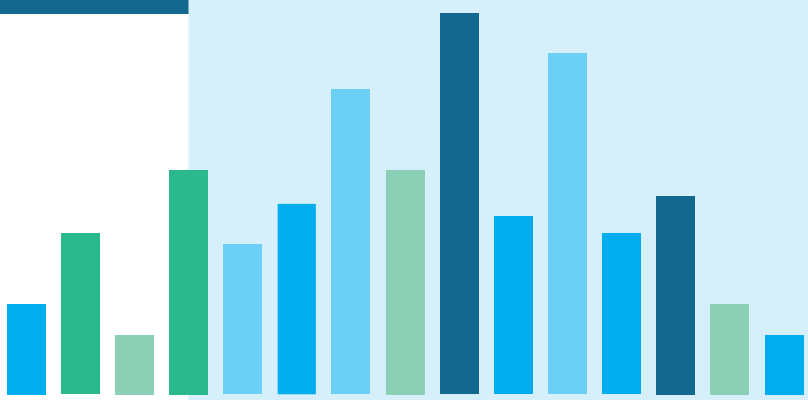
GUIDANCE FOR PRESENTING

GREENHOUSE GAS EMISSIONS AND REMOVALS PROJECTIONS **FOR CLIMATE ACTION PLANNING AND COMMUNICATION**

CLIMATE AMBITION & TRANSPARENCY

AMBICIÓN CLIMÁTICA Y TRANSPARENCIA



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With the support of:

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Acronyms

BAU	Business As Usual
BRT	Biennial Transparency Report
BUR	Biennial Update Report
CGE	Computable General Equilibrium
CH_4	Methane
CMA	Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement
CO_2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
CRT	Common Reporting Tables
ETF	Enhanced Transparency Framework
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GST	Global Stocktake
IAMS	Integrated Assessment Models
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LDCs	Least Developed Countries
LEAP	Long range Energy Alternatives Planning
LTS	Long-Term Strategies
LULUCF	Land Use, Land Use Change and Forestry

MPG	Modalities, Procedures, and Guidelines
MRV	Measurement, Reporting, and Verification
N_2O	Nitrous Oxide
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contribution
NF_3	Nitrogen Trifluoride
NIR	National Inventory Report
OECD	Organization for Economic Cooperation and Development
PA	Paris Agreement
PAMS	Policies and Measures
QA	Quality Assurance
QC	Quality Control
SF_6	Sulphur Hexafluoride
SIDS	Small Island Developing States
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With Additional Measures
WEM	With Existing Measures
WOM	Without Measures

01 Introduction

One of the major global climate policy commitments, established by the United Nations Framework Convention on Climate Change (UNFCCC) in the Paris Agreement (PA), is to keep the temperature increase below 2°C and progressively limit it to not exceed a 1.5°C increase above pre-industrial levels (IPCC, 2024), aiming to avoid the severe impacts of climate change on the environment, societies, development, infrastructure among others. Achieving this requires implementing adaptation and mitigation measures and transitioning to low-carbon economies that include sustainable use and reuse of natural resources.

For planning mitigation measures that contribute to meeting national goals and international commitments regarding global emissions reductions, Parties must estimate the expected Greenhouse Gas (GHG) emission reduction potential, quantify the reductions generated once the measures are implemented, and report the progress and results of implementation in terms of GHG emissions but also in other relevant metric indicators.

Estimating future GHG emissions and removals behaviour is a fundamental tool of climate policy.

Estimating future GHG emissions and removals behaviour is a fundamental tool of climate policy. To understand these future scenarios, we need projections, which are estimates of future GHG emissions based on historical information, and future trends (for example, technology, and demand) and defined from conditions and assumptions (Partnership on Transparency in the Paris Agreement, 2021).

The GHG projections do not represent the future but rather one of several possible quantitative scenarios that may exist, based on a set of conditions and assumptions previously defined for their estimation (e.g., Business-as-usual scenarios or scenarios with implemented mitigation measures). Projections should be understood as dynamic elements that change over time according to available information (activity data or emission factors), implemented technologies, and national circumstances, among others (Partnership on Transparency in the Paris Agreement, 2021). Developing projections for 2050, for example, supports the development of evidence-based mitigation portfolios for designing decarbonization pathways towards carbon neutrality scenarios, which is complementary to the PA Article 4(1) to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, based on equity, and in the context of sustainable development and efforts to eradicate poverty.

The estimation of projection scenarios is not new; **some countries have used them as tools to establish their Nationally Determined Contributions (NDCs)**. Likewise, mitigation scenario projections are a fundamental part of proposals for financing from the Green Climate Fund or the NAMA Facility. Annex I[1] Parties have included their scenarios with existing mitigation measures in their Biennial Reports. Therefore, the incorporation of GHG emission and removal projections within a country's climate policy is an integral part of the climate action management process, providing a vision of the future scenario a country aims to achieve in the medium and long term and the mitigation measures needed to achieve it. **Projections are a key element of the climate change 5-year reporting cycle of the NDC, Biennial Transparency Reports (BTRs) and the Global Stocktake (GST) by providing relevant quantitative information that could be assessed over time. .**

The objective of this document is to provide conceptual elements, recommendations, and best practices to support countries in developing emission/removal projections for BTR and/or projections to define decarbonization pathways to 2050 within their Long-Term Development Strategies (LTS), transparently and meeting the requirements established in the PA, specifically those of the Enhanced Transparency Framework (ETF). This publication aims to contribute to integrating the development of projections into the climate policy cycle and transparency systems of developing countries.

1. Annex-I countries under the UNFCCC refer to industrial countries that are part of the Organization for Economic Co-operation and Development (OECD) (UNFCCC, 2024).

02 Requirements and reporting recommendations under the Paris Agreement

The ETF was established within the PA as the basis for its implementation, which seeks to build trust and common understanding about the efforts made by signatory countries to combat climate change, by providing clear and comprehensive information on countries' climate actions, mitigation, adaptation, and support (financial, technology, and capacity building) (UNFCCC, 2023). Additionally, it provides a clear view of the measures adopted and the support provided[2], mobilized, received, and required by each Party in terms of climate change. The operational details for the implementation of the PA and the definition of elements included in the ETF[3] were consolidated in December 2018 through the "Paris Rulebook" at the United Nations Climate Change Conference in Katowice (COP24) and finalized at COP26 in Glasgow.

Figure 1. Mandatory and non-mandatory elements[4] under the Paris Agreement.

Reporting

All Parties (shall)

- National GHG Inventory Report (A).
- Progress made in implementing and achieving NDC (B).

Developed countries (shall) and parties that provided support (should)

- Financial, technology transfer and capacity building support provided to developing countries parties.

All Parties (should, as appropiate)

- Climate change impacts and adaptation efforts.

Developed countries (should)

- Financial, technology transfer and capacity building support needed and recieved.

2. In terms of financing, technology development and transfer, and capacity building (UNFCCC, 2020).

3. https://unfccc.int/sites/default/files/resource/CMA2021_L10a2E.pdf#page=2

4. According to the convention guidelines, parties will have different types of requirements (obligations) and recommendations (non-mandatory). A "SHALL" requirement is mandatory; a "SHOULD" requirement is not mandatory; a "MAY" or "COULD BE" requirement is also not mandatory and serves as an encouragement.

Technical Expert review

All Parties (shall)

- Undergo technical expert review of information submitted (A+B).

+

Developed countries (shall)

- Undergo technical expert review of information submitted on support provided.

Multilateral Facilitative Consideration

All Parties (shall)

- Multilateral facilitative consideration of progress with respect to efforts under the article 9 (support), and its respective implementation and achievement of its NDCs.

- The transparency framework will provide flexibility in the implementation of the provisions of this Article to those developing country Parties that need it in light of their capacities (Article 13.2).
- The transparency framework shall recognize the special circumstances of least developed countries and small island developing States (Article 13.3)."

Source: (UNFCCC, 2024)

Within the **Modalities, Procedures, and Guidelines** (MPG[5]) of the ETF, guidelines are established for the preparation of National Greenhouse Gas Inventories, monitoring the progress of NDCs, mitigation measures and policies, the effects of climate change and adaptation, information on financing, technology development and transfer, and capacity building, among others. For developing countries, the ETF sets forth mandatory and non-mandatory reporting elements, as well as flexibility in mandatory provisions, to enable them to gradually approach the reporting standard established in the MPG (see Figure 1).

This document focuses on greenhouse gas emissions and removals projections (paragraphs 92 to 102 Decision 18/CMA.1), corresponding to elements of the BTRs and the implementation and track of the progress of the NDCs following Article 13.7(b).

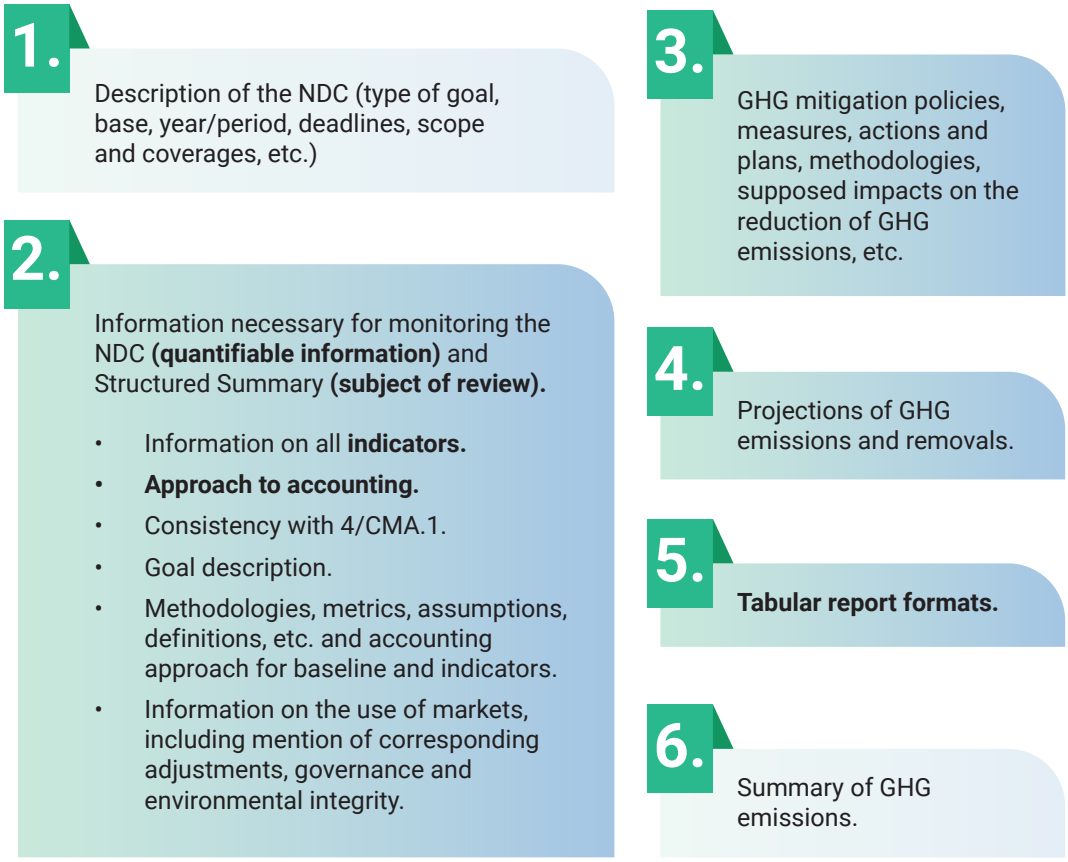
Under these new guidelines, both Annex-I and Non-Annex-I Parties must report their GHG emission projections; however, Non-Annex-I Parties that need flexibility in the light of their capacities may apply specific flexibility provisions[6]. This flexibility for projections is reflected by allowing reporting in shorter periods than established or using existing methodologies, even if they are less detailed.

