 5/CMA.3, annexes IV and V.2 Each Party should, to the extent possible, also identify, regularly update and include information on areas of improvement in relation to its reporting. Given their special circumstances, LDCs and SIDS may submit the relevant information at their discretion.

Information to be reported in the BTR by all Parties (outline of the BTR report adopted by CMA3):

- I. National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases
- II. Information necessary to track progress made in implementing and achieving nationally determined contributions
- III. Information related to climate change impacts and adaptation

- IV. Information on financial, technology development and transfer and capacity building support provided and mobilized
- V. Information on financial, technology development and transfer and capacity building support needed and received
- VI. Information to be reported when national communications and biennial transparency reports are submitted jointly every four years
- VII. Information on flexibility
- VIII. Improvements in reporting over time
- IX. Any other relevant information
- Annexes
    - Annex 1: Technical annexes for REDD+, as applicable
    - Annex 2: Common reporting tables for the electronic reporting of the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases
    - Annex 3: Common tabular formats for the electronic reporting of:
        - Information necessary to track progress in implementing and achieving nationally determined contributions
        - Information on financial, technology development and transfer and capacity building support provided and mobilized
        - Information on financial, technology development and transfer and capacity building support needed and received
    - Annex 4: Information in relation to the Party's participation in cooperative approaches, as applicable

Parties shall submit their BTR and national inventory report (if submitted as a stand-alone report), via an online portal maintained by the secretariat, which in turn will post the reports on the UNFCCC website. These reports shall be submitted in one of the official languages of the United Nations (i.e. in Arabic, Chinese, English, French, Russian or Spanish)

In the following chapters, elements of tracking progress made in implementing and achieving NDC are explained in more detail.

5. Forms of tracking progress in NDC implementation

5.1 Relationship between domestic targets and NDC targets

The formulation of NDCs builds usually on existing and planned climate policies or evolves from domestic mitigation targets. Ideally, domestic mitigation targets and policies are aligned with, or aggregated into, the NDC. In this sense, domestic mitigation targets may represent a disaggregation of an NDC target. For instance, the NDC target could include an economy-wide mitigation target, while the government may have adopted further domestic mitigation targets that break down the economy-wide NDC target into sectoral targets. There may also be cases in which domestic mitigation targets have already existed before the NDC was formulated and are thus not essentially a breakdown of the NDC.

Domestic targets may have a different coverage or scope (e.g. covering only a region of the country) than the NDC target. In terms of NDC accounting, the simultaneous existence of different layers of mitigation targets in one country raises the need to clearly distinguish between NDC targets and

domestic targets. The table below above introduces a terminology to differentiate these target types and explains other features of different types of targets.

Table 1 :Relationship between domestic targets and NDC targets. (source :[15])

Domestic target(s)	NDC target(s)
Not specified in the NDC	Specified in the NDC
Mitigation targets not included in NDCs but adopted by national or sub-national authorities within the country. Those may complement NDC targets. By sharing responsibilities, they can strengthen the ability of the country to achieve its NDC.	All mitigation target(s) communicated in NDCs to the UNFCCC.
———	**Conditional / Unconditional target(s)** An unconditional target is a target that the country intends to achieve without international support. In contrast, a conditional target is a target that a country intends to achieve only on the condition that it receives relevant international support.
Aggregated / Disaggregated target(s) A disaggregated target is the breakdown of a target into sub-targets. Vice versa, an aggregated target is the sum of sub-targets. Examples are sectoral targets (as disaggregated targets) in conjunction with an economy-wide target (as aggregated target). Typically, the aggregated target is communicated in the NDC, while disaggregated targets may or may not be included in the NDC.	
GHG / Non-GHG target(s) A GHG target is quantified in greenhouse gas emissions metrics (t CO2e), covering gases addressed under the UNFCCC. In contrast, non-GHG target(s) refer to measures whose effects ultimately also contribute to climate change mitigation but are not quantified in greenhouse gas emission metrics (e.g. megawatts of renewable energy generation capacity to be installed).	

- When it comes to the implementation of NDCs, setting domestic targets, for example in the form of a disaggregation of the NDC target into sectoral targets, may be helpful. This may facilitate the domestic planning process of how the NDC is achieved and help assign responsibilities to different domestic institutions for achieving the sectoral targets.
- Countries should be clear about which targets they communicate through the NDC to the international community, and which targets they keep exclusively as domestic.
- NDC accounting does not apply to domestic targets. If countries establish domestic targets, tracking the achievement of those targets is still important, though it is not required under the Paris Agreement.

5.2 Forms of tracking progress

Tracking progress towards NDC targets and accounting for NDC targets answers the question of how much progress the country has made towards achieving its NDC targets over time and to what extent the country has achieved its NDC. This is implemented by reporting a time series of the relevant indicator and comparing it to the target level.

A second form of progress tracking relates to the tracking of "mitigation policies and measures, actions and plans" as set out in section III.D of the MPGs. This concept has previously also been

referred to as MRV of Policies and Measures (PaMs). MRV of policies and measures has been a voluntary action for developing countries, with little specifications of what and how to implement MRV systems. The MPGs now provide more specific requirements. As part of the information on tracking progress towards NDC, paragraph 80 of the MPGs requires all countries to "provide information on actions, policies and measures that support the implementation and achievement of its NDC under Article 4 of the Paris Agreement, focusing on those that have the most significant impact on GHG emissions or removals and those impacting key categories in the national GHG inventory." Paragraph 85 of the MPGs adds that "each Party shall provide, to the extent possible, estimates of expected and achieved GHG emissions reductions for its actions, policies and measures (…)". The MPGs provide some flexibility in the tracking of PaMs by requiring it only "to the extent possible". Moreover, the paragraph refers to those PaMs "that have the most significant impact on GHG emissions or removals", a focus that makes sense when factoring in the purpose of this form of progress tracking – i.e., understanding generally whether certain PaMs deliver or not – and also when factoring in associated costs and methodological challenges (e.g. overlapping PaMs impacts).

A third form of progress tracking is the MRV of domestic mitigation targets. Elements of MRV of domestic mitigation targets are already in place and known in many countries. As with PaMs tracking, policymakers may also wish to evaluate the overall socio-economic impacts of domestic targets. Such evaluations may address questions around social aspects of measures (e.g. job creation, distribution effects) or other environmental aspects (air quality, etc.).

Table 2 : Forms of tracking progress. (source :[15])

Form	Main evaluation question	Paris Agreement reference	Concept	Level	What is tracked ?
NDC progress tracking and accounting	To what extent is the country on track to achieve its NDC target(s) and has it achieved its NDC?	Art. 13 & MPGs, section III.C, Art. 4.13 & Katowice mitigation decision	Tracking progress towards and accounting for NDCs	International requirement	Indicators related to NDC targets
PaMs tracking*	How are policies and measures contributing to NDC implementation and achievement?	Art. 13 & MPGs, section III.D	Information on PaMs that support NDC implementation and achievement	International requirement	- Key performance indicators related to PaMs - GHG Emissions reductions of PaMs
Domestic target tracking*	To what extent is the country on track to achieve relevant domestic targets?	None	MRV for relevant target types (e.g. emission targets or specific policies)	Domestic rules	- Key performance indicators related to PaMs - GHG Emissions reductions of PaMs

*This may include tracking of co-benefits beyond mitigation impacts, such as other environmental (e.g. other air pollutants), social (e.g. job creation from renewable energies), or economic impacts.

6. Overview of ETF reporting requirements related to tracking progress of NDC

Each Party is required to report in its BTR the information necessary to track progress in implementing its NDC during the implementation period and, ultimately, to demonstrate whether it has achieved its NDC. Information used to track progress of NDCs is of key importance in the ETF, since it is crucial to be able to analyse whether countries are on track to meet the objectives of their national targets, and to allow the aggregated NDCs to be assessed in the global stocktake, informing countries of the subsequent NDC revision process.

This information is subject to a TER by a team of expert reviewers. TERs are focused on reviewing the consistency of the reported information with the MPGs, taking into account flexibility provisions, and considering the Party's implementation and achievement of its NDC.

The MPGs provide guidance on the relevant information to be reported to describe the NDC, track the progress of its implementation and assess its achievement. The reporting obligations for tracking progress in implementing and achieving NDCs are outlined in chapter III of the MPGs, and summarized in table below.

Table 3 : Reporting provisions on information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of Paris Agreement (source :[22])

Paragraph(s) of the MPGs	Heading	Area of flexibility under the MPGs	Format of reporting
Paragraphs 59-63	A. National circumstances and institutional arrangements	NA	Information to be reported in a narrative format
Paragraph 64	B. Description of a Party's NDC under Article 4 of the Paris Agreement, including updates	NA	Information to be reported in a narrative and common tabular format (CTF tables)
Paragraphs 65-79	C. Information necessary to track progress made in implementing and achieving a Party's NDC under Article 4 of the Paris Agreement	NA	Information to be reported in a narrative and common tabular format (CTF tables)
Paragraphs 80-90	D. Mitigation PaMs, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving an NDC under Article 4 of the Paris Agreement	Estimates of expected and achieved GHG emission reductions (para. 85)	Information to be reported in a narrative and common tabular format (CTF tables)
Paragraph 91	E. Summary of GHG emissions and removals	NA	Information to be reported in a narrative and common tabular format (CTF tables)
Paragraphs 92-102	F. Projections of GHG emissions and removals, as applicable	Projections of GHG emissions and removals (paras. 92, 95 and 102)	Information to be reported in a narrative and common tabular format (CTF tables)
Paragraph 103	G. Other information	NA	Information to be reported in a narrative format

All Parties shall report information necessary to track progress made in implementing and achieving their NDC **in a narrative and common tabular format**, as applicable. As depicted in the figure below, area of flexibility under the MPGs is previewed for some of these information.

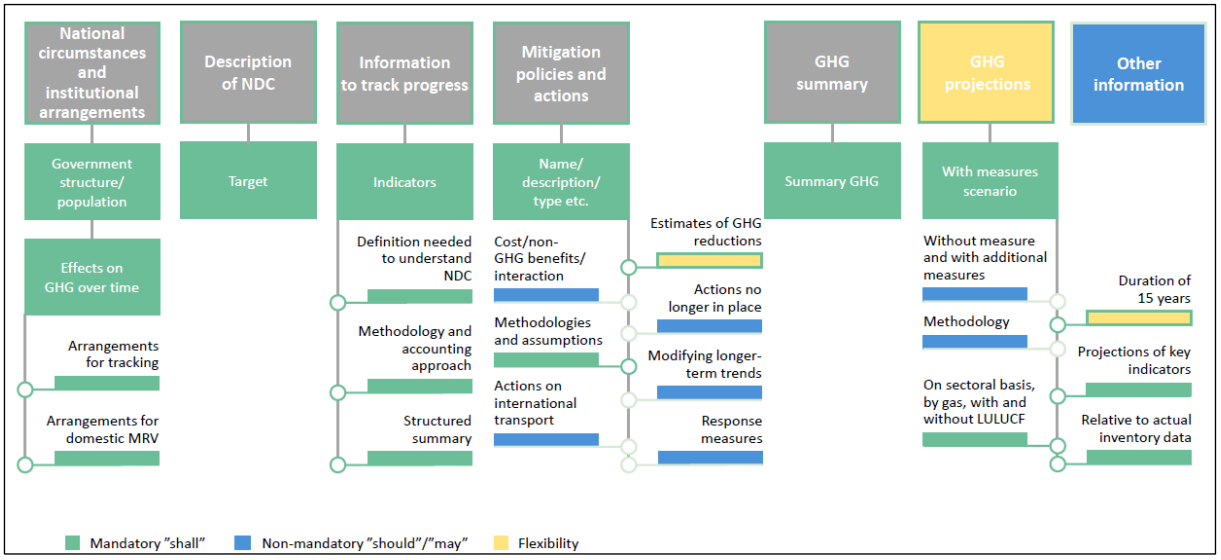


Figure 7. Tracking progress of NDC: Overview of reporting requirements (source :[3])

Annex II to the transparency guidance contains a total of 13 tabular formats, to be used for reporting the information specified in chapter III of the MPGs – the information necessary to track progress made in implementing and achieving NDCs. Not all tabular formats need to be filled in by all Parties, and the information provided in these formats may be complemented by other formats in the BTR (narrative, figures etc.), as stated in paragraph 4 of the transparency guidance.

Figure below provides an overview of the common tabular formats for tracking progress and how they are related to the various sections and paragraphs of the MPGs.

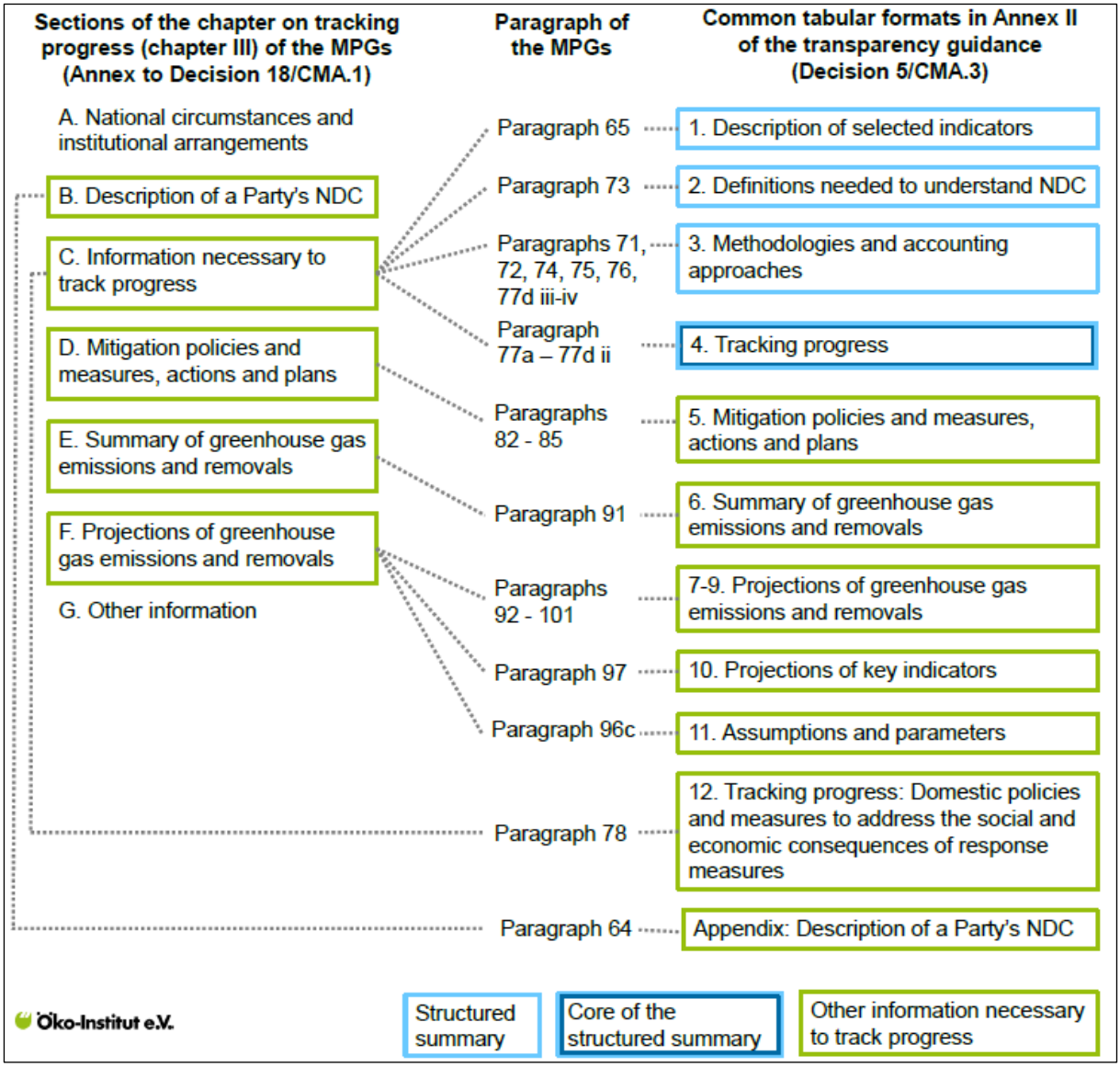


Figure 8. Overview of common tabular formats for tracking progress (source :[17])

The first four tabular formats are known as the 'structured summary'. This is because paragraph 77 of the MPGs states that 'each Party shall provide the information referred to in paragraph 65-76 above in a structured summary […]'. The structured summary in a narrow sense, or its core, is covered by CTF 4. It addresses the specific information listed in paragraph 77.

Some reporting elements aim to understand the past and progress to date: they are backwards looking. Other reporting requirements aim to understand potential future progress: they are forward looking.

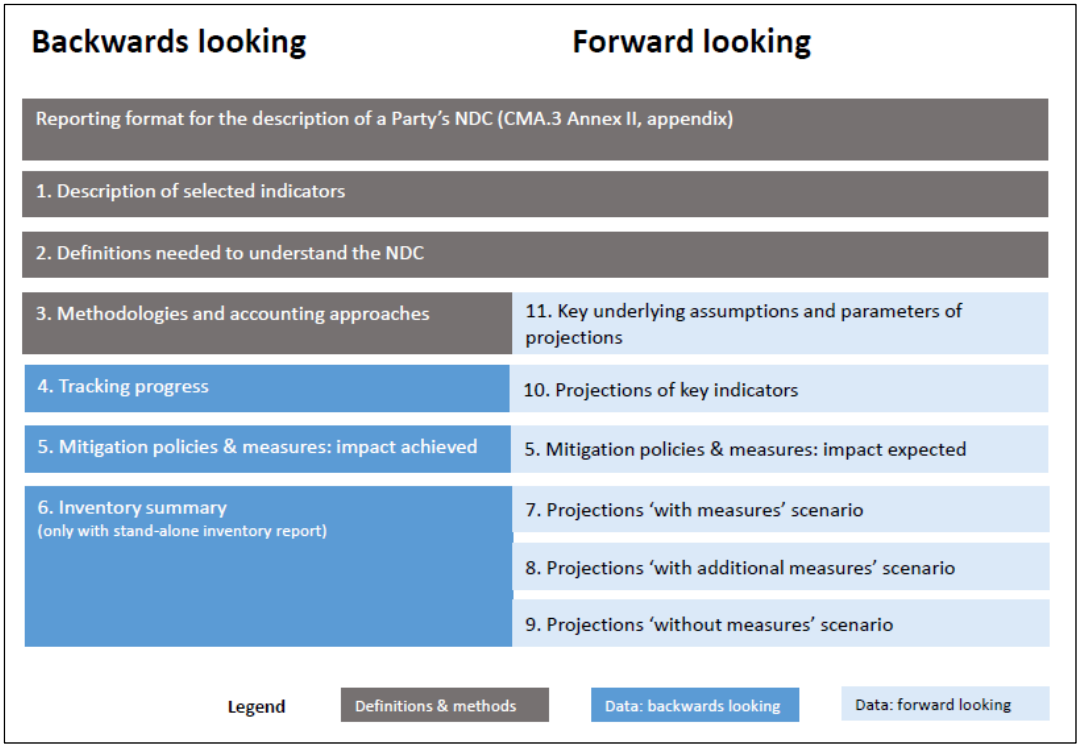


Figure 9. Understanding the perspective of requirements for the common tabular formats related to tracking progress (source :[5])

7. Information necessary to track progress made in NDC

7.1 Information on national circumstances and institutional arrangements

Paragraph(s) of the MPGs	Heading	Format of reporting	Related CTF
Paragraphs 59-63	A. National circumstances and institutional arrangements	Information to be reported in a narrative format	Not applicable

Various national circumstances affect a Party's ability to implement and achieve its NDC under Article 4 of the Paris Agreement, including its government structure, features of its population profile, geography, economy and climate, and sector-specific details.

Well-functioning institutional arrangements are vital to enabling countries to collect, process and provide reliable, comprehensive and regularly updated information that meets the enhanced reporting requirements and serves national decision makers and relevant stakeholders.

The reporting requirements related to national circumstances and institutional arrangements are contained in paragraphs 59–63 of the MPGs, reproduced below. Examples of information to be reported to meet each requirement are also provided below.

i. **Paragraph 59: Each party shall describe its national circumstances relevant to progress made in implementing its NDC under Article 4 of the Paris Agreement,** including:

- Government structure;
- Population profile;
- Geographic profile;
- Economic profile;
- Climate profile;
- Sector details.

- As national circumstances are, by definition, country-specific, a Party can report any information that is relevant to the implementation and achievement of its NDC.
- Information reported to meet this requirement could include, for example, how political authority on matters relating to climate policy is delegated to different levels of government or how a primarily export-based agricultural economy may make it challenging to meet emission reduction commitments.

ii. **Paragraph 60: Each Party shall provide information on how national circumstances affect GHG emissions and removals over time.**

- Information reported to meet this requirement could include, for example, how an increasingly urbanized population is able to achieve reduced GHG emissions in the transport sector or how harsh climatic conditions may affect the need for heating or cooling, thus affecting GHG emission trends over time.

iii. **Paragraph 61: Each Party shall provide information on the institutional arrangements in place to track progress made in implementing and achieving its NDC under Article 4, including those used for tracking internationally transferred mitigation outcomes, if applicable, along with any changes in institutional arrangements since its most recent biennial transparency report.**

- Information reported to meet this requirement could include, for example, government requirements to assess the GHG impacts of policy proposals; requirements to measure, monitor and report on the GHG impacts of activities undertaken by government agencies; requirements for periodic reporting on progress in achieving GHG emission reduction objectives; and policies on the use of international market mechanisms, including the tracking of any units obtained and/or sold.

iv. **Paragraph 62: Each Party shall provide information on legal, institutional, administrative and procedural arrangements for domestic implementation, monitoring, reporting, archiving of information and stakeholder engagement related to the implementation and achievement of its NDC under Article 4.**

- Information reported to meet this requirement could include, for example, legislative arrangements and enforcement and administrative procedures, such as overarching national measures relevant to climate change; decrees, regulations and governmental decisions on the implementation of climate-related measures; and environmental laws, acts and regulations related to stakeholder consultation.

v. **Paragraph 63: In reporting the information referred to in paragraphs 59-62 above, a Party may reference previously reported information.**

- Information could be previously reported in, for example, biennial reports.

7.2 Description of NDC (paragraph 64 of MPGs)

Paragraph(s) of the MPGs	Heading	Format of reporting	Related CTF
Paragraph 64	B. Description of a Party's NDC under Article 4 of the Paris Agreement, including updates	Information to be reported in a narrative and common tabular format	Appendix: Description of a Party's NDC (to be used by Parties on a voluntary basis.)

As part of the information necessary to track progress in implementing and achieving NDCs under Article 4 of the Paris Agreement, Parties are required to provide a **description of their NDC**, including information on the nature of the NDC, relevant reference points and values; the time frame for implementation; scope and coverage; intention to use units under Article 6; and any updates or clarifications. This information will be used to track progress in implementing and achieving the NDC.

The entire reporting requirements related to the description of the NDC are contained in paragraph 64 of the MPGs. Depending on NDC target type, information should be provided in the BTR on the following elements presented in table below.

Table 4 : Information to be provided in the BTR on the description of the NDC and similar information to be provided in the NDC. (source :[16])

BTR[a] requirements	Related NDC requirements[b]
Target(s) and description (see examples in Table 12)	General description of the target
	Target relative to the reference indicator, expressed numerically (e.g. in % or amount)
Target year(s) or period(s), and whether they are single-year or multi-year target(s)	Whether it is a single-year or multi-year target
Reference point(s), level(s), baseline(s), base year(s) or starting point(s) and their respective value(s)	Reference year(s), base year(s), reference period(s) or other starting point(s)
Time frame(s) and/or periods for implementation	Time frame and/or period for implementation, including start and end dates
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases	Sectors, gases, categories and pools covered by the NDC
	Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans
Intention to use cooperative approaches that involve the use of ITMOs in relation to the NDC	Intention to use voluntary cooperation under Article 6 of the Paris Agreement, if applicable
Any updates or clarifications of previously reported information	Information on the circumstances under which the Party may update the values of the reference indicators

The information on a Party's NDC constitutes a special case because the MPGs do not explicitly require this information to be provided in a common tabular format. In Glasgow, Parties agreed on a tabular format for the description of a Party's NDC, but it was added as an appendix to Annex II and a note was included stating that this table is to be used by Parties on a voluntary basis.

The use of this tabular format for information on the Party's NDC will facilitate the understanding of the information in the BTR as well as the technical expert review. This situation is comparable to the reporting of 'information to facilitate, clarity, transparency and understanding of NDCs' (annex I to decision 4/CMA.1). While such information is mandatory from the second NDC only, many Parties provided it when they updated their first NDCs in 2020/2021, and many decided to provide this information in a tabular formatБ

The detailed information to be reported to meet the requirements are provided below.

Paragraph 64: Each Party shall provide a description of its NDC under Article 4, against which progress will be tracked. The information provided shall include the following, as applicable, including any updates to information previously provided:

a) Target(s) and description, including target type(s) (e.g. economy-wide absolute emission reduction, emission intensity reduction, emission reduction below a projected baseline, mitigation co-benefits of adaptation actions or economic diversification plans, policies and measures, and other);

The reported information shall include, as applicable, a description of the target explaining the nature of the target, for example:

- **Absolute emission reduction relative to a base year**, expressed as an emission reduction from the level in a specified base year. These targets may be economy-wide or sector-specific. They can reflect a decrease in emissions compared with a base-year or period. They can also take the form of a target for carbon neutrality. The Paris Agreement specifies that developed country Parties should undertake economy-wide emission reduction targets, while developing country Parties are encouraged to move over time towards economy-wide emission reduction or limitation targets.

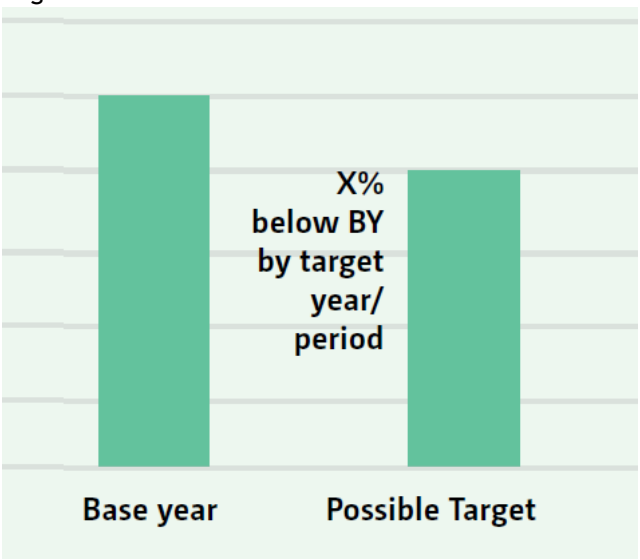


Figure 10. Example of an emission reduction target and a limitation on emissions compared with a base-year or period (source :[13])

- **Absolute limitation target relative to a base year**: These targets may be economy-wide or sector-specific. They reflect a limitation on emissions compared with a base-year or period. The Paris Agreement specifies that developed country Parties should undertake economy-wide emission reduction targets, while developing country Parties are encouraged to move over time towards economy-wide emission reduction or limitation targets.

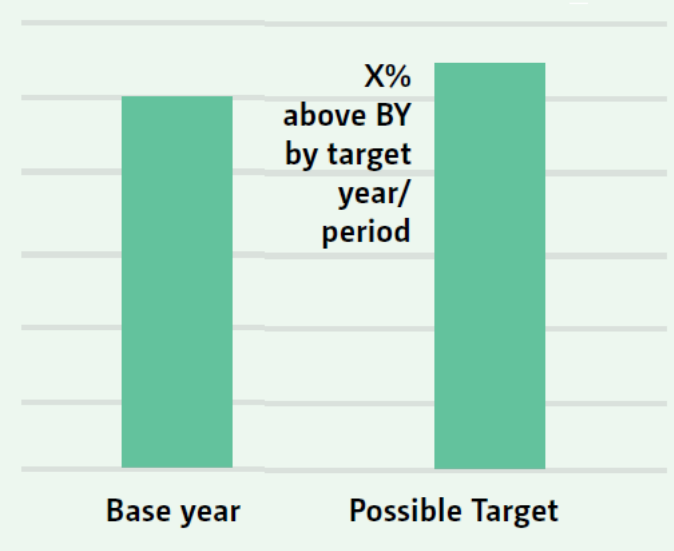


Figure 11. Example of limitation on emissions compared with a base-year or period (source :[13])

- **Emission peaking targets**, expressed as a maximum level of emissions in a specified year where subsequent emissions are expected to continuously decline. A peaking target allows a Party to emit increasing amounts of GHG emissions for a specified period and then peak either at a certain level of emissions or in a certain year. In this context, the country may define what a 'peak' is and how it differs from inter-annual variation.

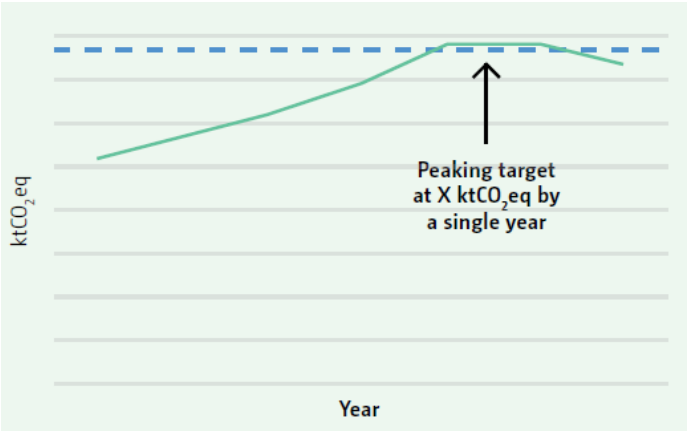


Figure 12. Example a peaking target (source :[13])

- **Fixed-level targets :** A fixed-level goal is a goal that reduces, or limits the increase of, emissions to an absolute emissions level in a target year (see Figure below). Fixed-level goals include carbon neutrality goals, which are designed to reach zero net emissions by a certain date. Fixed-level goals are not expressed relative to either a historical base year or a projected baseline scenario.

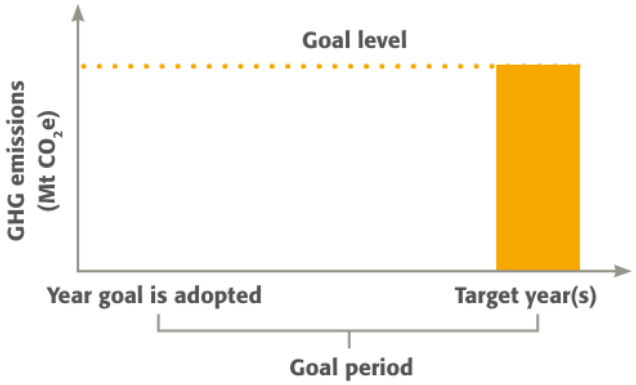


Figure 13. Example a fixed-level target (source :[18])

- **Targets based on carbon budget approaches**, expressed as a total amount of emissions that can be emitted over a given period;
- **Base year emission intensity targets:** a base year emission intensity target is a goal that reduces emissions intensity (emissions per unit of another variable, typically GDP) by a specified quantity relative to a historical base year. Emissions intensity refers to emissions per unit of another variable, which is typically economic output, such as GDP, but may also be population, energy use, or a different variable. The emissions level will be the nominator, and the unit of variable will be the denominator, in equations related to accounting for base year intensity goals. For example, a country that wish to reduce emissions intensity of the economy would choose GDP as the unit of variable.

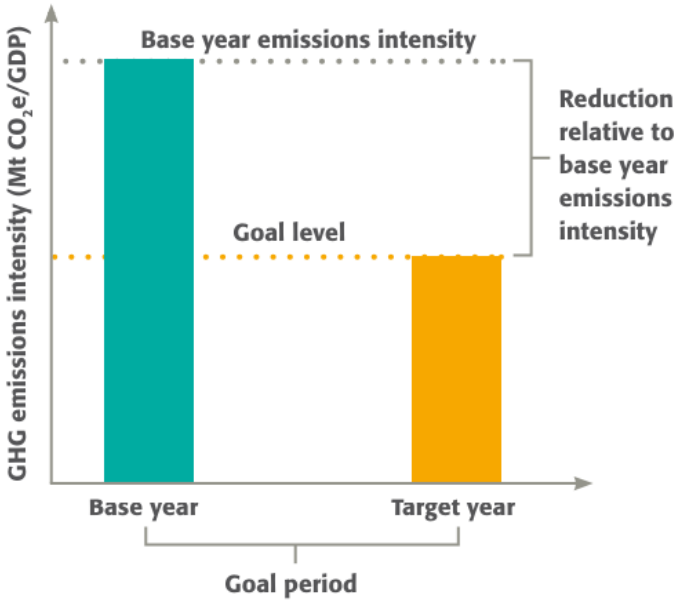


Figure 14. Example of a base year emission intensity target (source :[18])

- **Targets of emission reductions below a projected baseline:** A baseline scenario goal is a goal -across the entire economy or for a single sector- that reduces emissions by a specified quantity relative to a projected emissions baseline scenario (see Figure below). A baseline scenario is a reference case that represents the events or conditions most likely to occur in the absence of activities taken to meet a mitigation goal. These goals are sometimes referred to as business-as-usual (BAU) goals. Baseline scenarios may be static or dynamic. A static baseline scenario is developed and fixed at the start of the goal period and not recalculated over time. A dynamic baseline scenario is developed at the start of the goal period and

recalculated during the goal period based on changes in emissions drivers such as GDP or energy prices. The target may reflect a single year or a budget over multiple years.

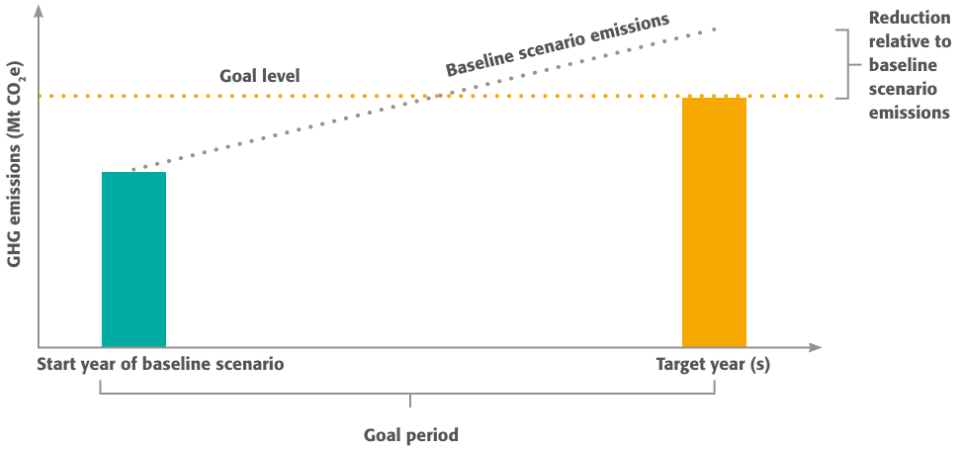


Figure 15. Example of a baseline scenario target (source :[18])

- **Policies and actions:** In this case, a Party does not necessarily commit to an emission based target, but rather to implementing one or a series of policies and actions designed to address climate change given the national circumstances (e.g. a low carbon development strategy for urban planning or renewable energy legislation).

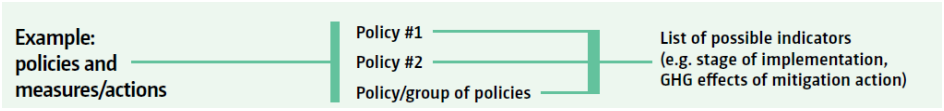


Figure 16. Example of a policies and actions target (source :[13])

- **Other targets:** Other targets in NDCs communicated by Parties to date, which in some cases overlap with the ones identified above, include tracking the mitigation co-benefits of adaptation actions and non-GHG targets (e.g. the share of renewables in the energy sector, an increase in forest land area or a specified measure of energy efficiency)

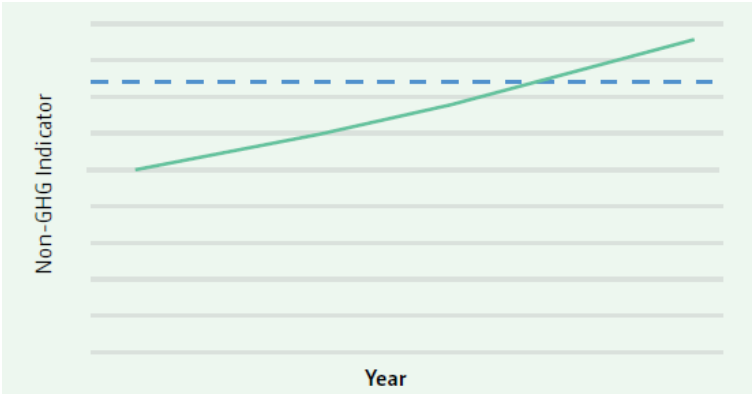


Figure 17. Example of non-GHG goals (e.g. forest cover, electricity sector efficiency, share of renewable energy) (source :[13])

Most of NDCs include targets such as absolute targets, intensity targets, emissions reductions below a projected baseline (business as usual), qualitative indicators for a specific policy or measure (policy and actions) or peaking targets.

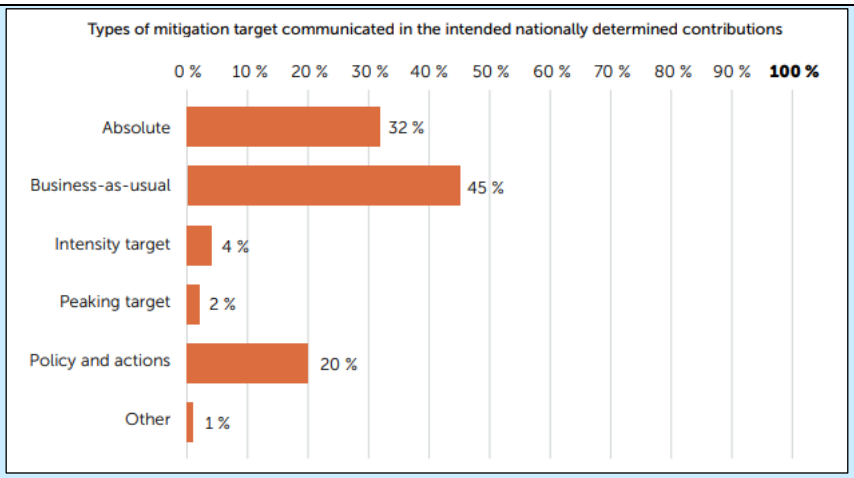


Figure 18. Types of mitigation targets communicated in the INDC (source: [16].)

Examples of how Parties have formulated NDC targets:

- A single, economy-wide absolute emission reduction target: a 30 per cent reduction in emissions below the 2005 level by 2030, to be implemented as an emission budget covering 2021–2030.
- Multiple target components:
  - Peaking of emissions by 2028;
  - Decline in emission intensity (emissions per unit of GDP);
  - Increase in forest area by 25 per cent of the 1990 area.
- A mixed conditional and unconditional target:
  - Unconditional target of a 30 per cent reduction in emissions compared with the 2005 level by 2030;
  - Conditional target of up to a 40 per cent reduction in emissions compared with the 2005 level, dependent on the level of international support.

b) Target year(s) or period(s), and whether they are single-year or multi-year target(s);

- The reported information shall include, as applicable, information indicating the target year(s) or period(s) of the NDC.
- In addition, the Party is required to indicate whether the target is intended to be met in a **single year** or over **multiple years**.

- A single-year target means that emissions must be reduced below the target level in a specific year. For example, if a Party's NDC includes a single-year target by which it pledges to reduce emissions by 30 per cent below the 2005 level in 2030, the Party would need to provide information on the expected emission level in 2030 only.
- In contrast, a multi-year target means that total cumulative emissions must remain below the target level over the entire period of NDC implementation. For example, if a Party has a multi-year target as part of its NDC by which it pledges to reduce emissions by 40 per cent below the 1990 level, the Party would need to provide information on emission levels in each year of the period of implementation (i.e. start date to the target year).

- Multi-year targets may involve either an averaging of emissions across the implementation period or an absolute cumulative emission target over the period. Multi-year targets may also be referred to as "budget" approaches.
- Alternatively, a multi-year target could also mean that the Party has a target for several consecutive years (e.g. 2025, 2030 and 2050) because it will implement different policies and measures over different time periods.

c) Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s);

- The reported information shall include, as applicable, information on any reference point(s), level(s), baseline(s), base year(s), or starting point(s), and their respective values.
- This information will be used to track progress of implementation of the NDC.
- When providing information on reference point(s), the type of information to be reported depends on the type of target and approach(es) being used.

Type of information to be reported by Parties according to target type

- **Absolute emission reduction targets**
  - Emission levels for the base and target year in terms of CO2 eq
  - Headline number (percentage) of emission reduction
- **'Business as usual' targets**
  - Emission levels for the base and target year in terms of CO2 eq
  - Headline number (percentage) of emission reduction
  - Assumptions used and sources for data series that form part of the NDC target (e.g. GDP, population, energy use, type of model used if NDC is based on projected values, past trends)
  - Model used to develop 'business as usual' baseline
  - Whether the baseline scenario is static or dynamic
  - Which policies and measures are included/excluded in the baseline, and on what basis (e.g. does the baseline include policies and measures adopted up to a specific point in time?)
- **Intensity targets**
  - Quantified target level of emissions or emission reduction per unit of GDP, unit of product/output or population, or another indicator
  - Base and target years
  - Intensity level for the base year, as well as past trends and projections (if available)
  - Headline number (percentage) of emission reduction
  - Expected emission level for the target year
- **Targets based on policies and measures**
  - Detailed list of intended and proposed policies and measures
  - Description of actions, including mitigation co-benefits
  - Qualitative description of policies and measures
  - Quantitative information on expected emission reductions from the policies and measures (if possible)
  - Explanation of how progress will be tracked (e.g. quantification, status of implementation of policies and measures)
- **Emission peaking targets**
  - Peak year
  - Indicators to be used to assess whether the target has been met
  - Estimated emission level in the peak year
  - Emissions trajectory towards peak year
  - Expected emissions trajectory after peak year

d) Time frame(s) and/or periods for implementation;

- The reported information shall include, as available, information on the time frame and/or period of implementation, which refers to the time by which or in which the NDC is to be achieved.

- According to UNFCCC 2022 NDC Synthesis Report, 92 per cent of NDCs have a time frame and/or period of implementation of until 2030 while 8 per cent of NDCs have specified periods of until 2025, 2035, 2040 or 2050
- As regard the starting date, according to the same report, 55 per cent of NDC have 1 January 2021 as a starting date: , 31 per cent in or before 2020 and 3 per cent starting implementation in 2022

Examples of target time frames

- Party X has indicated a starting date of 1 January 2021 and an implementation period up until 31 December 2030;
- Party Y has indicated a starting date of 1 January 2021 and an implementation period up until 31 December 2025.Absolute emission reduction targets

e) Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases;

- The reported information shall include, as available, information describing the scope and coverage of the NDC.
- Sectors and greenhouse gases covered by Parties that communicated their NDC

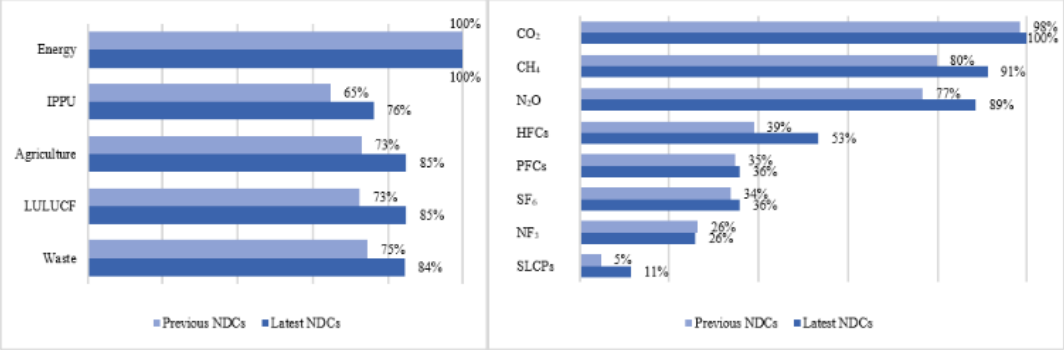


Figure 19. Sectors and greenhouse gases covered by Parties [20]

Example of description of NDC scope and coverage from a Party's revised NDC:

Sectors, gases, categories and pools covered by the nationally determined contribution, including, as applicable, consistent with Intergovernmental Panel on Climate Change (IPCC) guidelines	The sectors, gases, categories and pools covered by the UK's NDC are based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the 2013 IPCC Kyoto Protocol Supplement and the 2013 IPCC Wetlands Supplement. The UK also looks forward to implementing methodologies introduced by the 2019 Refinement to the 2006 IPCC Guidelines in the future. **Sectors covered** Energy (including transport); Industrial Processes and Product Use (IPPU); Agriculture; Land-use, Land-Use Change and Forestry (LULUCF); and Waste. **Gases covered** CO2, CH4, N2O, HFCs, PFCs, SF6 and NF3. **Pools covered** All LULUCF pools are included in the NDC: above ground biomass, below ground biomass, litter, deadwood soil organic carbon and stocks of harvested wood products.

f) Intention to use cooperative approaches that involve the use of internationally transferred mitigation outcomes under Article 6 towards NDCs under Article 4 of the Paris Agreement;

- To fulfil this requirement, any Party intending to use internationally transferred mitigation outcomes acquired through cooperative approaches to meet its NDC must indicate this in the BTR.
- As part of tracking progress, additional information on participation in Article 6 is required to be reported, including in CTF tables 3 and 4.

g) Any updates or clarifications of previously reported information (e.g. recalculation of previously reported inventory data, or greater detail on methodologies or use of cooperative approaches).

The reported information shall include, as available, any updates or clarifications from previously reported information. For example:

- A recalculation of previously reported inventory data that results in a change in the base year emissions which, in turn, affects the quantification of emission reductions needed to meet the target;
- Recalculation of BAU emissions and removals;
- Updated information on methodologies;
- Additional information on the use of cooperative approaches.

In a nutshell: how to fill-in appendix on description of a Party's NDC

- For submitting information on description of a Party's NDC, a pre-defined reporting format is available. It can be found in the appendix to Annex II of the transparency guidance.
- The use of this reporting format is voluntary, and Parties may alternatively provide the related information in a freely chosen format in their Biennial Transparency Report. However, it is recommended that the defined reporting format is used because it helps country experts to ensure that all required elements are included. It also helps readers and reviewers to understand this information and it may reduce the number of questions raised during the review process.
- Parties with both unconditional and conditional targets in their NDC may add a row to the table to describe conditional targets
- The table below provides a filled-in reporting format for an example using a base year target.

Table 5 : Example of a filled-in appendix to Annex II of the transparency guidance. (source: [15])

Item	Description
Target(s) and description, including target type(s), as applicable	Economy-wide net greenhouse gas emission reduction of 20% by 2030 compared to the base year 2005 Target Type: economy-wide emission reduction target
Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable	Target year: 2030 Single-year target
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable	Reference level: Economy-wide net greenhouse gas emissions and removals in 2005 Value: 100 Mt CO2e

Time frame(s) and/or periods for implementation, as applicable	Period for implementation: 2021-2030
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable	Sectors: Energy, industrial processes and product use, agriculture, land use, land use change and forestry, waste Coverage: All emissions and removals on the national territory Gases: CO2, CH4, N2O, HFCs, PFCs, SF6, NF3
Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable	The Party does not intend to use cooperative approaches
Any updates or clarifications of previously reported information, as applicable	The reference level has been updated due to recalculations in the national greenhouse gas inventory. The value communicated in the NDC was 101 Mt CO2e. The updated reference level (emissions level in the base year) is 100 Mt CO2e.

- In case of a baseline scenario target, for example an emission reduction compared to a baseline, the following information has to be provided:
    - In the first row, the target is identified as “emission reduction below a projected baseline”.
    - In the third row, the baseline has to be provided instead of the reference level. For an implementation period of 2021 to 2030, the baseline consists of emission levels in each year from 2021 to 2030. It is recommended that these ten years and emission values are entered directly in the table.
    - All other entries in the table remain the same as in the case of a base year target.
- The reporting format allows for entering a combination of numerical and textual information. For some targets, a more detailed structure of the table would be more helpful. However, the table was designed in a rather generic way to ensure that the same table accommodates all types of NDCs. If additional explanations are needed to fully describe the target, such information can be provided in the Biennial Transparency Report.
- The table [14] below provides country examples of NDC description for different types of targets

NDC target type	Country Examples	Scope	Target value	Target unit	Target timeframe	Value in reference / Base period / BAU
GHG related targets						
Absolute emission reduction or limitation target relative to a base year	Brazil's NDC commits 'to reduce its greenhouse gas emissions in 2025 by 37%, compared with 2005'[16].	CO_2, CH_4, N_2O, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and SF_6	37	%	2025	Base year emission estimation in the fourth BUR is around 2.4 Mio. kt of CO_2 eq. May be updated according to the latest inventory.
Emission reduction target below a BAU level	Morocco's NDC unconditional reduction target, "18.3% below BAU emissions by 2030"[17].	CO_2, CH_4, N_2O and HFCs	18.3	%	2030	The BAU scenario is projected approx. 1.4 Mio. kt CO_2 eq in 2030
Fixed-level target	Argentina's 's fixed-level target, will not exceed net emissions of 359 Mt CO_2 eq by 2030 to 369 Mt CO_2 eq for 2030[18].	CO_2, CH_4, N_2O, HFCs and PFCs	359	Mt CO_2 eq	2030	No reference value is used. But in its NDC submission Argentina compares the level of ambition to its 2016 emissions, which were around 364 Mt CO_2 eq.
Trajectory target	China's target is to peak CO_2 emissions before 2030 and achieve carbon neutrality before 2060[19].	CO_2	NDC does not indicate at which emission level peaking will occur	kt CO_2 eq (comparing emission levels of the unspecified peaking year with the levels of later years)	Year of peaking to be compared with all following years	N/A

NDC target type	Country Examples	Scope	Target value	Target unit	Target timeframe	Value in reference / Base period / BAU
GHG related targets						
Intensity target	India's target is to reduce the emissions intensity of its GDP by 45% by 2030 compared to the 2005 level[20].	CO_2	45	t CO_2 eq per unit of GDP	2030	2005 emissions/2005 GDP
Non-GHG targets						
Sectoral non-green-house gas targets	China has pledged to 'increase the share of non-fossil fuels in primary energy consump-tion to around 25%.	N/A	25	%	2030	N/A
Mitigation actions	Cape Verde set goals for the share of electric vehicles that will be acquired for different vehicle categories. The example here is the goal for public transport buses.	N/A	50	%	2025	N/A

7.3 Information necessary to track progress made in implementing and achieving NDCs (paragraphs 65-79 of MPGs)

7.3.1 Reporting requirements

Paragraph(s) of the MPGs	Heading	Format of reporting	Related CTF
Paragraphs 65-79	C. Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4 of the Paris Agreement	Information to be reported in a narrative and common tabular format	• CTF table 1 Description of selected indicators; • CTF table 2 Definitions needed to understand NDC; • CTF table 3 Methodologies and accounting approaches; • CTF table 4 Tracking progress in implementing and achieving the NDC • CTF12 Information necessary to track progress on the implementation and

			achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures

Tracking progress in implementing and achieving NDCs is based on self-determined indicators selected by Parties. Indicators may be quantitative or qualitative but must be relevant to a Party's NDC.

For each selected indicator, a Party shall provide:

1. The information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), and shall update the information in accordance with any recalculation of the GHG inventory, as appropriate;

2. The most recent information for each reporting year during the implementation period of its NDC

Parties track progress by comparing information on indicators during the implementation period of the NDC with the information for the reference points that correspond to the NDC targets.

The use of indicators is a novel approach for tracking progress in implementing and achieving NDCs under the ETF, developed and agreed by Parties primarily to accommodate the various types of NDC targets.

Tracking progress in implementing and achieving NDCs involves an understanding of:

- Levels and trends of the indicators a Party has chosen on the basis of its NDC targets;
- Progress achieved during the implementation period;
- Additional actions, if any, needed to reach the NDC targets;
- The likelihood of achieving the NDC targets during the implementation period;
- Whether the NDC target was achieved.

Furthermore, in addition to the target and indicator values, countries shall describe each methodology and/or accounting approach used to define the targets, construction of baselines and each indicator, including key parameters, assumptions, definitions, data sources and models used, IPCC guidelines and metrics used. Information on applied methodologies is also requested for countries whose targets include the implementation of policies and measures, and the use of cooperative approaches that involve the use of ITMOs. Countries shall also to explain how the methodology in each reporting year is consistent with the methodology or methodologies used when communicating the NDC, explain any methodological inconsistencies with the Party's most recent NIR, if applicable, and describe how the double-counting of net GHG emissions reductions has been avoided.

For the first NDC, each Party shall clearly indicate and report its accounting approach, including how it is consistent with Article 4, paragraphs 13 and 14, of the Paris Agreement. Parties may choose to apply accounting guidance contained in decision 4/CMA.1, annex II to its first NDC.

For the second and subsequent NDCs, the description of the NDC and the information on tracking of progress, including accounting of NDCs, must be consistent with the guidance contained in decision 4/CMA.1 and its annexes. Further, Parties must clearly indicate how their reporting is consistent with decision 4/CMA.1.

A Party must provide any definitions needed to understand its NDC, including definitions of indicators selected to track progress of implementation or achievement of the NDC; any sectors or categories defined differently than in the national inventory report; and mitigation co-benefits of adaptation actions and/or economic diversification plans.

The information on accounting shall also include, as applicable and available to an NDC:

1. Key parameters, assumptions, definitions, data sources and models used;
2. The IPCC guidelines used;
3. The metrics used;
4. Where applicable to its NDC, any sector-, category or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, taking into account any relevant decision under the Convention, including as applicable:
    a) The approach used to address emissions and subsequent removals from natural disturbances
    on managed lands;
    b) The approach used to account for emissions and removals from harvested wood products;
    c) The approach used to address the effects of age–class structure in forests;
5. Methodologies used to estimate mitigation co-benefits of adaptation actions and/or economic
diversification plans;
6. Methodologies associated with any cooperative approaches that involve the use of internationally transferred mitigation outcomes towards the NDC, consistent with CMA guidance related to Article 6;
7. Methodologies used to track progress arising from the implementation of policies and measures;
8. Any other methodologies related to the NDC;
9. Any conditions and assumptions relevant to the achievement of the NDC.

In addition, each Party shall also:

1. For each indicator identified, describe how it is related to its NDC;
2. Explain how the methodology in each reporting year is consistent with the methodology(ies) used when communicating the NDC;
3. Explain methodological inconsistencies with its most recent national inventory report, if applicable;
4. Describe how double counting of net GHG emission reductions has been avoided, ncluding in accordance with guidance developed in relation to Article 6, if relevant.

7.3.2 Structured summary

All the information referred to above (including information related to the chosen indicator(s)) shall be presented in a "structured summary" to track progress made in implementing and achieving the NDC.

The structured summary synthesizes the Party's reported information in a uniform and consistent manner, which assists external stakeholders, including other Parties and the international community, in viewing each Party's progress towards meeting its NDC targets.

The MPGs define the content of the structured summary. Note that in addition to the specific reporting requirements for the structured summary set out in paragraph 77(a)-(d), the structured summary must also provide the information stipulated by paragraphs 65–76, such as indicators, definitions, methodologies and accounting approaches.

The figure below presents information included in the structured summary, with reference to relevant paragraphs of the MPGs and relevant CTF tables.

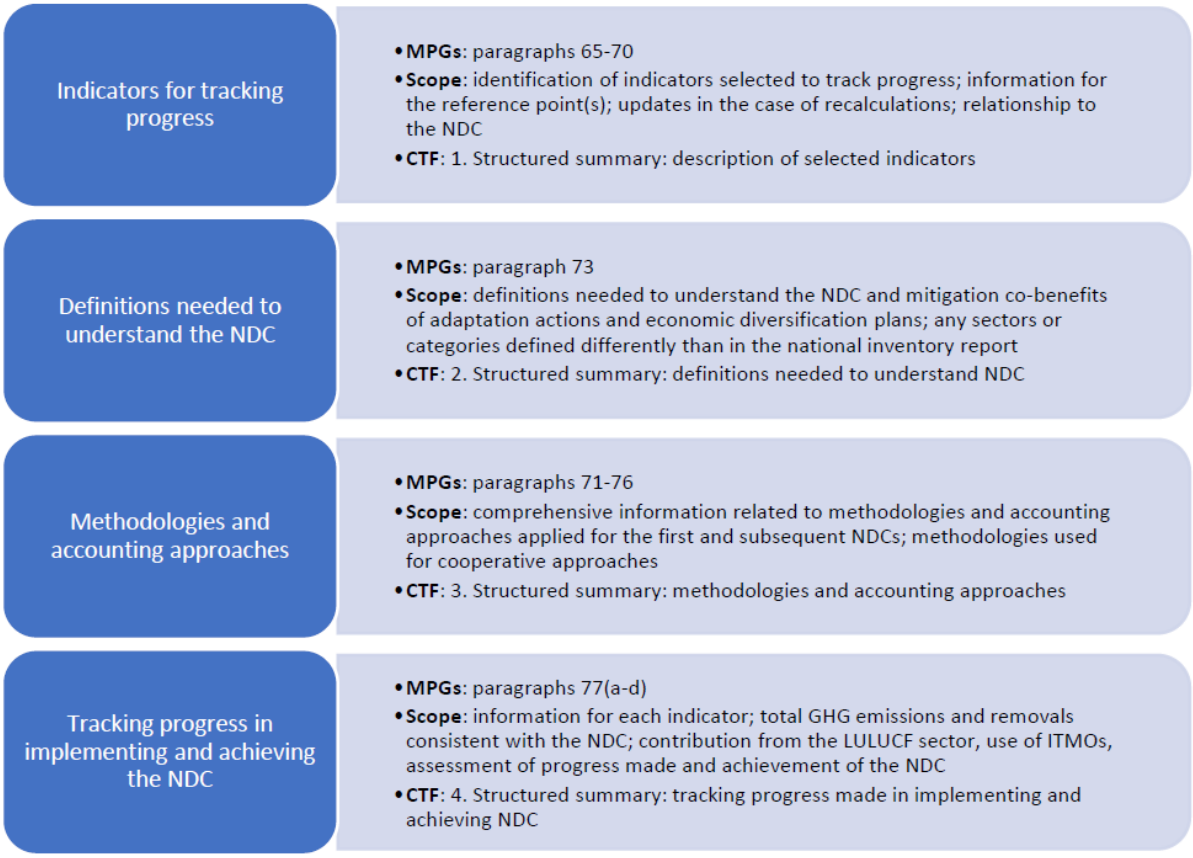


Figure 20. Information to be reported in the structured summary (Source: [8])

The structured summary is made of 4 CTF tables:

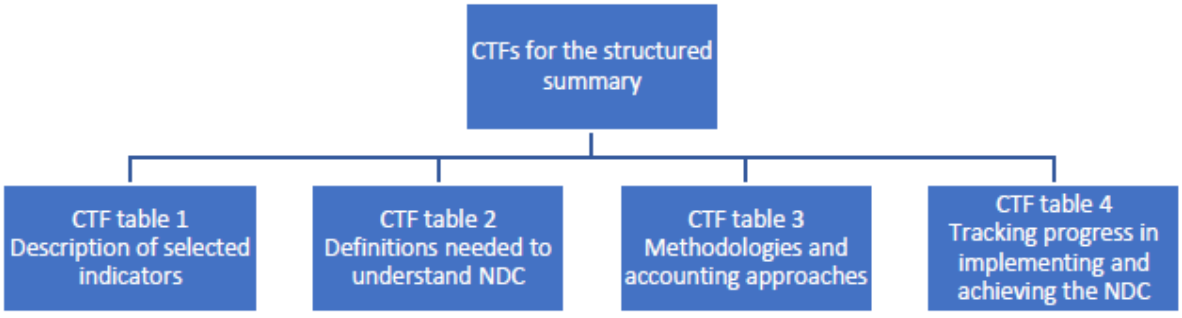


Figure 21. CTF tables for the structured summary (Source: [8])

The first three common tabular formats address background information which is necessary to transparently track progress in the implementation and achievement of NDCs.

First, **CTF 1** allows for listing one or more indicators which are selected by the Party to track its progress in implementing and achieving its NDC. As a typical example, such an indicator could be the total emissions and removals of greenhouse gases within the boundaries of the country. The information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s) could be the total emissions and removals in the base year, e.g. in 1990.

1. Description of selected indicators

Indicator(s) selected to track progress	Description
{Indicator}	
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	
Updates in accordance with any recalculation of the GHG inventory, as appropriate	
Relation to NDC	

Figure 22. CTF table 1 Description of selected indicators (Source: [5])

Next, **CTF 2** provides space for definitions needed to understand each indicator, and other definitions needed to understand the NDCs.

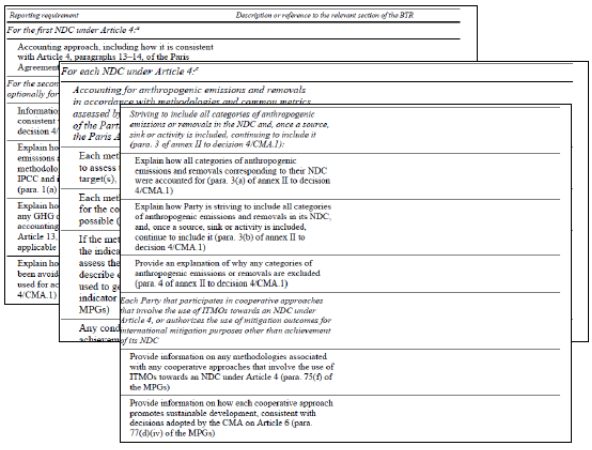
2. Definitions needed to understand the NDC

	Description
Definition needed to understand each indicator:	
{indicator}	
Any sector or category defined differently than in the NIR:	
{Sector}	
{Category}	
Definition needed to understand mitigation co-benefits of adaptation actions and/or economic diversification plans:	
{Mitigation co-benefit(s)}	
Any other relevant definitions:	
{...}	

Figure 23. CTF table 2 Definitions needed to understand NDC (Source: [5])

Finally, **CTF 3** addresses information on the accounting approach. This information is consistent with the accounting guidance (Annex II to decision 4/CMA.1)17 which was adopted in Katowice. Such information may include lengthy text and it may be more practical to provide it in the BTR, instead of using the table. Therefore, CTF 3 allows for entering references to the relevant section(s) of the BTR.

3. Methodologies and accounting approaches



Information can be reported in the common tabular format or a reference to the relevant section of the BTR can be provided:

- Methodologies and accounting approaches
- Metrics and IPCC guidelines
- Assumptions, key parameters, definitions, data sources, models
- Consistency (communicated and implemented NDC; accounting for NDC and GHG inventory)
- Changes (corrections, improvements, updates)
- Inclusion of all relevant categories, and exclusions
- Information associated with any cooperative approaches that involve use of ITMOs, if applicable

Figure 24. CTF table 3 Methodologies and accounting approaches (Source: [5])

CTF 4 is the core of the structured summary – it allows for comparing the target or targets of the NDC to the progress made so far, by using selected indicators. While all Parties have to enter information on indicators, on greenhouse gas emissions (as applicable) and on achievement, a large part of this CTF is relevant only for Parties that use cooperative approaches. Specifically, this part is relevant for Parties that

- participate in cooperative approaches that involve the use of internationally transferred mitigation outcomes (ITMOs) towards an NDC (this would be the participation in voluntary cooperation under Article 6 of the Paris Agreement), or
- authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of the NDC (this would be, for example, the use of credits under the Carbon Offsetting and Reduction Scheme for International Aviation – CORSIA).

Parties that make use of ITMOs to achieve their NDC target, as well as Parties that authorize the use of ITMOs, have to adjust their emissions (or other indicators) according to specific rules, in order to ensure that emission reductions are not double-counted.

4. Tracking progress

	Unit	Reference level	Implementation period of the NDC Year 1 Year 2 ... ... End year	Target level	Target year	Progress made (comparison of most recent and ref. level)
{Indicators}						
Total GHGs, consistent with NDC coverage	➡ *Where the goal is an economy-wide emission reduction target, data from GHG inventory* ➡ *Where the goal covers a subset of the economy, data will be a subset of the GHG inventory*					
Contribution from LULUCF sector, as applicable	➡ *May not be applicable to all NDC goal types if the NDC does not cover the LULUCF sector*					
ITMOs	➡ *May not be applicable, if ITMOs will not be considered towards the NDC goal*					
Assessment of the achievement of the NDC: → Restatement of the target → Information for reference level → Final information for the indicator at the target year → Comparison → Achievement of NDC (Y/N, explanation)	➡ *To be reported in the first BTR that contains information on the end year of NDC*					

Figure 25. CTF table 4 Tracking progress in implementing and achieving the NDC (Source: [5])

Parties that have both a conditional and an unconditional target could proceed as follows:

  - Duplicate the table.
- In one version of the table, enter the unconditional target level (e.g. 80 Mt CO2e) in column "Target level".
- In the other version of the table, enter the conditional target level (e.g. 70 Mt CO2e) in the column "Target level".
- In the documentation box below the table, specify which target is the conditional target and which target is the unconditional target.

7.3.3 Approach and steps for tracking of progress made in implementing NDCs

According to the MPGs, to track progress in **implementing its NDC**, each Party shall in its BTR compare the most recent information for each selected indicator with the information for the reference points, levels, baselines, base years or starting points.

For the first biennial transparency report that contains information on the end year or end of the period of the NDC, each Party shall provide an assessment of whether it has **achieved the targets for its NDC**.

Assessing Party's progress in implementing its NDC is based on five steps thus constitute the NDC accounting approach as defined by the MPGs. If a NDC includes several targets, these steps should be applied to each target.

General approach for tracking Party's progress in implementing its NDC:

1. Countries define a relevant indicator for each target included in the NDC to track progress made in the implementation and achievement of the NDC (paragraph 65).
2. Second, countries provide the value of the indicator for a reference point, level, baseline, base year or starting point. For NDCs expressed as mitigation policies and measures, actions or plans, provide a summary of their status based on the selected qualitative (e.g. status (planned, adopted, implemented)) or quantitative (e.g. X per cent share of renewables owing to the implementation of the selected policy or measure) indicators (paragraph 67).
3. Further, countries must provide a full time series for each indicator from the base year until the most recent reporting year of the indicators, along with information on contribution of LULUCF and use of ITMOs, as applicable, and value of the indicators that correspond to the target year or period for each indicator (paragraph 68)
4. Compare the value of the indicators for the most recent year available with the reference point and note the relative (percentage) and absolute (in kt CO2 eq) difference (e.g. X.X per cent or X,XXXX.XX kt CO2 eq below the base year); in case of the qualitative indicator compare its status to the reference point if available (e.g. Policy A is still in the adoption phase while it was supposed to be implemented) (paragraph 69).;
5. Assess, on the basis of (1) to (4) above, whether the Party is making progress or not making sufficient progress towards its NDC targets;

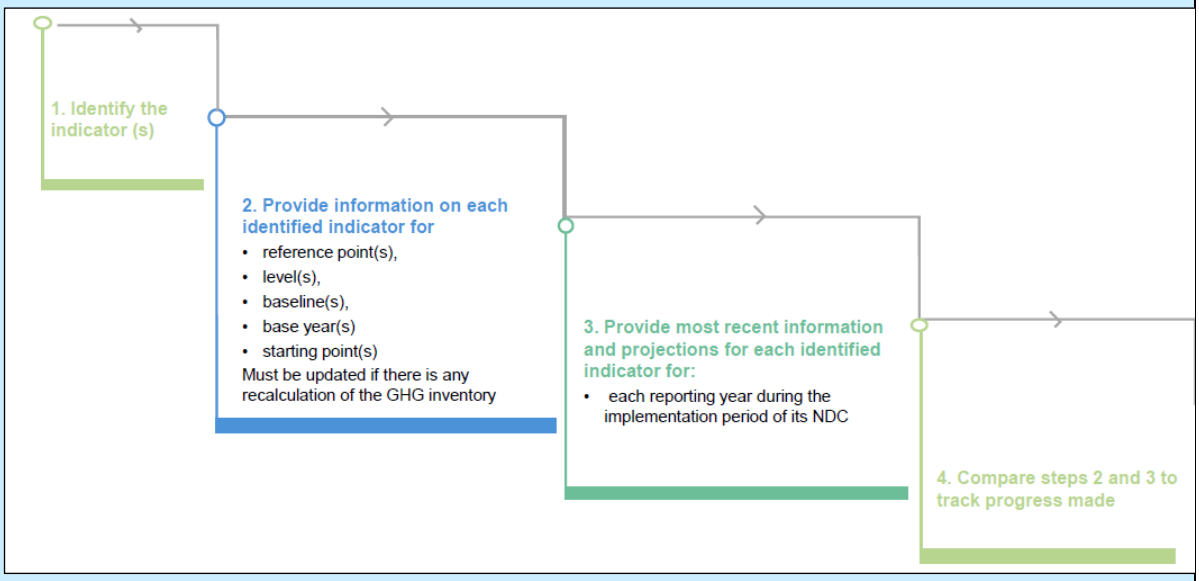


Figure 26. General approach for Parties to track progress made in implementing nationally determined contributions using indicators (Source: [5])

For the last year of the NDC's implementation period, each country must additionally provide an assessment of whether it has achieved the target(s) for its NDC (paragraph 70).

❖ Step 1: Identification of indicator(s).

Countries shall identify an indicator for each target included in their NDC. The indicator applied shall be relevant to the target. This means that for quantitative targets the indicator must also be quantitative. The indicator should also be in the same metric as the target.

Most relevant indicator can be identified from the target itself if the target is SMART (Specific; Measurable; Ambitious; Relevant; Time-bound).

For example, if a target is expressed as a GHG emissions target, the indicator should be the GHG emissions covered by the NDC, reported in the same GWP metric.

As illustrated in table below, different types of indicators can be used, on the basis of the NDC target types.

Table 6 : Potential indicators to keep track of progress in implementing and achieving NDCs with different types of NDC targets. (source: [14])

Type of mitigation target	Relevant indicators	Unit
GHG-related targets		
Absolute emission reduction or limitation target relative to a base year	GHG emissions • as reported in the national GHG inventory adapted to the specific scope of the target (e.g., gases and sectors covered), • including use of market-based mechanisms, and • adapted to the specific timeframe of the target (e.g., where a multi-year target-period applies).	kt CO_2 eq
Emission reduction target below a BAU level	Relationship (e.g., difference in %) between • GHG emissions in the BAU target year/ period (updated, where applicable) and • GHG emissions as reported in the national GHG inventory adapted to the specific scope of the target (e.g., gases and sectors covered), including use of market-based mechanisms, and adapted to the specific timeframe of the target (e.g., where a multi-year target-period applies)	%
Peaking Target	GHG emissions in all years leading to the current year, • as reported in the national GHG inventory adapted to the specific scope of the target (e.g., gases and sectors covered), • including use of market-based mechanisms	kt CO_2 eq
Intensity target	• GHG emissions – as reported in the national GHG inventory adapted to the specific scope of the target (e.g., gases and sectors covered), – including use of market-based mechanisms, and – adapted to the specific timeframe of the target (e.g., where a multi-year target-period applies) • divided by the relevant factor the target relates to, i.e., GDP, population, energy consumption, etc.	kt CO_2 eq / capita / GDP / etc. % (if compared to BAU or base period)

Type of mitigation target	Relevant indicators	Unit
Non-GHG related targets		
Renewable Energy	Depending on specific definition of target, relevant indicators include • % of electricity generated by source • Total generation by source • Installed capacity by source	 • % • GWh • MW
Energy Efficiency	Depending on specific definition of target, relevant indicators include • Total energy demand or consumption • Energy intensity of the economy	 • GWh • TJ / unit of GDP
Forest cover	Depending on specific definition of target, relevant indicators include • Share of land covered by forest • Area covered by forest • Area restored or reforested • Forest stock • CO_2 sequestered per year	 • % • ha • ha • m^3 • t CO_2 eq
Implementation of qualitative policies and measures	• Indicators helping to understand whether implementation takes place and at what status it is, e.g., specific documentation • Planning of the development and implementation of measures, including milestones and timelines • Administrative acts approving, requiring, supporting for the implementation of measures, e.g., building standards, legal requirements on the fuel efficiency of cars, allocation of responsibilities to a Ministry / agency, etc. • Indicators showing change which can clearly be related to the measure, e.g., number of EV-cars supported by an economic incentive scheme	

It is important to emphasize that Parties can include more than one target in their NDCs (for an example, see box below) and in such cases, it is expected that they will select different indicators for each of their targets.

NDC targets: China

- China's NDC includes the following targets:
  - to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060;
  - to lower CO2 emissions per unit of GDP by over 65 per cent from the 2005 level;
  - to increase the share of non-fossil fuels in primary energy consumption to around 25 per cent;
  - to increase the forest stock volume by 6 billion m3 from the 2005 level;
  - and to bring total installed capacity of wind and solar power to over 1.2 billion kW by 2030.
- China's NDC is available at the NDC Registry.
- There is no definition in the MPGs on what an indicator is, except that it should be self-determined by Parties, must be relevant for the NDC, and may be qualitative or quantitative.

- Although there is no agreed definition in the MPGs as to what an indicator is, there are several examples in the relevant literature of how an indicator could be defined. For example:
  - The European Environment Agency defines an indicator as "a measure, generally quantitative, that can be used to illustrate and communicate complex phenomena simply, including trends and progress over time". For more information, visit https://www.eea.europa.eu/ims.
  - The Organization for Economic Co-operation and Development defines the (environmental) indicator as "a parameter, or a value derived from parameters, that

points to, provides information about and/or describes the state of the environment, and has a significance extending beyond that directly associated with any given parametric value". For more information, visit https://www.oecd.org/environment/environment-at-a-glance/

Furthermore, it is important to note that under the BTR review process, TERTs will not review the adequacy or appropriateness of the indicators selected by Parties to track progress in implementing and achieving their NDCs.

What is an indicator?

- There is no definition in the MPGs on what an indicator is, except that it should be self-determined by Parties, must be relevant for the NDC, and may be qualitative or quantitative.
- Although there is no agreed definition in the MPGs as to what an indicator is, there are several examples in the relevant literature of how an indicator could be defined. For example:
  - The European Environment Agency defines an indicator as "a measure, generally quantitative, that can be used to illustrate and communicate complex phenomena simply, including trends and progress over time". For more information, visit https://www.eea.europa.eu/ims.
  - The Organization for Economic Co-operation and Development defines the (environmental) indicator as "a parameter, or a value derived from parameters, that points to, provides information about and/or describes the state of the environment, and has a significance extending beyond that directly associated with any given parametric value". For more information, visit https://www.oecd.org/environment/environment-at-a-glance/

Understanding which indicators are relevant

To be able to determine relevant indicators to track progress of the NDC, it is important to understand the nature of the NDC.

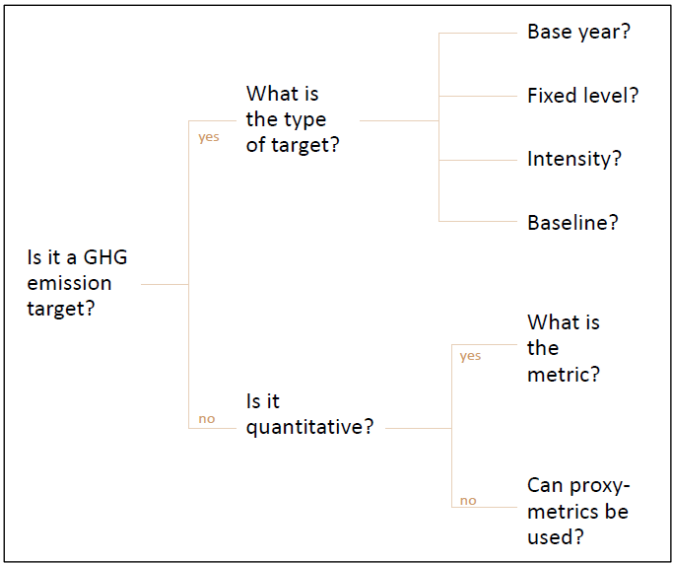


Figure 27. Logic to define relevant indicators (Source: [3])

For a base year GHG emissions target, the indicator should thus be the GHG emissions covered by the NDC in the relevant reporting year, expressed in t CO_2e. It is hereinafter referred to as ***Emissions***:

Emissions: GHG emissions covered by the NDC in the relevant reporting year (t CO_2e)

In determining the emissions covered by the NDC, countries must take into account which greenhouse gases, sectors, categories, and activities and carbon pools in the LULUCF sector are included in the NDC.

If the GHG emissions target is economy-wide, the total GHG emissions as reported in the national GHG inventory must be used. Where the GHG emission target is not economy-wide, the relevant emission categories and gases from the national GHG inventory must be added together to determine the GHG emissions covered by the NDC.

This ensures consistency between the national GHG inventory and the indicator used to track progress towards the NDC target.