5. https://unfccc.int/resource/tet/0/00mpg.pdf

6. The flexibility provisions include scope of reporting: for GHG inventories and reporting the progress towards implementing their NDC: Frequency of reporting; Level of detail for data accuracy and completeness: and the timing if implementation of the new reporting framework (additional information: https://unfccc.int/resource/tet/0/00mpg.pdf).

To utilize these flexibility mechanisms, countries must communicate existing limitations and the actions that will be implemented to progressively comply with the requirements established by the MPG of the ETF.

Figure 2. Elements for the communication and follow-up of the progress under the NDC implementation.



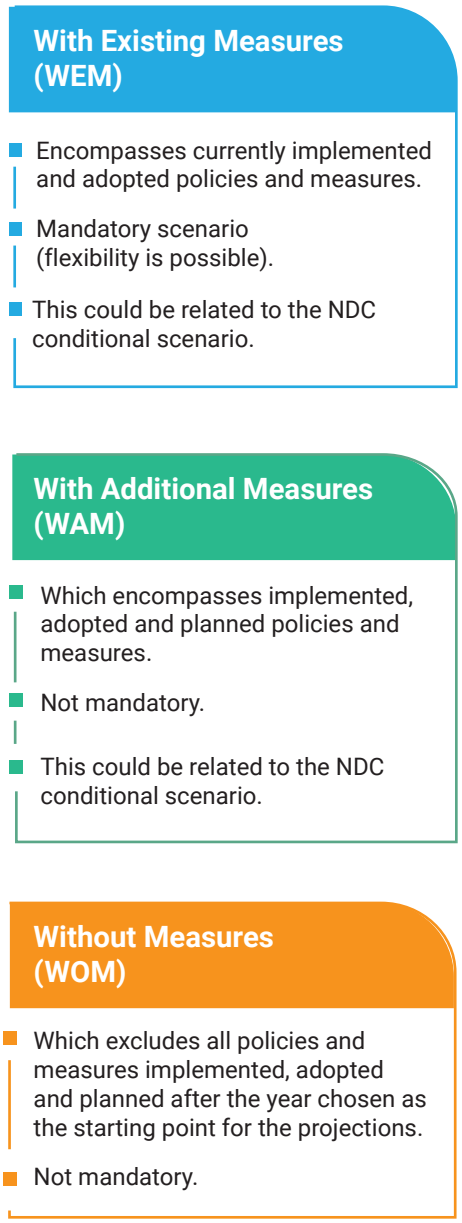
Source: own elaboration based on (UNFCCC, 2018)

In the context of the UNFCCC, the objective of GHG emission and absorption projections is to provide an indicative picture of the impact of mitigation policies and measures on future trends in GHG emissions and removals; that is, they are not a tool for assessing the progress in the implementation and results of NDCs. However, countries may use the projections developed as part of their Monitoring, Reporting, and Verification (MRV) systems, NDCs, or LTS according to their internal decisions.

The MPGs defines three types of projections as shown in Figure 3, which must have a time series of at least 15 years, with the final year ending in zero or five, and starting from the year of the most recent[7] national inventory report. For example,

7. That could be part of a National Communication, the Biennial Report, or the Biennial Update Report (as appropriate), or could have been submitted as an independent report.

Figure 3. Scenarios under the MPGs



Source: own elaboration based on (UNFCCC, 2018)

if the last year of the inventory was 2026, the projections should be reported up to 2045, given that they must cover at least 15 years and end in a zero or five. For the first round of projections to be presented in 2024, the period to be covered is 2024–2040.

Additionally, Parties must provide information on their GHG emission and removal projections with the following characteristics:

1. Projections of the main progress indicators of the NDCs under Article 4 of the PA must be presented. However, the MPG does not specify what the key indicators should be; **each country should define them considering the most ambitious mitigation measures** or those linked to key categories of the GHG inventory.
2. Projections must be **disaggregated by sector and by gas**, as well as integrated into the national total using a metric consistent with the national GHG inventory. A good practice is to **use metric tons of CO_2 equivalent (CO_2e) as the reporting unit.**
3. Projections will be presented about data from previous years' **national GHG inventories**. A good practice is to consider the historical series of the GHG inventory as part of the calibration of the projections.
4. Aggregated national projections must be presented both **including and excluding the LULUCF sector.**
5. Projections should be **presented in both graphical and tabular formats.**

The MPG recommend (i.e., it is not mandatory) including information regarding the description of the methodology used to develop the projections, including:

- Models and approaches, the main assumptions, and parameters used for the projections.
- Changes in the methodology used in previous BTRs (from the second BTRs) Assumptions used in policies and measures included in the scenario with existing measures (WEM) and with additional measures (WAM).
- Sensitivity analysis[8] of the projections, as well as the description of the methodology and parameters used.

8. A sensitivity analysis is a method used to evaluate the influence of hypotheses or alternative analyses on the projections made (Joseph & John, 2013).

For countries **requiring flexibility** due to their capacities, the following provisions apply for reporting projections in their BTRs:

- Encouragement to report projections of greenhouse gas emissions and removals (MPGs, paragraph 92).
- Flexibility in extending the projection timeframe at least to the end point of their NDCs (MPGs, paragraph 95).
- The use less detailed methodologies or coverage for reporting projections (MPGs, paragraph 102).

These provisions help developing countries provide necessary data while accommodating their unique circumstances and capacities .

Relationship between NDCs, LTS, and GHG projections

Under the Paris Agreement of 2015, countries adopted collective goals to continue efforts to limit temperature rise to 1.5°C, promote adaptation and resilience, and align financial flows with low-emission, climate-resilient development. These objectives must be pursued "in the context of sustainable development and efforts to eradicate poverty" and in a manner that reflects "equity and the principle of common but differentiated responsibility and respective capabilities, in the light of different national circumstances" (UNFCCC, 2015).

In the PA, the development of projections must consider the mitigation measures applied. To do this, the previously prepared information must be examined. For Non-Annex-I Parties, we refer to the Biennial Update Reports (BURs), as historical information, which includes National GHG Inventories), and the future vision of the NDCs and LTS. In the case of Annex-I Parties, it refers to the Biennial Reports, the NDCs, and the LTS.

NDCs serve as specific building blocks for each country to contribute to collective objectives. Article 4 of the APA requires each country to prepare and communicate its NDCs every five years, presenting and updating, among other things, its mitigation objectives. These commitments may include GEI reduction objectives or not.

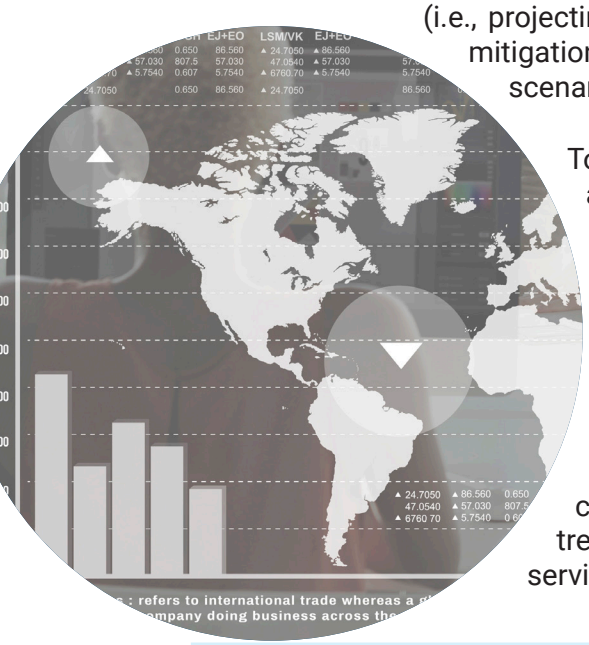
The NDCs set emissions reduction commitments for 2030, in some cases defined as an absolute value of emissions to be reduced, in other cases as a percentage of emissions reduced by 2030 based on a reference year or compared to a baseline. Depending on the methodology used, countries may have a projection that should be considered as a starting point.

Something similar happens with the LTS, in which countries define their long-term emission reduction plans and objectives, for example, achieving carbon neutrality or zero emissions by mid-century. Defining these objectives requires countries to develop future emissions and absorption trajectories that allow for a combination of measures to meet the established goals.

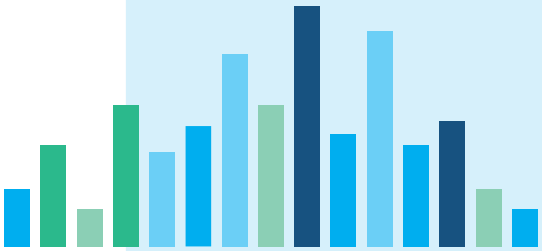
The development of projections required under the BTR should consider these objectives outlined in other climate policy instruments, that is, aligning commitments for 2030 and 2050 with projections that consider 2040 as an intermediate point to define mitigation and decarbonization pathways.

03 The process to elaborate the projections

The central challenge of international climate change policy is to limit future emissions while promoting resilience and reducing vulnerability, which involves the implementation of mitigation and adaptation measures, as well as cross-cutting measures. To design mitigation measures more effectively, countries need to be able to identify and estimate their future emissions based on their current situation (i.e., projecting a baseline), and/or also project their emissions considering the mitigation measures they have implemented or plan to implement (i.e., their scenarios with measures).



To be able to develop these emission projections (both their baseline and their scenarios with mitigation measures), some tools can be used. The selection of the most appropriate one will depend on factors such as the objective, the sector of interest, the starting date, the timeframe of the projections (which, according to the MPG, should be up to 2040[9], but planning up to 2050 will help to develop or update LTS), as well as human, technological, and financial capacities; considering the differences that may exist in the aforementioned elements, not all countries need or should choose the same methodologies. The selected methodologies must consider the national context, determined by economic, demographic trends, development, and technological rates, and by productive and service activities carried out in the country, and those that work in one context may not necessarily apply in another.



Tools for developing projections can range from simple regression models developed in spreadsheets to models integrated into programming code or specialized software (see section Methodologies for Developing Projections). Regardless of the tool used, the most important thing to consider is the assumptions used to represent reality. Depending on the available data, the selected tool, and the assumptions, different results can be obtained, which do not necessarily indicate incorrect results but rather reflect the qualities of the model. **To have greater certainty about the results obtained, a good practice is to incorporate sensitivity analysis and calculate the uncertainty of the estimates made.**

9. MPG, chapter III. F, paragraph 95, 97, 98 and 100.

Developing countries needing flexibility due to their capacities are encouraged to report greenhouse gas projections and can use less detailed methodologies and coverage. They can also extend the projection timeframe to at least the endpoint of their NDC.

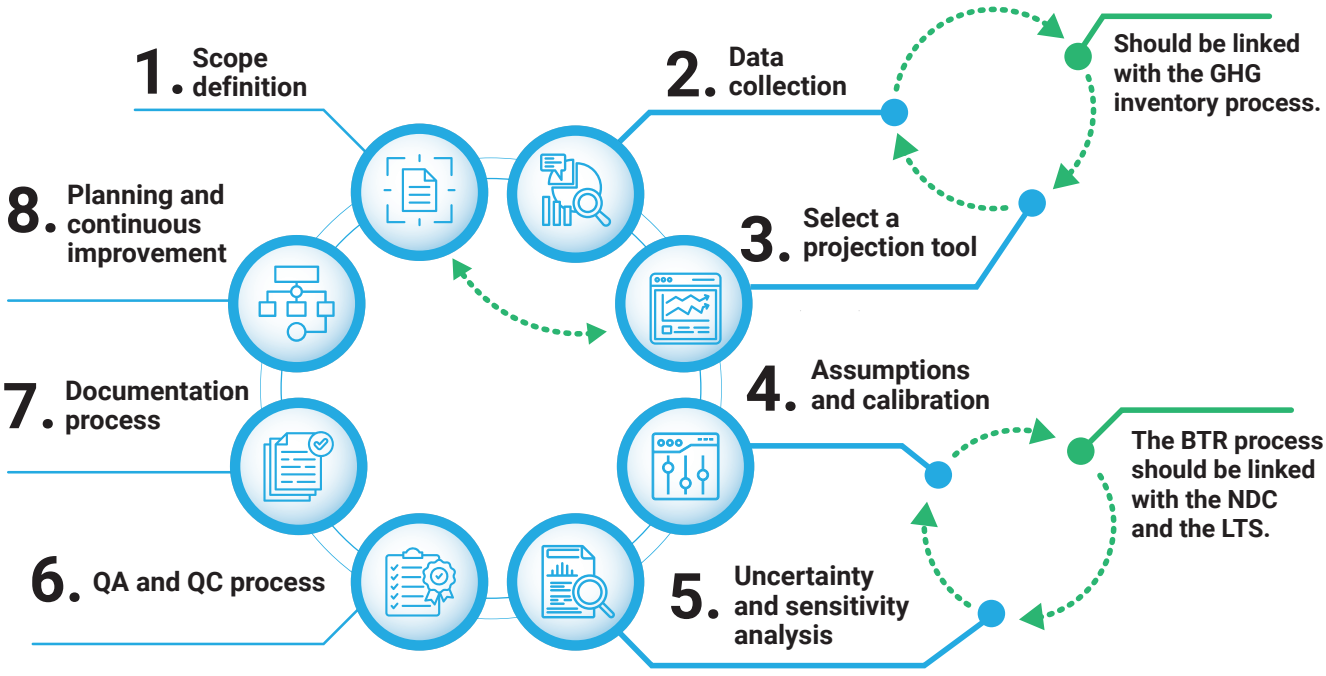
Likewise, a good documentation process of the procedure performed is key to allowing replicability, informing relevant stakeholders, and promoting continuous improvement, as well as for the transparency processes required in the new reporting framework of the PA.

Cycle to develop the projections

The development of emission projections will be a recurring task, as they are part of the elements that must be included in the BTR, according to the guidelines established in the MPG of the Paris Agreement. Therefore, projections must be considered as a cyclical process that should be integrated into the country's climate policy processes. **Additionally, projections should be aligned with three key elements: national GHG inventories (historical data), planned and implemented mitigation measures, and monitoring and tracking systems (to identify national progress, which is not part of the MPG).**

Considering the above, Figure 4 presents nine cyclical steps for the development of projections that will be applied to any type of scenario (WEM, WOM, WAM) that one may want to develop.

Figure 4. Cycle to elaborate the projections



Source: own elaboration

1. Scope definition

The MPG require that each Party includes sectoral and gas-specific projections, as well as the national total, using a common reporting metric consistent with their national GHG inventory. However, for developing countries, there are flexibility mechanisms that allow reporting based on the existing capacities in each country.

A good practice is to include the estimation of total national projections regardless of the categories or subcategories included.

Considering the above, national projections must at least include disaggregation for each of the IPCC sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land Use, Land-Use Change and Forestry (LULUCF), and Waste. Disaggregation for each sector should include the corresponding GHG gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), F-gases, sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

It is possible that the necessary information or capacities may not be available to reach this level of detail; in such cases, countries may decide to prioritize the sectors and gases to report. This prioritization can be based on the following elements:

1. Exclude from reporting categories that do not occur in the country, or those that have not been included in the inventory due to lack of information[10].
2. Main categories: based on the latest main category analysis of the national GHG emissions inventory, prioritize sectors or subsectors identified as key categories, either due to their level or trend.
3. Priority sectors for NDCs: projections can focus on sectors or categories with the greatest contribution to mitigation goals (which, in some cases, will also be for sectors with previous projections).
4. Consider sectors that are economically relevant to the country, those with a greater contribution to Gross Domestic Product (GDP), for example.
5. Categories or sectors with previous models or projection exercises conducted by national research centres that have supported sectoral policies.
6. Sectors relevant to the fulfilment of long-term objectives, for example, the LULUCF sector, when zero emissions or carbon neutrality goals have been set for 2050.

When using these criteria, or any other defined by the country to prioritize reporting categories, it must also be **documented, justified, and transparently included in the report.** It is also important to consider that, for prioritized categories and for the national total, different tools or projection estimation models can be used, as long as the process is transparently documented.

10. However, if these categories are included in subsequent BTRs, they must be considered for updating the projections.

Once priority sectors have been identified, it is necessary to identify the technical capacities and tools available in the country, i.e., what types of projections, estimation sheets, or models have been used in these sectors at the national level; both at the governmental institutional level and in academia and research centres. For example, projections developed for projects under the NAMA Facility[11] , Forest Reference Levels[12], LEAP models[13] for the energy sector, to name a few.

A good practice is to involve different relevant stakeholders in the process of defining sectoral priorities for projection development, as well as to explore existing modeling tools.

The tools available at the national level must be reviewed, starting with identifying those that can be used and discarding those that are outdated or, if necessary, updating the tools to identify their consistency with GHG inventories (in terms of activity data and emission factors), their temporal validity, the human resources required for their development and review, as well as those that can be sustained over time. The process of updating projections will occur every two years, as part of the BTR.

The timeframe for projections must be defined; while the ETF sets 15 years from the last year of the inventory, estimating projections up to 2040 (with the last year of projections ending in zero or five), countries may also decide to extend the projection deadline to 2050, allowing them to have elements for planning and consistency with LTS.

Within the scope definition, it is also important to consider which scenario will be projected, i.e., whether only projections of existing measures will be made, WEM scenario (the only mandatory under the MPG), that could be aligned with the unconditional NDC scenario, or whether it will start from the estimation of a "Business as Usual[14]" scenario, i.e., without considering the implementation of measures (WOM), or whether an additional measures scenario (WAM) will be developed, in some cases this could correspond to the NDC conditional scenario. For some countries, it may be relevant to include non-mandatory WOM and WAM scenarios according to the context and individual needs and capacities (more details in the Scenarios section under the ETF).

11. https://transparency-partnership.net/system/files/document/201802-NAMA%20Tool-EN_0.pdf

12. https://redd.unfccc.int/fact-sheets/forest-reference-emission-levels.html

13. https://www.fao.org/4/AD549E/AD549E00.htm#:~:text=LEAP%20is%20an%20energy%20planning,the%20future%20under%20certain%20assumptions.

14. Under the Enhanced Transparency Framework, a Business-As-Usual (BAU) scenario can be a No Measures (NM) scenario or a With Existing Measures (WEM) scenario. It is important to review the definition that each country will apply based on its national circumstances.

Some of the key questions to consider are:

- What will be the categories for which projections will be developed?
- How will total projections be estimated, as an aggregate of sectoral projections or independently?
- In the case of sectoral projections, which sectors will be prioritized for efforts?
- What tools are available in government institutions, sectors, research institutes, or academia that can be used to develop projections?
- What additional information is available as a starting point besides the GHG Inventory data?

2. Data collection

One of the critical points for developing projections is the collection of data and parameters to be used. In principle, two types of inputs will be needed: retrospective data for calibration and prospective data that will define changes towards the future.

Historical data should initially consider activity data and emission factors from the most recent national GHG inventory and can be supplemented with national statistics.

Prospective data will be used as a starting point to understand and define some characteristics of our projections. These may include:

- **Population growth:** the result of national projections or international projections, such as those from the United Nations (https://population.un.org/wpp/).
- **Economic development:** mainly from national statistics.
- **Energy demand:** from national statistics or international sources such as the International Energy Agency (https://www.eia.gov/).
- **Technological development:** there are no defined statistics; however, assumptions about the level of penetration of these new technologies in future years can be included, as well as expected performance.