In the case of a base year intensity target, countries have two options:

- First, they may use the GHG emissions covered by the NDC as indicator. In this case, the target level needs to be expressed in GHG emissions. This requires converting the target level expressed as GHG emissions per unit of GDP or capita ex-post into an absolute GHG emissions level
- Alternatively, countries may use the GHG emissions covered by the NDC divided by the relevant intensity denominator as indicator. The metric of this indicator would be t CO_2e per unit of GDP or per capita (or relevant other denominators), hereinafter referred to as ***Intensity***:

Intensity: GHG emissions covered by the NDC per unit of GDP in the relevant reporting year (e.g. t CO_2e / USD)

or

Intensity: GHG emissions covered by the NDC per population in the relevant reporting year (t CO_2e / capita)

The MPGs require that countries provide information on their GHG emissions covered by the NDC, regardless of whether they use an indicator that is in t CO_2e or not (paragraphs 77(b) and (d)). Therefore, and in order to enhance transparency, countries that use an intensity indicator (e.g. t CO_2 / GDP) should provide information on both the emissions in t CO_2e and the denominator values used to determine the intensity level.

In the case of a baseline GHG emissions target, the indicator should thus be the GHG emissions covered by the NDC in the relevant reporting year, expressed in t CO_2e. It is hereinafter referred to as ***Emissions***:

Emissions: GHG emissions covered by the NDC in the relevant reporting year (t CO_2e)

In determining the emissions covered by the NDC, countries have to take into account which greenhouse gases, sectors, categories, and activities and carbon pools in the LULUCF sector are included in the NDC.

If the baseline GHG emissions target is economy-wide, the total GHG emissions as reported in the national GHG inventory must be used. Where the baseline GHG emission target is not economy-wide, the relevant emission categories and gases from the national GHG inventory must be added together to determine the GHG emissions covered by the NDC.

In the case of a baseline intensity target, countries have two options:

- First, they may use the GHG emissions covered by the NDC as indicator. In this case, the target level needs to be expressed in GHG emissions. This requires converting the target level expressed as GHG emissions per unit of GDP or capita ex-post into an absolute GHG emissions level
- Alternatively, countries may use the GHG emissions covered by the NDC divided by the relevant intensity denominator as indicator. The metric of this indicator would be t CO_2e per unit of GDP or per capita (or relevant other denominators), hereinafter referred to as *Intensity*:

Intensity: GHG emissions covered by the NDC per unit of GDP in the relevant reporting year (e.g. t CO_2e / USD)	or	***Intensity:*** GHG emissions covered by the NDC per population in the relevant reporting year (t CO_2e / capita)

Countries that use a baseline intensity indicator (e.g. t CO_2 / GDP) should provide information on both the emissions in t CO_2e and the denominator values used to determine the intensity level.

For quantitative non-GHG targets, ie goals that relate to indicators other than GHG emissions, such as:

- Renewable energy shares
- Forest cover
- Mode shares
- Electric vehicle fleets
- Rail infrastructure expansion

Relevant indicators are the metric related to the goal, such as share of electric vehicles in vehicle stock.

In the case of qualitative non-GHG targets, ie NDCs that commit to the implementation of policies and actions, such as:

- Reform of fiscal policies on fossil fuels
- Establishment of efficiency standards
- Ban on import of specific vehicles

In such cases the focus will be on tracking progress how and when planning, adoption, and implementation phases were carried out without specific quantification of the outcomes of such actions, polices and measures or projects. Relevant indicators are potentially metrics related to activities carried out or milestones achieves, such as legislation coming into force.

❖ Step 2: Provision of the reference value(s) for the indicator(s).

Countries shall provide the respective value(s) of the indicator(s) for the relevant reference point(s), level(s), baseline(s), base year(s) or starting point(s).

What is the reference value of the indicator?

- In the case of base year targets: the reference value is the value of the indicator in the base year or period
- In the case of baseline scenario targets: the reference value is the projected BAU value in the target year or period

For example, if an NDC target is a GHG emission reduction compared to 2005, the GHG emissions as covered by the NDC target should be provided for 2005.

For a base year GHG emission target, the reference value for the indicator is the value of the GHG emissions covered by the NDC in the base year or period, hereinafter referred to as ***RefEmissions***.

> ***RefEmissions:*** GHG emissions covered by the NDC in the base year or period (t CO_2e)

For a base year intensity target, the reference value for the indicator is:

- The value of emissions intensity in the base year or period, hereinafter referred to as ***RefIntensity***.

> ***RefIntensity:*** GHG emissions covered by the NDC per unit of GDP or population in the base year or period (t CO_2e / USD or t CO_2e / capita)

with

> ***RefIntensity = RefEmissions / RefDenominator***

- The value of the GHG emissions covered by the NDC in the base year or period, hereinafter referred to as ***RefEmissions***.

> ***RefEmissions:*** GHG emissions covered by the NDC in the base year or period (t CO_2e)

- The value of the denominator (GDP or population) in the base year or period, hereinafter referred to as ***RefDenominator***.

> ***RefDenominator:*** GDP or population in the base year or period (e.g. USD or capita)

For a baseline GHG emissions target, the reference value for the indicator is the projected value of BAU GHG emission covered by the NDC in the target year or period, hereinafter referred to as ***RefEmissions***.

> ***RefEmissions:*** Projected BAU GHG emissions covered by the NDC in the target year or period (t CO_2e)

For a baseline intensity target, the reference value for the indicator is:

- The projected BAU emissions intensity value in the target year or period, hereinafter referred to as ***RefIntensity***.

> ***RefIntensity:*** Projected BAU GHG emissions covered by the NDC per unit of GDP or population in the target year or period (t CO_2e / USD or t CO_2e / capita)

with

> ***RefIntensity = RefEmissions / RefDenominator***

- The projected value of BAU GHG emission covered by the NDC in the target year or period, hereinafter referred to as ***RefEmissions***.

> ***RefEmissions:*** Projected BAU GHG emissions covered by the NDC in the target year or period (t CO_2e)

- The projected value of the denominator (GDP or population) in the target year or period hereinafter referred to as ***RefDenominator***.

> ***RefDenominator:*** Projected GDP or population in the target year or period (e.g. USD or capita)

Filled-in example tables (CTF1 and CTF2) on description of selected indicators, and definitions needed to understand each indicator

Table 7 : Filled-in example CTF1 table on description of selected indicators (source: [14])

Indicator(s) selected to track progress	Description
Net GHG emissions and removals in CO_2eq	
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	The reference level in the base year (1990) is 12,345 kt CO_2eq.
Updates in accordance with any recalculation of the GHG inventory, as appropriate	The reference level has been recalculated from 12,321 kt CO2eq in the previous national inventory to 12,345 kt CO_2eq in the national inventory which is submitted together with this BTR.
Relation to NDC	The indicator is defined in the same metric and unit as the target of the NDC.
Total area of forest in hectares	
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	The reference level in the base year (2020) is 123,456 hectares.
Updates in accordance with any recalculation of the GHG inventory, as appropriate	No updates have been made.
Relation to NDC	The indicator is defined in the same metric and unit as the forestry-related target of the NDC.
Reduction of GHG emissions compared to the business-as-usual scenario	
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	The baseline corresponds to total net GHG emissions and removals in a business-as-usual scenario. The baseline value in the base year (2020) is 12,345 kt CO_2eq. The baseline value in the target year (2030) is 16,789 kt CO_2eq. Baseline values for all years from 2020 to 2030 are provided in chapter 2 of the BTR
Updates in accordance with any recalculation of the GHG inventory, as appropriate	The baseline value in 2020 has been recalculated from 12321 kt CO_2eq to 12,345 kt CO_2eq. The baseline value in 2030 has been recalculated from 16,890 kt CO_2eq to 16,789 kt CO_2eq.
Relation to NDC	The percentage reduction (as communicated in the NDC) is determined by comparing total net GHG emissions from the GHG inventory (in kt CO_2eq) to the baseline level (in kt CO_2eq).

Table 8 : Filled-in example CTF2 table on definitions needed to understand each indicator (source: [14])

Definitions[a]	
Definition needed to understand each indicator:	Indicator 'Net GHG emissions and removals': Net GHG emissions and removals correspond to the annual totals reported in CO_2 equivalents in the latest national GHG inventory. The totals comprise all sectors and gases listed in the CTF table entitled 'Reporting format for the description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates'.
	Indicator 'Total area of forest in hectares': Area with woody vegetation consistent with the thresholds used to define Forest Land in the national inventory document.
	Indicator 'Reduction of GHG emissions compared to the business-as-usual scenario': The reduction of GHG emissions in percent is determined by comparing total net GHG emissions from the GHG inventory (in kt CO_2eq) to the baseline level (in kt CO_2eq).
Any sector or category defined differently than in the national inventory report:	{Sector} Not applicable
	{Category} Not applicable
Definition needed to understand mitigation co- benefits of adaptation actions and/or economic diversification plans:	{Mitigation co-benefit(s)} Not applicable
Any other relevant definitions:	{...} Not applicable

❖ Step 3: Provision of a time series of the indicator value(s)

Countries must provide the most recent indicator value(s) as well as the value(s) for previous years of the NDC implementation period (paragraph 67 and 77(a)(ii)). This means that countries must provide a time series of indicator values. The most recent indicator values(s) must be compared to the reference value(s) (paragraph 67).

In providing time series information, it is important that methodological consistency is ensured. This means that the same methods and a consistent approach should be used for each reported year (see section II.C, paragraphs 26–28, of the MPGs for GHG inventories). Countries are encouraged to improve their emissions and other data over time, moving towards more accurate methods. In practice, national GHG inventories are often recalculated due to such methodological improvements. If new methods are applied, it is important to recalculate the entire time series of the emissions or other relevant data. This is to ensure methodological consistency and to avoid that changes in emission trends (or GDP or population data) are introduced as a result of changes in methods or assumptions across the time series (see section II.C, paragraph 27, of the MPGs for GHG inventories). Any changes in the methods and recalculations must also be applied to the reference value in the base year target or period (paragraph 67).

For base year GHG emission targets, countries should provide a full time series of GHG emissions covered by the NDC (***Emissions***) from the base year or period until the most recent reporting year. Such a time series should also be provided for all other relevant parameters.

	Unit, as applicable	Reference point(s) […]	2021	2022	…	2030	Target level	Target year or period	Progress made […]
Indicator(s) selected […]									
GHG emissions covered by the NDC	Mt CO_2e	100 *RefEmissions*	88	86			80 *TargEmissions*	2030	
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC	Mt CO_2e	100	88	86					
Contribution from LULUCF […]									
Each Party that participates in cooperative approaches […]									
[…]	Relevant for Parties using cooperative approaches. See *Table 9*								
Assessment of the achievement of the Party's NDC under Article 4 of the Paris Agreement									
Relate the target of the Party's NDC:									
[…]	Relevant after the end of the NDC period. See *Table 10*								

Figure 28. Example of a time series of GHG emissions covered by the NDC filled in CTF table 4 for a base year GHG emission target (Source: [15])

For base year intensity targets, countries should provide a full time series, from the base year or period until the most recent reporting year, of:

- GHG emissions covered by the NDC (***Emissions***)
- the relevant denominator (***Denominator***)
- and the GHG emissions intensity (***Intensity***).

For baseline GHG emission targets, countries should provide a full time series of their GHG emissions covered by the NDC (*Emissions*) starting at least from the beginning of the NDC implementation period until the most recent reporting year. If the starting point of the baseline scenario is earlier than the beginning of the NDC implementation period, it is recommended that the time series starts at least at the starting point of the baseline scenario. In order to increase transparency, it is helpful to provide a time series that goes even further back, as this aids understanding of how the baseline scenario aligns with historical emission trends. It is therefore recommended that countries strive to start the time series in the year 2000 or earlier. The time series should be provided for all relevant parameters.

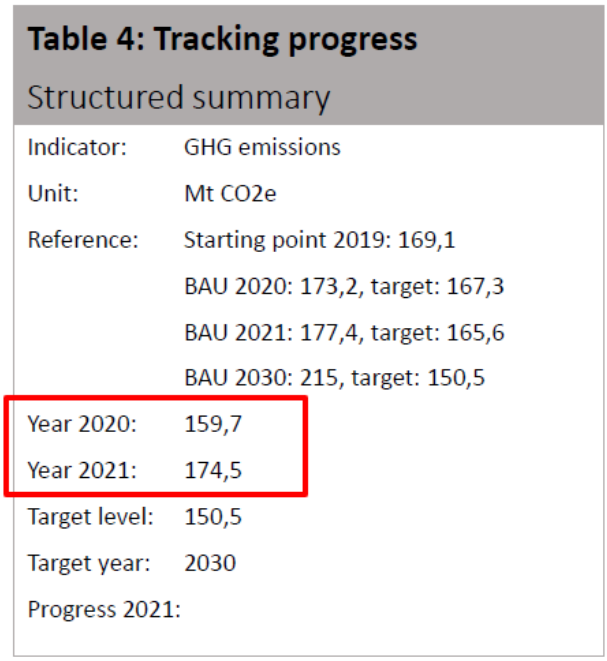


Table 4: Tracking progress

Structured summary

Indicator:	GHG emissions
Unit:	Mt CO2e
Reference:	Starting point 2019: 169,1
	BAU 2020: 173,2, target: 167,3
	BAU 2021: 177,4, target: 165,6
	BAU 2030: 215, target: 150,5
Year 2020:	159,7
Year 2021:	174,5
Target level:	150,5
Target year:	2030
Progress 2021:	

Figure 29. Example of a time series of GHG emissions covered by the NDC filled in CTF table 4 for a baseline GHG emission target (Source: [5])

For baseline intensity targets, countries should provide a full time series, starting at least from the beginning of the NDC implementation period until the most recent reporting year, of:

- GHG emissions covered by the NDC (***Emissions***)
- the relevant denominator (***Denominator***)
- and the GHG emissions intensity (***Intensity***).

❖ Step 4: Comparison of the most recent indicator value with the reference value

Countries must provide for each reporting year within the NDC implementation period the most recent information for each indicator (paragraph 68) and compare it to the reference value (paragraph 69).

When comparing the most recent indicator with the reference value, countries could determine the absolute and/or the relative change of the respective values.

For base year GHG emission targets, the absolute change in GHG emissions can be determined as follows:

$$AbsCompEmissions = Emissions - RefEmissions$$

Where:

- ***AbsCompEmissions***: Absolute change in GHG emissions covered by the NDC in the relevant reporting year compared to base year or period (t CO2e).
- ***Emissions***: GHG emissions covered by the NDC in the relevant reporting year (t CO2e).

The relative change in GHG emissions can be determined as follows:

$$RelCompEmissions = (Emissions / RefEmissions - 1) * 100$$

Where:

- ***RelCompEmissions***: Relative change in GHG emissions covered by the NDC in the relevant reporting year compared to base year or period (%).

Figure below shows a simplified example of a filled in CTF4 table in a Party BTR3 submission, reporting for the period 2025–2026. The Party's NDC target is a 30 per cent reduction in emissions below the base year (2005) level by 2030 (target year). The implementation period is from 2021 to 2030. The Party will not account for the contribution from the LULUCF sector and is not participating in cooperative approaches.

	Unit	Reference point (base year)	Implementation period of the NDC	2025	2026	Target level	Target year or period	Progress made by comparing the information for indicator with the base year
Indicator(s) selected to track progress and supporting information:								
Total GHG emissions without LULUCF	kt CO_2 eq	1,000	....	1,100	1,150	700	2030	In 2026, total GHG emissions without LULUCF is 15 per cent [above] base year emissions
Where applicable, total GHG emissions and removals consistent with the NDC	kt CO_2 eq	NA	....	1,100	1,150			
Contribution from the LULUCF sector, as applicable	NA	NA	NA	NA	NA			
Information on ITMOs, if applicable	NA	NA	NA	NA	NA			

NA = not applicable

Figure 30. Example of a filled in CTF4 table in a Party BTR3 submission (Source: [8])

For base year intensity targets, the absolute change in GHG emissions intensity can be determined as follows:

$$AbsCompIntensity = Intensity - RefIntensity$$

Where:

- ***AbsCompIntensity***: Absolute change in GHG emissions covered by the NDC per unit of GDP or population in the relevant reporting year compared to base year or period (t CO2e / USD or t CO2e / capita).
- ***Intensity***: GHG emissions covered by the NDC per unit of GDP or population in the relevant reporting year (e.g. t CO2e / USD or t CO2e /capita).

The relative change in GHG emissions intensity can be determined as follows:

$$RelCompIntensity = (Intensity / RefIntensity - 1) * 100$$

Where:

- ***RelCompIntensity***: Relative change in GHG emis ions covered by the NDC per unit of GDP or population in the relevant reporting year compared to base year or period (%).

For baseline GHG emissions targets, comparing the most recent information (e.g. emissions in 2024) with the reference value (e.g. BAU emissions in 2030), as required by paragraph 69 of the MPGs, only provides limited information for assessing progress towards the target. This is because this provision does not compare the emissions and the BAU projection for the same year but for different years. Comparing different years may be misinterpreted, though, since the development between the years (e.g. economic growth) is not considered. It is therefore recommended that baseline values for each year be provided to fulfil the requirement in paragraph 69 of the MPGs, but that this data be not further interpreted in terms of progress towards the target. When providing this information, countries could determine the absolute and/or the relative change of the respective values.

The absolute difference in GHG emissions can be determined as follows:

$$AbsCompEmissions = Emissions - RefEmissions$$

Where:

- ***AbsCompEmissions***: Absolute difference in GHG emissions covered by the NDC between the relevant reporting year and the projected BAU value for the target year or period (t CO2e)
- ***Emissions***: GHG emissions covered by the NDC in the relevant reporting year (t CO2e).

The relative difference in GHG emissions can be determined as follows:

$$RelCompEmissions = (Emissions / RefEmissions - 1) * 100$$

Where:

- RelCompEmissions: Relative difference in GHG emissions covered by the NDC between the relevant reporting year and the projected BAU value in the target year or period (%).

Figure below shows a first simplified example of a filled in CTF4 table for a NDC with a baseline GHG emission target.

	Unit, as applicable	Reference point(s) [...]	2021	2022	...	2030	Target level	Target year or period	Progress made [...]
Indicator(s) selected [...]									
GHG emissions covered by the NDC	Mt CO_2e	100 *RefEmissions*	88	86			80 *TargEmissions*	2030	14% below the reference level
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC	Mt CO_2e	100	88	86					
Contribution from LULUCF [...]									
Each Party that participates in cooperative approaches [...]									
[...]	Relevant for Parties using cooperative approaches. See *Table 9*								
Assessment of the achievement of the Party's NDC under Article 4 of the Paris Agreement									
Relate the target of the Party's NDC:									
[...]	Relevant after the end of the NDC period. See *Table 10*								

Figure 31. Example of progress tracking filled in CTF table 4 for a base year GHG emission target (Source: [15])

For baseline intensity targets, the absolute difference in GHG emissions intensity can be determined as follows:

$$AbsCompIntensity = Intensity - RefIntensity$$

Where:

- ***AbsCompIntensity***: Absolute difference in GHG emissions covered by the NDC per unit of GDP or population between the relevant reporting year and the projected BAU value in the target year or period (t CO2e / USD or t CO2e / capita)
- Intensity: GHG emissions covered by the NDC per unit of GDP or population in the relevant reporting year (e.g. t CO2e / USD or t CO2e /capita)

The relative difference in GHG emissions intensity can be determined as follows:

$$RelCompIntensity = (Intensity / RefIntensity - 1) * 100$$

Where:

- ***RelCompIntensity***: Relative difference in GHG emissions covered by the NDC per unit of GDP or population between the relevant reporting year and the projected BAU value in the target year or period (%)

Table 4. Filled-in example CTF4 table on tracking progress in implementing and achieving the NDC (Source: [14])

- **Example 1: Net GHG emissions and removals; percentage reduction of GHG intensity; total area of forest; renewable energy production.**

		Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)					Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
	Unit, as applicable		Year 1 2021	Year 2 2022	End year	Target level	Target year or period	
Indicator(s) selected to track progress of the NDC or portion of NDC under Article 4 of the Paris Agreement (paras. 65 and 77(a) of the MPGs):								
Net GHG emissions and removals	kt CO_2eq	12,345	12,000	11,500		7,000	2030	The most recent level of the indicator is 9% below the base year level.
Percentage reduction in GHG intensity	percent	0%	20%	22%		40%	2030	The most recent reduction amounts to 22%.
Total area of forest	hectares	123,456	130,000	135,000		150,000	2030	The most recent level of the indicator is 9% above the base year level.
Renewable energy production	Terajoules	123	150	160		200	2030	The most recent level of the indicator is 30% above the base year level.
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC (para. 77(b) of the MPGs)	kt CO_2eq	12,345	12,000	11,500		7,000	2030	
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable (para. 77(c) of the MPGs)	NA	NA	NA	NA		NA	NA	
[Information to be filled in by Parties participating in cooperative approaches][34]								
[Assessment of the achievement of the NDC – this part of the table is to be provided after the end of the NDC period only]								

- **Example 2: indicator for a specific policy or measure; mitigation co-benefits of adaptation actions; mitigation co-benefits of economic diversification; emission reduction compared to a business-as-usual (BAU) scenario.**

		Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)					Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
	Unit, as applicable		Year 1 2021	Year 2 2022	End year	Target level	Target year or period	
Indicator(s) selected to track progress of the NDC or portion of NDC under Article 4 of the Paris Agreement (paras. 65 and 77(a) of the MPGs):								
Implementation phase of the measure 'Shutdown of coal power plant X and replacement by renewable energy'	NA	Phase 0	Phase 1	Phase 2		Phase 5	2030	The implementation of the measure has reached phase 2. For more information, please see chapter 2 in the BTR.
Removal of CO2 as a co-benefit of adaptation actions	kt CO2eq	0	10	15		100	2030	The most recent removal of CO_2 amounts to 15 kt CO_2eq.
Reduction of GHG emissions as a co-benefit of economic diversification	kt CO2eq	100	200	300		1,000	2030	The most recent reduction of GHG emissions amounts to 300 kt CO_2eq.
Reduction of GHG emissions compared to a business-as-usual scenario	percent	0%	10%	15%		50%	2030	The most recent reduction of GHG emissions amounts to 15% compared to the business-as-usual scenario.
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC (para. 77(b) of the MPGs)	kt CO2eq	12,345	12,000	11,500		10,000	2030	
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable (para. 77(c) of the MPGs)	NA	NA	NA	NA		NA	NA	
[Information to be filled in by Parties participating in cooperative approaches][35]								
[Assessment of the achievement of the NDC – this part of the table is to be provided after the end of the NDC period only]								

- Step 5: Assess whether the Party is making progress or not making sufficient progress towards its NDC targets

Figure below shows a simplified example of the trend of a quantitative indicator used in tracking progress of an NDC, that is, total GHG emissions, and three key points necessary to assess the progress: reference point (GHG emissions in the base year), GHG emissions for the most recent year available and the level of emissions that corresponds to the emission reduction target (calculated as a per cent reduction of base-year emissions because the NDC target in this hypothetical case is a base-year emission reduction target). For simplicity, it is assumed that the Party will not account for the contribution from the LULUCF sector and will not use ITMOs.

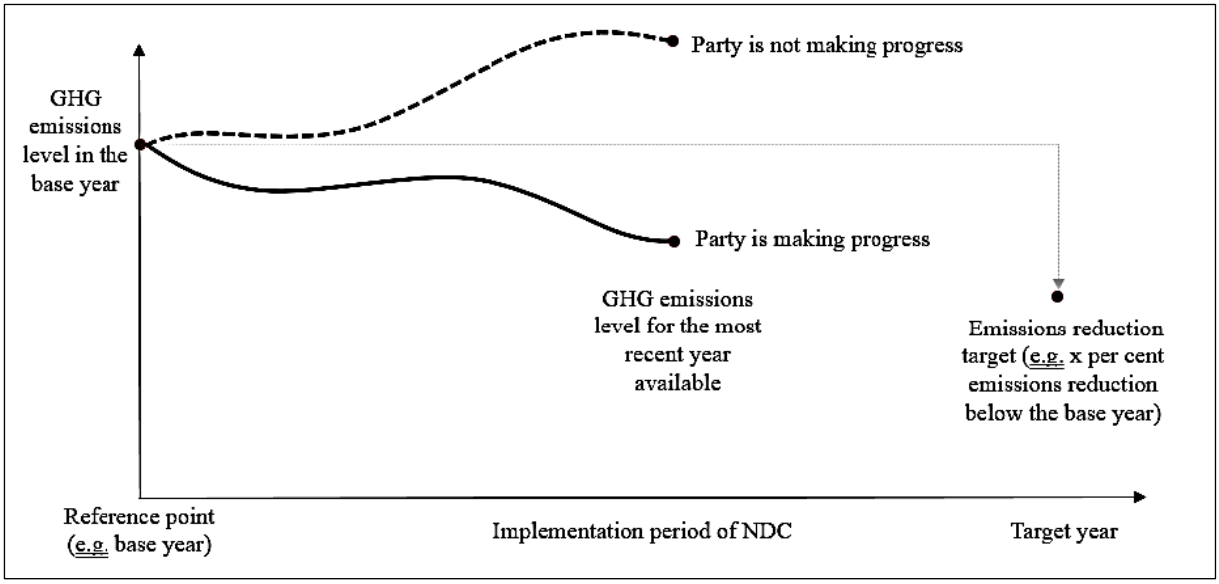


Figure 32. Example of tracking progress in the implementation period of an NDC (Source: [8])

In considering the progress, the value of the indicator for the most recent year available is compared with the reference point findings in terms of the relative (percentage) and absolute (in kt CO2 eq) difference are noted. If the value of the indicator for the most recent year is constantly below the reference point (base-year emissions) and the trend is more or less consistent with this relative position, it means that Party is progressing towards the NDC target.

Conversely, if the value of the indicator for the most recent year is constantly above the reference point (dashed line) and the trend is more or less consistent with this relative position, it means that the Party is diverging from the NDC target and could face challenges in achieving it.

7.3.4 Accounting for cooperative approaches under Article 6

Countries that wish to engage in Article 6 need to fulfil several additional requirements in relation to accounting for their NDC. These include four broad elements that are summarized in more detail below:

- Fulfilling Article 6 participation requirements;
- The authorization of ITMOs;
- The tracking of ITMOs; and
- The reporting and accounting for ITMOs.

As regards Article 6 reporting and NDC accounting, The Article 6 guidance and the MPGs require countries to regularly report on their ITMO activities and to account for ITMOs through the application of corresponding adjustments in an accounting balance, referred to as “structured summary” in the MPGs (paragraph 77 of the MPGs). Countries engaging in Article 6 need to provide relevant information in an initial report, annual reports, and biennial transparency reports. This requires relevant institutional arrangements and processes for regular reporting to be in place. Non-submission of relevant reports, in particular on the application of corresponding adjustments, can pose serious threat to ensuring that double claiming is avoided. The following type of accounting information needs to be provided:

- In an initial report, communicated “no later than authorization of ITMOs from a cooperative approach or where practical (in the view of the participating Party), in conjunction with the next Biennial Transparency Report”, countries need to communicate inter alia their

accounting choices, as set out above (paragraph 18 of the draft Article 6.2 guidance). The term "first transfer" refers to the first time that a specific ITMO is transferred; subsequently, an acquired ITMO could be further transferred to another country.

- In annual reports, countries need to provide information on "authorization of ITMOs for use towards achievement of NDCs, authorization of ITMOs for use towards other international mitigation purposes, first transfer, transfer, acquisition, holdings, cancellation, voluntary cancellation, voluntary cancellation of mitigation outcomes or ITMOs towards overall mitigation in global emissions and use towards NDCs" (paragraph 20 of the Article 6.2 guidance).
- In their BTRs, countries need to provide comprehensive information on their engagement in cooperative approaches. For accounting purposes, a key requirement is the reporting on the application of corresponding adjustments. For each year, countries need to make additions and subtractions to their net emissions and removals covered by the NDC. The resulting balance is then compared with the target emissions level (necessarily in t CO2e) (paragraph 70 of the MPGs).

Example of a completed CTF4 table for a country participating in cooperative approaches (source: [15])

- A Party has selected the option of providing an emissions trajectory to account for ITMOs and engages in ITMOs expressed in greenhouse gas metrics. The Party defined a trajectory, starting with 89 Mt CO2e in 2021 and decreasing linearly down to 80 Mt CO2e in 2030. This trajectory will be taken into account for assessing compliance at the end of the NDC implementation period; it is not sufficient to just achieve the target value in the year 2030.
- Annual quantity of ITMOs first transferred : ITMOs amounting to 2 Mt CO2e are first transferred in 2021 and in 2022.

	Unit, as applicable	Reference point(s) [...]	2021	2022	...	2030	Target level	Target year or period	Progress made [...]
Indicator(s) selected [...]									
GHG emissions covered by the NDC	Mt CO_2e	100 *RefEmissions*	88	86		*TargEmissions*	80	2021 to 2030	14% below the reference level
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC	Mt CO_2e	100	88	86					
Contribution from LULUCF [...]									
Each Party that participates in cooperative approaches [...]									
[...] indicative trajectory, trajectories or budget [...]									
[...] trajectory, trajectories or budget [...]	Mt CO_2e		89	88		80			
[...] emissions/ removals (non-GHG metrics)									
[...] emissions/ removals (PaMs NDC)									
[...] non-GHG indicator									
Annual quantity of ITMOs first transferred	Mt CO_2e		2	2					
Annual quantity of mitigation outcomes authorized	Mt CO_2e		1	1					
Annual quantity of ITMOs used towards achievement of the NDC									
Net annual quantity of ITMOs	Mt CO_2e		2	2					
[...] cumulative amount of ITMOs [...]									
Total quantitative corresponding adjustments used [...]	Mt CO_2e		2	2					
[...] cumulative information									
[...] annual emissions balance	Mt CO_2e		90	88					
[...] annual adjusted indicator									
Any other information									

7.3.5 Assessment of the target achievement

In the first BTR that includes information on the end year of the NDC implementation period, countries must assess whether the target has been achieved (paragraph 70). The assessment of achievement is done by comparing the indicator value in the target year with the reference point. This requires that the reference point is expressed in the same metrics as the indicator. Depending on the type of target, the NDC target level may need to be calculated:

- For base year targets: if the achieved emission reduction between the target year and base year is equal to or greater than the NDC target, the NDC is considered to be achieved.
- For baseline targets: if the achieved GHG emission level in the target year is below the level that corresponds to the NDC target, the NDC is considered to be achieved.

Figure below shows a simplified example of assessing the achievement of an NDC.

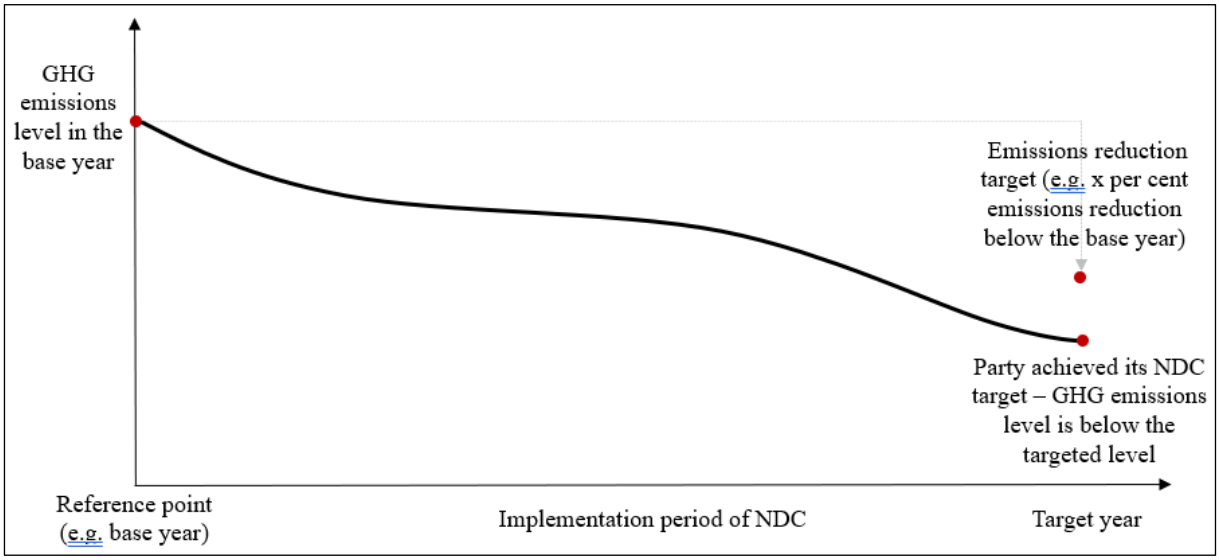


Figure 33. Example of assessment of NDC target achievement (Source: [8])

Assessment of the achievement of the NDC should follow the same steps as those for assessing a Party's progress in implementing its NDC, except in step (v), instead of assessing progress, provide assessment of whether the NDC target was achieved:

i. Identify a relevant indicator for each target included in the NDC
ii. Provide a summary of quantitative or qualitative information on the reference points. For NDCs expressed as mitigation policies and measures, actions or plans, provide a summary of their status based on the selected qualitative (e.g. status (planned, adopted, implemented)) or quantitative (e.g. X per cent share of renewables owing to the implementation of the selected policy or measure) indicators;
iii. Provide a full time series from the base year until the end year of the NDC implementation period of the indicators, along with information on contribution of LULUCF and use of ITMOs, as applicable, and value of the indicators that correspond to the target year or period
iv. Compare the value of the indicators for the end year of the NDC implementation period with the reference point and note the relative (percentage) and absolute (in kt CO2 eq) difference (e.g. X.X per cent or X,XXXX.XX kt CO2 eq below the base year); in case of the qualitative indicator compare its status to the reference point if available (e.g. Policy A is still in the adoption phase while it was supposed to be implemented);
v. Assess, on the basis of (i) to (iv) above, whether the Party has achieved its NDC target;

The assessment of NDC target achievement must be done at the CTF 4 table level. The table below shows a simplified example of a filled in CTF4 table for a NDC with a base year target expressed as a

20% reduction in GHG emissions compared to 2005 emissions. The reference point corresponds in such case to 100 Mt CO2 e, while the target level would be calculated as 80 Mt CO2e.

Example of a completed CTF4 table for assessing NDC target achievement (source: [15])

	Unit, as applicable	Reference point(s) […]	2021	2022	…	2030	Target level	Target year or period	Progress made […]
Indicator(s) selected […]									
GHG emissions covered by the NDC	Mt CO_2e	100 *RefEmissions*	88	86		79	80 *TargEmissions*	2030	21% below the reference level
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC	Mt CO_2e	100	88	86		79			
Contribution from LULUCF […]									
Each Party that participates in cooperative approaches […]									
[…]	Relevant for Parties using cooperative approaches.								
Assessment of the achievement of the Party's NDC under Article 4 of the Paris Agreement									
Relate the target of the Party's NDC:									
Information for reference point(s) […]	Mt CO_2e	100							
Final information for the indicator […]	Mt CO_2e		88	86	…	79			
Comparison	The level in the target year is 79 Mt CO_2e. It is 21% below the reference level and it is below the target level.								
Achievement of NDC	Yes. The target has been achieved because the level in the target year is below the target level. *TargAchievement*								

7.3.6 Domestic policies and measures to address the social and economic consequences of response measures (CTF 12)

The implementation of mitigation measures (also known as 'response measures') has particular consequences in countries whose economies are centred on fossil fuels. These countries have to address the social and economic consequences resulting from a shift away from fossil fuels, e.g. by diversifying their economy and by supporting a just transition of their workforce.

When the MPGs were negotiated in Katowice, it was important for several Parties to be given a space for the reporting on domestic policies and measures to address the social and economic consequences of response measures. This space was provided in the chapter on tracking of progress, in paragraph 78 of the MPGs. In line with this paragraph, a common tabular format – CTF 12 – was included in the transparency guidance.

CTF 12 is to be filled in by Parties that have one of two types of NDCs:

- NDCs that consists of economic diversification plans resulting in mitigation co-benefits; or

- NDCs that consists of adaptation actions resulting in mitigation co-benefits.

For Parties with a NDC that consists of economic diversification plans, it is rather straightforward to fill in CTF 12 because economic diversification is a typical example of a policy that addresses the social and economic consequences of response measures. However, it may be difficult for Parties with a NDC that consists of adaptation actions to provide the requested information, because they may not have policies or measures in place to address the social and economic consequences of response measures.
Parties with other types of NDCs (e.g. those with emissions reduction targets) are not required to provide the information requested in CTF 12.

12. Information necessary to track progress on the implementation and achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures[a]

Sectors and activities associated with the response measures[b]	*Social and economic consequences of the response measures[c]*	*Challenges in and barriers to addressing the consequences[d]*	*Actions to address the consequences[e]*

Figure 34. CTF12. Information necessary to track progress on the implementation and achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures (Source: [21])

7.4 Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans

7.4.1 Introduction

Article 3 of the Paris Agreement requires Parties to undertake ambitious efforts as part of their NDCs towards achieving the purpose of the Agreement.

As part of this, Parties are required to pursue domestic mitigation measures (Article 4, paragraph 2) and provide information necessary to track progress in implementing and achieving NDCs (Article 13, paragraph 7).

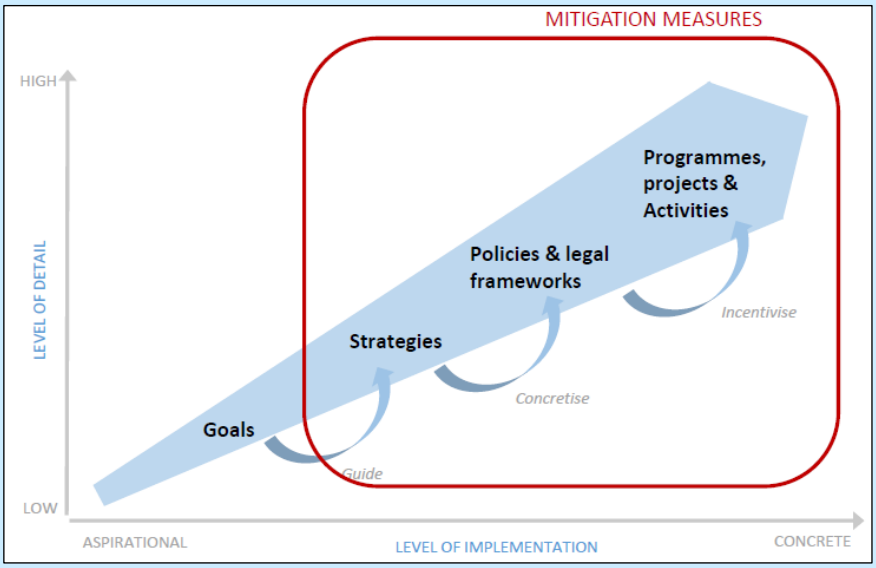
As part of tracking progress made in the implementation and achievement of its NDC, countries shall report necessary information on mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving an NDC.