It is preferable to use official national data, i.e., those recognized at the national level and used for international reporting. In some countries, there may be different series of national data with different update dates; it is a good practice to use those recognized as official, and if other national sources are chosen for being more up to date, then the data selection process must be documented.

Close collaboration with the teams in charge of compiling and elaborating the GHG inventory will allow both data collection and tool selection to be aligned with lessons learned from past experiences.

Identifying together with the sectoral inventory specialists the drivers of sectoral emissions will increase the transparency and consistency of the projection estimates.

Regarding emission factors, they must be consistent with those used in the GHG inventory. For some categories, this may involve using the same data, and for others, modifications may be made based on forecasts of technological changes or other variables, which should be documented with traceable assumptions, i.e., transparent documentation.

In addition to the general identification of necessary data, for each of the sectors or categories considered, variables that influence GHG emissions and the change in the variable's behaviour should be identified; that is, the drivers of sectoral emissions, which depending on the projection estimation tool, will play a very relevant role.

A good practice to ensure the quality of projections (regardless of the estimation method) is to achieve consistency with GHG emissions estimated in the last historical inventory for the last year or for the last years of the inventory. This requires reviewing whether future activity data and emission factors show a development explainable from historical values.

3. Select a projection tool

Once the scope of the projections has been defined and the available information identified, and when necessary, the information has been reprocessed, the next step is to select the tool that will be used to estimate the projections, according to the sector and the tools available in the country.

Estimating projections requires a broad technical understanding of different types of variables, as there are no standardized methodologies for estimating GHG projections since they depend on variables and intrinsic decisions of each country. However, there are several calculation and modelling tools that can assist with their estimation. It is important to consider that different tools help to answer different questions or "perspectives" when estimating GHG projections. The section "Methodologies for developing projections" focuses on providing elements to select the projection estimation tool and includes types of existing tools and examples of sectoral models.

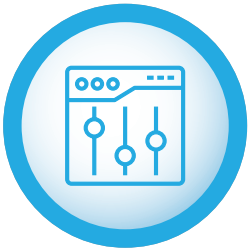
There is no "best tool or model," as each model is built to help the modeller answer a specific question or set of questions. The choice of tool should consider different factors related to the objective of the projections and the limitations of each tool (see section Methodologies for Developing Projections). Limitations may be related to the data needed for a specific model, human, financial, or technological resources (use of paid software), as well as the expertise required to configure and execute the model and interpret its results. This implies that, even if the same category is to be modelled, the same tool will not always be the best option for two different countries.

It is a good practice to select tools on a sector-by-sector basis, considering the importance of the sector both presently and in the future, as well as the availability of data, resources, and capacities.

Some of the elements to consider when selecting the tool to develop projections are:

1. **Available data:** Available data are directly related to the resources and experience available. As mentioned earlier, greater detail does not necessarily improve the quality of projections if the data becomes more uncertain. The level of breakdown, the type of model, and the approach followed should be guided by the specificity and type of available data.
2. **Resources and experience:** Depending on the modelling approach, the chosen software, and the degree of complexity, the resource intensity for compiling projections can vary greatly. There may be an interest in using the most sophisticated modelling approach available, but caution should be exercised in selecting the approach that best utilizes local knowledge, experience, and skills. This local knowledge will be invaluable in helping to understand the uncertainty surrounding the inputs and, therefore, working to reduce it.
3. **Financial resources:**
    - **Cost of modelling software:** Special attention should be paid to whether it requires a licensing fee, a one-time payment, or if its use is free. Hardware requirements should also be considered, as additional hardware or cloud storage may be required, leading to additional costs.
    - **Operating costs:** If the team and human resources available can update the estimates, or if additional resources will be required to hire external staff every time a new estimate or update is made.
4. **Simplicity:** The more detailed a tool is, the more data, calibration time, and much more specialized equipment it will require.

A key aspect is to identify the tool that is suitable for our national reality, i.e., that is cost-effective and affordable with the country's data, not necessarily the use of models is the best option, a well-documented systematized tool based on linear regressions may be the most appropriate tool.



4. Assumptions and calibration

Once the scope has been defined, the available data identified, and the tools to be used selected, projections should be estimated. This should be an iterative process, requiring adjustments and re-estimations.

One key aspect to consider (although it will depend on the selected tool for the projections) is to calibrate a reference year or a historical period to adjust the projections. The definition of the baseline year is a country decision; however, it could be aligned to 2015 to be aligned to the PA, some common years used as baseline years are 2010, twenty years after the first reporting year in their GHG inventories or 2020 aligned to the submission to the first NDC.

During the estimation process, it is important to conduct participatory consultation schemes with sectoral experts to obtain feedback. These experts should include the team responsible for preparing the inventory, who can provide elements for alignment between historical data and future estimates. This adjustment process may require several rounds of estimation and be one of the most complicated processes. Assumptions and adjustments made during this step must be documented, as well as any elements that did not fit the model or were identified as errors, to prevent them from recurring in the future.

5. Uncertainty and sensitivity analysis

The objective of assessing uncertainty in projections is not to question the validity of the estimates, but to prioritize efforts to improve the accuracy of future projections and guide decisions on methodology selection, contributing to the process of continuous improvement (IPCC, 2003).

The development of projections inherently involves a certain level of uncertainty because it is based on assumptions to project variables and necessary rates of change for future projections, as well as defining theoretical assumptions about the future situation. None of these elements are completely certain, therefore, each of these variables must be evaluated. Estimating uncertainty is necessary regardless of the methodology or model used for the development of projections.

In the case of some source categories, the lack of specific growth projections or a poor understanding of future emission factors will increase the uncertainty associated with the estimates presented. **Better understanding the uncertainty associated with projected estimates is an important step to prioritize future work and improve the overall quality of projections.**

The uncertainty of an emission projection could be considered very similar to that of an inventory, assuming we have a perfect forecast of future evolution, which is not the case. Uncertainties are induced because it is not possible to predict with absolute certainty any of the economic, technological, or legislative developments, confusing the picture if they are not worked on in terms of sensitivities. This is the main reason for proposing different policy scenarios (and possibly different economic scenarios and different hypotheses about technological evolution). These different scenarios essentially show the sensitivity of the projection to these different possible future developments and incorporate into different assumptions.

Additionally, it is important to recognize that projections, being based on other projections such as population growth rates (or future population), expected trends in economic development or technological change, inherently carry a certain level of uncertainty, which when combined with additional sectoral variables adds variability. One way to strengthen this process is precisely through integrated sensitivity and uncertainty analysis. This is extremely relevant for developing countries, which tend to have more volatile economies and are vulnerable to external disturbances that are not always captured within the estimation of a projection (World Resources Institute, 2005).

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6. Quality control and quality assurance

The activities of Quality Control (QC) and Quality Assurance (QA) must be applied to both the parameters (activity data, emission factors, and rate of changes) and the projections themselves. This process should be similar to that carried out for GHG inventories.

QC is a system of routine technical activities to evaluate and maintain the quality of emission projections as they are compiled. It is conducted by the same personnel involved in developing the projections. The QC system should be designed to:

- Provide routine and consistent checks to ensure integrity, completeness, and adequacy.
- Identify, correct, or document errors and omissions as elements for improvement.
- Systematize the materials used and ensure future replicability.

Quality control activities may include general methods such as precision checks in the use of data and estimates, which involve using approved standardized procedures for emission and removal calculations, measurements, uncertainty estimation, information storage, and reporting. Quality control activities should also include technical reviews of each reported category, activity data, emission factors, and other parameter estimates and methods.

QA is a planned system of review procedures performed by individuals who have not directly participated in the process of developing the projections, also known as third-party review. Unlike QC, which can be carried out during the process of developing the projections, QA must be performed once the process is complete.

The overall objective of both processes is to ensure that the projections developed represent the best estimates of future emissions and removals considering the available information, capacities, and resources. It is recommended to develop a quality management plan based on those developed for GHG inventories[15] , which should include roles and responsibilities, a schedule, and a guide to reviewing key points.

It is important to ensure that the resulting emission projections have a QC/QA like that applied to the GHG inventory. It is a good practice to check the following:

- **"Integrity":** Included sources of emissions and removals.
- **"Consistency":** Consistency in the time series (including historical to projected).
- **"Accuracy":** Errors in the application of assumptions or biased assumptions.

15. Such as: https://transparency-partnership.net/system/files/document/GIZ%20(2017)_Guidance%20for%20national%20technical%20teams%20for%20GHG%20inventories_Spanish_0.pdf

Not only under the ETF, but also as a good practice, the development of projections and their documentation process should consider the IPCC principles (IPCC, 2006). The key objectives of QC/QA for projections should **ensure compliance with the principles of Transparency, Completeness, Consistency, Comparability, and Accuracy,** and that the projections are characterized by:

- **Transparency:** In the methods, assumptions, and data sources used to compile projections, and in the inclusion of policies and measures, identifying the start year of implementation of actions, and other national assumptions (e.g., population, GDP, energy prices, carbon prices, etc.). Transparency in documentation should be sufficient and clear to allow stakeholders to understand and replicate the projections made. This includes documentation of assumptions and information used.
- **Completeness:** Of projected emissions and including all emissions/removals from all UNFCCC categories, assumptions, and socio-economic policies and measures for all required years, categories, gases, and scenarios. While all categories must be reflected, the level of detail and complexity do not necessarily need to be the same for each category. Projections include (as far as possible considering flexibility mechanisms) all emission and absorption categories, and all gases.
- **Consistency:** For trends in emissions and parameters between historical and projected estimates, and internal consistency in the aggregation of emissions. It should be consistent in estimating the time series by category and gas. It must be also consistent with inventory estimates (considering calibration with historical data or source data).
- **Comparability:** With other projections using reporting templates (templates corresponding to the NDCs of the Paris Agreement are currently being developed); in addition, consistency should include comparable measurement units such as CO_2 equivalent.
- **Accuracy:** Refers to the application of methods, use of data sources, and inclusion of national assumptions as reported in the BTR. The estimation of projections should neither overestimate nor underestimate scenarios and to the extent possible, they should minimize estimates.

The IPCC principles include a fifth principle, Comparability, however, this principle does not fully apply to the development of projections considering that there is no standard methodology. However, comparability in this case will be linked to reporting the results of projections in the specific reporting tables and formats Decision 5/CMA3, Annex 1, Tables 7 to 11 should also include comparable measurement units such as CO_2 equivalent.