Definitions

- **Mitigation policies or mitigation plans** generally refer to a decision or a set of decisions that a government takes to achieve certain objectives.
- **Actions or measures** generally refer to a concrete activity or set of activities taken by a government to implement a policy or plan.
- **Mitigation co-benefits** result from actions undertaken as part of adaptation and/or economic diversification plans where these generate emissions reductions and thereby contribute to achieving mitigation outcomes.

It should be noted that the CGE uses the term '**mitigation measures**' in its training material (source [4]) in a broad sense, to cover:

- Strategies & strategic documents.
- Policies & legal frameworks.
- Programmes, projects & activities.



Examples of mitigation policies and measures, actions and plans being implemented around the world, as reported by Parties, include:

Country	Mitigation policies and measures, actions and plans
Australia	Australia has extended and deepened its support for clean technology through the launch of its Technology Investment Roadmap, which will help to drive further investment in low-emission technologies, including clean hydrogen, electricity storage, low-emission steel and aluminium production, carbon dioxide capture and storage, and carbon sequestration.
Canada	Canada is investing in public transport and making zero emission vehicles more affordable and accessible, for instance through rebates and funding for more charging stations.
France	France has implemented a carbon tax with an energy excise fee, an energy savings certificate system, and investment schemes for the development of infrastructure and alternative fuels.
Japan	Japan promotes compliance with energy-saving standards for new buildings and energy-saving renovation of existing homes and promotes investment in net zero energy buildings. It is also working towards the realization of a 'hydrogen society'.
New Zealand	New Zealand has reformed its national Emissions Trading Scheme to support the country in meeting its NDCs and domestic emission reduction targets. The reforms include introducing an emissions cap in line with climate change targets, phasing out emission allocation to the industrial sector from 2021 and introducing an auction by the Government of New Zealand Units (emission units).
Norway	Norway has committed to achieving a 50–55 per cent reduction in emissions by 2030 and a climate-neutral, low-emission society by 2050. Norway plans to achieve these goals through various measures, including participation in the European Union Emissions Trading System, application of green taxes and provision of support for energy-efficient and climate-friendly technologies, including carbon capture and storage.
Botswana	Botswana is addressing emission reductions in the energy sector by increasing the share of renewable energy sources, including by investing in solar power stations, solar appliances and biogas development.
The Republic of Korea	The Republic of Korea launched a national emissions trading system in 2015, covering 525 companies in its first phase (2015–2017). Through this system, the country plans to promote low-carbon industry innovation and green investment, reduce GHGs in a cost-effective and flexible way and achieve national emission reduction targets.
Lebanon	Lebanon is working to increase the share of renewable energy sources as part of its energy mix, aiming to increase the share of renewables to 18 per cent of overall power demand and 11 per cent of heat demand by 2030. These efforts will be complemented by energy efficiency measures.
Maldives	Maldives is working to reduce emissions from the waste sector through a combination of improved waste management across the islands and the introduction of a new waste-to-energy project.

7.4.2 Reporting requirements

Paragraph(s) of the MPGs	Heading	Format of reporting	Related CTF
Paragraphs 80-90	D. Mitigation PaMs, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving an NDC under Article 4 of the Paris Agreement	Information to be reported in a narrative and common tabular format	CTF table 5

Paragraph 80: Each Party shall provide information on actions, policies and measures that support the implementation and achievement of its NDC under Article 4 of the Paris Agreement, focusing on those that have the most significant impact on GHG emissions or removals and those impacting key categories in the national GHG inventory. This information shall be presented in narrative and tabular format.

- ➔ Parties do not need to report every action, policy or measure that impacts GHG emissions or removals. Parties should focus on those that have the most significant impact on emissions or removals. It is recommended that Party describe how it has determined which actions, policies and measures to include in its BTR.
- ➔ A key category is one that is prioritized within the national GHG 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 associated with emissions and removals. Whenever the term key category is used, it includes both source and sink categories.

Paragraph 81: To the extent possible, Parties shall organize the reporting of actions by sector (energy, transport, industrial processes and product use, agriculture, LULUCF, waste management and other).

- ➔ According to the guidance provided in note (i) to CTF table 5, the reporting of information on actions by sector must be organized, to the extent possible, using the given sectors.
- ➔ Where a Party does not use the given sectors, it should provide an explanation for not doing so, as well as an indication of how its definition of sectors corresponds to or differs from the suggested sectors.
- ➔ Note that, as indicated in decision 18/CMA.1, annex, paragraph 82(f), Parties may indicate that a measure affects a single sector or multiple sectors.

Paragraph 82: Each Party shall provide the following information on its actions, policies and measures, to the extent possible, in a tabular format:
a) Name;

- ➔ The information reported must include the name of the policy, measure, action or plan.
- ➔ The Party may indicate whether a policy, measure, action or plan is included in the 'with measures' scenario.

b) Description;

- ➔ The description of the policy, measure, action or plan can be brief.

- ➔ Additional information may be provided on the cost of the mitigation action, the non-GHG mitigation benefits of the action or how the mitigation action interacts with other mitigation actions, as appropriate.
- ➔ The Party should identify those actions, policies and measures that influence GHG emissions from international transport.
- ➔ The Party should, to the extent possible, provide information about how actions, policies and measures are modifying longer-term trends in GHG emissions and removals.

c) Objectives;

- ➔ The information reported must include the key objectives and benefits of the policy, measure, action or plan.

d) Type of instrument (regulatory, economic instrument or other);

- ➔ The information reported must include, to the extent possible, whether the measure is a regulation, an economic instrument or another type of instrument.
- ➔ Examples of possible other types of instruments include fiscal, voluntary (e.g. agreements), informational, educational and research measures.

e) Status (planned, adopted or implemented);

- ➔ The information reported must include, to the extent possible, whether the policy, measure, action or plan is in the planning stage, adopted or implemented.
- ➔ Parties may also provide information related to the status of implementation, for example, funds already allocated to

f) Sector(s) affected (energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other);

- ➔ The information reported must include, to the extent possible, which sector(s) is/are affected by the action, policy or measure.
- ➔ The following sectors must be used by Parties: energy, transport, IPPU, agriculture, LULUCF, waste management or other.

g) Gases affected;

- ➔ The information reported must include, to the extent possible, which gas or gases the policy, measure, action or plan targets.

h) Start year of implementation;

- ➔ The information reported must include, to the extent possible, in which year the policy, measure, action or plan was or is expected to be implemented.

i) Implementing entity or entities.

- ➔ The information reported must include, to the extent possible, the implementing entity or entities (e.g. national, state, provincial, regional or local government) and the involvement of any other entities (e.g. private sector organizations).

Paragraph 83: Each Party may also provide the following information for each action, policy and measure reported:

a) Costs;

- ➔ Any action taken to mitigate climate change may divert financial resources from alternative uses. Mitigation assessments estimate the value of these resources using cost-benefit analysis. Incremental costs are normally measured relative to a 'no action'

counterfactual baseline. As far as possible, assessments should include all costs, but bear in mind that technical options, including many energy efficiency measures, may have negative costs in terms of, for example, economic benefits.

- ➔ It may not make sense to specify a cost for non-technical, socially focused actions. Examples of this type of action include campaigns to encourage the public to waste less energy or efforts to develop less energy intensive urban environments. These actions are typically referred to as 'no regrets' actions.

b) Non-GHG mitigation benefits;

- ➔ Any action taken to mitigate climate change may also generate non-GHG benefits. These can range from impacts on sustainable development to economic and social consequences of response measures to reduced emissions of other types of pollutants and/or health benefits.
- ➔ Parties can report using quantitative and/or qualitative indicators when describing non-GHG benefits.
- ➔ The information reported may be linked to the availability of reliable indicators or data that can be collected on a regular basis and at reasonable cost.

c) How the mitigation actions as identified in paragraph 80 above interact with each other, as appropriate.

- ➔ Two or more actions taken to mitigate climate change may interact and could completement one another in ways that enhance overall GHG mitigation. Parties may report on the interaction between such policies.

Paragraph 84: For each Party with an NDC under Article 4 of the Paris Agreement that consists of mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans consistent with Article 4, paragraph 7, information to be reported under paragraphs 80, 82 and 83 above includes relevant information on policies and measures contributing to mitigation co-benefits resulting from adaptation actions or economic diversification plans.

- ➔ Information on mitigation co-benefits resulting from Parties' adaptation actions or economic diversification plans must be reported in both narrative and tabular (CTF table 5) format, as applicable, in line with decision 5/CMA.3.
- ➔ Examples of adaptation actions or economic diversification plan measures that may result in mitigation co-benefits include the following:
    - Applying climate-smart agriculture;
    - Reducing food waste;
    - Adapting coastal ecosystems;
    - Increasing the share of renewable energy sources in energy generation;
    - Improving energy efficiency;
    - Implementing carbon dioxide capture and storage;
    - Switching fuels and implementing fuel price reforms;
    - Transitioning to a more circular economy;
    - Adopting sustainable tourism practices;
    - Deploying technologies for the fisheries, industrial and buildings sectors.

Paragraph 85: Each Party shall provide, to the extent possible, estimates of expected and achieved GHG emission reductions for its actions, policies and measures in the tabular format referred to in paragraph 82 above; those developing country Parties that need flexibility in the light of their capacities with respect to this provision are instead encouraged to report this information.

- ➔ Parties may report this information for individual mitigation actions, policies and measures, or for groups thereof.
- ➔ Developing country Parties that need flexibility in the light of their capacities are encouraged rather than required to report this information.

REFERENCE IN THE MPGS (ANNEX TO DECISION 18/CMA.1)	PROVISION IN THE MPGS	FLEXIBILITY PROVISION FOR THOSE DEVELOPING COUNTRY PARTIES THAT NEED IT IN THE LIGHT OF THEIR CAPACITIES
Paragraph 85 *Expected and achieved GHG emission reductions for PAMs*	Each Party shall provide, to the extent possible, estimates of expected and achieved GHG emission reductions of its PAMs	Instead encouraged to report such information

Figure 35. Flexibility provisions relating to estimates of GHG emission reductions (Source: [6])

- ➔ This information should indicate the estimated emission reduction in CO2 eq for a particular year - and not the cumulative impact.
- ➔ CTF table 5 indicates that Parties must provide estimates of GHG emission reductions in kt CO2 eq and distinguish between estimates for reductions achieved and reductions expected.

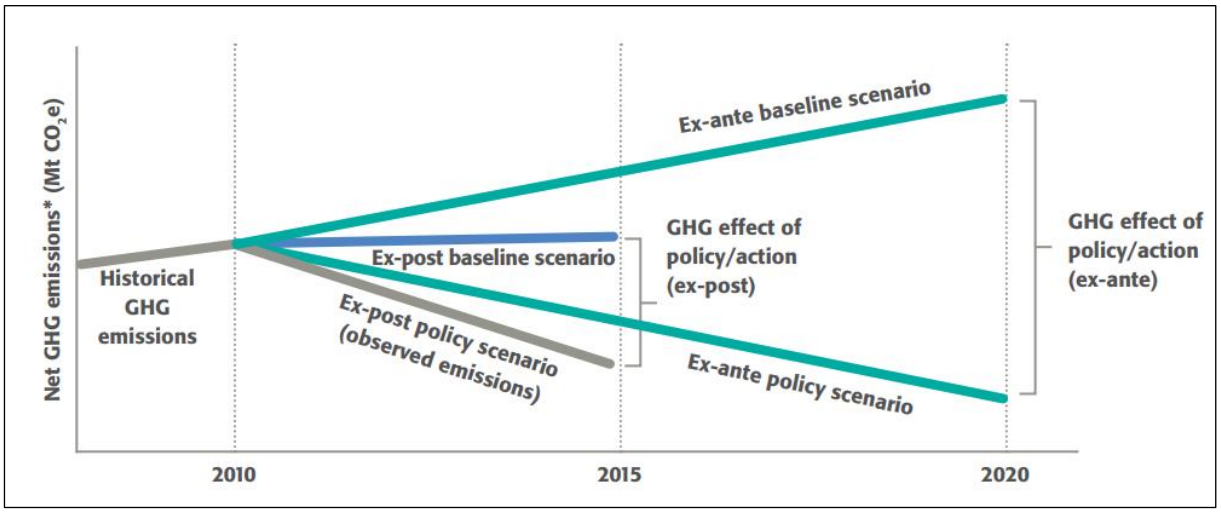


Figure 36. Assessment of the GHG emission reductions expected (ex-ante) and achieved (ex-post) (Source: [19])

Paragraph 86: Each Party shall describe the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy and measure, to the extent available. This information may be presented in an annex to its biennial transparency report.

- ➔ The information reported should explain how Parties have arrived at the values reported in CTF table 5 for estimates of expected and achieved GHG emission reductions for the years reported.
- ➔ In addition to information on the specific methodologies used for calculating the estimates of expected and achieved GHG emission reductions or removals, Parties could

report on any key underlying assumptions, for example for GDP growth, population growth, tax level and international fuel price.

➔ Information on methodologies and assumptions may be presented in an annex to the BTR.

Paragraph 87: Each Party should identify those actions, policies and measures that are no longer in place compared with the most recent biennial transparency report, and explain why they are no longer in place.

➔ For the first BTR, a comparison with previous BTRs will not be possible. Some Parties may voluntarily compare their actions, policies and measures with their previous biennial report or biennial update report, but this is not required.

Paragraph 88: Each Party should identify its actions, policies and measures that influence GHG emissions from international transport.

➔ Parties are encouraged to provide information on measures taken to influence emissions from international transport. This information should be reported in CTF table 5, in the "Description" column.

➔ The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (vol. 1, section 8.3) and the MPGs both indicate that emissions from international aviation and maritime transport (also known as international bunker fuel emissions) should be calculated as part of the national GHG inventories of Parties – but should be excluded from national totals and reported separately, if disaggregated information is available.

➔ Examples of policies and measures that influence GHG emissions from international transport include:

- Participating in global market-based measures, such as CORSIA (Carbon Offsetting Reduction Scheme for International Aviation);
- Implementing incentives to support the development of sustainable aviation fuels;
- Improving aviation and marine technologies, including developing electric or hybrid electric aircraft and energy-efficient ships;
- Building the capacity to develop systems for monitoring, reporting and verifying emissions in international transport;
- Preparing national action plans to reduce emissions from international shipping.

Paragraph 89: Each Party should, to the extent possible, provide information about how its actions, policies and measures are modifying longer-term trends in GHG emissions and removals.

➔ This information is to be provided to the extent possible; some Parties may not have the capacity to provide it.

➔ Parties may choose to fulfil this requirement in various ways, including by indicating the mitigation impact of their actions, policies and measures over time or by providing information on their national circumstances, climate strategy and planned actions.

➔ Parties may also choose to provide qualitative information on how actions, policies and measures are modifying longer-term trends. This information could include, for example, relevant elements of a long-term emission reduction strategy or sustainable development strategy. This information could be included in the "Description" column of CTF table 5.

Paragraph 90: Each Party is encouraged to provide detailed information, to the extent possible, on the assessment of economic and social impacts of response measures.

➔ Response measures in the context of the UNFCCC are the actions, policies, programmes and other measures undertaken by Parties mostly for mitigating GHG emissions. In

addition to their direct mitigation impact, implementation of these response measures can have social, environmental and economic consequences (both positive and negative) with impacts that could be either domestic or cross-border.

- ➔ Examples of social impacts include changes in gender equality, social relationships, health, education, status of different social groups (Indigenous peoples; ethnic minorities; lesbian, gay, bisexual, transgender and intersex persons; etc.) and access to rights. Economic impacts include changes in national or regional GDP, employment levels and income. Environmental impacts include changes in pollution levels and impacts on biodiversity.
- ➔ In assessing and analysing the impacts of response measures, both quantitative and qualitative methodological approaches can help.
- ➔ Examples of quantitative approaches include:
    - Computable general equilibrium models, which model whole economies using economic data;
    - Integrated assessment models, which integrate geophysical and economic data;
    - Macroeconometric models, which provide behavioural data.
- ➔ Examples of qualitative approaches include:
    - Stakeholder interaction analyses, which can provide insight into policy impacts and help to validate quantitative findings;
    - Expert assessments, which can assist in providing country-specific insights;
    - Qualitative surveys, which can help to close gaps in quantitative data.
- ➔ Noting that information on response measures is also required for tracking progress (as per decision 18/CMA.1, annex, para. 78), the information to be provided as per paragraph 90 is:
    - Specific actions, policies or measures that are expected to have social and economic impacts;
    - Specific Parties affected;
    - Sectors and/or stakeholders affected;
    - Methods of assessing impacts;
    - The results of impact assessments.
- ➔ However, to fulfil the requirement of paragraph 90, Parties are encouraged to provide detailed information, to the extent possible, on the assessment of economic and social impacts of response measures.
- ➔ Examples of the information to be provided in relation to this requirement include
    - A description of international impact assessment methods;
    - A description of national impact assessment methods;
    - Examples of international financial support and/or collaboration.:

7.4.3 Format of reporting

The information provided by a Party on its mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, will be reported in both narrative and tabular format, and both formats are subject to review:

- Information reported in narrative format
- Information reported using CTF (CTF table 5 , annex II to decision 5/CMA.3 contains CTF tables)

Information reported using CTF should be filled in CTF table 5 shown below:

5. Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving an NDC

*Name**	*Description***	*Objectives*	*Type of instrument (i.e. regulatory, economic instrument or other)*	*Status (i.e. planned, adopted or implemented)*	*Sectors affected^*	*Gasses affected*	*Start year of implementation*	*Implementing entity or entities*	*Estimates of GHG emissions reductions (kt CO2 eq)*	
									Achieved	*Expected*

* Parties may indicate whether a measure is included in the 'with measures' projections.
** Parties may/should, to the extent possible, provide information including, costs, non-GHG benefits, interactions, those influencing international transport, how PAMs are modifying longer term trends in GHGs.
^ Energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other.

7.5 Summary of greenhouse gas emissions and removals

If a country submits its national GHG inventory report as a stand-alone report (i.e. a report which is submitted separately from the BTR and from the CTF), then a summary of its GHG emissions and removals must be provided as part of the information necessary to track progress made in implementing and achieving its NDC.

Under CTF 6, no common tabular format is provided. It follows from the heading of CTF 6 that this summary is to be in accordance with the common reporting table 10 emission trends – summary. The CRT 10 provides information on emission and removal trends. Parties can report the same information which they submitted in CRT 10 also in CTF 6.

Figure below presents an overview of CRT table 10 emission trends – summary (Sheet 6 of 6).

GREENHOUSE GAS EMISSIONS AND REMOVALS	Reference year/period for NDC (1)	Base year (2)	1990 (3)	(Years 1991 to 2019)	(Years 1991 to 2019)	(Years 1991 to 2019)	2020	(Years 2021 to latest reported year)	(Years 2021 to latest reported year)	(Years 2021 to latest reported year)	Change from [1990][base year][reference[year]] period]] to latest reported year
	CO_2 equivalents (kt) (7)										(%)
CO_2 emissions without net CO_2 from LULUCF											
CO_2 emissions with net CO_2 from LULUCF											
CH_4 emissions without CH_4 from LULUCF											
CH_4 emissions with CH_4 from LULUCF											
N_2O emissions without N_2O from LULUCF											
N_2O emissions with N_2O from LULUCF											
HFCs											
PFCs											
Unspecified mix of HFCs and PFCs											
SF_6											
NF_3											
Total (without LULUCF)											
Total (with LULUCF)											
Total (without LULUCF, with indirect)											
Total (with LULUCF, with indirect)											

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Reference year/period for NDC (1)	Base year (2)	1990	(Years 1991 to 2019)	(Years 1991 to 2019)	(Years 1991 to 2019)	2020	(Years 2021 to latest reported year)	(Years 2021 to latest reported year)	(Years 2021 to latest reported year)	Change from 1990[base year][reference[year]] period]] to latest reported year
	CO_2 equivalents (kt) (7)										(%)
1. Energy											
2. Industrial processes and product use											
3. Agriculture											
4. Land use, land-use change and forestry (6)											
5. Waste											
6. Other											
Total (with LULUCF) (8)											

Figure 37. Assessment of the GHG emission reductions expected (ex-ante) and achieved (ex-post) (Source: [21])

In current reporting under the Convention, developed country Parties also provide in a CTF some of the information which they already submitted with their greenhouse gas inventories.

7.6 Projections of greenhouse gas emissions and removals

7.6.1 Introduction

Parties must report information on projections of GHG emissions and removals. Projections are meant to provide an indicative picture of the impact of mitigation policies and measures on the future trends of GHG emissions and removals and shall not be used to assess progress towards the implementation and achievement of a Party's NDC unless the Party has identified a reported projection as its baseline for its NDCs.

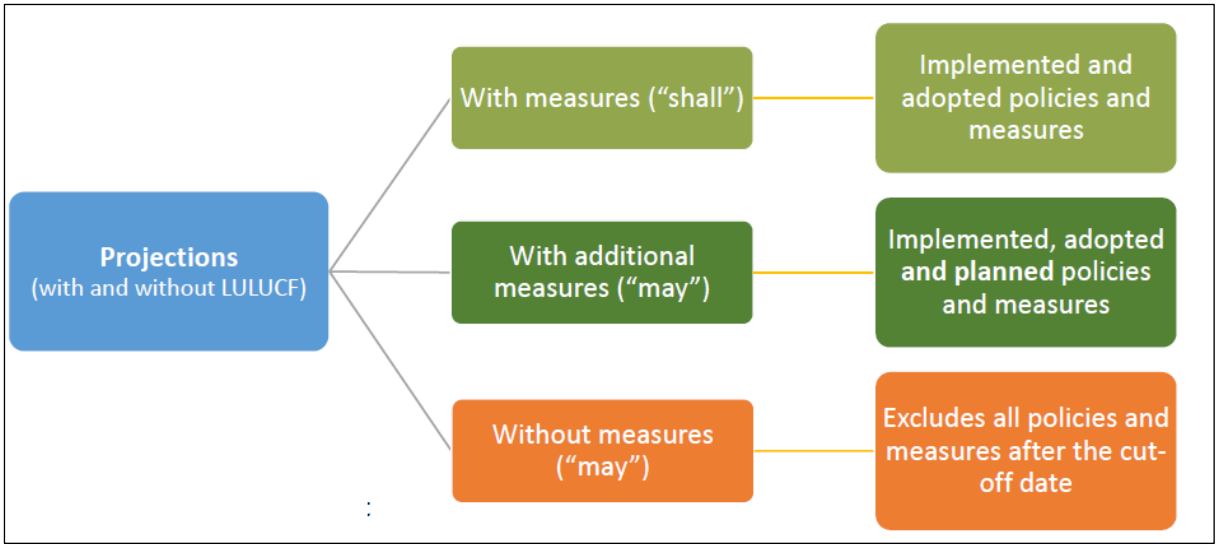
7.6.2 Reporting requirements

Paragraph(s) of the MPGs	**Heading**	**Format of reporting**	**Related CTF**
Paragraphs 92-102	F. Projections of GHG emissions and removals, as applicable	Information to be reported in a narrative and common tabular format	• CTF table 1 Description of selected indicators; • CTF table 2 Definitions needed to understand NDC; • CTF table 3 Methodologies and accounting approaches; • CTF table 4 Tracking progress in implementing and achieving the NDC

7.6.2.1 Projection scenarios

The MPGs in paragraph 94 define the three scenarios associated with projections of GHG emissions and removals:

- **A 'with measures' (WEM) projection scenario**: Encompasses currently [implemented] and [adopted] policies and measures
- **A 'with additional measures' (WAM) projection scenario**: Encompasses [implemented], [adopted] and [planned] policies and measures, and
- **A 'without measures' (WOM) projection scenario**: If provided, it excludes all policies and measures [implemented], [adopted] and [planned] after the year chosen **as the starting point for the projections**



It needs to be clear which measures reported under MPG section III.D and in the CTF table 5 are included in which of the scenarios **'with measures' and 'with additional measures'.** Not all measures may be included, as some may not be quantifiable. Estimated future impacts of individual measures may not add up to scenario results due to interactions between measures

Definitions

Although the difference between implemented, adopted, and planned polices and measures is not specifically described in the MPGs, based on the existing reporting practice under Convention (see decision 6/CP.25, paragraph 26) the following descriptions could be considered:

- **Implemented policies and measure** are those to which one or more of the following may apply: national legislation is in force; one or more voluntary agreements have been established; financial resources have been allocated; human resources have been mobilized.
- **Adopted** are those in relation to which an official government decision has been made and there is a clear commitment to proceed with implementation.
- **Planned** are those for which options are under discussion and have a realistic chance of being adopted and implemented in the future.

According to the MPGs, each Party shall report a 'with measures' scenario and may report the other scenarios; those developing countries that need flexibility in the light of their capacities are encouraged to report information on projections.

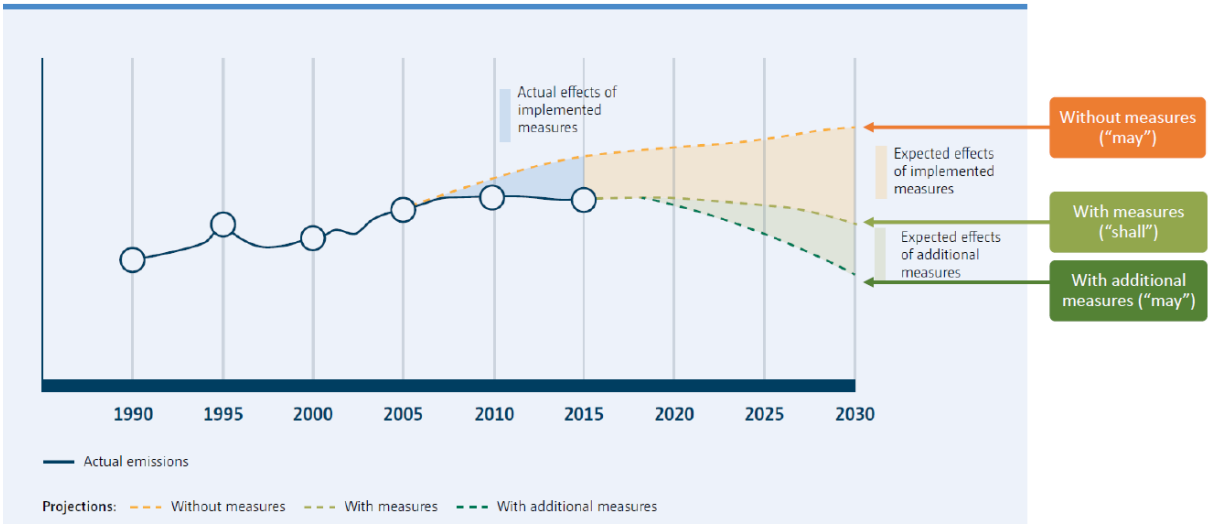


Figure 38. Hypothetical projections of GHG emissions and removals under different scenarios (Source: [4])

Baseline scenario

- Baseline scenario projections are used as a reference to set a baseline scenario target. A baseline scenario projection is a hypothetical case that represents future events or conditions most likely to occur in the absence of activities taken to meet a mitigation target.
- According to the MPGs, if a Party has identified a reported projection as its baseline, then this baseline should be used to assess progress towards the implementation and achievement of its NDC.
- Baseline scenario projections are sometimes referred to as business-as-usual (BAU) scenario. Note that business-as-usual scenario could include some implemented and/or adopted policies and measures and, as such, **is not identical to a WOM scenario**.
- Developing baseline scenario projections depend on a wide variety of inputs, such as data on factors that drive emissions (economic activity, energy prices, population growth, etc.), assumptions about how emissions drivers are expected to change over the goal implementation period, and data on the effects of implemented or adopted policies and measures.
- For Parties that adopt baseline scenario targets, baseline scenarios may either be static or dynamic:
  - A static baseline scenario is fixed at the start of the target period and not recalculated over time, so that the target level of emissions in the target year remains fixed.
  - A dynamic baseline scenario is recalculated regularly during the target period based on changes in emissions drivers such as GDP or energy prices, so that the target level of emissions in the target year changes over time.
- It should be emphasized that a dynamic baseline scenario is particularly difficult to implement and review owing to inherent uncertainties and constant changes of underlying assumptions and key variables.

7.6.2.2 Coverage of projections

Projections shall begin from the most recent year reported in the Party's national inventory report and extend at least 15 years beyond the next year ending in zero or five (e.g. 2025, 2030).

Projected emissions and removals of greenhouse gases are to be reported for each sector, including transport, which is a sub-sector of the energy sector. They are also to be reported separately for each gas.

Projections shall also:

- Use a common metric consistent with the one used in the national inventory report;
- Be presented relative to actual inventory data for the preceding years;
- Be provided with and without LULUCF.
- Reported for key indicators to determine progress towards NDCs

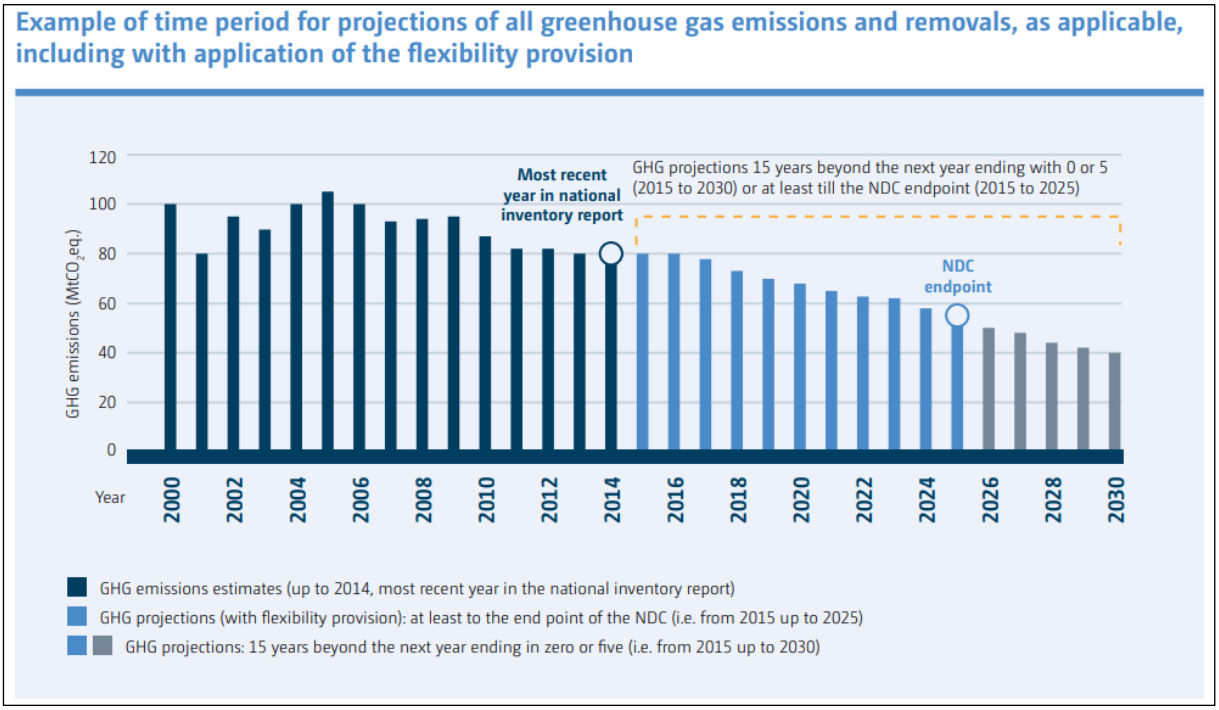


Figure 39. Example of time period for projections of all GHG emissions and removals (Source: [6])

Flexibility for developing country Parties

Each Party shall report projections, however those developing country Parties that need flexibility in the light of their capacities may apply the specific flexibility provisions offered to them in the MPGs for reporting some of the information on projections in their BTRs.

Flexibility provided for reporting projections of GHG emissions and removals is as follows:

- Those developing country Parties that need flexibility in the light of their capacities are encouraged to report projections (MPGs, paragraph 92);
- With regards to the timeframe that projections cover, developing countries applying flexibility could extend their projections at least to the end point of their NDC (MPGs, paragraph 95);
- Developing country Parties can use a less detailed methodology or coverage in reporting projections (MPGs, paragraph 102).

7.6.2.3 Methodologies, parameters, assumptions and sensitivity analysis

Parties should describe the methodology used to develop the projections by including the following:

- Models and/or approaches used and key underlying assumptions and parameters used for projections (e.g. gross domestic product growth rate/level, population growth rate/level);
- Changes in the methodology since the Party's most recent BTR;
- Assumptions on policies and measures included in the "with measures" projections and "with additional measures" projections, if included;
- Sensitivity analysis of any of the projections, together with a brief explanation of the methodologies and parameters used.

❖ **Methodologies**

Contrary to the case for estimating emissions for national GHG inventories, there are **no prescribed methodologies for the preparation of projections**.

Parties may use any models and approaches at their disposal, and as deemed relevant to their needs and national circumstances, to project future GHG emissions and removals.

Most Parties use an integrated approach to projecting energy-related emissions, whereby macroeconomic top-down models are coupled with sector- and technology-specific bottom-up models. However, the type and characteristics of the models can differ significantly among Parties. In many cases, Parties also use simpler spreadsheets models consistent with methodologies used for preparing their GHG emissions inventories to project emissions from non-energy sources.

All projections of GHG emissions and removals are modelled in some way. The models Parties are using to develop scenarios and estimate GHG emission projections can be broadly classified into four categories:

- **Economy-wide macroeconomic models** (e.g. computable general equilibrium (CGE), dynamic stochastic general equilibrium (DSGE));
- **Sectoral models to project emissions from the energy sector** (e.g.Price-induced Market Equilibrium System (PRIMES), Market Allocation (MARKAL), Integrated Market Allocation-Energy Flow Optimization Model System (TIMES), Model for Energy Supply Strategy Alternatives and their General Environmental Impact (MESSAGE), Low Emissions Analysis Platform (LEAP);
- **Sectoral models to project non-energy related GHG emissions** (e.g. Common Agricultural Policy Regional Impact (CAPRI) for agriculture);
- **Sectoral models to project GHG emissions and removals from land use, land-use change and forestry** (e.g. CLUE, GEONAMICA, IMAGE, LANDSHIFT, PLM, SITE).

❖ **Parameters and assumptions**

Contrary to the case for estimating emissions for national GHG inventories, there are **no prescribed methodologies for the preparation of projections**.

Models used for preparing projections require a set of parameters and assumptions to estimate projections of future emissions. Non-exhaustive list of the commonly used parameters and assumptions are provided below.

Commonly used parameters:	Commonly used assumptions:
Population growth and structure	Structure of the domestic economy: • Increase or decrease in manufacturing (production) activities; • Increase or decrease in services; • Increase or decrease in agricultural activities.
Gross domestic product growth rates	Technological development trends: • Energy efficiency improvements of products and services; • Development of carbon capture and storage infrastructure; • Increase in electric vehicles and development of supporting infrastructure
Tax rates	Available energy sources and costs:

	• Political acceptability of expansion or restructuring of the energy system – nuclear, coal, • gas, hydro, renewables, combined heat and power, district heating, etc.; • Country-specific events like annual fluctuations in hydropower availability.
International fossil fuel prices (coal, gas, oil)	The development of energy markets and the impact on GHG emissions: • Regulation or deregulation of domestic energy markets and the electricity market in particular; • Exports and imports of primary or transformed energy; • Availability of natural gas; • Development and introduction of renewable energy; • Future developments in nuclear power (e.g. time needed for the set-up or shutdown of nuclear power plants).
International, regional or domestic carbon prices or taxes	Sector-specific developments: • Expansion or closure of specific industrial activities; • Improvements in agricultural practices (e.g. manure management and use of fertilizers); • Changes in demand for timber, wood products and biomass; • Changes in waste generation rates and waste management practices (landfilling, thermal treatment, recycling, composting).
Heating degree days	
Passenger-kilometres	
Currency exchange rates	
etc.	

❖ **Sensitivity analysis**

In general, sensitivity analysis investigates how variation in the output of a model can be attributed to variation in its input factors (variables).

Typical questions addressed by sensitivity analysis are:

- What input factors cause the largest variation in the output?
- Is there any factor whose variability has a negligible effect on the output?
- Are there interactions that amplify or dampen the variability induced by individual factors?

The usual steps in any sensitivity analysis are:

1. Selecting which input factors will be subject to sensitivity analysis;

2. Setting the values of other input factors that will be kept constant throughout the sensitivity analysis;

3. Defining the model output (e.g. GHG emissions).

One of the simplest and most common approaches is that of changing one factor at a time to see what effect this has on the output. Sensitivity may then be measured by monitoring changes in the output results.

With regard to GHG emission projections, sensitivity analysis usually involves:

1. Selecting the most influential input variables (e.g. price of oil or natural gas) and quantifying the uncertainty on the basis of changes in underlying assumptions (e.g. range of future fuel prices, rates of gross domestic product, industrial growth rates, etc.);

2. Running the model;

3. Observing changes in the levels of projected GHG emissions as an output of the model.

Sensitivity analysis is useful for testing the robustness of the models used for projections, for understanding the relationships between input and output variables in a model and for identifying errors in a model.

Although reporting information on models used is not mandatory, it is important for transparency and for the assessment of the plausibility and robustness of the projections.

7.6.2.4 Flexibility for developing country Parties

Each Party shall report projections, however those developing country Parties that need flexibility in the light of their capacities may apply the specific flexibility provisions offered to them in the MPGs for reporting some of the information on projections in their BTRs.