7. Documentation process

The documentation process should be carried out during the development of the projections. However, it's important to designate specific time for internal documentation, communication documents and the reporting requirements under the UNFCCC such as the Common Reporting Tables (CRTs). **Documentation contributes to transparency, allowing access to information for replication, communication with relevant stakeholders, and reporting national and international commitments.**

These reports should include sufficient technical information to enable readers to understand the assumptions used and reconstruct the projection calculations for each estimation made.

As of today, there are no specific guidelines on how the projection report should be structured (beyond the ongoing guidelines for reporting tables). However, some of the elements that should be included in the report are:

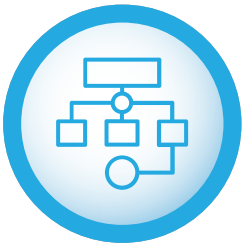
- Detailed data to aid transparency, including values and sources of activity data used, growth factors used, emission factors, reporting level (tier), sector definitions, sector stratification, assumptions made to derive future emission factors, and any national circumstances influencing the projections.
- Description of the methodology followed for each sector.
- Information on quality assurance and quality control performed.
- Lessons learned, presenting any significant issues related to data quality, methods, or processing and how they were addressed or are planned to be addressed.
- Identification of areas where introducing new improvements would be beneficial.
- Contact information to obtain data sources, if applicable.

Below is a proposed outline of the information to be integrated when documenting the process and results of the projections. It's important to note that it's not necessary to copy or transcribe information found in other sectoral reports; including links to public reports is sufficient if the information is transparent.

1. **Introduction:** including the background of the GHG inventory, a description of the overall results of the projections, and the mitigation measures considered.
2. **General elements:** institutional arrangements for projection development, explaining where the national social, economic, demographic, and technological projections used originated from.
3. **Emission projections:** description of the methodology used for each sector, the data, assumptions, results obtained, and uncertainties for different scenarios.

Under the ETF in Decision 5/CMA 3[16], Common Reporting Tables have been defined in Annex I for the electronic reporting of information from national inventory reports of anthropogenic emissions by sources and anthropogenic removals by sinks of greenhouse gases. Parties must follow these reporting tables in the BTRs. Specifically for projections, tables 7 to 11 must be considered.

It is important to consider that, during the process of reviewing the BTRs, the focus will be on completeness (as established in the decisions of the UNFCCC), and on transparency. This implies the need for sufficient explanations about the sources, methods, models, and assumptions used in the projections.



8. Planning and Continuous Improvement

Once the scenarios of projections have been documented and reported (within the BTR), it is important to take time for reflection to **initiate the planning of activities for the next projection cycle.**

The process should begin with the identification of findings, as well as critical points, gaps, and areas for improvement identified during the projection development process. For a systematic process of continuous improvement, it is recommended that desired improvement points be identified for each of the previous steps.

Continuous improvement may be directed towards the following elements:

- Developing detailed projections for additional sectors (categories, gases) beyond those already developed.
- Enhancing the level of detail of the tools used for emissions estimation, meaning utilizing more complex models.
- Reducing the uncertainty of projections.

Additionally, recognizing that it is an integrated process within the country's climate policy, continuous improvement also includes elements of constant updating:

- Updating or recalculating estimates based on improvements made to activity data and emission factors of the National GHG Inventory.
- Including new or additional mitigation measures according to activities being undertaken in the country.
- Monitoring and improving estimates using recalibrations based on the results of mitigation measures implementation.

16. https://unfccc.int/sites/default/files/resource/cma3_auv_5_transparency_0.pdf

Creating a continuous improvement plan contributes to the elaboration of the section on "Information on the financial, development, and technology transfer support and training necessary and received[17] " of the BTR. Having a systematic process facilitates access to international financing as requests are made based on evidence or findings arising during the projection development process.

Finally, and no less important, **identifying the training needs of human resources is essential.** This is aimed at enabling national teams to become increasingly autonomous in conducting projections within national government institutions.

17. https://unfccc.int/files/portal_espanol/application/pdf/cross_cutting_issues__2_(31_oct_2013)_v06_es_rv_ea_manual.pdf

04 Methodologies for Developing Projections

A GHG emissions projection is a representation of a country's future GHG emissions scenario based on a series of assumptions that use historical information, primarily referencing what has been reported in the National Inventory Reports (NIR) submitted to the UNFCCC.

Depending on the needs, capacities, existing national information, as well as policies that have been implemented or planned for implementation, **each country will determine the type of projections to develop.** It is worth noting that under the ETF, it is required to include WEM projections[18]. It is important to acknowledge that each country may have a different starting point when beginning the development of projections, and therefore, the path each country will take will be different and may consider different levels of complexity in the methodology of their projections, which we will refer to as degrees[19]. It is possible to start with linear regressions and gradually transition to more comprehensive and complex methodologies until reaching the use of models.

Methodologies for Developing Grade 1 Projections

Grade one projections are the simplest and are primarily based on historical GHG emissions reported in GHG inventories and statistical information from the country. The tool for developing these projections can be a spreadsheet (e.g., Microsoft Excel) or some other statistical program like R, Python, or STATA. **The choice of tool will depend on the technical capabilities of the country.** The methodology used for the projections will be linear regression. Projections based on linear regression can be made for each sector or subcategory of the IPCC.

Developing projections from linear regression is a data analysis technique that predicts the value of unknown (future) data by using other related and known data (including GHG emissions and other socio-demographic variables). In linear regression, the unknown or dependent variable is mathematically estimated based on an established correlation with one or more known or independent variables through a linear equation. In other words, we have data on GHG emissions and the main historical drivers. Linear regression techniques analyse this data and determine and calculate future emissions based on these variables.

The key to this projection methodology is to identify those economic, social, technological, and demographic variables that will allow us to propose the future scenario to be modelled. Among the most common variables will be Gross Domestic Product, population growth rate, and energy demand, which will allow us to define these scenarios for the projections.

18. However, there are flexibility mechanisms for those countries that require and request them.

19. We will call them "degrees," to distinguish them from the "Tier/levels" in greenhouse gas emissions estimation methods in GHG inventories.

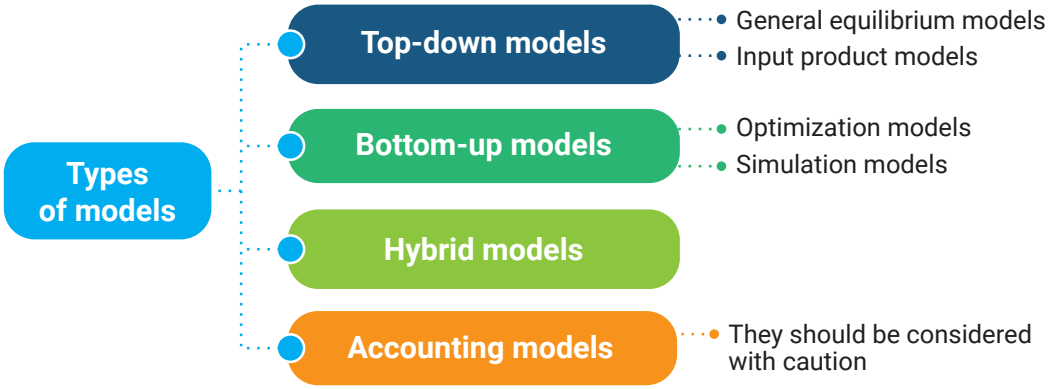
Methodologies for Developing Grade 2 Projections

A next level of complexity for developing projections involves using sectoral models, understanding a model as a series of interrelated mathematical equations that allow us to represent and project the relationship between different variables and parameters through a series of constraints and assumptions. Each available modelling tool can answer different questions when developing them. We can categorize models into four different types:

- **Top-down models** start from aggregated macro variables (e.g., energy supply and demand).
- **Bottom-up models** start from disaggregated variables such as technological options or climate change mitigation policies that are specific to each project.
- **Hybrid models** use a combination of Top-Down and Bottom-Up approaches.
- **Accounting models** include descriptions of key performance characteristics of systems (e.g., an energy system), allowing users to explore the implications of decisions on resources, the environment, and social costs. They are often less complex than models included in the other three categories and may therefore be an easier starting point for compiling GHG projections if there is no previous experience. However, these models have not been designed to make projections, so the results should be considered cautiously and reviewed by national experts.

With all models, GHG emissions are still projected using the basic approach of activity data multiplied by an emission factor. Activity data will often be estimated through a model; for example, a model could calculate energy demand in the economy as a whole or in specific sectors under certain conditions. Emission factors are often input into the model, for example, as emission factors for specific fuels or emission factors for process emissions when using a specific production technology (e.g., related to cement or steel production).

Figure 5. Model Classification



Source: own elaboration

General Equilibrium Models

A Computable General Equilibrium (CGE) model allows for simulating the core interactions of an economy. It assumes of an efficient allocation of goods and services, achieved through a set of decisions that balance supply and demand and coordinate production. The starting point is that all economic agents optimize their behaviour, and price mechanisms work by equalizing the supply and demand of goods and inputs. Generally, they represent economies well in the long term, although the representation of technological change is a weakness.

The use of these types of models does not directly result in GHG emissions. The process must simulate mitigation measures within the general equilibrium model, which will result in activity data. This activity data is used to estimate GHG emissions using the emission factors available in the National GHG Emissions Inventory.

Input-Output Models

Input-output models analyse interdependencies between sectors or economic industries. This allows, for example, evaluating the impact of a sectoral measure on the rest of the industries. Like with CGE models, the model's calculations will provide activity data that will form the basis for estimating emissions in the projections.

Optimization Models

Optimization models aim to reach an optimal or preferred solution based on a specific objective, resulting in the elements that need to be modified to achieve it. One of the challenges of these models is the need for detailed system information, and for better results, they should be applied to specific situations, such as subsectors or subnational levels.

These models are often used to represent countries' energy systems that want to analyse a set of technological options. Care must be taken when analysing the results of these models, as they are isolated and do not consider the effects they may have on other economic sectors, underestimating transaction costs. Depending on the model used, it may directly result in GHG emissions or, as in the previous cases, only provide activity data for subsequent estimation.

Simulation Models

These models simulate the behaviour of a system under a series of predefined parameters (e.g., energy consumption). They allow creating scenarios to estimate different options and compare them. Simulation models may include models of energy supply and demand technologies, including end-use, conversion, and production technologies, and therefore require some technical expertise to set up the model correctly.