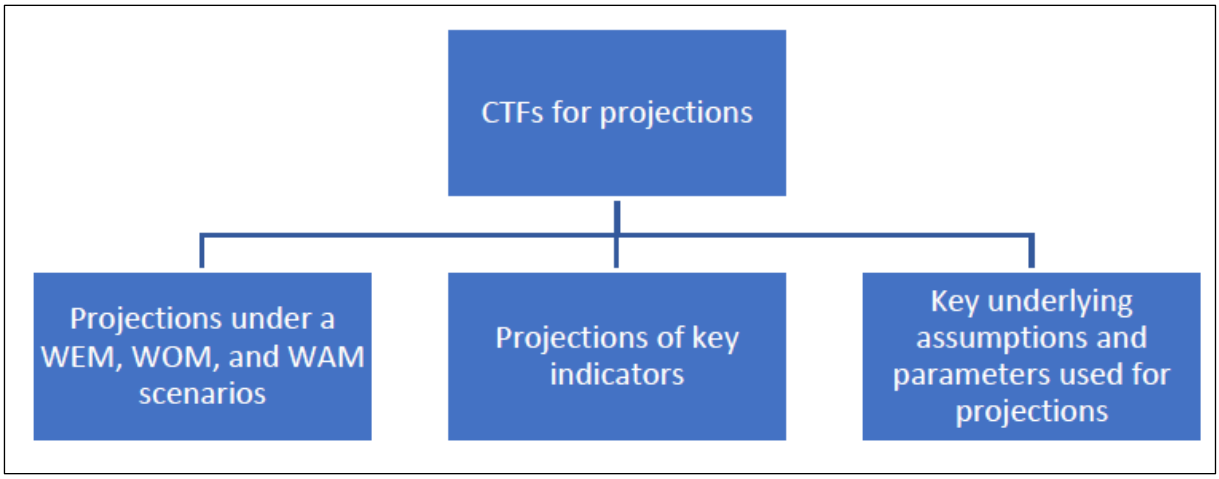
The table below presents the flexibility provisions available to those developing country Parties that need it in the light of their capacities in relation projections of greenhouse gas emissions and removals.

REFERENCE IN THE MPGS (ANNEX TO DECISION 18/CMA.1)	PROVISION IN THE MPGS	FLEXIBILITY PROVISION FOR THOSE DEVELOPING COUNTRY PARTIES THAT NEED IT IN THE LIGHT OF THEIR CAPACITIES
Paragraph 92 *GHG emission and removals projections*	Each Party shall report projections	Instead encouraged to report such projections
Paragraph 95 *Projections extension*	Projections shall begin from the most recent year in the Party's national inventory report and extend at least 15 years beyond the next year ending in zero or five	May extend their projections at least to the end point of their NDC
Paragraph 102 *Projections methodology or coverage*	See paragraphs 93 through 101 of the annex to decision 18/CMA.1	May report using a less detailed methodology or coverage

Figure 40. Flexibility provisions relating to GHG projections (Source: [6])

7.6.3 Format of reporting

Annex II to decision 5/CMA.3 contains CTF tables for the electronic reporting of the information on projections. The tables relevant to projections are shown in figure below.



A total of five CTF address the projections of greenhouse gas emissions and removals. CTF 7 to 9 are almost identical; they are intended for reporting 'with measures', with additional measures' and 'without measures' scenarios. Projections are reported in 5-year steps in the CTF7 to 9 tables. Full time series data can be reported in the BTR in tabular or graphical format, if desired.

The CTFs 7 to 9 are very similar to the CTF currently used by developed country Parties for their biennial reporting under the Convention.

7. Information on projections of greenhouse gas emissions and removals under a 'with measures' scenario[a,b]

	Most recent year in the Party's national inventory report (kt CO_2 eq)[c]	*Projections of GHG emissions and removals (kt CO_2 eq)[c]*		
	20XX	*20X(0)(5)*	*20X(0)(5)*	*20X(0)(5)*
Sector[d]				
Energy				
Transport				
Industrial processes and product use				
Agriculture				
LULUCF				
Waste				
Other (specify)				
Gas				
CO_2 emissions including net CO_2 from LULUCF				
CO_2 emissions excluding net CO_2 from LULUCF				
CH_4 emissions including CH_4 from LULUCF				
CH_4 emissions excluding CH_4 from LULUCF				
N_2O emissions including N_2O from LULUCF				
N_2O emissions excluding N_2O from LULUCF				
HFCs				
PFCs				
SF_6				
NF_3				
Other (specify)				
Total with LULUCF				
Total without LULUCF				

Figure 41. CTF7. Information on projections of greenhouse gas emissions and removals under a 'with measures' scenario (Source: [21])

8. Information on projections of greenhouse gas emissions and removals under a 'with additional measures' scenario[a, b]				
	Most recent year in the Party's national inventory report (kt CO_2 eq)[c]	*Projections of GHG emissions and removals (kt CO_2 eq)[c]*		
	20XX	*20X(0)(5)*	*20X(0)(5)*	*20X(0)(5)*
Sector[d]				
Energy				
Transport				
Industrial processes and product use				
Agriculture				
LULUCF				
Waste				
Other (specify)				
Gas				
CO_2 emissions including net CO_2 from LULUCF				
CO_2 emissions excluding net CO_2 from LULUCF				
CH_4 emissions including CH_4 from LULUCF				
CH_4 emissions excluding CH_4 from LULUCF				
N_2O emissions including N_2O from LULUCF				
N_2O emissions excluding N_2O from LULUCF				
HFCs				
PFCs				
SF_6				
NF_3				
Other (specify)				
Total with LULUCF				
Total without LULUCF				

Figure 42. CTF8. Information on projections of greenhouse gas emissions and removals under a 'with additional measures' scenario (Source: [21])

9. Information on projections of greenhouse gas emissions and removals under a 'without measures' scenario[a, b]			
	Most recent year in the Party's national inventory report (kt CO_2 eq)[c]	*Projections of GHG emissions and removals (kt CO_2 eq)[c]*	
	20XX	*20X(0)(5)*	*20X(0)(5)*	*20X(0)(5)*
Sector[d]				
Energy				
Transport				
Industrial processes and product use				
Agriculture				
LULUCF				
Waste				
Other (specify)				
Gas				
CO_2 emissions including net CO_2 from LULUCF				
CO_2 emissions excluding net CO_2 from LULUCF				
CH_4 emissions including CH_4 from LULUCF				
CH_4 emissions excluding CH_4 from LULUCF				
N_2O emissions including N_2O from LULUCF				
N_2O emissions excluding N_2O from LULUCF				
HFCs				
PFCs				
SF_6				
NF_3				
Other (specify)				
Total with LULUCF				
Total without LULUCF				

Figure 43. CTF9. Information on projections of greenhouse gas emissions and removals under a 'without measures' scenario (Source: [21])

CTFs 10 and 11 require the reporting of key indicators, and of key underlying assumptions and parameters used for the projections. While key variables and assumptions are already reported by developed country Parties under the Convention, the reporting of key indicators is a new requirement under the Paris Agreement. It is related to the fact that many NDCs contain non-greenhouse gas targets. While the progress towards achieving greenhouse gas targets can be tracked using projections of greenhouse gas emissions and removals (CTFs 7 to 9), the progress towards non-greenhouse gas targets has to be tracked using CTF 11. An example would be to enter, in CTF 11 projected values of the share of renewable energy in total electricity generation, if the Party's NDC contains a renewable electricity target.

10. Projections of key indicators[a,b]					
		Most recent year in the Party's national inventory report, or the most recent year for which data is available	*Projections of key indicators[d]*		
Key indicator(s):[c]	*Unit, as applicable*	*20XX*	*20X(0)(5)*	*20X(0)(5)*	*20X(0)(5)*
{Key indicator}					

Figure 44. CTF10. Projections of key indicators (Source: [21])

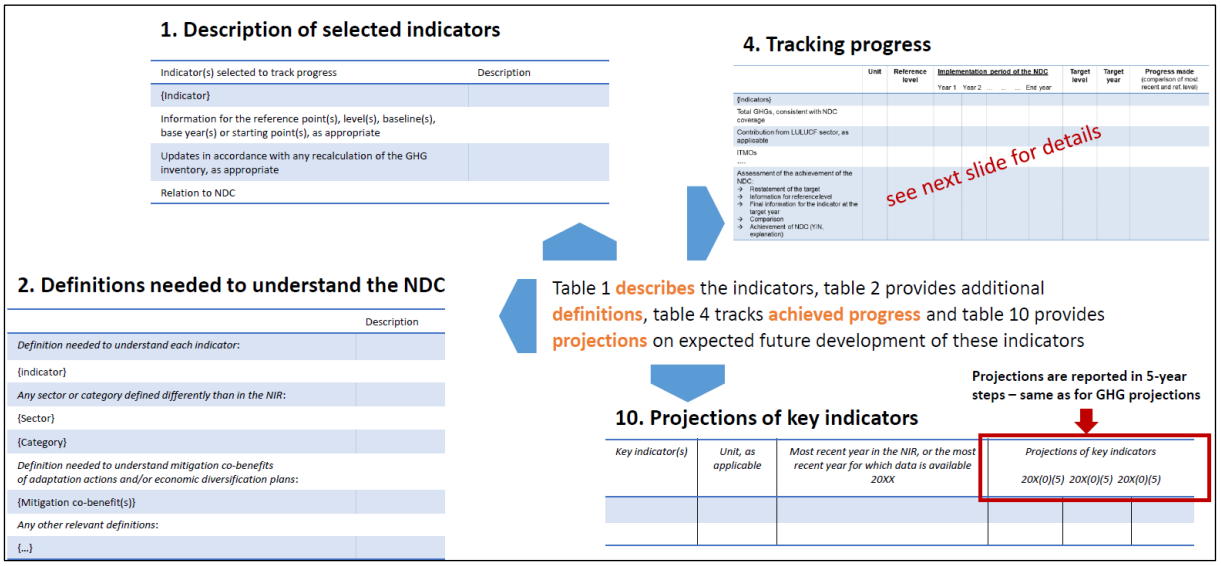
11. Key underlying assumptions and parameters used for projections[a, b]

Key underlying assumptions and parameters[c]	*Unit, as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of key underlying assumptions and parameters*[d]		
		20XX	*20X(0)(5)*	*20X(0)(5)*	*20X(0)(5)*
{Key underlying assumption/parameter}					

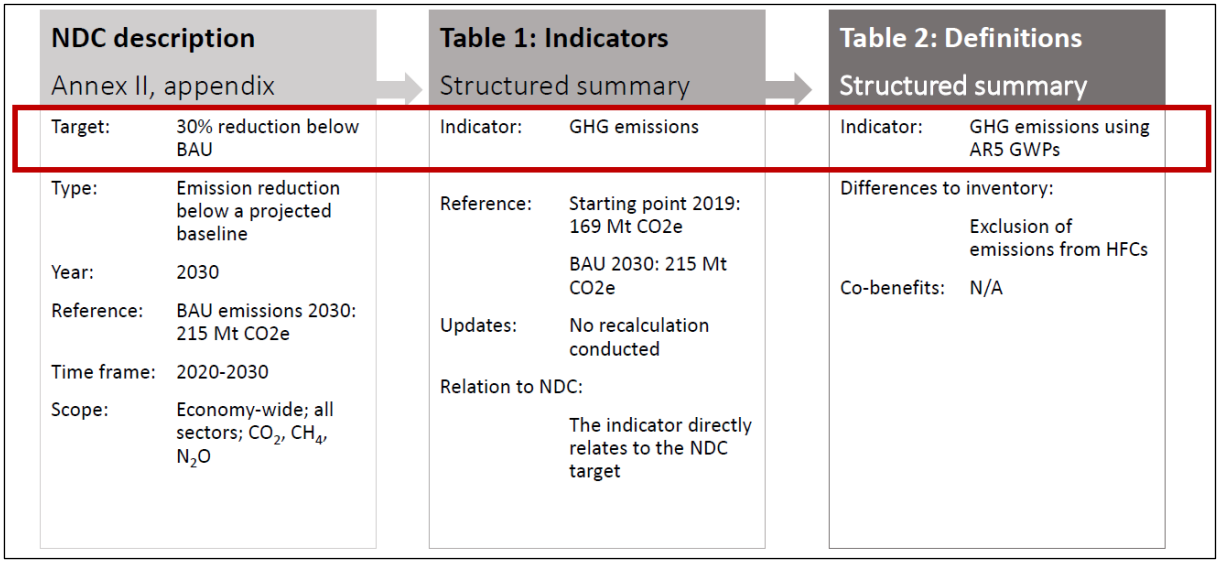
Figure 45. CTF11. Key underlying assumptions and parameters used for projections (Source: [21])

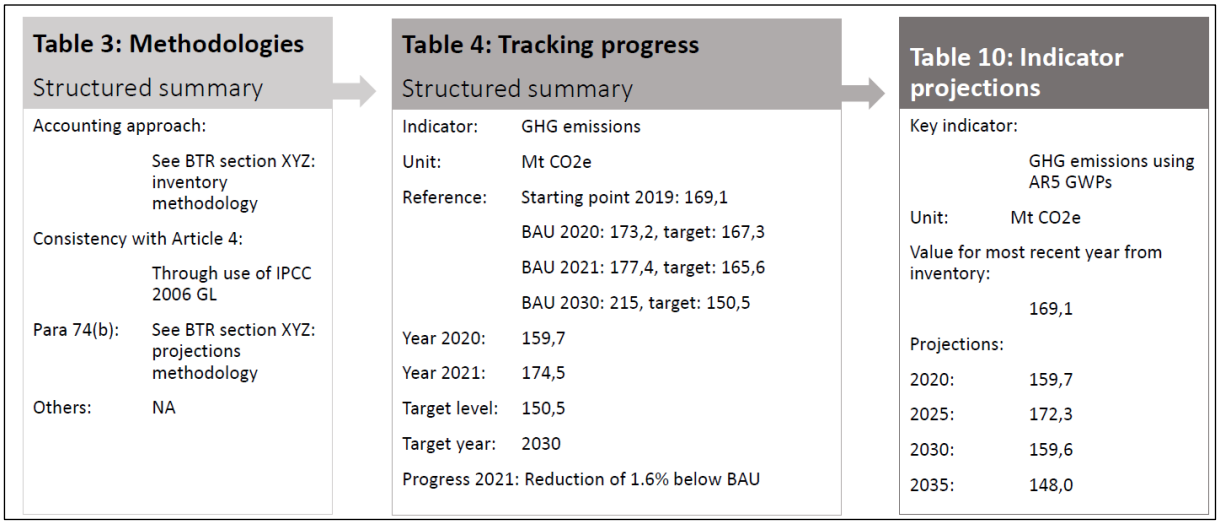
7.6.4 Interlinkage between CTF 10 on projections of key indicators and CTF tables 1, 2 and 4

CTF Table 10 on projections of key indicators is interlinked with CTF tables 1, 2 and 4 as follows: CTF table 1 describes the indicators, CTF table 2 provides additional definitions, CTF table 4 tracks achieved progress and CTF table 10 provides projections on expected future development of these indicators.

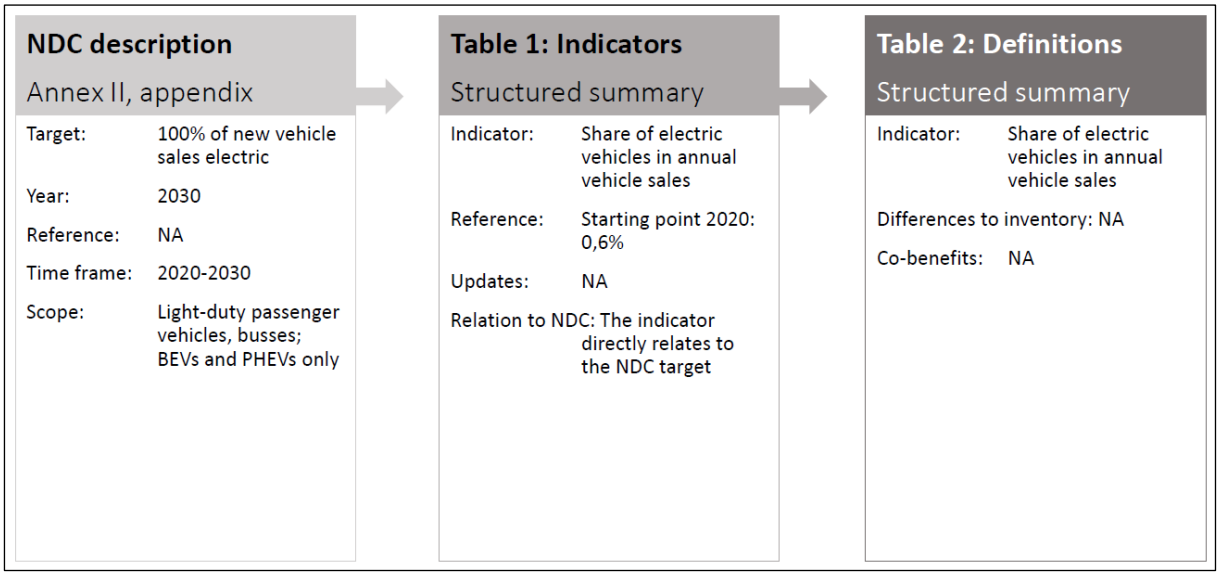


The table below provides a filled-in reporting format for a baseline target with illustration of interlinkages between NDC description table, CTF tables 1,2, 3 and 4, and CTF table 10.





The table below provides a filled-in reporting format for a quantitative non GHG transport target with illustration of interlinkages between NDC description table, CTF tables 1,2, 3 and 4, and CTF table 10.



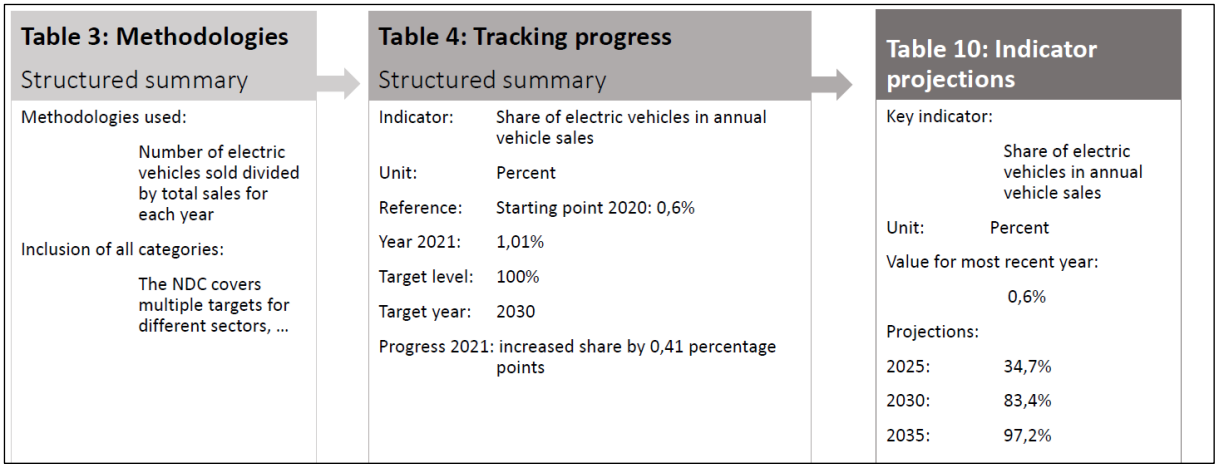


Table 3: Methodologies
Structured summary
Methodologies used:
Number of electric vehicles sold divided by total sales for each year
Inclusion of all categories:
The NDC covers multiple targets for different sectors, ...
Table 4: Tracking progress
Structured summary
Indicator: Share of electric vehicles in annual vehicle sales
Unit: Percent
Reference: Starting point 2020: 0,6%
Year 2021: 1,01%
Target level: 100%
Target year: 2030
Progress 2021: increased share by 0,41 percentage points
Table 10: Indicator projections
Key indicator:
Share of electric vehicles in annual vehicle sales
Unit: Percent
Value for most recent year:
0,6%
Projections:
2025: 34,7%
2030: 83,4%
2035: 97,2%

8. Tracking progress in implementing mitigation actions, policies and measures

8.1 Key concepts related to mitigation actions and GHG assessment

8.1.1 Definitions

Actions or measures generally refer to a concrete activity or set of activities taken by a government to implement a policy or plan.

Baseline: is a scenario that aims to represent likely developments under a given policy framework as accurately as possible. It is a reference case that represents the events or conditions most likely to occur in the absence of specific implemented or planned mitigation action(s). Baselines are used to understand effects of most likely developments. This can serve as a basis for setting emission goals, but also to assess financial, economic or other impacts of mitigation actions against a situation without these actions (WRI, 2014c). There are other terms that are used as synonyms:

Business-as-usual: synonym of baseline, normally used for an ex-ante baseline, although the term can also be used ex-post;

Counterfactual: synonym of baseline, normally used in the context of an ex-post assessment;

Data: Historic values of individual parameters, ideally in the form of a time series. The term is normally used for measurable, i.e. historic values. Expected future values for parameters are called trends or projections. To avoid confusion the terms 'historic data' and 'future trend data' or 'projected data' could be used.

Ex-ante assessment: The process of estimating expected future GHG effects of a policy or action

Ex-post assessment: The process of estimating historical GHG effects of a policy or action

GHG/Mitigation assessment: refer to the estimation of changes in GHG emissions resulting from a policy or action. A GHG assessment is classified as either ex-ante or ex-post depending on whether it is prospective (forward-looking) or retrospective (backward-looking):

Method: Equations, algorithms and models used to estimate emissions. These include top-down, bottom-up and complex methods as well as simple equations.

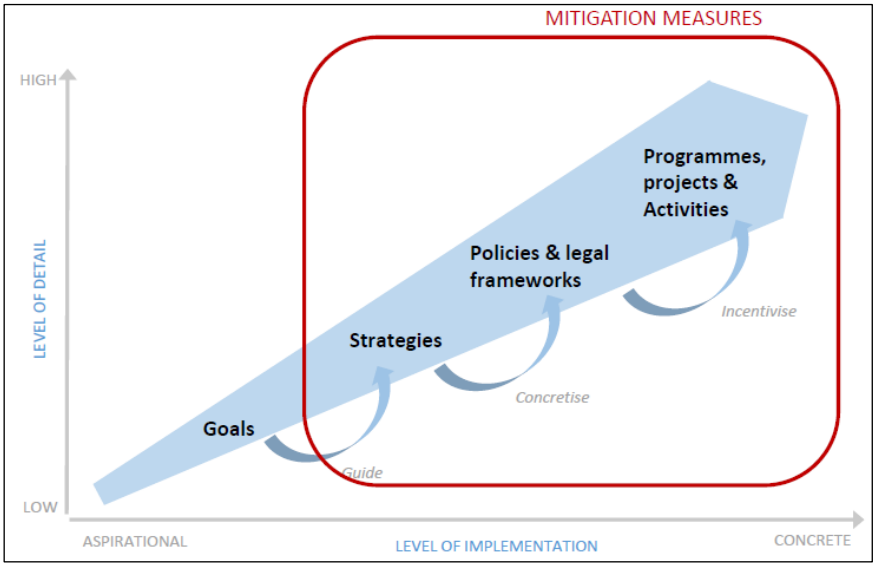
Methodology: The assessment methodology defines the actual steps that will be conducted for the planned mitigation assessment. More importantly, it defines the methods and tools to be used, especially for the steps that quantify effects. The methodology includes the justification why choices are appropriate for the purpose.

Mitigation co-benefits result from actions undertaken as part of adaptation and/or economic diversification plans where these generate emissions reductions and thereby contribute to achieving mitigation outcomes [9].

Mitigation policies or mitigation plans generally refer to a decision or a set of decisions that a government takes to achieve certain objectives [9].

Mitigation measures: the CGE uses the term '**mitigation measures**' in its training material (source [4]) in a broad sense, to cover:

- Strategies & strategic documents.
- Policies & legal frameworks.
- Programmes, projects & activities.



Model: A schematic (mathematical, computer-based) description of a system that accounts for its known or inferred properties (DEA, OECD & URC, 2013).

Parameter: A variable (e.g. activity data, emission factor) that is part of an emissions estimation equation or algorithm or other calculation.

Example: 'emissions per kWh of electricity' and 'quantity of electricity supplied' are both parameters in the equation

0.5 kg CO2e/kWh of electricity x 100 kWh of electricity supplied = 50 kg CO2e.

Policy and action: The terms "policy" and "action" may refer to interventions at various stages along a policy-making continuum, from (1) broad strategies or plans that define high-level objectives or desired outcomes (such as increasing energy efficiency by 20 percent by 2020); to (2) specific policy instruments to carry out a strategy or achieve desired outcomes (such as an energy efficiency standard for appliances); to (3) the implementation of technologies, processes, or practices (sometimes called "measures") that result from policy instruments (such as the replacement of old appliances with more efficient ones) [19].

Policies and measures: means all instruments which contribute to meeting the objectives of the integrated national energy and climate plans and/or to implement commitments under Article 4(2)(a) and (b) of the UNFCCC, which may include those that do not have the limitation and reduction of greenhouse gas emissions or change in the energy system as a primary objective [23].

Projection: A more general term for estimating future values, based on formal statistical methods. The term should mainly be applied to individual parameters, but is often also used as synonymous.

Reference scenario: synonym of baseline, especially used where the scenario serves as the reference for determining other values, for example goals.

Scenario: represents a coherent, internally consistent and plausible description of a possible future state of the world given a pre-established set of assumptions. Several scenarios can be adopted to reflect, as well as possible, the range of uncertainty in those assumptions (DEA, OECD & URC, 2013).

Tools: Tools support the application of methods, often through computer based solutions, but are not limited to this. Tools can support various methods and steps, from apps that support data collection, databases that help process and archive data, to spreadsheets and complex models that calculate effects based on input parameters.

Trend: Determination of tendencies of a time series of past data. Historic trends that have been statistically determined can also be used as a tool to extrapolate developments to the future. The trend is a statistical method. It is often used to understand past developments. Under the assumption that certain parameters are most likely to develop in the same way as in the past, the trend is often extrapolated to the future. As such it does not necessarily constitute the 'most likely scenario' for all relevant variables for the determination of a baseline.

8.1.2 Design and implementation cycle for mitigation actions

Ideally the implementation of mitigation actions is embedded in a robust analytical framework that supports decision-making and allows policymakers to evaluate success. Such a robust framework includes the analysis of the current greenhouse gas (GHG) emission profile, expected future developments and the identification of potential mitigation actions within the overall political context and the sustainable development priorities of the country.

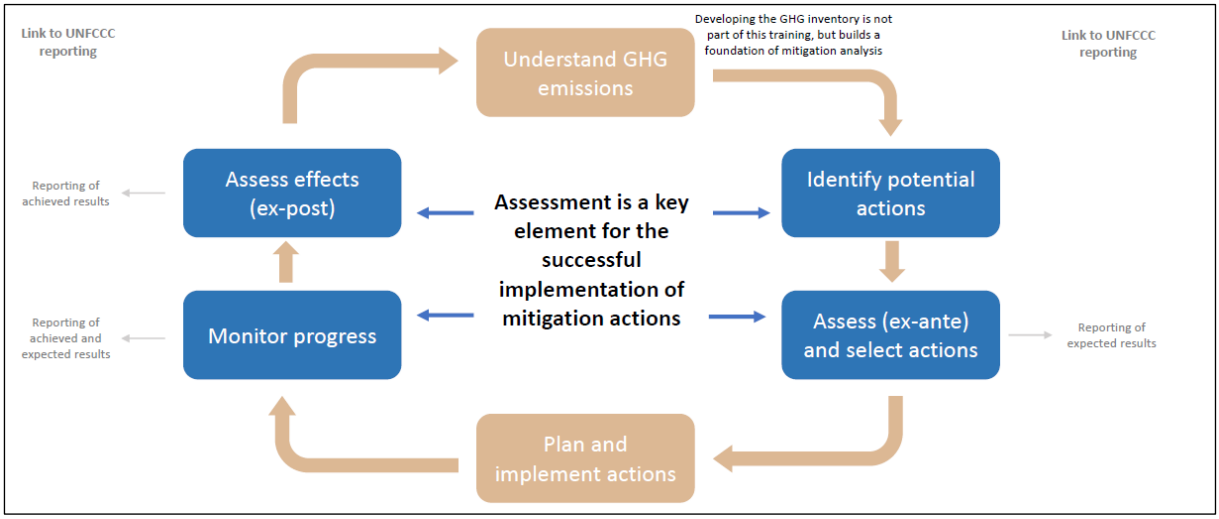


Figure 46. Illustrative example of a design and implementation cycle for mitigation actions (Source: [4])

8.1.3 Interaction of mitigation action with existing political framework

The existing policy framework will influence the effectiveness of mitigation measures. It represents the institutional and administrative framework for the implementation of measures as well as the existing landscape of goals, strategies, policies and regulations that affect a sector where mitigation actions are implemented. Underlying political regulation will affect the mitigation action and present barriers or enablers for effective mitigation action. To understand the effects of mitigation actions, the interaction of the measure with the existing policy framework must be taken into consideration.

The existing political framework influences the effectiveness of mitigation actions at different levels:

- **Purpose**: Strategies provide guidance, while detailed implementation regulations aim to achieve specific objectives and translate the strategies into practice;
- **Scope**: Strategies and policy instruments can be cross-cutting or multisectoral in nature or aim at sector or technology specific interventions. They can also overlap, reinforce or weaken each other.
- **Engagement**: Policies can be formulated around aspirational goals or constitute binding and enforceable legislation.

It is important to be aware of these different levels and dimensions of the policy framework. Strategies and related goals offer important guidance for the formulation of more concrete actions and implementation at the different levels of legislation. However, only the concrete implementation of instruments and actions will enable the achievement of expected results.

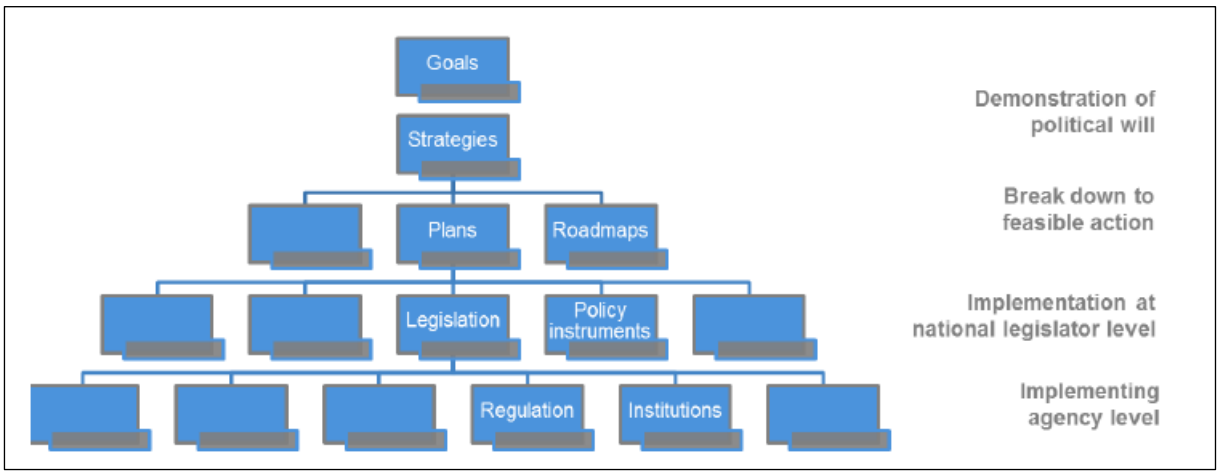


Figure 47. Different levels of the political framework (Source: [11])

The table below presents general types of policies and actions that are usually applied at the national legislator level, thus forming the policy framework for mitigation actions. In many cases such policies will form the basis of mitigation actions.

Table 9 : Examples for different types of policies (Source: [11])

Type of policy or action	Description
Regulations and standards	Regulations that specify abatement technologies or minimum requirements for energy consumption, pollution output, or other activities. They may set obligations or mandates for specific sectors. They typically include penalties for non-compliance.
Taxes and charges	A levy imposed on each unit of activity by a source (e.g. fuel tax, carbon tax, traffic congestion charge, import or export tax).
Subsidies and incentives	Direct payments, tax reductions, price supports or the equivalent thereof from a government to an entity for implementing a practice or performing a specified action.
Tradable permits	A programme that establishes a limit on aggregate emissions by specified sources, requires each source to hold permits, allowances, or other units equal to its actual emissions, and allows permits to be traded among sources. These are also known as emissions trading programmes, emissions trading systems, or cap-and-trade programmes.
Voluntary agreements or measures	An agreement, commitment, or measure undertaken voluntarily by public or private sector actors, either unilaterally or jointly in a negotiated agreement. Not all voluntary agreements are truly voluntary; some include rewards and/or penalties associated with participating in the agreement or achieving the commitments.
Information instruments	Required public disclosure of information, generally by industry to consumers. These include labelling programmes, rating and certification systems, and information or education campaigns aimed at increasing awareness and changing behaviour.
Research, development, and deployment policies	Policies aimed at supporting technological advancement, through direct government funding or investment, or facilitation of investment, in technology research, development, demonstration, and deployment activities.

Source: Gupta et al. (2007); WRI (2014c).

8.1.4 Linkages between mitigation actions and deployment of low carbon technologies and practices

Irrespective of the final objective of actions, the identification of mitigation actions usually starts with making choices on the low carbon technologies and practices appropriate for the national circumstances. The deployment of these technologies and practices can then be supported by a wide range of different mitigation actions.

Only the real use of low carbon technologies and practices on the ground will result in reduced GHG emissions. It is however important not to confuse technology with mitigation action. Mitigation actions aim to ensure that such technologies and practices are deployed at levels that would not be achieved in the absence of the mitigation action.

The figure below illustrates that different mitigation actions can be used to influence the uptake of the same technology.

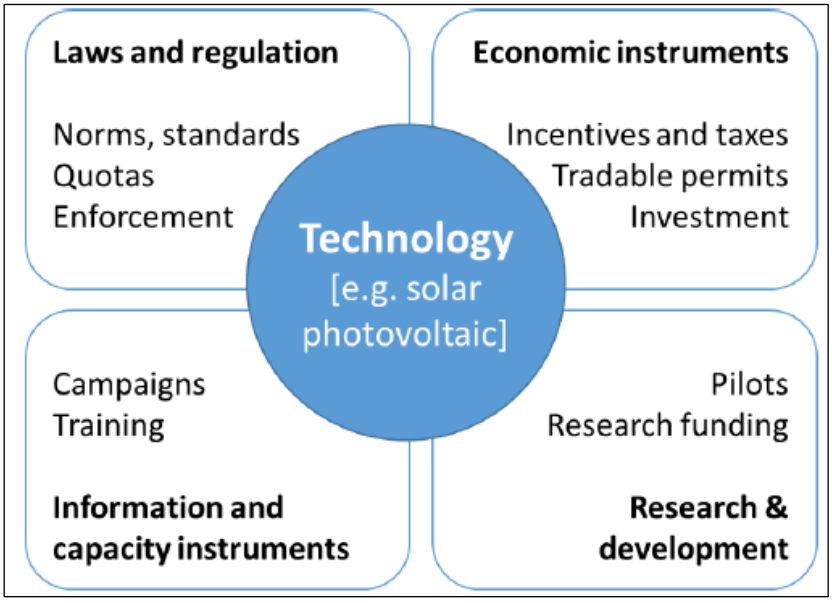


Figure 48. Example of different mitigation actions to support a low carbon technology (Source: [11])

It is important to provide a stable enabling environment, irrespective of the choice of instruments.

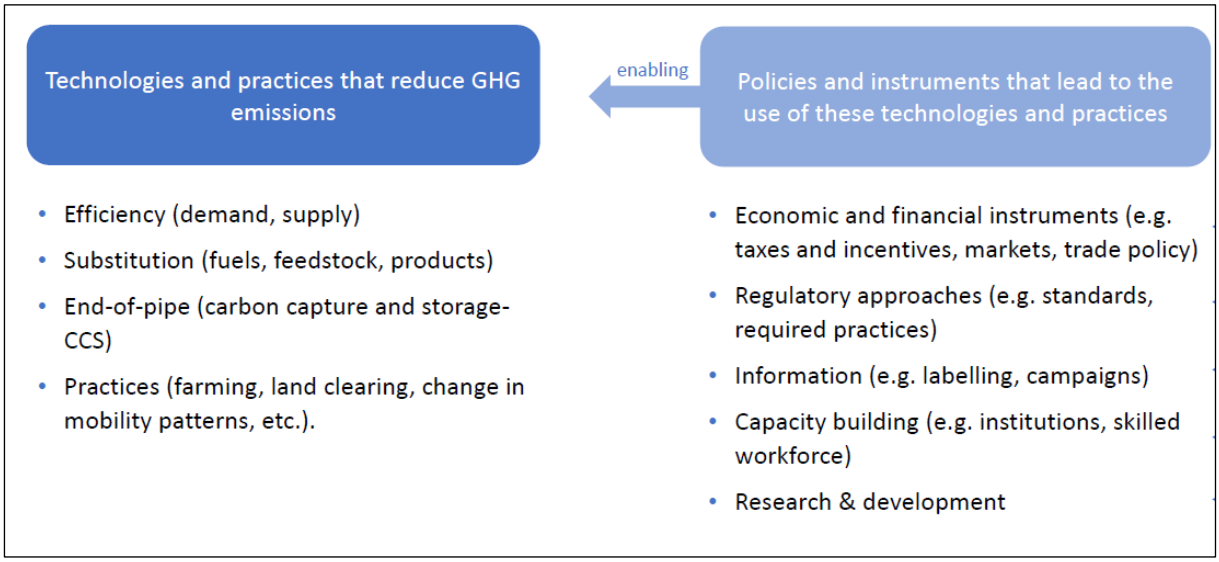


Figure 49. Linkages between Policies and instruments that lead to the use of these technologies and practices, and technologies and practices that reduce GHG emissions (Source: [2])

If the goal is to achieve a certain capacity or share of solar photovoltaic (PV) power in a country, this could be achieved with a variety of different tools, including:

- PV could be made mandatory for new buildings (e.g. of certain type);
- Energy providers could be obliged to achieve a specific quota of PV within their energy mix;
- Taxes or charges on non-PV generation capacity could be applied;
- PV investments could be incentivized through subsidy, feed-in or loan schemes;
- Government could directly invest in PV capacity;
- Information campaigns could aim to inform the public and decision makers on advantages and opportunities for PV installation;
- Experts in PV installation and maintenance could be trained;

- Research and development capacity in the country could be supported to develop solutions specifically adapted to the national context.

8.1.5 Scope of mitigation actions

A number of factors relating to the scope of the action further refine the understanding of the mitigation action, including the sectoral and geographic coverage of the action, which indicate how much of national emissions could be impacted. To this end, it is also important to understand which sources and/or sinks are targeted by the action. Finally, the choice of gases covered will influence the expected and/or achieved impact of the action.

8.1.5.1 Sectors

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories have a different sector classification than the Revised 1996 IPCC Guidelines. Non-Annex I countries are encouraged to use the latest IPCC guidelines, if capacity and resources allow or the country finds elements from the 2006 IPCC Guidelines useful for its national context. These sector classifications are:

- Energy;
- Industrial processes and product use (IPPU);
- Agriculture, forestry and other land use (AFOLU);
- Waste;
- Other.

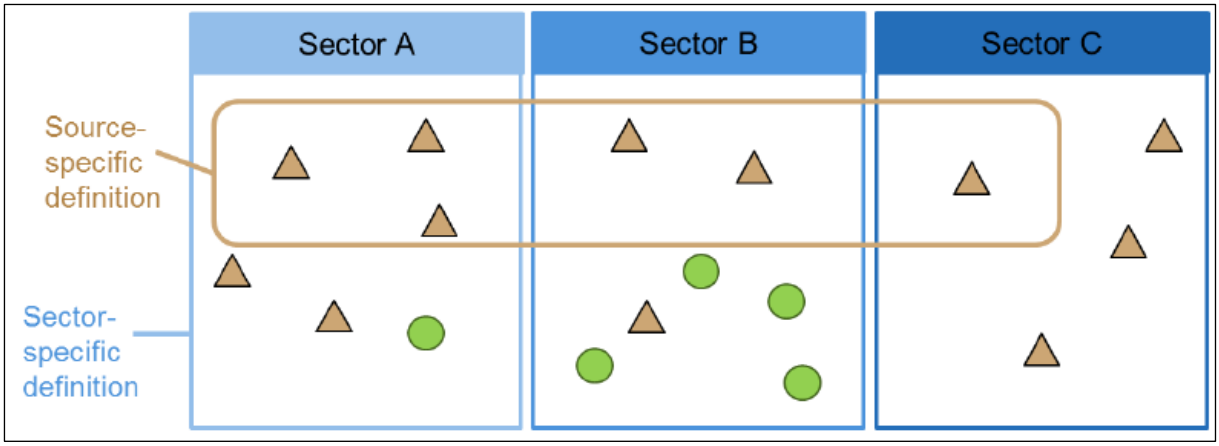
8.1.5.2 Sources and sinks

Apart from the sectoral approach, mitigation actions can also be framed around a specific set of sources and/or sinks. Sources and sinks are also the main guiding categories for the development of GHG inventories. However, in the context of mitigation actions, they can reflect a specific target group within or across sectors.

Sources and sinks are the elements of sectors responsible for emitting or uptake of greenhouse gases. They are defined as:

- Sources: Any process or activity that releases a greenhouse gas, an aerosol, or a precursor of a greenhouse gas into the atmosphere, for example a power plant or a landfill.
- Sinks: A reservoir that absorbs a pollutant from another part of its cycle. Soil and trees tend to act as natural sinks for carbon.

Mitigation actions can target individual sources and sinks, for example fossil fuel combustion in specific power plants. They can also target aggregated categories of sources and sinks, like for example all fossil fuel combustion in all power plants connected to an electric grid.



Mitigation actions that target specific types of sources can also cross different sectors, depending on the sector definitions. If for example buildings in general are targeted as a source, they could be covered by the residential, commercial and industry sector.

8.1.5.3 Geographic coverage

Normally it is the case that the larger the geographic coverage the larger the share of national emissions that is potentially covered by the mitigation action. There may be exceptions to this rule, where specific sources or sinks, for example industrial installations or forest areas, are strongly clustered in selected regions. In such cases, concentrating on specific regions may cover most of the relevant sectoral emissions and be an efficient way to achieve expected results. An example of this is from Brazil, where the mitigation actions regarding deforestation concentrate on the two provinces where the majority of deforestation occurs.

Implementation of mitigation actions may in some cases be easier at a smaller geographic scale. This can for example be the case with transport related measures or related to the conservation of forests. Other cases will require action at a national level to be effective. In many cases the policy framework at the national level needs to supports more local actions.

Irrespective of the rationale for selecting the appropriate geographic boundary for a mitigation action, the reporting should clearly define in which geographic area the mitigation measure is applied or planned to be applied, for example:

a) At the national level;

b) At a regional level;

c) Within one or more communities;

d) For one or more cities.

8.1.5.4 Gases

The GHG data reported by non-Annex I Parties contains estimates for direct greenhouse gases, such as (FCCC/CP/2002/7/Add.2):

- Carbon dioxide (CO2);
- Methane (CH4);
- Nitrous oxide (N2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs);

- Sulphur hexafluoride (SF6).

They could also cover nitrogen trifluoride (NF3) and the indirect greenhouse gases such as sulphur dioxide (SO2), nitrogen oxides (NOx), carbon monoxide (CO) and non-methane volatile organic compounds.

It is important to be clear which of these gases are targeted by the mitigation measure and if other gases are expected to be impacted by the mitigation action. Given the large differences in global warming potential (GWP) of different gases, the impacts of other gases can easily outweigh CO2 effects.

8.1.6 Baseline scenario and policy scenario

Estimating the change in GHG emissions resulting from a given policy or action requires a reference case, or baseline scenario, against which the change is estimated.

The baseline scenario represents the events or conditions most likely to occur in the absence of the policy or action being assessed. The baseline scenario is not a historical reference point but is instead an assumption about conditions that would exist over the policy implementation period if the policy or action assessed were not implemented. The baseline scenario depends on assumptions related to other policies or actions that are also implemented, as well as various external drivers and market forces that affect emissions, such as changes in economic activity, population, energy prices, weather, autonomous technological improvements, and structural shifts in the economy.

Total net change in GHG emissions resulting from the policy or action (t CO_2e) =
Total net policy scenario emissions (t CO_2e) – Total net baseline scenario emissions (t CO_2e)

Note: "Net" refers to the aggregation of emissions and removals. "Total" refers to the aggregation of emissions and removals across all sources and sinks included in the GHG assessment boundary.

In contrast to the baseline scenario, the policy scenario represents the events or conditions most likely to occur in the presence of the policy or action being assessed. The policy scenario is the same as the baseline scenario except that it includes the policy or action (or package of policies/ actions) being assessed. The difference between the policy scenario and the baseline scenario represents the effect of the policy or action.

8.1.7 Ex-ante and ex-post assessment

A GHG assessment is classified as either ex-ante or ex-post depending on whether it is prospective (forward-looking) or retrospective (backward-looking).

Ex-ante assessment can be carried out before or during policy implementation, while ex-post assessment can be carried out either during or after policy implementation.

Countries may carry out an ex-ante assessment, an ex-post assessment, or both, depending on objectives. In general, effective GHG management involves both ex-ante and ex-post assessment.

	Before implementation: Ex-ante assessment	After implementation: Ex-post assessment
Objective	Estimate expected future GHG emission reductions.	Estimate achieved GHG emission reductions.
Method:	Estimate and compare ex-ante baseline with ex-ante policy scenario.	Estimate ex-post baseline scenario and compare with observed emissions (ex-post policy scenario).
Benefits	• Choose among mitigation options based on their expected GHG effects. • Improve the design of measures by understanding the GHG effects of different design choices. • Understand potential GHG reductions from options to inform GHG reduction goals. • Report on expected future GHG effects of measures being considered or implemented (for domestic or international purposes). • Attract and facilitate financial support for mitigation actions.	• Understand whether measures are effective in delivering the intended results. • Inform and improve implementation. • Decide whether to continue current activities or implement additional measures. • Learn from experience and share best practices. • Evaluate the contribution of measures toward the NDC. • Ensure that policies and actions are cost effective and that limited resources are invested efficiently. • Report on the GHG effects of measures over time. • Meet funder requirements to report GHG reductions from mitigation actions.

Figure below illustrates the relationship between ex-ante and ex-post assessment. In the figure, a policy comes into effect in 2010. A country carries out an ex-ante assessment in 2010 to estimate the expected future GHG effects of the policy through 2020 by defining an ex-ante baseline scenario and an ex-ante policy scenario. The difference between the ex-ante policy scenario and the ex-ante baseline scenario is the estimated GHG effect of the policy (ex-ante).

In 2015, the country carries out an ex-post assessment of the same policy to estimate the historical GHG effects of the policy to date, by observing actual emissions over the policy implementation period—that is, the ex-post policy scenario—and defining a revised ex-post baseline scenario. The difference between the ex-post policy scenario and the ex-post baseline scenario is the estimated GHG effect of the policy (ex-post). If conditions unrelated to the policy or action unexpectedly change between 2010 and 2015, the ex-post baseline scenario will differ from the ex-ante baseline scenario. For example, the ex-post and ex-ante baseline scenarios will differ if observed fuel prices or rates of economic growth differ from ex-ante forecasts made in 2010, or if significant new policies are introduced. The ex-post policy scenario may differ from the ex-ante policy scenario for the same reasons, or if the policy is less effective in practice than it was assumed to be. In such cases, the ex-ante and ex-post estimates of the policy's GHG effect will differ.

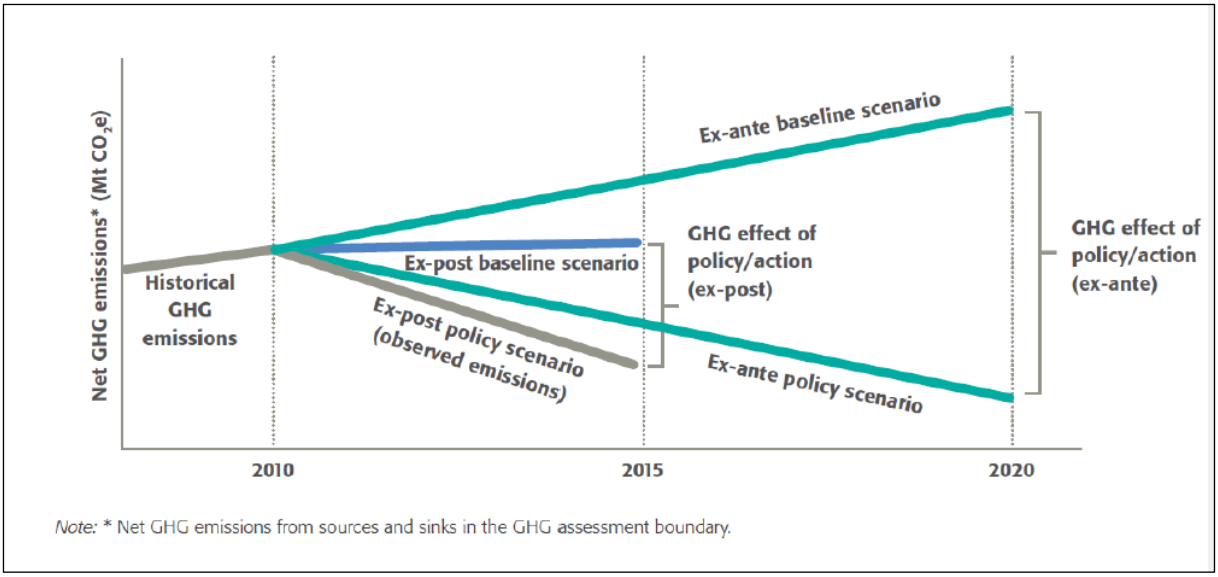


Figure 50. Ex-ante and ex-post assessment (Source: [19])

In a nutshell

- In an ex-ante assessment, the baseline scenario and policy scenario are both hypothetical or forecasted, rather than observed.
- In an ex-post assessment, only the baseline scenario is hypothetical, since the ex-post policy scenario can be observed.

8.1.8 Timeframe for ex-ante mitigation assessment

The timeframe for an assessment refers to the period over which emissions are projected. The start year can depend on:

- Availability of data
- Objective of the assessment
- Starting point of implemented or planned mitigation activities

The end year can depend on:

- The time frame set for a goal
- The time frame set for mitigation actions
- Political cycles
- Internationally relevant points in time
- Availability of reliable data projections for key assumptions
- Rate of technological change and lifetime of capital stock
- Estimated time frame of effects

The base year is normally the last available historic data year for ex ante assessments.

The policy cut-off date can differ from this. It represents the date up to which implemented policies are reflected in the baseline.

➔ This is mostly relevant for sectoral or national assessments.
➔ For individual measures, the relevant date is when the measure is implemented.

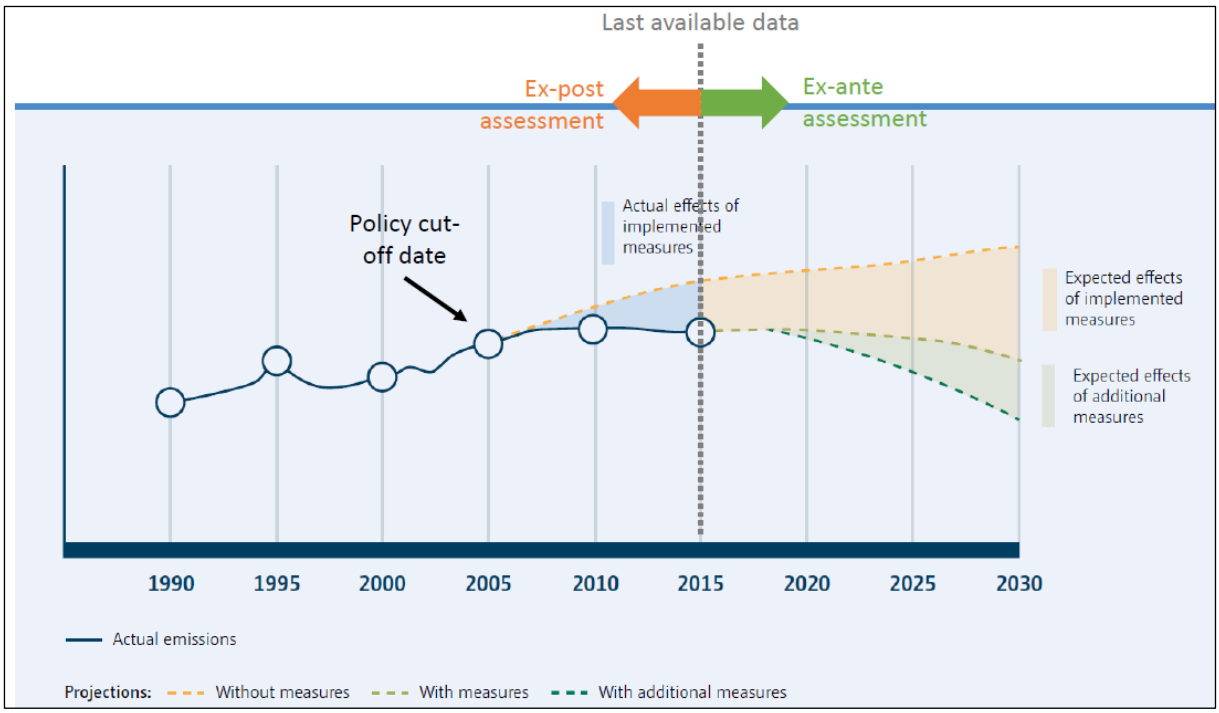


Figure 51. Ex-ante and ex-post assessment (Source: [4])

8.1.9 Timeline of mitigation actions

To understand the effects of mitigation actions, it is important to understand what the status of the mitigation action is within the mitigation implementation cycle. This will provide an indication of how long it will take until effects can be expected, or how long effects can have been effective. There can be a substantial time lag between different steps of the process to implement mitigation actions. Additionally effects can take some time after implementation to take off. The figure below illustrates the different timing of elements of mitigation actions.

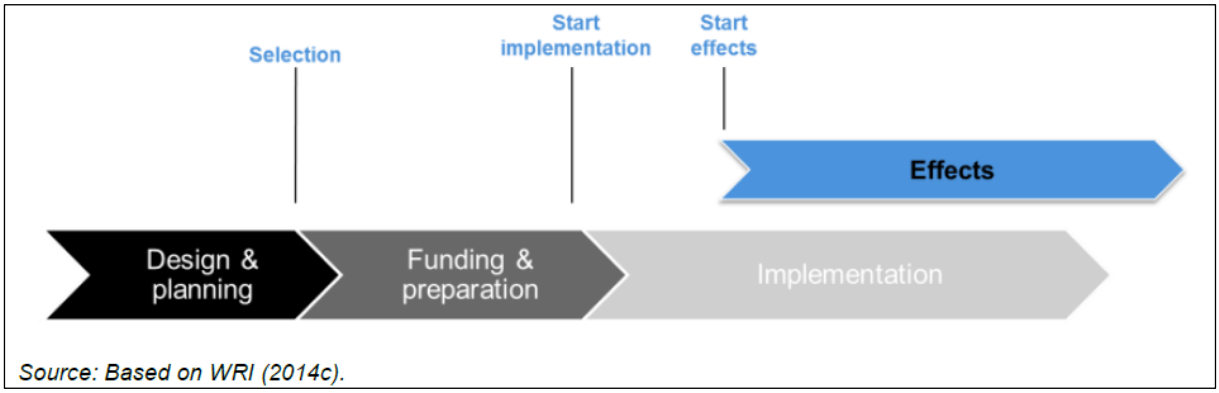


Figure 52. Timeline of a mitigation action (Source: [11])

It is important to keep in mind that:

- **Design and planning processes can take a substantial amount of time**, especially for larger scale actions and policies and where there are intensive stakeholder engagement processes deployed. Ideally this process is completed when the mitigation actions are

reported, but this may not always be the case, especially if the mitigation actions are formulated as goals.

- **Securing funding and preparing for the actual implementation can also take a long time**. This is especially the case for policy-based mitigation actions where the national legislative process and the political situation will strongly influence the time it takes to adopt and enact new legislation or to implement new institutions.
- **It is important to be clear on the duration of the implementation phase**. While projects normally can be clearly defined with a start and end date, this is less easy for policy-based or goal-type mitigation actions. Some policy instruments are, at least at the time of implementation, not intended to end at a certain point, like for example regulations or taxes, which remain in place until the government revises or revokes the legislation. Others are time-bound, which is usually the case for incentive schemes that have an impact on public budgets.
- **Effects often do not start directly after implementation has started.** Depending on the type of action, different factors need to be considered: for investment projects, the time required for procurement, building and installation can take anything from a few months to a number of years for large-scale installations. Policies need to filter down to all relevant levels of administration and often show slow pick-up rates at the start with increasing impact over time, depending on the policy instrument.
- **How long effects will be sustained depends strongly on the type of action**. For all actions that aim to impact infrastructure, the long time horizons for different types of infrastructure need to be considered.

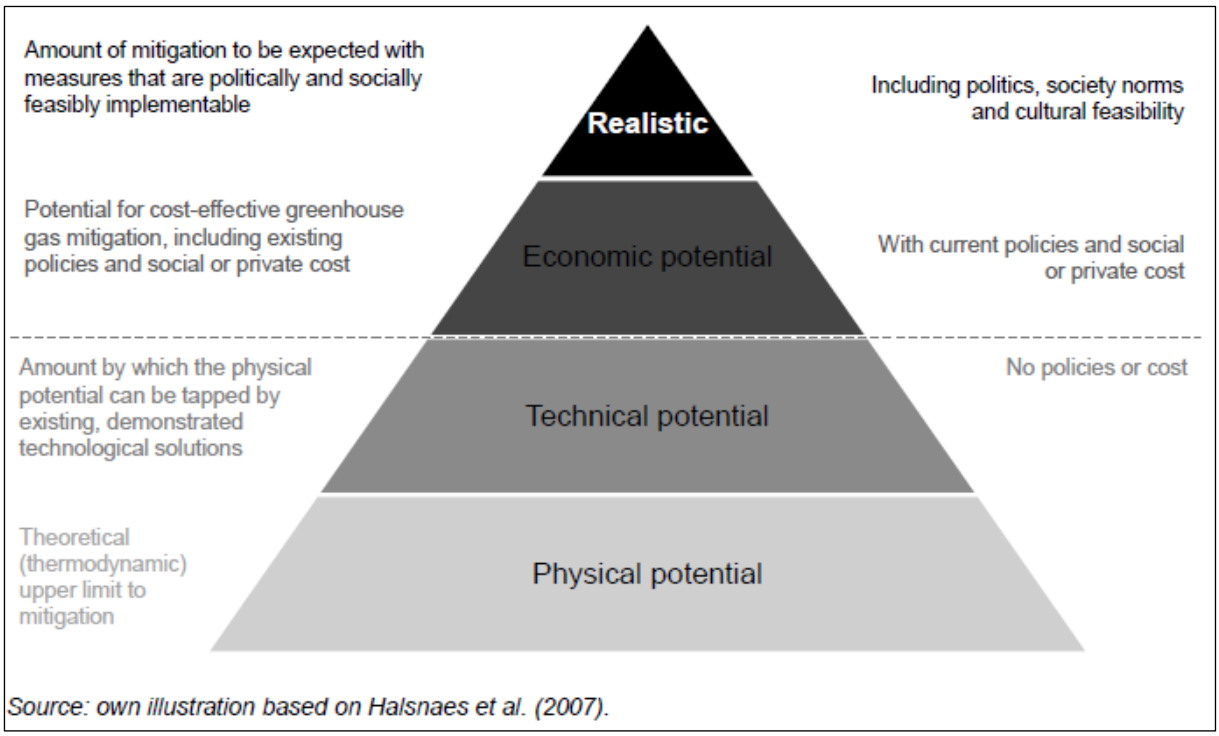
8.1.10 Mitigation potential

Mitigation potential is an important element in the design phase of activities to screen sectors and measures for their suitability. It is usually determined on a sectoral or sub-sectoral level and in many cases represents technical or economic potential.

Understanding the methodologies and assumptions used to determine potential at an early stage is important, as it often influences the assessment of effects of mitigation actions. At the same time, underlying data for the potential analysis, as well as the assessment of effects, needs to be consistent.

The term ‘potential’ is used to report the quantity of GHG mitigation compared with a baseline or reference case that can be achieved by a mitigation option over a given period” (Halsnaes et al., 2007)

The term ‘potential’ can represent very different concepts, depending on which factors are taken into account in the analysis:



Source: own illustration based on Halsnaes et al. (2007).

Potential is usually expressed as megatonnes of carbon dioxide equivalent (Mt CO2e) of avoided emissions per given time frame (e.g. year, 5-year period, etc.).

- Understanding the reference case

Reductions are normally compared to baseline emissions or the 'reference case'. Reductions could, however, also be stated compared to a historic reference year, where emissions are already known. While this is less frequent, it is important to be clear what the basis is.

- Understanding the time frame

What is the relevant time frame for the analysis, i.e. from which year did/do emissions start to decline and what is the end year of the analysis?

- Understanding the numbers

Potential can be presented in different ways:

a) Cumulative mitigation potential over the assessment period → Mt CO2e (2015 – 2030);

b) Average annual savings over the assessment period → Mt CO2e/a or Mt CO2e/yr;

c) Annual savings for a given year (usually the end year) → Mt CO2e/a (2030);

d) Net present values of reductions (discounted future savings) → Mt CO2e/a (2014);

- Understanding how emission reductions are expected to develop over time

Expected potentials may not be realized at a constant rate over time, but may be increasing, or declining over time. Understanding these effects is important to evaluate which numbers are most relevant for decision-making.

It is important to have clarity on these different aspects. Especially if assessments from different sources are used, it often happens that numbers are compared or even added up that are not really

comparable. It is essential to obtain sufficient information on all of these elements with each assessment, to enable informed decision-making.

- Understanding economic potential

The economic potential can differ significantly, depending on which type of mitigation cost is assessed. The differences between social cost and market cost are illustrated in the table below. Each of the analysis types has its value. Together they provide a comprehensive picture. Both analyses arrive at a mitigation potential for particular levels of carbon prices in US$/t CO2e.

Table 10 : Differences between social cost and market cost (Source: [11])

Social cost	Market cost
Macroeconomic	**Microeconomic**
• Unit cost to society • Including externalities, i.e. non-market social costs and benefits • Social discount rates	• Unit cost to private actors • Current market price and projected market price development • Excluding non-market cost and benefits • Private discount rates
Assessment from a **government** perspective	Assessment from an **investor** perspective

Source: Based on Halsnaes et al. (2007).

8.1.11 Methods and tools to assess mitigation potential

A variety of equations, algorithms and models may be used to estimate emissions and mitigation potential, including (WRI, 2014c):

- Top-down methods (e.g. econometric models, regression analysis, computable general equilibrium models);
- Bottom-up methods (e.g. engineering models, marginal abatement cost (MAC) curves);
- Simple equations (e.g. simple extrapolation);
- Complex models (e.g. simulation models, integrated assessment models);
- A combination of methods.

It is important to note that mitigation potential in this context is not necessarily the same as envisaged mitigation effects of a specific mitigation action. The mitigation potential derived at this stage often represents the full available technical or economic potential. The final design of selected mitigation actions may not tap this fully.

Modelling approaches can be very different. These differences can have important implications for the variation among scenarios. Understanding these differences is therefore important to correctly understand and interpret results of such models. Differences identified by the Intergovernmental Panel on Climate Change (IPCC) for top-down models also apply to most other approaches and include:

- Scope: Full-economy models vs. partial-economy models (often sectoral);
- Foresight: Perfect-foresight models vs. recursive-dynamic models;
- Trade: Homogeneous goods (global uniform price) vs. preference for domestic products vs. no trade;
- Flexibility: Degree to which models can change course, e.g. regarding capital allocation across sectors, resource availability, substitution across technologies, etc.;

- Detail: Sectoral, regional, technological and GHG gases covered;
- Technological change: Exogenous technological change vs. endogenous (induced) technological change;
- Actor behaviour: rational or preferential.

8.1.11.1 Top-down methods

Top-down methods use economics as the basis for decision-making and typically assume fully functioning markets and competitive market behaviour. Top-down models generally rely on aggregated data and various types of macroeconomic and/or econometric modelling methods. Consumption trends are forecast into the future using historical trends or aggregate econometric relationships (gross domestic product (GDP), fuel prices, price elasticity, etc.). Most top-down models are global in scope or specific to a particular country. Important input assumptions for top-down methods include population growth, economic growth, resources, and technological change (Clarke et al., 2014; UNFCCC, 2013c).

There are different types of top-down models:

- **Computational general equilibrium models** use economic data to estimate how an economy will respond to changes in policies, technologies and prices;
- **Input/output models** focus on interdependencies between different sectors of an economy;
- **Other macroeconomic models**.

The advantages of top-down models are that they provide insights into non-GHG effects at the macroeconomic level and capture macroeconomic feedback effects.

The disadvantages include the fact that few are easily adaptable for use by developing countries. They rely heavily on having good historical time series data, which is often not readily available in developing countries. They also assume a stable macroeconomic evolution as relationships are based on historic observations and trends. For long-term assessments, they may not be well suited, since the exogenous variables (e.g. prices) are themselves poorly known in the long run. Their highly abstract structure does not capture technology trends in detail. This does not allow the examination of technology-specific issues, like for example the choice of appropriate technologies and subsequent mitigation actions.

8.1.11.2 Bottom-up methods

Bottom-up methods provide a more fundamental understanding of how systems behave and may evolve into the future, so are well suited for examining potential long-term transitions. At a general level bottom-up models can be distinguished by their sectoral scope:

- **Integrated models:** Cover an entire country and thus allow for modelling of interactions between sectors. This comes at the expense of detail within sectors;
- **Sector-specific models:** Provide informed inputs into integrated models and can be used on their own to evaluate high-emitting and key sectors with a higher level of detail.

Different types of models based on the methodologies used are:

- **Optimization models:** Use mathematical programming to identify configurations of energy systems that minimize the total cost of providing services.
- **Accounting frameworks:** Account for physical stocks and flows in systems based primarily on engineering relationships and explicit assumptions about the future (e.g. technology improvements, market penetration rates).
- **Technology screening:** Focuses on how a particular technology (or set of technologies) will perform under certain constraints and can track associated costs and emissions. MAC curves

represent a specific type of technology screening method (see Error! Reference source not found.).

The advantages of bottom-up models are that complexities of individual sectors are better captured and individual technologies are better represented through the high level of technological detail.
The disadvantages include the lack of macroeconomic feedback effects. There is no reflection of indirect rebound effects and limited representation of cost-independent market distortions. While bottom-up models, unlike top-down methods, are able to provide technology-specific evaluation, they can also not provide measure-specific evaluation of individual mitigation actions.
The figure below provides a summary of strengths and weaknesses of bottom-up, top-down and hybrid approaches.

	Bottom-up		Top-down		Hybrid
	Accounting	Optimisation	Simple extrapolation	Computable general equilibrium	
Strengths	Ease-of-use and potentially small data needs	Technological detail and least-cost projections	Ease-of-use and potentially small data needs	Feed-back effects on macroeconomic variables	Technological detail and consist-ency with economic projections
Weaknesses	Linkages with broader macroeco-nomic developments missing		Lack of technological detail		Can be very resource-intensive
Examples[12]	LEAP[13], MEDEE and MAED	MARKAL/ TIMES, POLES, RESGEN and EFOM	Spreadsheet models	ENV-Linkages (OECD), SGM and CETA	WEM (IEA), NEMS, MARKAL-MACRO and IPAC

Source: DEA, OECD & URC (2013).

Figure 53. Summary of strengths and weaknesses of different types of models (Source: [11])

8.1.11.3 Simple equations

Simple equation-based calculations can easily be implemented in standard software, such as Microsoft Excel. They cover basic relationships between activity data, fuel use and emissions.

The advantages are that they are easy to use, also in developing countries, and provide highly transparent calculations.

The disadvantages include the limited coverage of interactions between sectors and the limited possibilities to represent dynamic development over time.

8.1.11.4 Complex models

The equations which form the basis of complex systems are generally derived from statistical physics, information theory and non-linear dynamics. They represent organized but unpredictable behaviours of systems that are considered fundamentally complex. Examples include:

- Integrated assessment models: Tend to be based on physical or technological descriptions of systems and their interconnections. They combine natural earth systems (physical climate science) with human systems (economy, infrastructure, security, etc.).

- Simulation models: Simulate behaviour of consumers and producers under various signals (e.g. price, income levels) and constraints (e.g. limits on rate of stock replacement).

The advantages and disadvantages for top-down methods apply also to complex models.Data types

The quality of the monitoring depends on the quality of the data used to develop it, as well as on the methodologies applied to process it. The relevant data to be collected depends on the objective to be monitored and on the methods chosen for assessment ex-post, and if applicable ex-ante. We differentiate the different types of data based on the level where it is collected:

- **Bottom-up data** is measured, monitored, or collected (e.g. using a measuring device such as a fuel meter) at the source, facility, entity or project level. Examples include energy used at a facility (by fuel type) and output of production;
- **Top-down data** are macro-level statistics collected at the jurisdiction or sector level. Examples include national energy use, population, GDP and fuel prices. In some cases, top-down data are aggregated from bottom-up data sources.

Data can also be differentiated by whether it is measured, modelled, calculated or estimated. **Measured data** refers to direct measurement, such as directly measuring emissions from a smokestack. **Modelled data** refers to data derived from quantitative models, such as models representing emissions processes from landfills or livestock. **Calculated data** refers more specifically to data calculated by multiplying activity data by an emission factor, such as multiplying natural gas consumption data by a natural gas emission factor. **Estimated data** (in the context of monitoring) refers to proxy data or other data sources used in the absence of more accurate or representative data sources (WRI, 2014c).

Additionally, data is divided by level of detail. **Primary data** is collected from specific sources or sinks, for example installations affected by the mitigation measure, and usually collected for the specific purpose of the analysis. **Secondary data** is not source or sink specific and is normally available in aggregated form, for example from public databases, government statistics or sectoral associations. Secondary data was often collected for other purposes.

8.2 Tracking progress in implementation of mitigation actions, policies and measures

Monitoring performance during the policy implementation period serves two related functions:

1. Monitoring implementation progress: Monitor trends in key performance indicators to understand whether the policy or action is on track and being implemented as planned
2. Estimating GHG effects: Collect the data needed for ex-post assessment of GHG effects and assess to what extent the policies and measures is on track regarding expected emissions reductions.

This is implemented by:

- Reporting a time series of the relevant key performance indicator related to non-GHG targets of mitigation policies and measures and comparing it to the target level and/or the reference level.
- Ex-ante assessment of GHG impact of mitigation policies and measures and reporting of expected emissions reductions

- Ex-post assessment of GHG impact of mitigation policies and measures and reporting of achieved emissions reductions
- Comparing achieved emissions reductions with expected ones

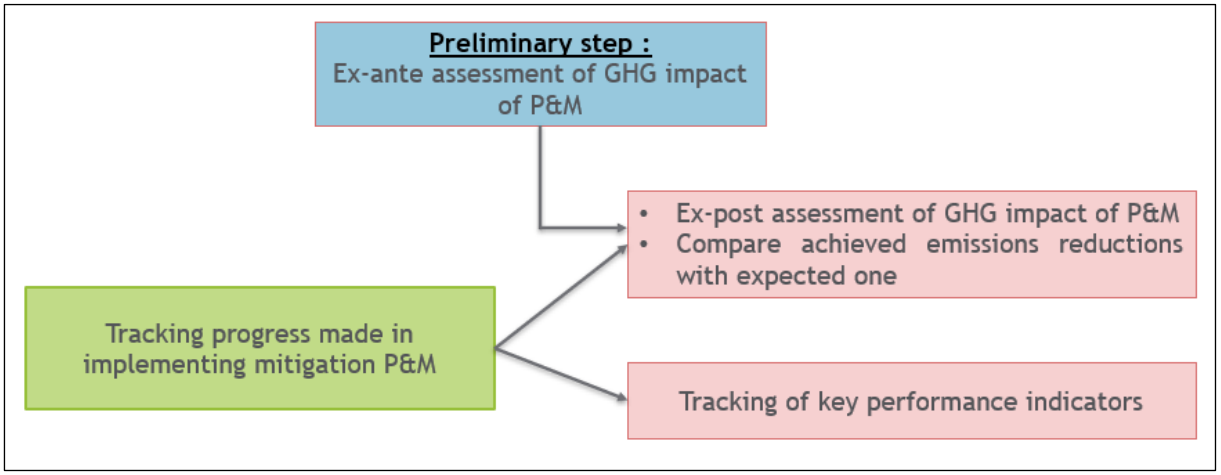


Figure 54. Forms of tracking progress in implementing mitigation policies and measures [source: Citepa]

Key performance indicators are metrics that indicate the performance of a policy or action, such as tracking changes in targeted outcomes. *Parameter* is a broader term meaning any type of data (such as activity data or emission factors) needed to estimate emissions.

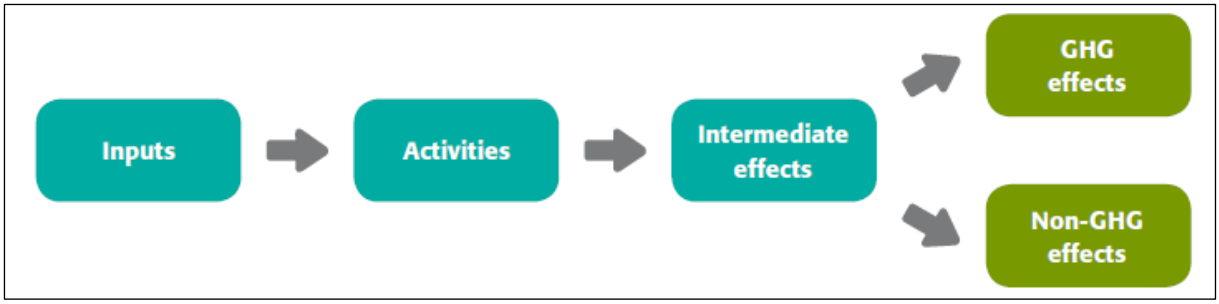
Monitoring key performance indicators is generally less onerous than estimating GHG effects and can provide a low-cost way of understanding policy effectiveness by tracking trends in key indicators. If progress is not on track, monitoring can inform corrective action. However, monitoring indicators is not sufficient to estimate the effect of a policy. To estimate GHG effects ex-post, countries need to collect data on a broader range of parameters, which should be monitored during the policy implementation period.

Where possible, it is recommended that countries develop the monitoring plan during the policy design phase (before implementation), rather than after the policy has been designed and implemented. Doing so ensures that the data needed to assess the effectiveness of the policy are collected.

The monitoring plan should be informed by the ex-post estimation method that will be used in order to ensure that the proper data are collected.

8.2.1 Defining and monitoring key performance indicators

Countries should define key performance indicators to track performance of the policy or action over time. Where relevant, countries should define key performance indicators in terms of the relevant inputs, activities, and intermediate effects associated with the policy or action.



Inputs and activities are most relevant for monitoring policy or action implementation, while intermediate effects and non-GHG effects are most relevant for monitoring policy or action effects. Indicators can be either absolute (such as the number of homes insulated) or intensity-based (such as g CO2e/km). Countries may also define indicators to track non-GHG effects. Table below provides definitions and examples of each type of indicator.

Table 11 : Types of key performance indicators for monitoring performance (Source: [19])

Indicator types	Definitions	Examples for a home insulation subsidy program
Inputs	Resources that go into implementing a policy or action, such as financing	Money spent to implement the subsidy program
Activities	Administrative activities involved in implementing the policy or action (undertaken by the authority or entity that implements the policy or action), such as permitting, licensing, procurement, or compliance and enforcement	Number of energy audits carried out, total subsidies provided
Intermediate effects	Changes in behavior, technology, processes, or practices that result from the policy or action	Amount of insulation purchased and installed by consumers, fraction of homes that have insulation, amount of natural gas and electricity consumed in homes
GHG effects	Changes in greenhouse gas emissions by sources or removals by sinks that result from the intermediate effects of the policy or action	Reduced CO_2, CH_4, and N_2O emissions from reduced natural gas and electricity use
Non-GHG effects	Changes in relevant environmental, social, or economic conditions other than GHG emissions or climate change mitigation that result from the policy or action (see Appendix C for examples)	Household disposable income from energy savings

The selection of the indicators should be tailored to the policy or action in question, based on the type of policy or action, the requirements of stakeholders, the availability of existing data, and the cost of collecting new data.

Table below provides examples of activity indicators

Table 12 : Examples of activity indicators for various policies (Source: [19])

Examples of policies	Examples of activity indicators
Renewable portfolio standard	Quantity of long-term contracts with renewable energy power generators established, number of renewable energy certificates (RECs) issued
Fuel economy standard	Number of emission certificates issued per year, number of vehicle manufacturers from which information on cars sold is collected by the government
Subsidy for home insulation	Amount of subsidies issued
Energy efficiency standards for appliances	Number of appliance standards and reporting templates published, number of appliance manufacturers from which information on sold appliances is collected
Government buildings retrofit program	Number of retrofit projects procured (for example, number of contractors selected for installation through open bidding process)

Table below provides examples of intermediate effect indicators.