These models are relatively simple, have a better response for modelling in the short or medium term, and are useful for comparing different measures. However, they may not be the best option for long-term projection development.

Hybrid Models

This category refers to the possibility of combining models, i.e., considering both approaches. This can be extremely useful when exploring possible paths to deep decarbonization or establishing long-term goals. However, the combination of these models must be used considering the uncertainty associated with each of them; otherwise, highly volatile estimates could be obtained.

Accounting Models

Accounting models are often simpler to use and require less data in a less detailed approach. They serve as a starting point for sectoral projections for countries with limited experience in modelling. There is a wide range of such tools that can include preloaded data and measures based on international databases, to those that can be adjusted by the country according to its needs.

Some examples of these tools are:

- LEAP: https://leap.sei.org/
- PROSPECTS+: https://newclimate.org/2018/11/30/prospects-plus-tool/
- EX-ACT: http://www.fao.org/tc/exact/ex-act-home/en/
- GACMO: https://unepccc.org/gacmo-tool/
- FABLE: https://iiasa.ac.at/models-tools-data/food-agriculture-biodiversity-land-and-energy-fable-scenathon
- GEM: https://www.epa.gov/regulations-emissions-vehicles-and-engines/greenhouse-gas-emissions-model-gem-medium-and-heavy-duty
- TIMES: https://iea-etsap.org/index.php/etsap-tools/model-generators/times

Each of these accounting tools has been developed to address a series of specific questions, so when used for projection development, it is necessary to identify and review the limitations of each.

Additionally, the UNFCCC has developed MITICA (https://gauss-int.com/mitica/), a tool designed to help Parties to the Paris Agreement develop greenhouse gas (GHG) emission scenarios based on their national GHG emission inventory.

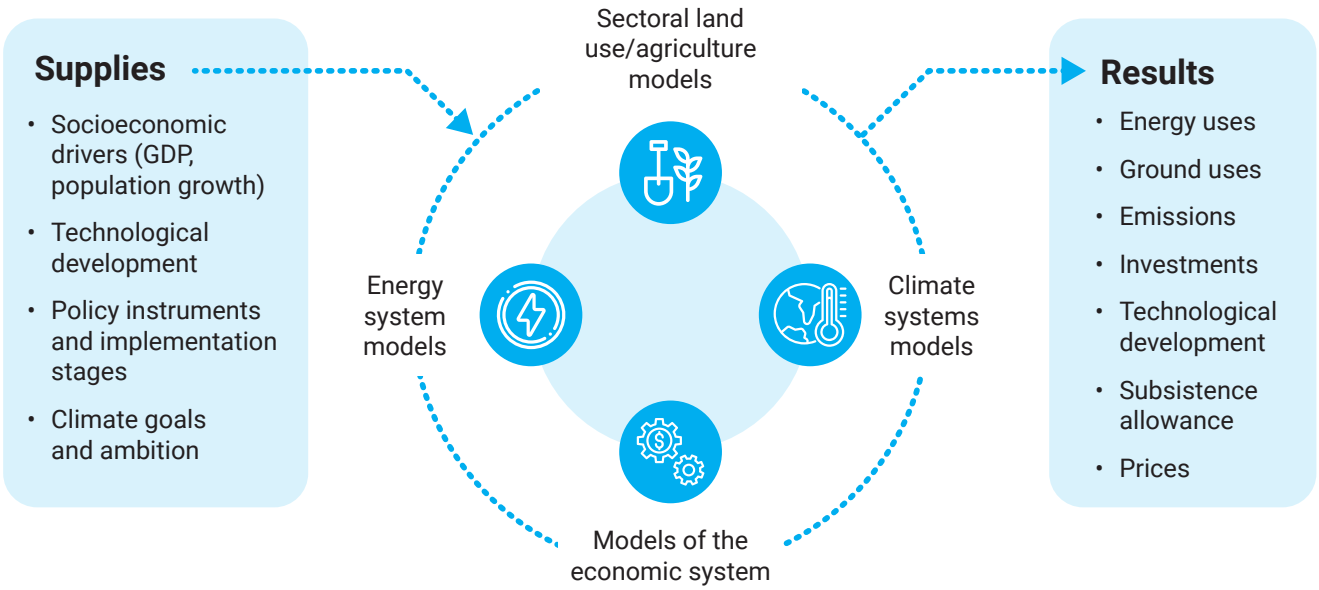
MITICA uses the national GHG emission inventory along with economic proxies to establish a WOM (Without Measures) scenario. Building on this baseline, a set of Policies and Measures (PAMs) can be defined and incorporated into the tool to create mitigation scenarios to evaluate GHG emission levels considering the impact of these PAMs. This approach allows for the creation of WEM (With Existing Measures) and WAM (With Additional Measures) scenarios. **This tool covers all IPCC sectors.**

Methodologies for Developing Grade 3 Projections

A third approach is the use of integrated models; that is, not only developing projections through sectoral models but using the results of sectoral models to feed back into each other. This will allow for a better representation of the future emissions situation of an economy, recognizing that sectors are integrated into reality. For example, integrating biomass energy demand projections with emissions estimates from the LULUCF sector allows for a better understanding of sector reductions.

Integrated Assessment Models (IAMs), as mentioned earlier, allow for a better understanding of the existing interactions between different sectors and emission categories, which in turn reflect interactions in the economy and society. In general, an IAM consists of a series of sectoral models that are intertwined with each other (not all IAM modules can be run independently) (Carlin, 2023).

Figure 6. Integrated Assessment Models



Source: own elaboration

IAMs are not necessarily the solution for developing projections for all countries, not only because data may or may not be available, but also because it is necessary to ensure that the investment (financial, time, and capabilities) required for the IAM to represent the country's reality will be sustainable over time. Otherwise, this type of model may not necessarily be an appropriate solution.

Some examples of models that can be used for this purpose are:

- MAGIC: https://magicc.org/
- PRIMES (Energy System Model): https://e3modelling.com/modelling-tools/primes/#
- GAINS: https://gains.iiasa.ac.at/models/index.html
- GLOBIOM: https://iiasa.ac.at/models-tools-data/globiom
- CAPRI: https://www.capri-model.org/dokuwiki/doku.php?id=start
- MESSAGEix: https://iiasa.ac.at/models-tools-data/messageix
- MARKAL: https://iea-etsap.org/index.php/etsap-tools/model-generators/markal

Alignment with GHG Inventory

One of the objectives of projections is to represent future GHG emissions. Therefore, we must align the estimates made in the models with the accounting rules and assumptions used in our GHG inventories.

One way to achieve this alignment is through a calibration process. Some recommendations for carrying it out include:

- Matching the input activity data of the model with the data from the last year of the inventory, or with the appropriate data for the estimates.
- Using the same emission factor to estimate GHG emissions, except in cases where the mitigation measure specifically affects a technological change related to emission estimates.
- Identifying specific sectoral emissions reflected in the model and adjusting based on historical data.

Additionally, for models, it is essential to harmonize assumptions such as population, land area, production, livestock heads, and energy matrix, among others. In countries, we may have different sources of sectoral statistical information, so it is important to use information consistently with that used in our GHG inventory. Another key element is documenting the process by which the model has been calibrated to make it comparable or equivalent to historically estimated GHG emissions. Including a description of the assumptions and methodological basis applied is particularly important (UN-REDD+ Programme, 2022).

When choosing an option for a particular sector, where there are no previous estimates or methodologies, it is recommended to start with the simplest approach and establish a baseline before modelling any particular scenario or measure. This will allow us to determine if this scenario aligns with our historical information, or if adjustments need to be made before including mitigation measures.

Once we are satisfied with the baseline scenario, it is imperative to document which policies/measures/actions will be included, as well as specify the assumptions considered. This must be done for each type of projection and scenario performed (WOM, WEM, and WAM).

05 Scenarios under the ETF

A Scenario is a coherent, internally consistent, and plausible depiction of a possible future state of the world; it is not a forecast. However, each scenario is an alternative of a future situation (IPCC, 2023). Therefore, as many scenarios can be developed as situations or conditions we wish to know about. However, there are three relevant scenarios (Figure 7) for the development of BTRs: the scenario with existing measures (WEM), the scenario without measures (WOM), and the scenario with additional measures (WAM), and only the first of these is mandatory.

The **scenario with existing measures (WEM)** represents GHG emissions based on the overall impacts of mitigation measures adopted and implemented (with an allocated budget and actions currently taken on the ground). It is very important in this scenario to consider the start dates of mitigation measures, which may vary for each sector. This scenario is mandatory, nevertheless flexibility provisions could be applied.

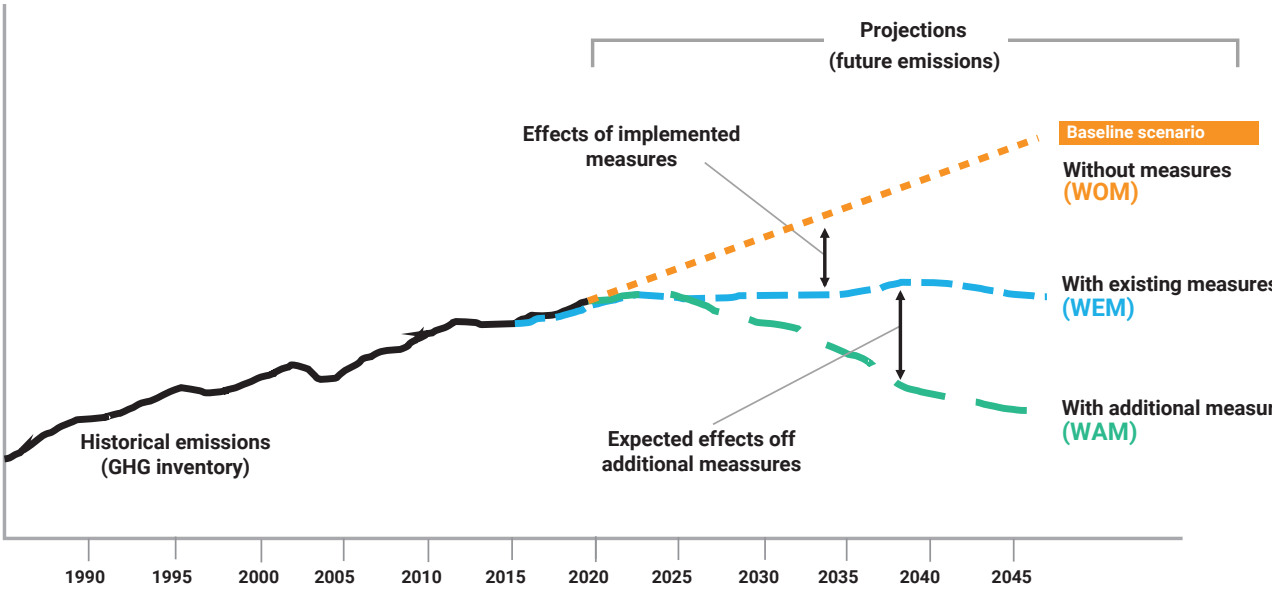
The **scenario without measures (WOM)**, also known as "Business as Usual" (BAU), is one in which future emissions are projected based on historical trends and assuming that the activities carried out remain the same and no mitigation measures are implemented (and in many cases also assumes that no measures have been implemented). This scenario is relevant because many of the emission reduction commitments outlined in the NDCs refer to a percentage reduction in emissions against this type of scenario. For example, Mexico's 2022 NDC sets a commitment to reduce 35% of its emissions by 2030 compared to its baseline.