Table 13 : Examples of intermediate effect indicators for various policies (Source: [19])

Examples of policies	Examples of intermediate effect indicators
Renewable portfolio standard	Total electricity generation by source (such as wind, solar, coal, natural gas)
Public transit policies	Passenger-kilometers traveled by mode (such as subway, bus, train, private car, taxi, bicycle)
Waste management regulation	Tonnes of waste sent to landfills, tonnes of waste sent to recycling facilities, tonnes of waste sent to incineration facilities
Landfill gas management incentive	Tonnes of methane captured and flared or used
Sustainable agriculture policies	Soil carbon content, tonnes of synthetic fertilizers applied, crop yields
Afforestation/reforestation policies	Area of forest replanted by type
Grants for replacing kerosene lamps with renewable lamps	Number of renewable lamps sold, market share of renewable lamps, volume of kerosene used for domestic lighting
Subsidy for building retrofits	Number of buildings retrofitted, energy use per building
Information campaign to encourage home energy conservation	Household energy use (sample of households or average use)

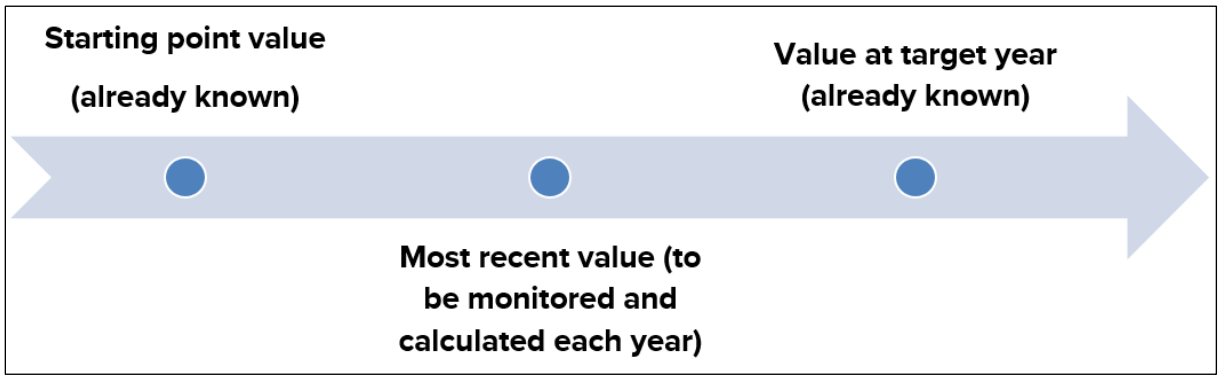
8.2.2 Overview of steps to track progress of intermediate effect target related to mitigation policies and measures

Tracking progress made in implementing a mitigation policy and measure using an indicator related to intermediate effects is based on:

1. Define a relevant indicator for each intermediate effect target of a mitigation policy and measure.
2. Providing the value of the indicator for:
    i. a reference point, level, baseline, base year or starting point.
    ii. The target year
3. Providing a full time series for each indicator from the base year until the most recent reporting year of the indicators
4. Compare the value of the indicators for the most recent year available with:

i. the reference level and note the relative (percentage) and absolute difference ;
ii. the target level and note the relative (percentage) and absolute (difference;

5. Assess, on the basis of (1) to (4) above, whether the Party is making progress or not making sufficient progress towards its mitigation policies and measures targets;



The figure below provides an example of tracking progress made in implementing a mitigation policy and measure using intermediate effect indicators.

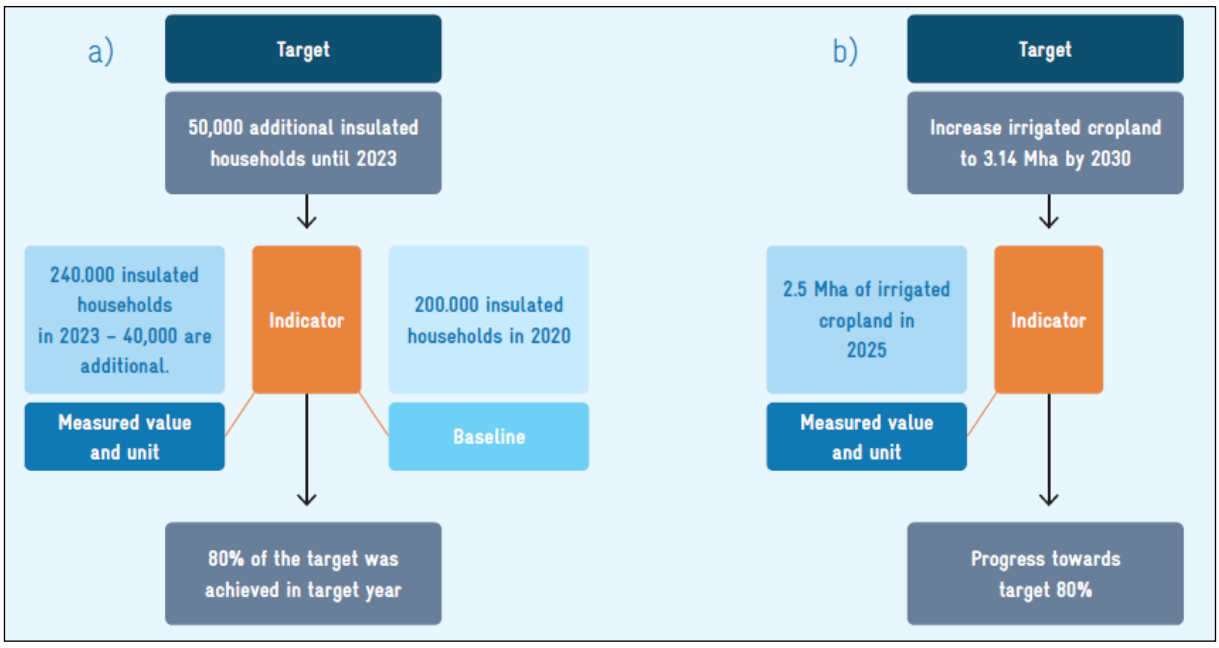


Figure 55. Examples of tracking progress made in implementing a mitigation policy and measure using intermediate effect indicators (Source: [14])

8.2.3 Defining and monitoring parameters needed for ex-post assessment

Countries shall define the parameters necessary to estimate ex-post policy scenario emissions and ex-post baseline scenario emissions.

Countries should first define the methods needed for ex-post assessment in order to identify the parameters that should be monitored. The selection of methods and identification of data sources is an iterative process, since the availability of data informs the selection of methods, and the selection

of methods defines the data that need to be collected. There may be overlap between parameters needed for ex-post assessment and intermediate effect indicators used for monitoring performance.

If relevant, countries should monitor the parameters in the ex-ante baseline estimation method, including data related to other policies and actions and non-policy drivers, to determine the extent to which the original assumptions in the baseline scenario remain valid or need to be recalculated. The parameters needed for ex-post assessment vary by type of policy or action and sector. The table below provides selected examples of parameters to be monitored by policy/action type

Table 14 : Examples of intermediate effect indicators for various policies (Source: [19])

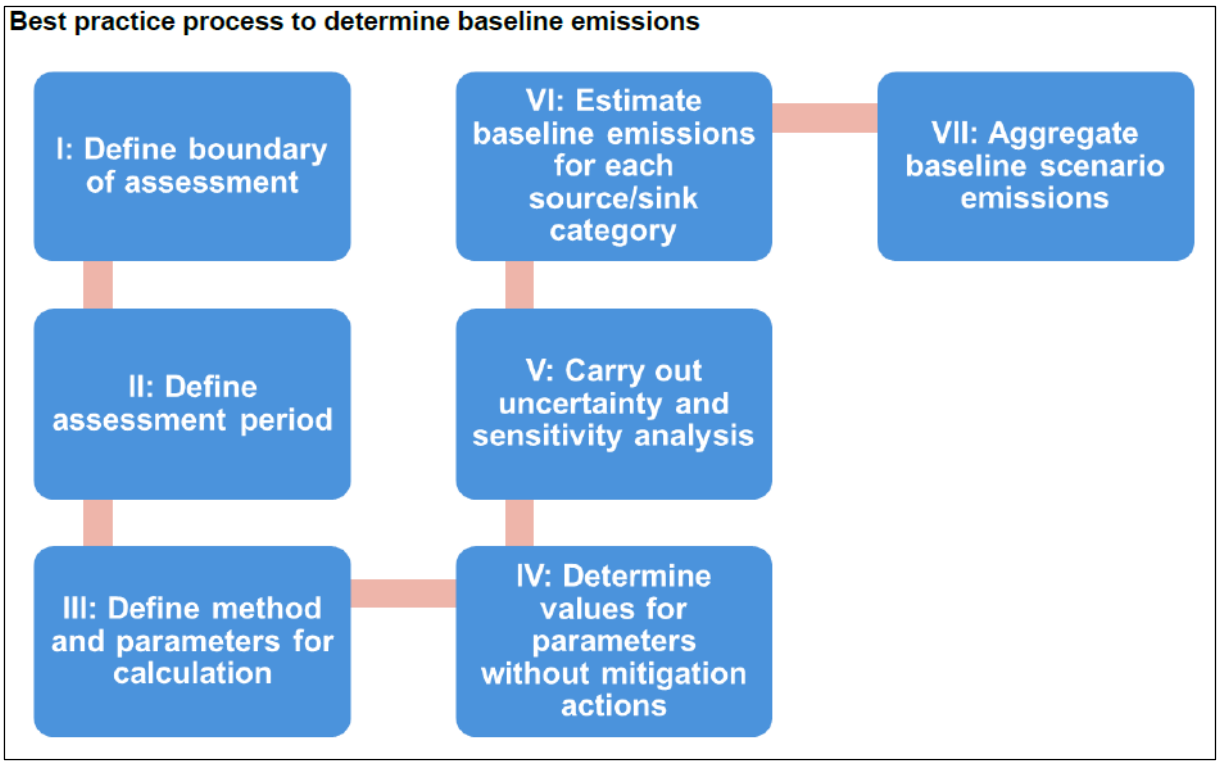
Examples of policies	Selected examples of parameters to be monitored
Energy efficiency program in the commercial buildings sector	• Electricity use (annual, direct metering) • Emission factor from grid electricity • Gross floor area of building units
Solar power incentives	• Solar panels produced each year • Capacity of solar power installed • Electricity generated from solar power
Electric vehicle subsidy	• Number of electric vehicles (quarterly) • Passenger figures (monthly) • Vehicle-kilometers traveled (monthly)
Emissions trading system	• Facility-level monitoring of emissions data from covered facilities
Information campaign to encourage energy savings in the residential sector	• Surveys of a representative sample of households to collect data such as: awareness of the campaign, actions taken as a result of the campaign, household size, household income, and household energy use over time

8.3 Assessment of the GHG impact of mitigation actions, policies and measures

8.3.1 Good practice methodology to determine baseline emissions

There are many valid ways to arrive at estimates for baseline emissions. A series of logical steps need to be carried out, many of which include choices on methods and assumptions.

Figure below illustrates a best practice process for determining baseline emissions. Steps may not necessarily be carried out in this exact order. Depending on the situation individual steps may be more or less important and may require different levels of detail. In principle, however, most standard tools and methods will follow these steps, although sometimes individual steps may not be made explicit. The steps can be applied to a wide variety of situations and types of mitigation measures. Robust analysis and transparent reporting is about making all elements and assumptions explicit.



It should be noted that in certain cases a simplified method can be used to calculate **greenhouse gas impacts** directly **without baseline**. This method, **deemed estimates method,** can be used for ex-ante and ex-post analysis. Caution needs to be exercised when using this approach, since it involves establishing implicit baseline and policy scenario assumptions (for ex-ante analysis), which are not normally made explicit and thus make understanding results difficult.

8.3.1.1 THE ASSESSMENT BOUNDARY (I)

Baselines can be developed for all types of actions, geographic scopes and sectoral coverage. For baselines with an economy-wide boundary, it needs to be specified whether land use, land-use change and forestry is included.

If a baseline is developed to formulate a goal for, or in general to assess effects of, mitigation actions, the boundary should be set in line with the mitigation action(s) as defined

8.3.1.2 THE ASSESSMENT PERIOD (II)

The timeframe for the baseline scenario refers to the period over which emissions are projected. The start year, often referred to as 'base year', can depend on:

- Availability of data;
- Objective of the assessment;
- Starting point of implemented or planned mitigation activities.

The end year can depend on:

- The time frame set for a goal;
- The time frame set for mitigation actions;
- Political cycles;
- Internationally relevant points in time;
- Availability of reliable data projections for key assumptions.

8.3.1.3 SELECTING THE METHOD (III)

The most 'appropriate' method depends on the available resources, modelling experience, country circumstances and key sectors. Most mitigation modelling has so far focused on bottom-up approaches due to the lack of off-the-shelf econometric models. Sophisticated models can be useful where expertise and data are relatively plentiful, otherwise, simpler, more user-friendly tools may be more suitable. Sector- specific tools can complement integrated models and provide a more detailed view on key sectors and technologies (UNFCCC, 2013c).

Examples for general algorithms for baseline scenarios include (WRI, 2014a):

Based on activity data:

$$Baseline\ emissions = Projected\ activity\ data \times Projected\ emission\ factor$$

Based on energy consumption data:

$$Baseline\ emissions = Projected\ energy\ consumption \times Projected\ energy\ efficiency^{*} \times Projected\ greenhouse\ gas\ intensity\ of\ energy\ generation\ +\ Projected\ non-energy\ emissions$$

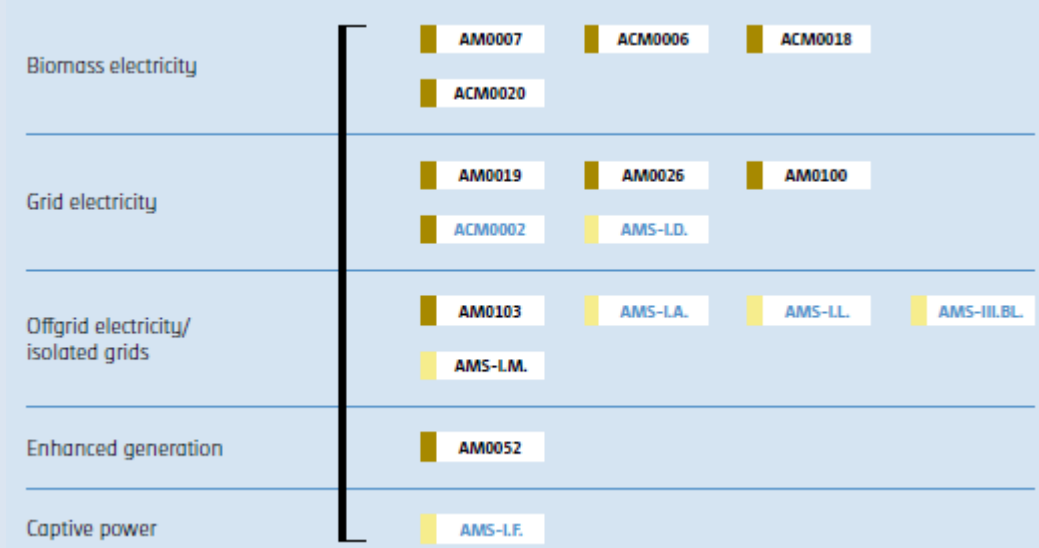
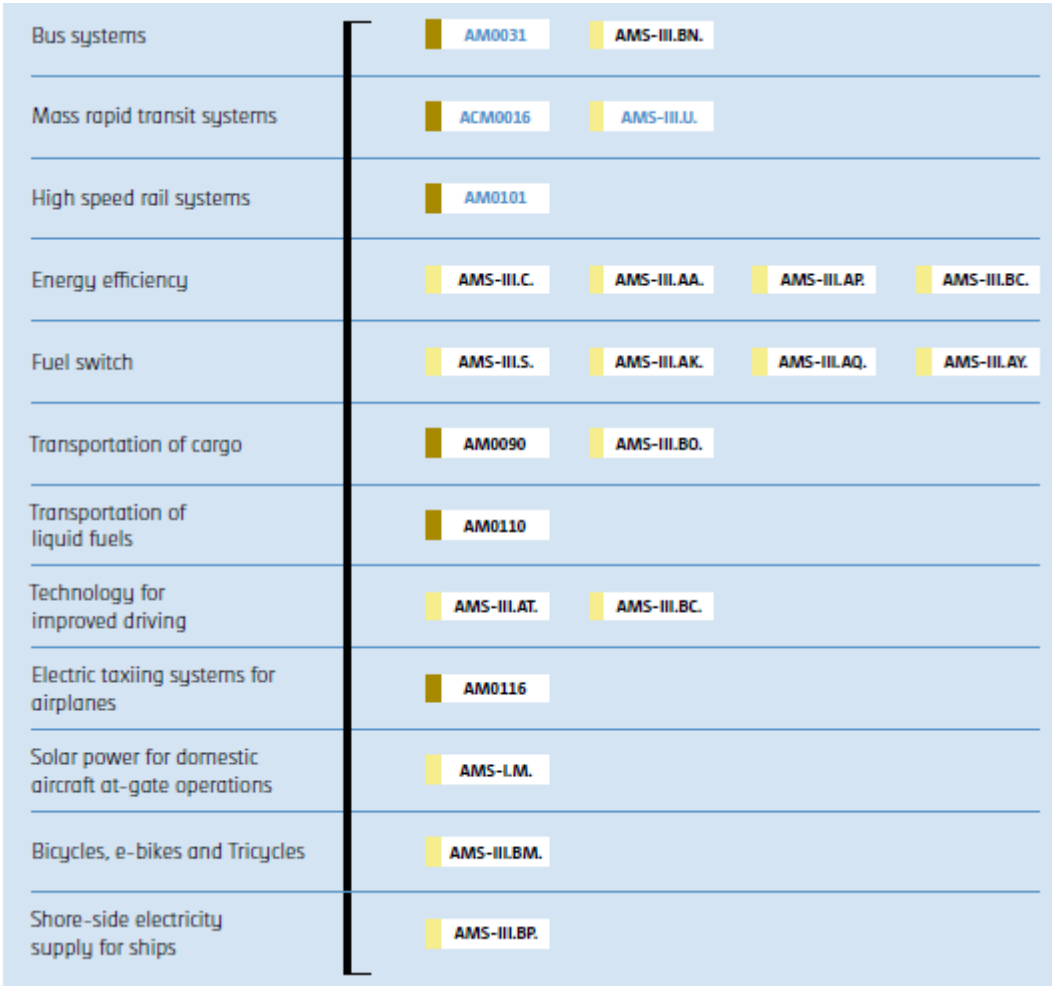
Based on the Kaya identity:

$$Baseline\ emissions = Projected\ population \times \frac{Projected\ GDP}{Projected\ population} \times \frac{Projected\ gross\ energy\ consumption}{Projected\ GDP} \times \frac{Projected\ emissions}{Projected\ gross\ energy\ consumption} + Projected\ non-energy\ emissions$$

These algorithms are not sufficient on their own to develop baseline scenarios but illustrate the underlying logic of how emissions projections may be created. Different methods may be required for different types of sources and/or sinks.

Depending on the type of mitigation action, established methodologies for the Clean Development Mechanism (CDM) can also provide useful tools. They provide methods for specific types of project activities, and in the absence of tailored sector- or economy-wide models can also provide useful information for larger-scale mitigation actions.

Methods will vary for individual source or sink categories. Even if integrated within sector- or economy-wide models, equations will be distinct for source and sink categories and will have their individual parameters. Some parameters will be input to a range of these methods, such as, for example, population.

Typical mitigation option	Applicable CDM methodologies
RENEWABLE ENERGY	
TRANSPORT	
LAND-USE CHANGE & FORESTRY	

8.3.1.4 DEFINING PARAMETERS FOR CALCULATION (III)

In the absence of secure knowledge about future developments, assumptions need to be made regarding the different elements impacting the model calculations:

- What are the relevant drivers within the assessment period?
- Which parameters in the calculation method are changing over time and how?

The number and level of detail of assumptions depend on the calculation method and model chosen. Assumptions represent expected developments over time. In certain cases, multiple options may seem equally likely. In such cases, reporting of a range of results based on multiple alternative baseline scenarios is good practice. Understanding assumptions for baseline development is essential in understanding baseline emission results in their national context.

Methods will vary between source and sink categories. The figure below illustrates how this relates to the definition of individual parameters.

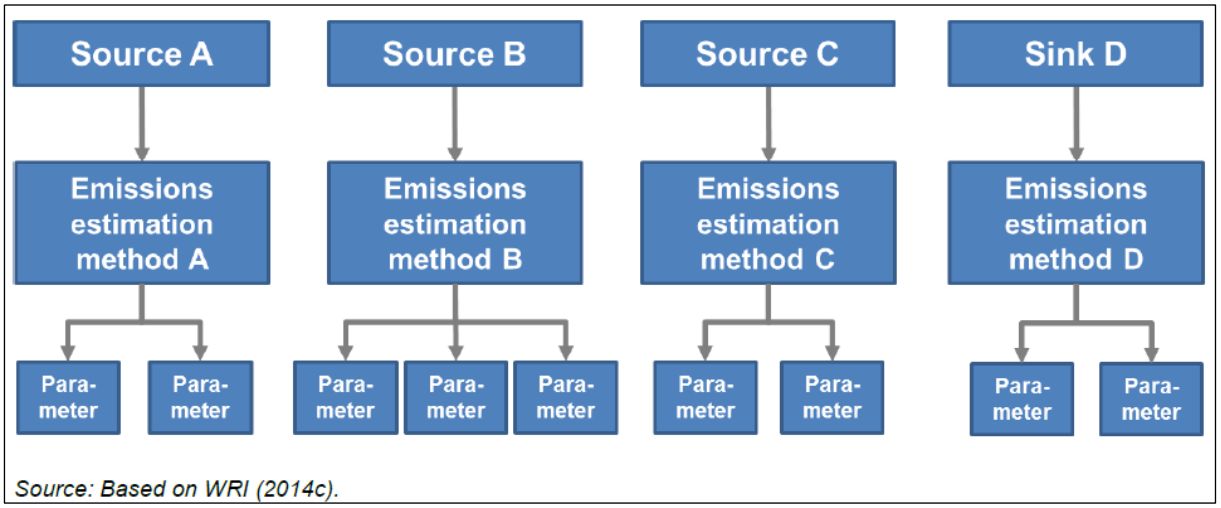


Figure 56. Relationship between sources/sinks, methods and parameters (Source: [11])

Drivers

Policies and socioeconomic or other conditions, so called drivers, affect the parameters, i.e. variables, in the calculation. We distinguish two types of drivers: policies and non-policy drivers (e.g. socioeconomic conditions).

For the baseline, all policy and non-policy drivers should be considered that are significant and to the extent that they are not related to the mitigation actions proposed.

In the baseline scenario, policies should be reflected that have a significant effect on GHG emissions (increasing or decreasing) from the sources or sinks included in the GHG assessment boundary; and are implemented or adopted at the time the assessment is carried out (for ex-ante assessment) or are implemented at the time the action is carried out (for ex-post assessment). The table below provides a definition for the potential status of a policy or action.

Table 15 : Status of policies or actions (Source: [11])

Policy or action status	Definition
Implemented[a]	Policies and actions that are currently in effect, as evidenced by one or more of the following: (a) relevant legislation or regulation is in force, (b) one or more voluntary agreements have been established, (c) financial resources have been allocated, (d) human resources have been mobilized.
Adopted	Policies and actions for which an official government decision has been made and there is a clear commitment to proceed with implementation, but that have not yet been implemented (e.g. a law has been passed, but regulations to implement the law have not yet been established).
Planned	Policy or action options that are under discussion and have a realistic chance of being adopted and implemented in the future, but that have not yet been adopted.

Source: FCCC/CP/1999/7.
[a] Policies that were stopped or withdrawn before the base year do not need to be considered, as they are reflected in historic developments. Policies that were stopped or withdrawn within the assessment period should be treated like implemented policies with a determined end date

A wide range of non-policy drivers influence calculations. These include socioeconomic factors as well as physical and technical elements. Examples of non-policy drivers include:

- Economic activity (e.g. GDP, household disposable income);
- Population;
- Energy prices (e.g. prices of natural gas, petroleum products, coal, biofuels, electricity) and other relevant prices (e.g. commodity prices);
- Costs (e.g. of various technologies);
- Weather (e.g. differences in energy use based on colder than average winters as expressed in heating degree days, or hotter than average summers as expressed in cooling degree days);
- Structural effects (e.g. structural changes in economic sectors, shifts from industry to service sector jobs, shifts of industrial production between countries);
- Changes in consumer preferences (e.g. preferences for types of vehicles, household size, commuting practices);
- Autonomous technological improvement over time (e.g. decarbonization of economic sectors, energy efficiency improvements, long-term trends in carbon- or energy-intensity of the economy), if applicable.

Parameters

The elements described above all impact on the individual variables of the chosen equations and models for calculating baseline emissions as illustrated in the figure below. Depending on the length of the assessment period, the value of parameters can change significantly over time, influenced by the various drivers.

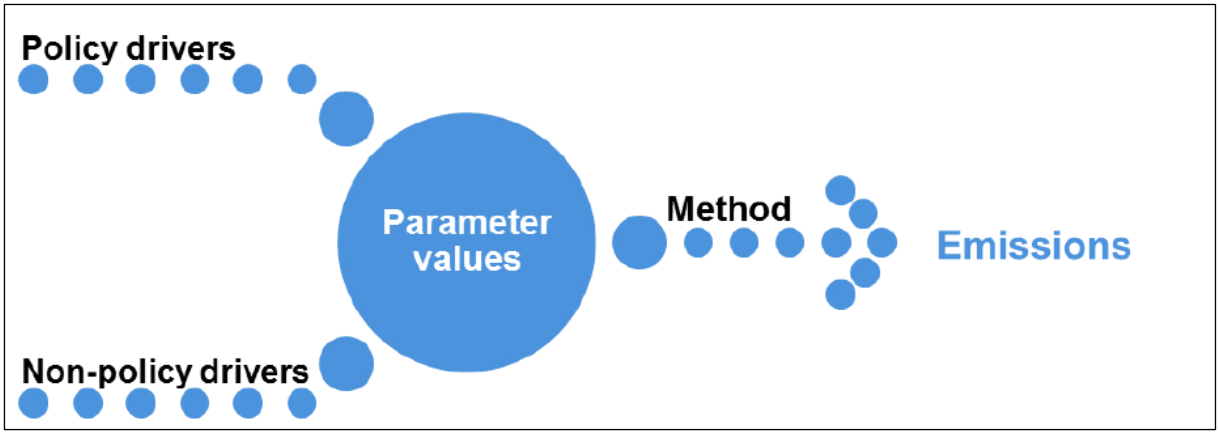


Figure 57. Relationship between drivers, parameters and methods (Source: [11])

Choices on technology development within the baseline can have a significant effect on the results. For instance, the special report on emissions scenarios concluded that technology is of similar importance for future GHG emissions as population and economic growth combined (IPCC, 2000). It is therefore essential to understand which type of baseline is represented. We distinguish two types of technology development in baselines (Halsnaes et al., 2007):

- **Frozen technology**: No technological change is assumed to occur over the assessment period;
- **Autonomous improvement**: Technological change is assumed to happen, based on different assumptions regarding availability, efficiency improvements and development of prices of different technologies.

8.3.1.5 DETERMINING PARAMETER VALUES WITHOUT MITIGATION ACTIONS (IV)

After it has been defined which parameters are needed, the actual values of the parameters over the assessment period need to be established. Determining the influence of drivers on the parameters used in the equations is the most challenging task of baseline development and requires a large number of assumptions on future developments. The magnitude and shape of the change over time can substantially influence results.

We categorize parameters as:

- **Static**: Parameters have constant values over the entire assessment period ;
- **Dynamic**: Parameter values change over the course of the assessment period.

Dynamic parameters can have different types of developments over time as illustrated in the figure below. Static parameters present a constant value over time, while dynamic parameters can increase or decrease with a constant factor over time or have a non-linear development.

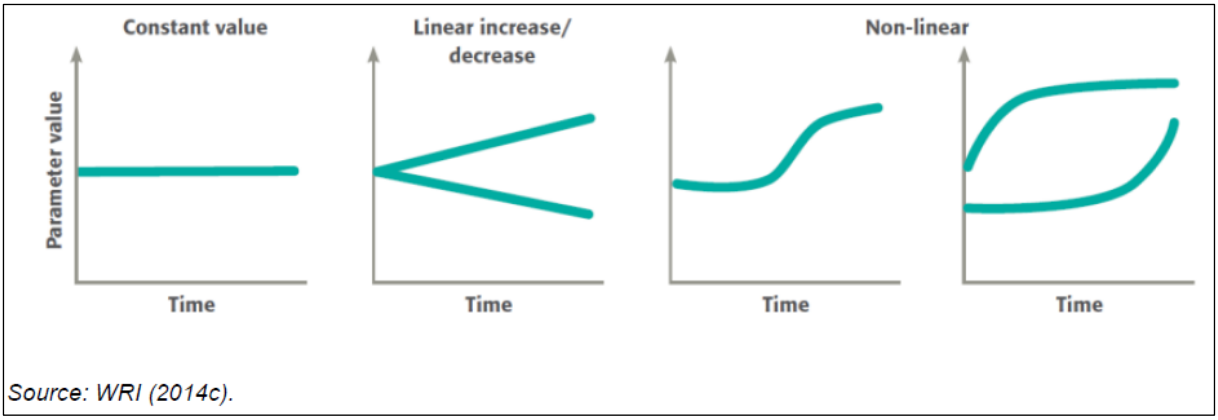


Figure 58. Parameter development over time (Source: [11])

The following examples further illustrate the practical implications of different forms of parameter development.

Constant values: Some parameters are usually assumed to remain constant because they represent the current understanding of physical processes, this includes:

- Emission factors for individual fuels;
- GWP values.

Another reason to choose constant values can be because no information is available on future developments and current values represent a best estimate.

Linear: Extrapolation of historic developments (trend) to the future often results in a linear increase or decrease of parameters. Examples, where this technique is often used include:

- Linear extrapolation of historic efficiency development in industry;
- Floor area (m2) of housing space per person.

Non-linear: Non-linear developments are usually captured by more complex models, but can also be found in simplified calculations. Typical non-linear effects include:

- Learning curves, with a slow effect at the beginning, then more rapid take-up and saturation after a certain period;
- Exponential growth functions;
- Developments based on bottom-up data, such as detailed electricity generation capacity planning.

Policy interaction

In many cases, an individual policy or action will overlap or interact with other policies and actions to produce total effects that differ from the sum of the individual effects of each individual policy. The best approach to assessing interacting policies – individually or as packages of policies – depends on the objectives of the analysis, the type and magnitude of interaction, as well as data availability and technical feasibility. A good way to report on such interaction is the policy interaction matrix. An example is provided in the table below.

Table 16 : Example of a policy interaction matrix for natural gas use in space heating (Source: [11])

	Insulation subsidy	Natural gas tax	Energy labelling	Energy efficiency standards
Insulation subsidy	**NA**			
Natural gas tax	- -	NA		
Energy labelling	++	-	NA	
Energy efficiency standards	- - -	-	- -	NA

Key: Independent: 0;
Overlapping: - - - major/- - moderate/ - minor interaction
Reinforcing: +++ major/++ moderate/+ minor interaction
Uncertain: U
Not applicable: NA
Source: WRI (2014c).

Levels of accuracy

Parties should select a desired level of accuracy based on the objectives of the assessment, the level of accuracy needed to meet stated objectives, data availability, and capacity and resources.

The table below provides an overview of the different elements related to methodology and the impact of choices on the level of accuracy of the results. For different choices, different levels of accuracy may be available. For example, the estimation method could be using simplified equations, while data could be used that is jurisdiction specific. Given this, there is no overall assessment of the level of accuracy possible in most cases. However, the level of accuracy for different methodology choices should be reflected in the uncertainty assessment.

Table 17 : Range of methodological options for estimating baseline emissions (Source: [11])

Level of accuracy	Emissions estimation method	Other policies included	Non-policy drivers included	Assumptions about drivers and parameters	Source of data for drivers and parameters
Lower ↓	Lower accuracy methods (e.g. Tier 1 methods in the IPCC Guidelines for National Greenhouse Gas Inventories)	Few significant policies	Few significant drivers	Most assumed to be static or linear extrapolations of historical trends	International default values
	Intermediate accuracy methods	Most significant policies	Most significant drivers	Combination	National average values
Higher	Higher accuracy methods (e.g. Tier 3 methods in the IPCC guidelines)	All significant policies	All significant drivers	Most assumed to be dynamic and estimated based on complex modelling or equations	Jurisdiction- or source-specific data

Source: WRI (2014c).
Abbreviation: IPCC = Intergovernmental Panel on Climate Change.

8.3.1.6 DEALING WITH UNCERTAINTY (V)

Uncertainty assessment refers to a systematic procedure to quantify and/or qualify the sources of uncertainty in a GHG assessment. Identifying and documenting sources of uncertainty can assist countries in improving assessment quality and increasing the level of confidence countries have in the results. There are different types of uncertainty (WRI, 2014c):

- **Parameter uncertainty**: Activity data, emission factors, GWPs;
- **Scenario uncertainty**: Methodological choices;
- **Model uncertainty**: Model limitations.

Parameter uncertainty describes the uncertainty regarding whether a parameter value used in the assessment accurately represents the actual activity. If parameter uncertainty can be determined, it typically takes the form of a probability distribution of possible values that include the chosen value used in the assessment. When evaluating the uncertainty of a result, parameter uncertainties can be propagated to provide a quantitative measure (also as a probability distribution) of uncertainty in the final assessment. There are two different forms of parameter uncertainty:

- **Single parameter** uncertainty refers to incomplete knowledge about the true value of a parameter. Single parameter uncertainty can arise with activity data and emission factors. Measurement errors, inaccurate approximation and how the data was modelled to fit the conditions of the activity influence parameter uncertainty;
- **Propagated parameter uncertainty** is the combined effect of each parameter's uncertainty on the total result. Methods are available to propagate parameter uncertainty from single data points. Two methods are random sampling (such as in Monte Carlo simulation) and analytical formulas (such as in the Taylor Series expansion method and other error propagation equations).

Scenario uncertainty refers to variation in calculated emissions due to methodological choices. Multiple methodological choices create scenario uncertainty. The use of standards results in a reduction in scenario uncertainty by constraining choices the country may make in their methodology. To identify the influence of these choices on the results, countries should undertake a sensitivity analysis.

Model uncertainty arises from limitations in the ability of the modelling approaches to reflect the real world. Simplifying the real world into a numeric model always introduces some inaccuracies. In many cases, model uncertainties can be represented, at least in part, through the parameter or scenario approaches described above. However, some aspects of model uncertainty might not be captured by those classifications and are otherwise very difficult to quantify.

There are a number of ways in which model uncertainties can be expressed. Model uncertainties should be acknowledged and the limitations stated qualitatively. If feasible, quantitative assessments may be carried out. There are three key approaches for estimating model uncertainty. These approaches can also be used in combination:

- Comparison of model results with independent data for purposes of verification;
- Comparison of the predictions of alternative models;
- Expert judgment regarding the magnitude of model uncertainty.

Sensitivity analysis assesses the extent to which the outputs of an emissions modelling approach (e.g. projected activity data, projected emissions factors and projected emissions) vary according to model inputs (e.g. assumptions, projected values for key parameters and methodological choices). It can be used to explore model sensitivity to inputs and the uncertainty associated with model outputs. For the sensitivity analysis the values for key parameters in the model are adjusted methodologically to

test how end results are affected. As a general rule, variations of parameter values in the sensitivity analysis should at least cover a range of +10% and –10%.

Qualitative uncertainty analysis is a way to express the confidence of the team developing the calculation in a qualitative way. Usually two variables are used, as illustrated in the figure below.

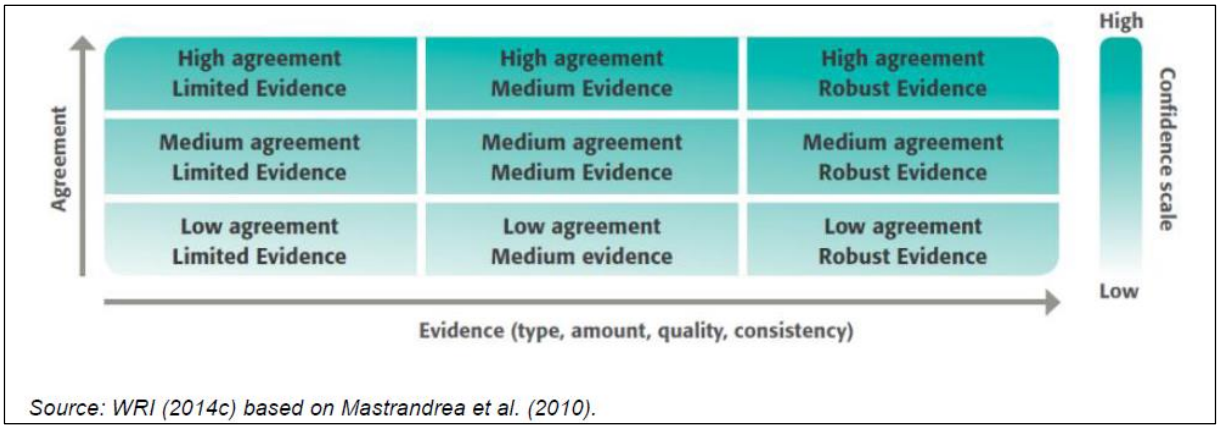


Figure 59. Matrix for qualitative uncertainty analysis (Source: [11])

Quantitative methods aim to provide a numerical assessment of the uncertainty. A wide range of tools exists for quantitative uncertainty analysis.

For **single parameter** uncertainty tools include:

- Measured uncertainty (represented by standard deviations);
- The pedigree matrix approach, based on data quality indicators;
- Default uncertainties for specific activities or sector data (reported in literature);
- Probability distributions from commercial databases;
- Uncertainty factors for parameters reported in literature;
- Expert judgement (based on as much data as available);
- Survey of experts to generate upper and lower bound in estimates;
- Other published approaches.

Propagated parameter uncertainty tools include:

- Taylor series expansion;
- Monte Carlo simulation;
- Error propagation equations.

Reporting uncertainty requires a description of the uncertainty, either quantitative or qualitative. Methods or approaches used to assess uncertainty need to be specified and the range of results from the sensitivity analysis should be included.

8.3.1.7 CALCULATING BASELINE EMISSIONS FOR EACH SOURCE OR SINK CATEGORY (VI)

Once all elements of the calculation have been identified, using best available data sources and the most appropriate methods, baseline emissions are calculated. In a first step, baseline emissions for each source or sink category are estimated using the selected calculation method and appropriate tools. The figure below illustrates the relationship between the different elements of the calculation.

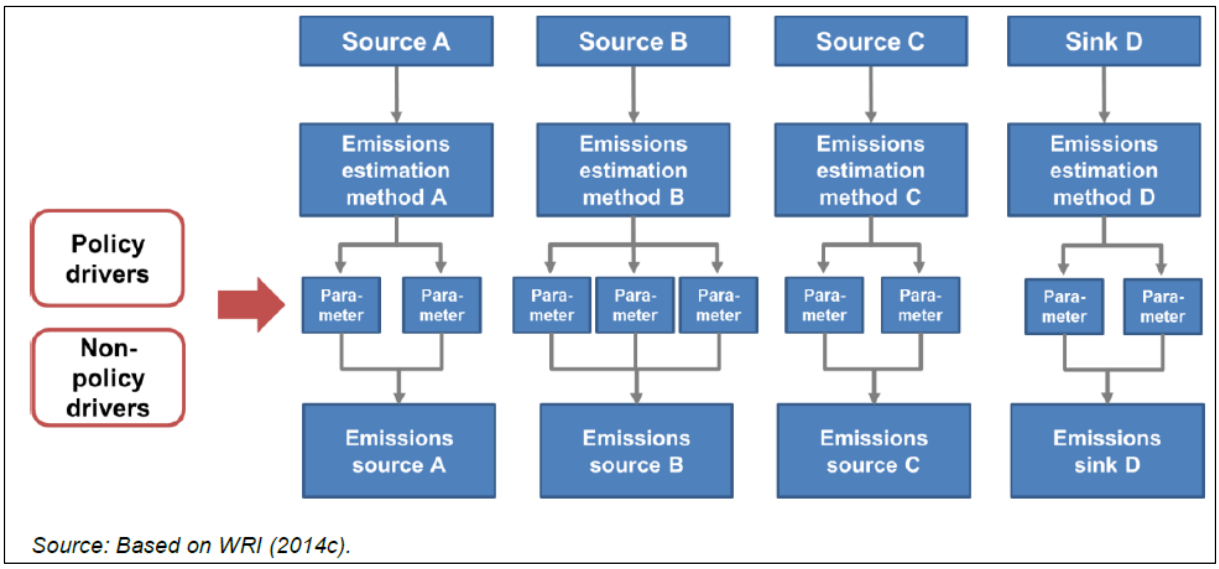


Figure 60. Impact of drivers on parameters for calculation (Source: [11])

Different source and sink categories can have different methods for calculating emissions. Classically the land-use sector and non-energy related emissions vary from other sectors.

8.3.1.8 AGGREGATING BASELINE SCENARIO EMISSIONS (VII)

Starting with the emissions per source or sink category (see Figure below), total baseline scenario emissions can be calculated. For the aggregation across sources and sinks, it is important to address any possible overlaps or interactions between sources and sinks to avoid over- or underestimation of total baseline emissions. Addressing these overlaps or interactions, the individual results for sources and sinks are added up to derive the total baseline scenario emissions.

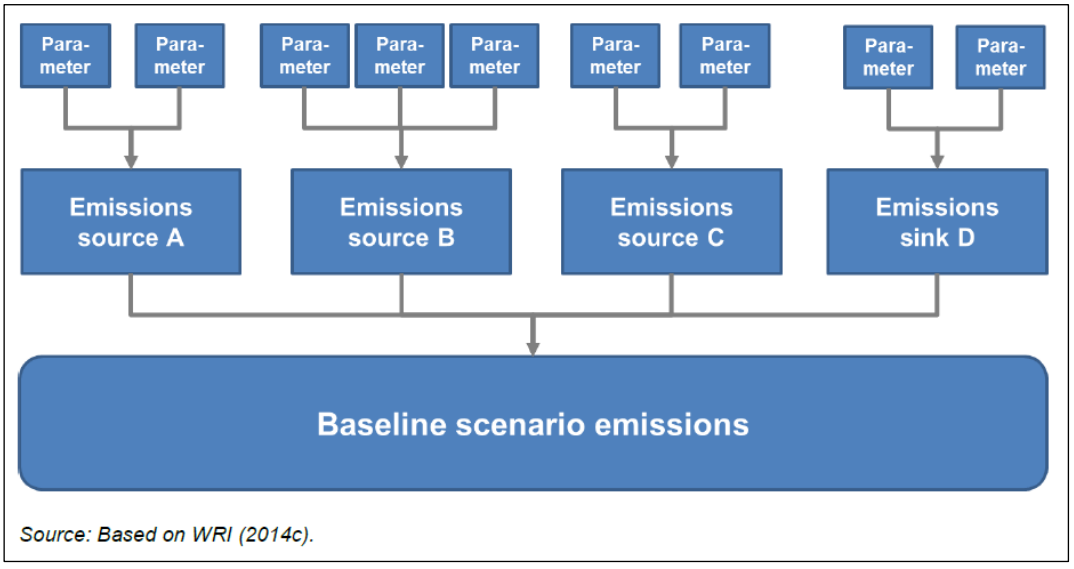


Figure 61. Aggregation of baseline scenario emissions (Source: [11])

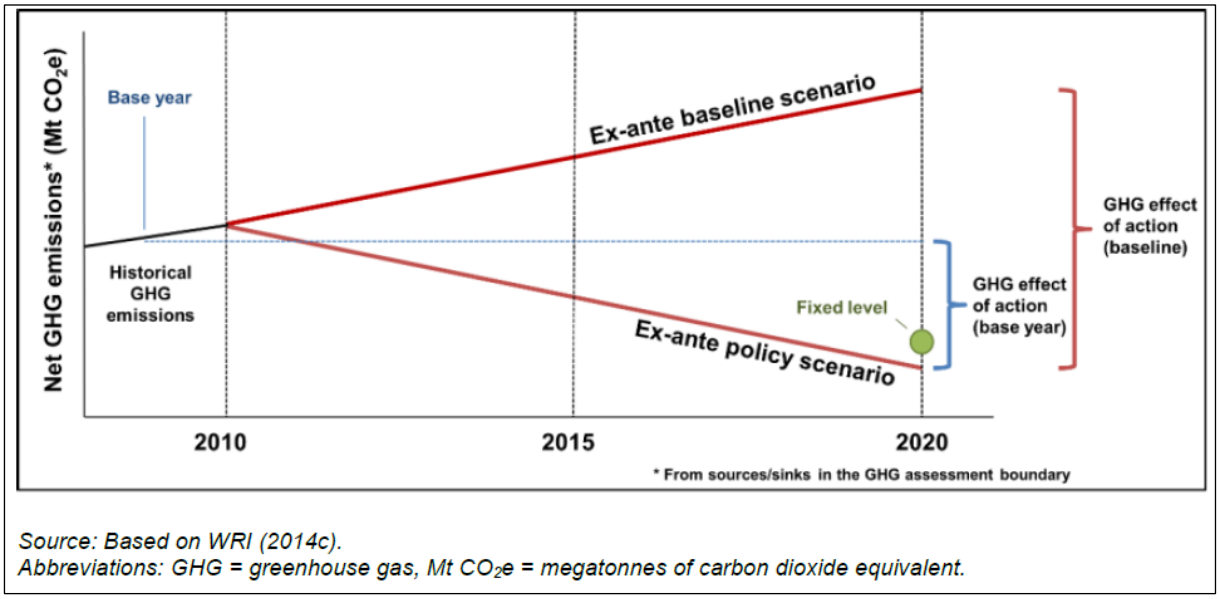
8.3.2 Good practice methodology to determine mitigation scenario impacts

The analysis of expected results of mitigation actions, i.e. ex-ante analysis of effects is usually carried out during the selection process of mitigation actions to support the identification of the most effective actions. Most ways of conducting mitigation potential analysis during the screening of

options follow some steps of the ex-ante analysis process. The analysis in the context of screening is often less detailed than a full ex-ante determination of effects. It does not necessarily reflect all aspects of the mitigation actions selected. Figure 20 provides an illustration of the principle of ex-ante determination of expected effects.

It could also be conducted:

- Once actions have already been selected, before or just after the start of implementation to determine expected effects;
- During implementation to re-assess expected effects based on changed circumstances.



Source: Based on WRI (2014c).
Abbreviations: GHG = greenhouse gas, Mt CO_2e = megatonnes of carbon dioxide equivalent.

Figure 62. The principle of ex-ante determination of expected effects (Source: [11])

The best practice process to determine mitigation impacts is illustrated below.

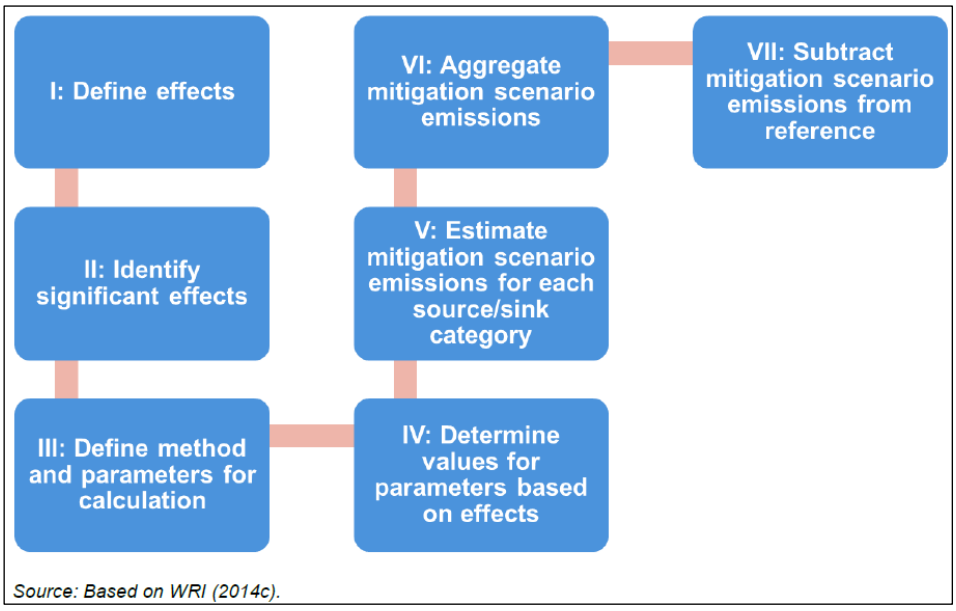


Figure 63. Best practice process to determine mitigation scenario emissions (Source: [11])

8.3.2.1 DEFINE EFFECTS OF MITIGATION ACTIONS (I)

❖ **Types of effects**

Many effects of the policy or action may not be immediately apparent, and many GHG effects (whether increases or decreases) may be far removed from the direct or immediate effects of the policy or action (WRI, 2014c). For a given objective not all effects will need to be quantified nor will this be possible given available data and resources. It is however important to be aware of these potential effects and their impact on the overall results from mitigation actions, which is detailed by the following.

Intended and unintended effects

Unintended effects may include a variety of effects. These include rebound effects, like for example increases in energy-using activities resulting from energy efficiency improvements. Unintended effects often occur in sectors other than the targeted sector or on members of society not targeted by the mitigation action. They also include effects on behaviour once a policy is announced but before it is implemented, for example increased sales of inefficient appliances before higher efficiency standards come into effect. Unintended effects can be either GHG increasing or decreasing.

Short-term and long-term effects

Effects that are both nearer and more distant in time, based on the amount of time between implementation of the policy and the effect. Depending on the nature of the mitigation action, it may be useful to assess both time horizons, defining them based on the individual circumstances.

Likely, possible and unlikely effects

Different effects will be more or less likely to occur. This depends on how directly the mitigation action causes the effect and which other drivers have an impact on the decisions leading to the effect. Where possible, all potential effects should initially be identified, regardless of their likelihood of occurring. The final estimation of effects will then only address effects that are deemed significant.

Greenhouse gas emissions or removals increasing and decreasing effects

Effects can increase and decrease emissions released from sources and sinks. Even though the final goal of any mitigation action is to decrease emissions or increase removals, a number of unintended effects can potentially be counteractive. It is important to explore these effects, as they can render mitigation actions ineffective, if they are found to be substantial.

In-jurisdiction and out-of-jurisdiction effects

Effects that occur both inside and outside of the geopolitical boundary over which the implementing entity has authority, such as a city boundary or national boundary. To identify such effects, we first need to define the relevant jurisdictional boundary. Out-of-jurisdiction effects are called spillover effects if they reduce emissions outside the jurisdictional boundary and leakage if they increase emissions outside the jurisdictional boundary.

Duration of effects

Effects can change over time in a linear or non-linear way. Additionally, effects can have different duration. Together this creates a complex set of possible developments of effects over time. The figure below highlights some of the most common patterns.

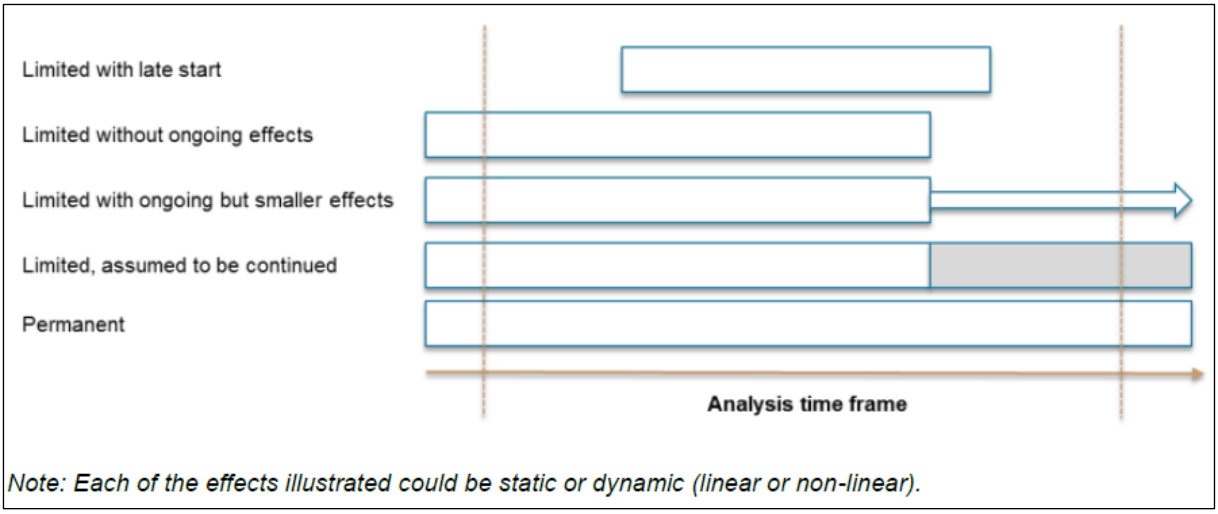


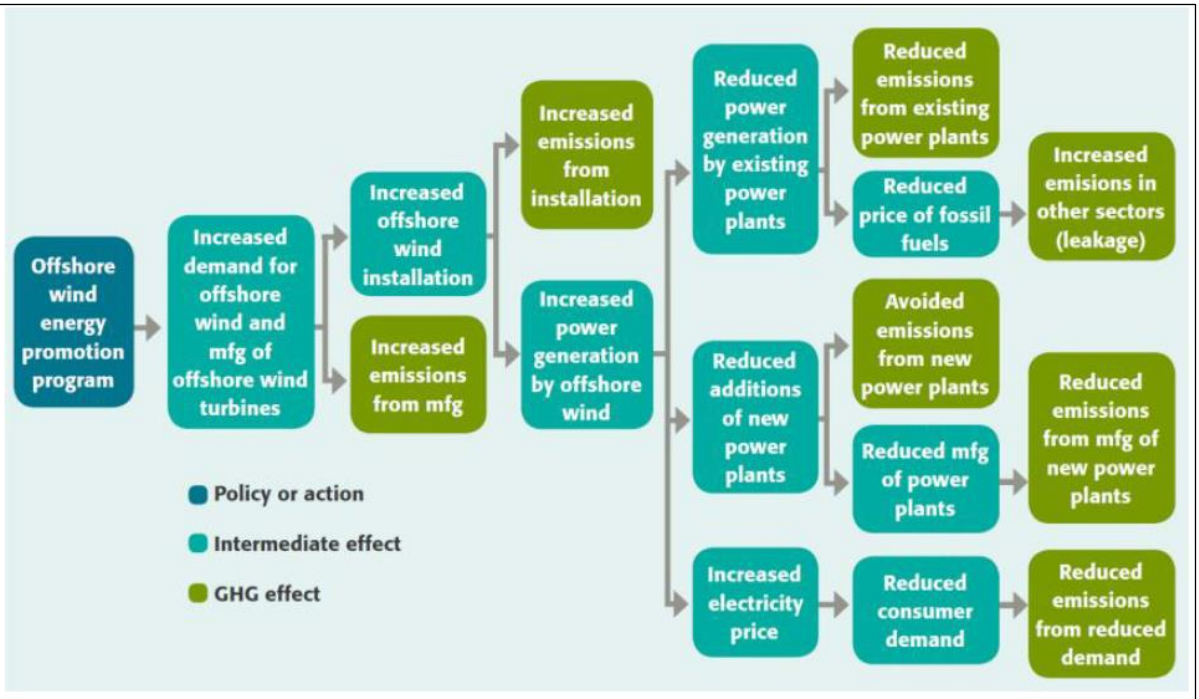
Figure 64. Types of effects over time (Source: [11])

❖ Reporting on effects of mitigation actions

Understanding and communicating the cause and effect relationships of a mitigation action is one of the key challenges of evaluating the impacts of such actions. There are multiple ways to do this, although often the cause and effect relationships remain implicit or hidden in highly technical annexes to model calculations. This section introduces the causal chain, a tool developed for the GHG Protocol Policy and Action Standard (WRI, 2014c).

The **causal chain** is a tool to make cause and effect relationships explicit that are often included implicitly in the analysis of mitigation effects, and thus not communicated. It is a conceptual diagram, tracing the process by which a mitigation action leads to effects through a series of interlinked logical and sequential stages.

Especially for policy-based mitigation actions this can help understand how the inputs and activities are expected to lead to GHG and non-GHG effects. The visualization of relationships also facilitates discussion and enhances understanding during the analysis within the team conducting the analysis and supports the identification of additional effects that otherwise would not have been identified. The resulting causal chain graphs also serve as a useful communication tool.



Source: Results from pilot testing illustrated in WRI (2014c).
Abbreviations: GHG = greenhouse gas, mfg = manufacturing.

Figure 65. Example causal chain: Belgium's offshore wind energy promotion programme (Source: [19])

8.3.2.2 IDENTIFYING SIGNIFICANT EFFECTS (II)

Some of the effects will be outside the boundary set by the mitigation action, for example effects occurring outside the geographic or sectoral boundary as defined in the mitigation action. However, governments may wish to include some of these effects in their analysis. For all effects that are within the defined boundary it should be determined whether they are significant, based on the likelihood and magnitude of the effect as illustrated in the figure below.

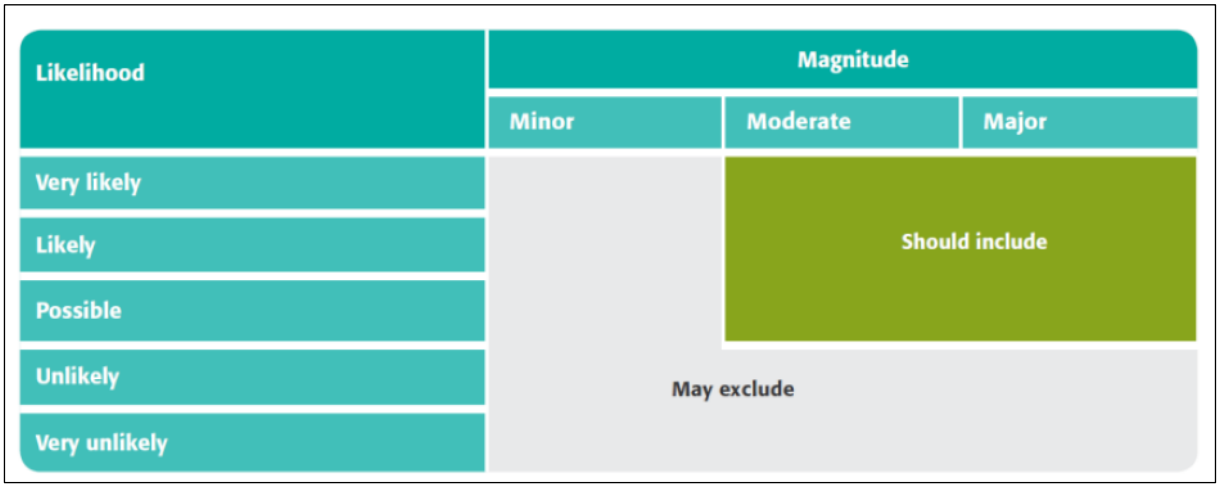


Figure 66. Recommended approach for determining significance (Source: [19])

Definition of likelihood:

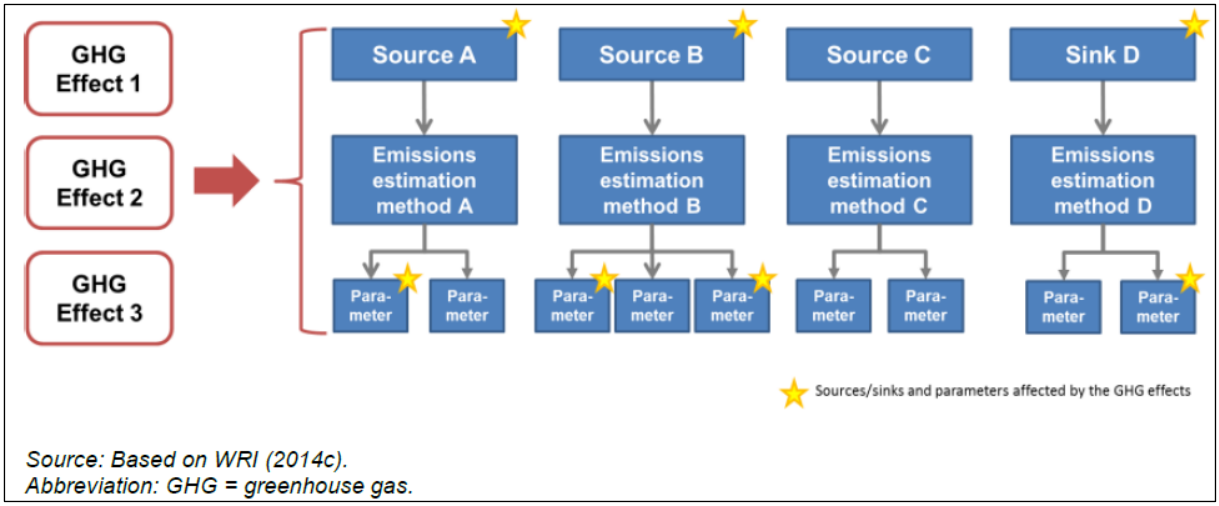
- **Very likely**: Reason to believe the effect will happen (or did happen) as a result of the policy. (For example, a probability in the range of 90–100 per cent).
- **Likely**: Reason to believe the effect will probably happen (or probably happened) as a result of the policy. (For example, a probability in the range of 66–90 per cent).
- **Possible**: Reason to believe the effect may or may not happen (or may or may not have happened) as a result of the policy. About as likely as not. (For example, a probability in the range of 33–66 per cent). Cases where the likelihood is unknown or cannot be determined should be considered possible.
- **Unlikely**: Reason to believe the effect probably will not happen (or probably did not happen) as a result of the policy. (For example, a probability in the range of 10–33 per cent).
- **Very unlikely**: Reason to believe the effect will not happen (or did not happen) as a result of the policy. (For example, a probability in the range of 0–10 per cent).

Definition of magnitude:

- **Major:** The effect significantly influences the effectiveness of the policy or action. The change in greenhouse gas emissions or removals is likely to be significant in size (> 10 per cent).
- **Moderate**: The effect influences the effectiveness of the policy or action. The change in greenhouse gas emissions or removals could be significant in size (1–10 per cent).
- **Minor**: The effect is inconsequential to the effectiveness of the policy or action. The change in greenhouse gas emissions or removals is insignificant in size (< 1 per cent).

8.3.2.3 IDENTIFYING AFFECTED PARAMETERS (III)

For mitigation actions that are assessed against a baseline, **all methods, parameters and values should be identical to the baseline, apart from those that have been determined to be affected by the GHG effects identified, for example through a causal chain process**. The figure below illustrates this concept. Only marked parameters are affected and values would differ compared to the baseline scenario. These differences in parameters, for example regarding energy use or fuel mix, determine the mitigation effect of the mitigation action.



Source: Based on WRI (2014c).
Abbreviation: GHG = greenhouse gas.

Figure 67. Relationship between effects and parameter values (Source: [11])

8.3.2.4 DETERMINING MITIGATION SCENARIO VALUES FOR PARAMETERS (IV)

The change in individual parameters over time should be based on what is considered the most likely scenario, based on evidence, such as peer-reviewed literature, modelling or simulation exercises, government statistics, or expert judgement. A variety of factors need to be considered in determining the parameter values for the mitigation scenario, some of which are similar to those considered for the baseline scenario, others are additional:

- **Policy interaction**: The mitigation action assessed may interact with policies included in the baseline scenario, i.e. those that are implemented or adopted, either in overlapping or reinforcing ways. Policies or actions that interact produce total effects that differ from the sum of the individual effects of each individual mitigation action.
- **Implementation changes over the assessment period**: The implementation of the mitigation action may include changes over the assessment period. Examples for such changes are increasing standards in a number of steps, or the phase out of subsidies according to a defined timeline. This also includes cases where a fixed budget is provided for an incentive scheme, which will lead to changes in parameters over the assessment period. Other policies are designed to operate permanently at a given level.
- **Barriers**: Barriers can limit the effectiveness of mitigation measures. Such barriers should be taken into consideration in the assessment as far as possible. One option is to discount the maximum effects under full implementation, based on expected limitations in policy implementation, enforcement or effectiveness.
- **Timing of effects**: effects of mitigation actions do not necessarily occur directly after implementation. They may also increase continuously with broader uptake over time. These effects should be captured in the assumed development of parameters over time.

The table below provides an example for the reporting of parameter values, methods and assumptions used and data sources.

Table 18 : Example: reporting parameter values (ex-ante) for a home insulation subsidy (Source: [11])

Parameters	Policy scenario value(s)	Method and assumptions to estimate value	Data source(s)
Natural gas used for space heating	1,000,000 MMBtu/year from 2010–2014; 910,000 MMBtu/year from 2015–2025	Values calculated based on 30 per cent anticipated uptake of the insulation subsidy starting in 2015 and remaining constant through 2025; and 30 per cent energy use reduction per home with insulation (based on previous studies of similar policies)	Peer-reviewed literature: Author (Year). Title. Publication.[9]
Natural gas used for water heating	500,000 MMBtu/year (constant)	Same value as in baseline scenario since the policy does not affect this parameter	National energy statistical agency
Natural gas used for cooking	300,000 MMBtu/year (constant)	Same value as in baseline scenario since the policy does not affect this parameter	National energy statistical agency
Natural gas emission factor	55 kg CO_2e/MMBtu (constant)	Same value as in baseline scenario since the policy does not affect this parameter	National energy statistical agency

Source: WRI (2014c).
Abbreviations: CO_2e = carbon dioxide equivalent, MMBtu = million British thermal units.

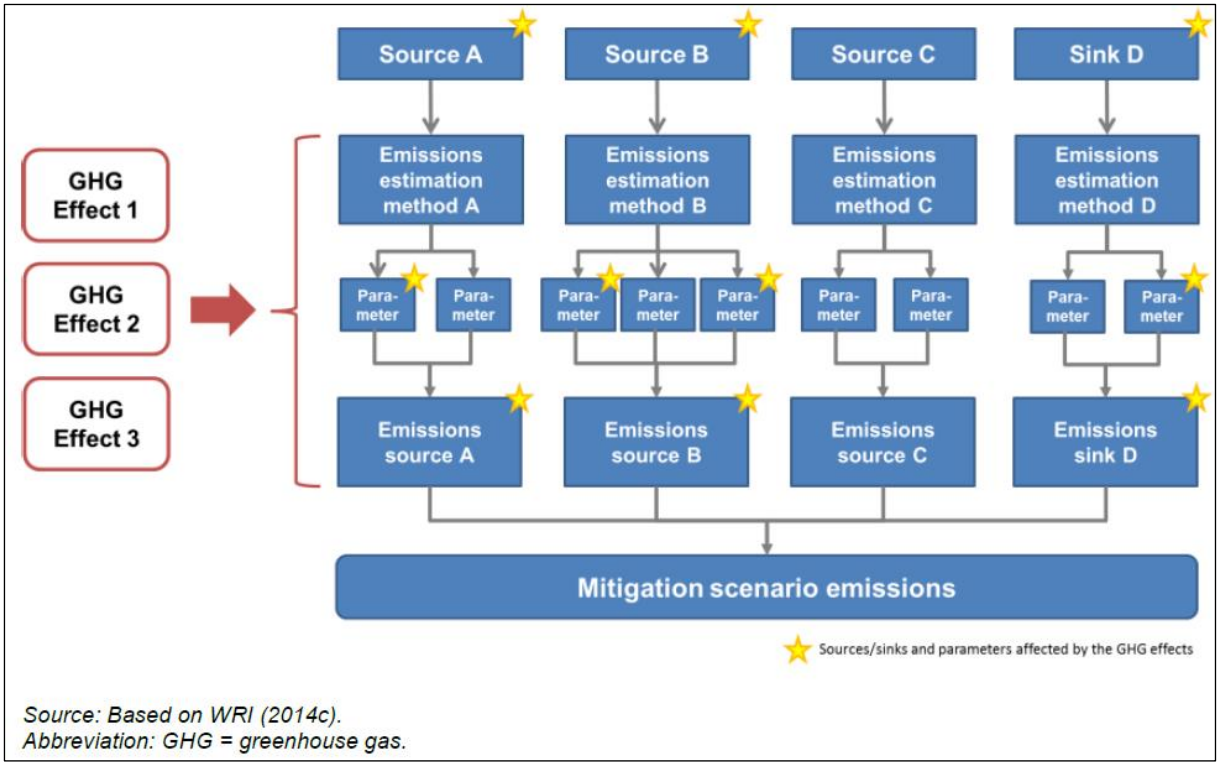
8.3.2.5 CALCULATING MITIGATION SCENARIO EMISSIONS FOR EACH SOURCE OR SINK CATEGORY (V)

The methods used for calculating emissions for each source and sink category should be the same as for determining baseline scenario emissions. The only difference is in parameter values that have been identified in the previous steps.

Depending on which sources, sinks and parameters are affected by the mitigation action, emissions for individual source and sink categories may or may not differ from baseline scenario emissions.

8.3.2.6 AGGREGATING MITIGATION SCENARIO EMISSIONS (VI)

The aggregation of mitigation scenario emissions follows the same logic as for baseline scenario emissions. Also here potential overlaps and interactions between source and sink categories need to be taken into account. The figure below shows the principle. All sources and sinks are added up, irrespective of whether they are affected by the mitigation action or not.



Source: Based on WRI (2014c).
Abbreviation: GHG = greenhouse gas.

Figure 68. Aggregation of mitigation scenario emissions (Source: [11])

8.3.2.7 CALCULATING THE GREENHOUSE GAS IMPACT OF MITIGATION ACTIONS (VII)

Once the differences in parameters are identified, the mitigation scenario emissions can be calculated using the same methods applied to the baseline. The impact of the mitigation action is then determined as the difference between mitigation scenario emissions and baseline emissions. There are two different ways to express the impact:

- **Total net change**: Represents the net change from the baseline and is expressed as a negative number if the mitigation scenario reduces emissions below baseline and a positive number if emissions are increased above the baseline scenario.

> *Total net change in GHG emissions and removals resulting from the mitigation action (t CO_2e) = Total net mitigation scenario emissions (t CO_2e) – Total net baseline scenario emissions (t CO_2e)*

- **Total net reduction**: Here the calculation is tailored to represent reductions, which means that positive numbers indicate a reduction in emissions below baseline, a negative number indicates an increase.

> *Total net reduction in GHG emissions and removals resulting from the mitigation action (t CO2e) = Total net baseline scenario emissions (t CO2e) – Total net mitigation scenario emissions (t CO2e)*

Annex: Tabular format for data collection

References

[1] United Nations Framework Convention on Climate Change (UNFCCC). (2023). CGE Training materials Mitigation Assessment. Module A Climate Change. Available at: https://unfccc.int/sites/default/files/resource/Module%20A.pdf

[2] United Nations Framework Convention on Climate Change (UNFCCC). (2023). CGE Training materials Mitigation Assessment. Module B Climate Change. Available at: https://unfccc.int/sites/default/files/resource/Module%20B.pdf

[3] United Nations Framework Convention on Climate Change (UNFCCC). (2023). CGE Training materials Mitigation Assessment. Module C Climate Change. Available at: https://unfccc.int/sites/default/files/resource/Module%20C.pdf

[4] United Nations Framework Convention on Climate Change (UNFCCC). (2023). CGE Training materials Mitigation Assessment. Module D Climate Change. Available at: https://unfccc.int/sites/default/files/resource/Module%20D.pdf

[5] United Nations Framework Convention on Climate Change (UNFCCC). (2023). CGE Training materials Mitigation Assessment. Module E Climate Change. Available at: https://unfccc.int/sites/default/files/resource/Module%20E.pdf

[6] United Nations Framework Convention on Climate Change (UNFCCC). Technical handbook for developing country Parties on Preparing for implementation of the enhanced transparency framework under the Paris Agreement. Available at: https://unfccc.int/sites/default/files/resource/ETF%20Handbook-Edt2_EN.pdf

[7] United Nations Framework Convention on Climate Change (UNFCCC). (2023). UNFCCC BTR REVIEW TRAINING: COURSE C. TRACKING PROGRESS IN IMPLEMENTING AND ACHIEVING NDCS. SUB COURSE C1: NATIONAL CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS, AND DESCRIPTION OF A PARTY'S NDC UNDER ARTICLE 4 OF THE PARIS AGREEMENT INCLUDING UPDATES. Available at: https://unfccc.int/sites/default/files/resource/C1_NC_IA_and_Description_Ed1.pdf

[8] United Nations Framework Convention on Climate Change (UNFCCC). (2023). UNFCCC BTR REVIEW TRAINING: COURSE C. TRACKING PROGRESS IN IMPLEMENTING AND ACHIEVING NDCS. SUB COURSE C2: INFORMATION NECESSARY TO TRACK PROGRESS IN IMPLEMENTING AND ACHIEVING NDC. Available at: https://unfccc.int/sites/default/files/resource/C2_Tracking%20progress_Ed1.docx.pdf

[9] United Nations Framework Convention on Climate Change (UNFCCC). (2023). UNFCCC BTR REVIEW TRAINING: COURSE C. TRACKING PROGRESS IN IMPLEMENTING AND ACHIEVING NDCS. SUB COURSE C3: MITIGATION POLICIES AND MEASURES, ACTIONS AND PLANS, INCLUDING MITIGATION CO-BENEFITS RESULTING FROM ADAPTATION ACTIONS AND ECONOMIC DIVERSIFICATION PLANS, RELATED TO IMPLEMENTING AND ACHIEVING NDC UNDER ARTICLE 4 OF THE PARIS AGREEMENT. Available at: https://unfccc.int/sites/default/files/resource/C3_Mitigation_Actions_Ed1.docx.pdf

[10] United Nations Framework Convention on Climate Change (UNFCCC). (2023). UNFCCC BTR REVIEW TRAINING: COURSE C. TRACKING PROGRESS IN IMPLEMENTING AND ACHIEVING NDCS. SUB COURSE C4: PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS. Available at: https://unfccc.int/sites/default/files/resource/C4_Projections_Ed1.docx.pdf

[11] United Nations Framework Convention on Climate Change (UNFCCC). (2015). CGE SUPPLEMENTARY TRAINING MATERIAL FOR THE TEAM OF TECHNICAL EXPERTS. Module 2.1 Background material: Mitigation actions and their effects. Available at: https://unfccc.int/sites/default/files/resource/Cluster%20B%20Module%202.1%20Mitigation_PDF.pdf

[12] United Nations Framework Convention on Climate Change (UNFCCC). (2022). CDM METHODOLOGY BOOKLET. Available at: https://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf

[13] United Nations Framework Convention on Climate Change (UNFCCC). (2022). Reference Manual for the Enhanced Transparency Framework under the Paris Agreement. Understanding the enhanced transparency framework and its linkages Available at: https://unfccc.int/sites/default/files/resource/v2_ETFreferencemanual.pdf

[14] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2023). NDC Progress Indicators: a guidance for practitioners. Available at: https://transparency-partnership.net/system/files/document/GIZ_NDC-Indicators-Paper_231031.pdf

[15] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2022). Accounting for Nationally Determined Contributions Guidance for Accounting for NDCs with Greenhouse Gas Emissions Targets. Second edition — Updated for the provisions of the Katowice Rulebook and decisions taken at COP26 in Glasgow. Available at: https://transparency-partnership.net/system/files/document/Guidance_Accounting%20for%20NDCs_engl_2022.pdf

[16] UNEP DTU Partnership. (2019). Unfolding the reporting requirements for Developing Countries under the Paris Agreement's Enhanced Transparency Framework. Available at: https://climateactiontransparency.org/wp-content/uploads/2019/11/ICAT-MPGs-publication-final.pdf

[17] Oeko-Institut. (2022). Working Paper Understanding the Transparency Guidance. Available at: https://www.oeko.de/fileadmin/oekodoc/WP-Transparency-Guidance.pdf

[18] World Resources Institute. (2014). Mitigation Goal Standard. An accounting and reporting standard for national and subnational greenhouse gas reduction goals. Available at: https://ghgprotocol.org/sites/default/files/standards/Mitigation_Goal_Standard.pdf

[19] World Resources Institute. (2014). Policy and Action Standard. An accounting and reporting standard for estimating the greenhouse gas effects of policies and actions. Available at: https://ghgprotocol.org/sites/default/files/standards/Policy%20and%20Action%20Standard.pdf

[20] United Nations Framework Convention on Climate Change (UNFCCC). Nationally determined contributions under the Paris Agreement. Synthesis report by the secretariat. Available at: https://unfccc.int/sites/default/files/resource/cma2022_04.pdf

[21] United Nations Framework Convention on Climate Change (UNFCCC). Decision 5/CMA.3. Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement.

[22] United Nations Framework Convention on Climate Change (UNFCCC). (2023). UNFCCC BTR REVIEW TRAINING Course A: General and cross-cutting aspects for the technical expert review under the enhanced transparency framework under the Paris Agreement. Available at: https://unfccc.int/sites/default/files/resource/General_and_cross_cutting_aspects_for_the_TER_under_ETF_PA.pdf

[23] EUROPEAN COMMISSION (EC). (2016). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the Governance of the Energy Union, amending Directive 94/22/EC, Directive 98/70/EC, Directive 2009/31/EC, Regulation (EC) No 663/2009, Regulation (EC) No 715/2009, Directive 2009/73/EC, Council Directive 2009/119/EC, Directive 2010/31/EU, Directive 2012/27/EU, Directive 2013/30/EU and Council Directive (EU) 2015/652 and repealing Regulation (EU) No 525/2013. Available at: resource.html (europa.eu)