The **scenario with additional measures (WAM)** reflects the potential scenario if additional measures were implemented in addition to those currently existing. This scenario can reflect the emission reduction potential if additional conditions are met, such as additional financing; for example, it can represent a conditional scenario of the NDCs.

As mentioned, the only mandatory scenario is the WEM; however, each country must consider which scenarios are most relevant for its climate change policy framework. Since a WOM scenario may be essential for aligning its BTR with the commitments established in the NDCs and the LTSs.

> *A good practice to consider whether to include the WOM scenario is to review whether any of the national climate policy instruments such as the NDC or the LT-LEDS include it. If so, it is relevant to update and include it in the BTR to maintain consistency.*

Figure 7. Scenarios under the ETF



Source: own elaboration (IPCC, 2006)

Mitigation Measures by Scenario Type

The scenario with existing mitigation measures is required by the MPGs to be included by countries in the BTRs. This scenario should reflect the current situation of the country, considering that mitigation measures have already been implemented, not only but primarily linked to the NDCs. That is, this scenario reflects the actions that the country has implemented, considering that they have: an allocated budget, are defined in a regulatory or programmatic framework, and have implementation actions in the territory. The last reported year in the inventory can be defined as the cut-off date for the implementation of the measures (and include them within this scenario), thus maintaining consistency between the two instruments.

For the scenario with additional measures, all measures implemented after the last year of the inventory can be included to maintain consistency with the assumptions defined in the WEM scenario, as well as all measures that are in planning for implementation. This includes, for example, measures that are in legal or programmatic frameworks but do not yet have an allocated budget or are waiting for implementation on the ground for some reason.

Considering the above elements, it is important that each country documents and explains within its report which measures have been included under the WEM or WAM scenario and the assumptions around this decision.

Regarding the WOM, different approaches can be considered. The first is to take a reference scenario that has been previously developed as a BAU scenario (usually when countries have defined their emissions reductions by 2030 as a percentage

against a baseline of a given year), or a reference scenario can be constructed based on historical information up to a certain year. For example, all measures implemented before 2010 (or the year the country defines) will be considered as BAU and not as implementation of mitigation measures.

Countries may opt for a different approach when they consider it appropriate for their national circumstances. **The main element to consider is clear, transparent, consistent, and robust documentation that allows understanding how the classification of measures was carried out in each of the scenarios.**

06 Cross-cutting Elements

Integrating the process of developing projections into a country's existing climate policy frameworks is important to reduce duplication of efforts and make the process efficient in terms of human and financial resources.

Institutional Arrangements for Developing Projections

Efforts should be made to avoid duplicating data collection, processing, or generating additional information, but also to integrate a holistic approach between the sectors and how the PAMs from the different sectors could affect other sectors (for example, the increase of use of biomass for energy could affect LULUCF sector). Close collaboration between national statistical teams, inventory technical teams, and those responsible for developing projections is essential. It could also be considered that these teams are composed of the same participants, or at least integrated by joint representatives.

Depending on national circumstances, institutional framework, and flexibility provisions established for transparency purposes to comply with the UNFCCC and the PA, this can represent an opportunity for subnational entities and other stakeholders to be involved in providing information, collecting, analysing, or interpreting more detailed or specific information. Collaboration agreements designed under these mechanisms can also help statistical services and other organizations to expand their coverage. **It is important that during the process, data reliability and temporal and spatial coherence are ensured.**

It is not necessary to create an additional unit for developing projections; instead, existing teams and institutions should be strengthened to undertake these complementary activities. It is recognized that cross-cutting coordination is a challenge, but it will be key to developing projections that reflect the country's efforts in implementing measures.

Although some countries have identified and defined a national transparency system to help improve data reliability and coherence, key elements for developing projection estimates and sectoral policies, these transparency systems must be aligned with reporting and monitoring frameworks developed earlier, such as MRV systems.

Institutional agreements are focused on national institutions and how they can reduce the effort, enhance transparency, and improve the reporting efforts, nevertheless, this could include the integration with international corporations working in the country and design and implement peer cooperation among other countries to share lessons learned and develop knowledge networks.

Time Series

The time series is an important component of greenhouse gas projections because it connects them with the GHG inventory, provides information on historical emission trends, and tracks the effects of mitigation measures to reduce emissions at the national level. Emission trends should not be overestimated or underestimated.

It is a good practice for GHG projections to start with the most recent GHG inventory, and GHG projections should be calculated consistently with activity data, emission factors, or technological changes as appropriate. All emission estimates in a time series should be estimated consistently, meaning that, as far as possible, the time series should be calculated using the same method, parameters, and data sources (i.e., models) in all years. Different methods and/or different data in a time series could introduce biases because the estimated emission trend will reflect not only actual changes in emissions or absorptions but also the pattern of methodological improvements. However, different approaches can be considered in different sectors.

Long-term Technical and Financial Sustainability

It should be considered that the development of projections (like other processes) is a cyclical process, so the choice of method, data, or estimation tools should take this into account. While budgets in many countries are annual, we must consider whether existing resources are recurrent or whether exceptional funding or project-based funding is available for the preparation of BTR or projections. Considering financial sustainability schemes for the recurrent preparation of projections is key.

With the transparency and international cooperation mechanisms supported by the UNFCCC, there [20] are (and will be) financial mechanisms for the development of BTR. Specifically, regarding sustainability, countries are recommended to consider the following questions:

- What national teams do I have that can develop projections without the need to hire an additional team?
- In case of hiring an additional team, how long can I maintain that team?
- Is the tool or software we will use for projections a one-time payment? Or should financial resources be considered for its maintenance and recurrent use?

20. The Global Environment Facility offers financing for the development of a cycle of 2 BTRs, that is, BTR1 + BTR2/CN (https://www.thegef.org/events/webinar-gef-support-biennial-transparency-reports-financing-and-access-modalities).

Guiding Principles of the modalities, procedures, and guidelines MPGs

The guiding principles of the MPGs established in the PA are a framework that provides a better understanding of the implementation requirements. These are:

1. **Leveraging and improving transparency provisions of the Convention, recognizing the special circumstances of Least Developed Countries (LDCs) and Small Island Developing States (SIDS).**

   Applying the transparency framework in a facilitative, non-intrusive, and non-punitive manner, respecting national sovereignty, and avoiding undue burdens on Parties. By recognizing country differences and allowing them to make their own decisions among the implementing actions they will rise.

2. **The importance of facilitating the improvement of information and transparency over time.**

   This framework provides different reporting tools such as the CRT, using these tools will increase the transparency and comparability among countries and allow the countries a systematized tool for their own tracking.

3. **Providing flexibility to developing country Parties as needed based on their capacities.**

   The flexibility provisions allow the countries to identify their knowledge needs and gaps, and to design a mid-term plan to improve their reporting. Countries can use the facility provisions as needed; it is recommended to design a plan to accomplish the identified reporting needs.

4. **Promover la transparencia, precisión, integridad, consistencia y comparabilidad.**

   La implementación de estos principios es un esfuerzo continuo derivado del informe anterior de la CMNUCC, más allá de ser una herramienta para el reporte internacional, también es una importante herramienta nacional para rastrear el progreso a lo largo del tiempo.

5. **Promoting transparency, accuracy, completeness, consistency, and comparability.**

   The implementation of these principles is a continuous effort coming from the previous UNFCCC report, beyond being a tool for international reporting is also an important national tool to trace the progress over time.

6. **Avoiding duplication of work and undue burdens on Parties and the Secretariat.**

   One of the objectives of the systematized formats for the BTR is to reduce the duplication of efforts for the Parties, the Secretariat, and the Technical Expert Review Team in the UNFCCC processes.

7. **Ensuring that Parties maintain at least the frequency and quality of reports in accordance with their respective obligations under the Convention.**

   Submitting every 2 years the BTR and every 5 years the NDC could be challenging for the countries however keeping consistency in the reporting periods will allow the countries to track the challenges and improvements over time. Implementing climate change reporting systems (aligned with the MRV, or any other country reporting system) and systemising the process will reduce the effort

8. **Ensuring that double counting is avoided.**

   Avoiding double counting in the reporting is a key element keeping consistency in the reporting categories of the GHG inventories will facilitate to avoid double counting, for example.

9. **Ensuring environmental integrity.**

   This involves reporting accurate and comprehensive greenhouse gas data with consistency for reliable tracking. Standardized methods ensure comparability across countries. Technical expert and peer reviews verify information and identify improvements. Developing countries have flexibility but must explain its use and plan for future enhancements. These strategies collectively uphold high standards of environmental integrity.

07 Projections in Latin America

Below are some examples of **how projections have been part of the climate policy of some Latin American countries**, specifically in the NDCs which include emission reduction objectives by 2030 and in the LCEs with objectives by 2050.

Projections used in NDCs

Considering the 168 NDCs submitted to the UNFCCC by December 2023, 85% present objectives based on GEI emissions, 9% present objectives not related to GEI, and 6% only present policies and actions without establishing goals (GEI or another goal not expressed in terms of GEI emissions).

GEI objectives are mainly linked to reducing or limiting GEI emissions over a specific period. Some examples are:

- Commitments to reduce or control the increase in emissions to a specific amount relative to a base year.
- Fixed-level commitment, to reduce or limit the increase in emissions to an absolute level of emissions in a target year or period (e.g., setting carbon budgets).
- Commitment to reduce emissions relative to a baseline scenario (Business as Usual).
- Commitments linked to emission intensity reduction, emissions per Gross Domestic Product, or per capita emissions.

Objectives not related to GEI emissions are framed in terms of specific, quantifiable objectives, desired outcomes in energy efficiency, renewable energy, forestry, or other sectors, and are not expressed in terms of GEI emissions or emission reductions. Objectives related to actions that do not involve quantitative objectives include, for example, the intention to increase sustainability, forest management, or promote methane capture, without establishing quantitative goals for these actions (which constitute objectives).

In the case of Latin American and Caribbean countries that have submitted their NDCs, most present emission reduction objectives linked to a reduction in a percentage of emissions relative to the usual level, followed by fixed-level objectives and absolute reduction or emission limit objectives in relation to a base year. In general terms, 50% of the countries in the region mention the construction of a reference scenario (BAU scenario) or the estimation of some emission projections by 2030 that have been used to define their mitigation commitments;

however, less than 10% of the countries make a specific mention of the model and assumptions used (more details can be found in Annex 1: Key Points of NDCs in Latin America and the Caribbean). There is foundational information in most countries, which can be used as a reference for developing projections. Overall, most countries define national objectives and do not disaggregate information by sectors. However, the sector that is most referenced is the energy sector, which is consistent as historically it has been the sector with the highest emissions.

The UTCUTS sector is the least mentioned. Nevertheless, this sector should gain high relevance not only when discussing emission reductions but also when beginning to think about long-term commitments and goals linked to carbon neutrality or zero emissions. It is necessary to integrate compensation or neutralization mechanisms for emissions that cannot be reduced.

Projections Used in LTS

Regarding LCEs, only eight countries in the region have submitted them to the UNFCCC. There are no guidelines or guides for the preparation of LCEs, so the preparation and presentation of information are much more open, and each country takes a different approach. However, what is consistent is that all present a goal for 2050. In the case of countries in the region, all seek to achieve carbon neutrality or be zero emitters, except for Mexico and Guatemala, which define a percentage reduction in emissions (for more information, see Annex 2: Key Points of LCEs in Latin America and the Caribbean). Regarding the scenarios to achieve their objectives, not all countries present them in detail, although some approaches used are as follows:

- Argentina describes the route in terms of policies and measures without detailing the scenario or the path to follow to achieve its goal.
- Belize presents detailed sectoral projections for 2050, presenting very comprehensive scenarios; however, it does not detail the methodology used or describe all the assumptions used.
- Colombia presents different decarbonization routes, mainly based on energy demands; it also presents three complementary scenarios for the UTCUTS sector, which allows understanding the strategy for carbon neutrality.
- Chile presents its strategy for 2050 based on sectoral carbon budgets, integrating the economy based on technological developments and the implementation of mitigation measures.
- Mexico presented the LCE in 2016, so it has a different approach. Although they mention the models used, they do not present sectoral routes or commitments for 2050, only a national aggregate.
- Uruguay includes scenarios for its emissions considering the main emission categories, i.e., those that represent 95% of its emissions; however, the methodology used is not detailed.

As can be seen, there are different advances and strategies for projections in the region, each based on the resources and information available in each country, which allows the construction of IBTs not to be from scratch.

08 Study Cases

As part of the activities developed in the Latin American region by the United Nations Environment Programme, within the framework of the Climate Transparency Platform (https://climate-transparency-platform.org/), a virtual seminar on Mitigation Commitments Planning: Greenhouse Gas Emissions and Removals Projections was conducted. During the seminar, the experiences of Argentina and Chile in their processes of developing the LCEs were presented, providing lessons learned and how challenges in the region have been overcome. The main findings are shared below, including key elements of the LCEs.

Argentina

In 2019, the general law on climate change was established, which mandates the presentation of a national adaptation and mitigation plan for climate change every 5 years. Argentina has submitted national communications, biennial update reports, and technical annexes on REDD+ under the Convention.

However, there are significant challenges regarding the management of these projections. High staff turnover and lack of adequate financing hinder the generation and sustainability of capacities and knowledge in the area. The complexity of models and lack of dialogue between academia and policy also represent challenges. Argentina presented its fifth biennial report and is working on improving documentation and transparency under the Paris Agreement.

Regarding the projections themselves, Argentina has not formalized a projection system, but the need to have one to meet various objectives is recognized. Scenarios have been developed in various sectors, such as energy, industrial processes (excluding the fluorinated gas component), agriculture and land use, and waste. Modelling has been simplified to facilitate work and has focused on key factors influencing emissions. However, there are challenges in using innovative methodologies in projection development.

Important lessons have been learned in this process. The existence of a solid legal and political framework is crucial to ensuring the continuity of efforts in climate change. Model simplification and collaboration with planning teams in ministries have proven to be effective. The connection between projections, mitigation measures, and adjustments under Article 6 of the Paris Agreement is an aspect to consider in the future. Additionally, work is being done on including costs associated with mitigation in the projection process.

Argentina – Technical Fact Sheet

General

The Argentine Republic has demonstrated a strong commitment to the United Nations Framework Convention on Climate Change (UNFCCC), by communicating two Nationally Determined Contributions (NDC) and an update until 2021, supported by five Biennial Update Reports (I WAS GOING). In addition, a Long-Term Low Emissions Resilient Development Strategy (ELP) to 2050 published in 2022. The main emissions sectors in the greenhouse gas (GHG) inventory cover energy, agriculture, livestock, waste management and manufacturing industry. As part of its initiatives to strengthen transparency and accountability, Argentina has implemented the National Greenhouse Gas Institute (INGEI) and the National Greenhouse Gas Information System of Argentina (SNI-GEI-AR).

Projected scenarios

No information found

Sectors

- Energy
- Agriculture
- Cattle raising
- Forest Land
- Waste

The projection of emissions and absorptions for 2030 was carried out using a simplified model consistent with the methodology and sources of emissions and absorption estimated in the INGEI 2016 reported in BUR 3.

Basic information

The base information for the National Greenhouse Gas Inventory (INGEI) in Argentina is derived from various key sources and processes. Inter-institutional collaboration, coordinated by the National Climate Change Cabinet (GNCC), and the participation of sectoral focal points are also essential. Argentina's National Greenhouse Gas Inventory System (SNI-GEI-AR) acts as a central component, facilitating the collection, validation, and compilation of robust and transparent inventories.

Generation frequency

The country works on scenarios every 5 years, in line with the general climate change law enacted in 2019. The presentation of national adaptation and mitigation plans every 5 years is a key component of this frequency.

Institutional arrangements

The country works on scenarios every 5 years, in line with the general climate change law enacted in 2019. The presentation of national adaptation and mitigation plans every 5 years is a key component of this frequency.

Chile

Chile's national foresight system stands as a pivotal tool in formulating and updating policies related to climate change. Its origins date back to 2015 when a series of foresight analysis exercises were initiated, laying the groundwork for its subsequent development. The system has proven to be of vital importance in shaping climate strategies and is framed within the Climate Change Framework Law, enacted in 2022.

This system is structured around close collaboration among public, academic, and private sectors. In its inception, foresight exercises were carried out in 2015, which were fundamental for the subsequent methodological construction and coordination of foresight analysis processes. The relevance of these efforts lies in providing a solid foundation for joint work between the public and private sectors in 2020, supporting planning and mitigation actions in the country.

The system is structured around different models and tools that allow for projecting emission scenarios by sector. The energy sector, for example, which accounts for around 80% of national emissions, is addressed by the Ministry of Energy, which has established tools due to its responsibility in long-term energy planning. Other sectors, such as agriculture and waste, are also incorporated into this framework, with collaboration from the Ministry of Agriculture and other agencies, using models that replicate inventory methodologies and consider determining variables in their behaviour.

The operation of this foresight system involves several challenges and processes. The participation of public and private actors in its construction and execution is crucial, and processes are distinguished based on their complexity and scope. Additionally, the system draws on various inputs, from economic data to survey results, which provide the necessary information for its functioning.

Chile – Technical Fact Sheet

General

Chile has demonstrated a solid commitment to the fight against climate change by submitting various documents to the Convention, including five Biennial Update Reports (BUR), a Nationally Determined Contribution (NDC)

in 2015 and its respective update. in 2020. The most prominent sector in its GHG inventory is energy, responsible for 77% of total emissions (Excluding LULUCF emissions). The AFOLU sector remains a net sink throughout the entire time series. Considering the existing systems for Monitoring, Reporting and Verification (MRV) together with the mitigation goals established in the NDC, the importance of the National Prospective System (SNP), the National Greenhouse Gas Inventory System in Chile, is highlighted. (SNICHILE) and the MRV of Mitigation Policies and Actions (linked to the Sectoral Mitigation Plans).

Projected scenarios

- Carbon Neutrality Scenario 2050 (or central scenario)
- Accelerated Transition Scenario
- Late Transition Scenarios

Temporary coverage
2010 - 2050

Sectors

Energy, IPPU, Agriculture, LULUCF, Waste

Models used

Not specified

Generation frequency

Not specified

Institutional arrangements

The Climate Change Framework Law was enacted on May 30, 2022. This legislation establishes a legal framework to address long-term climate change mitigation and adaptation, complying with international commitments to the UNFCCC and the Paris Agreement. Law 21,455 reinforces the institutional framework with the objective of achieving carbon neutrality by 2050 and increasing the country's resilience. This is achieved through the definition of principles, institutions, management instruments and financing mechanisms. In addition, it promotes citizen participation in the development of strategies to face the challenges of climate change.

09 Final Remarks

It is important to take into account national contexts as a primary starting point to fulfil what is established in the Paris Agreement. The Enhanced Transparency Framework is an instrument that provides elements to promote documentation, transparency, systematization, and make climate policy processes more efficient from design, planning, implementation, monitoring, reporting, and review to increase ambition.

The main challenge is to achieve the adequate articulation of the necessary processes to improve the reporting of climate policy instruments, which includes the development of projections aligned with both historical data from GHG inventories and mitigation measures established in climate policy.

It is important that the country's technical teams responsible for developing inventories, those developing tools or models to quantify the impacts of mitigation measures (and their monitoring indicators), those developing projections, as well as those responsible for defining climate objectives, work closely together to ensure consistency and coherence in the data, processes, and projections reported.

There is no single tool for developing projections; it must be taken into account that BURs will be prepared cyclically every 2 years; therefore, we must think about long-term sustainability and that it is correct to start with simple projections and gradually build towards more complex models that reflect the country's realities.

When starting to develop GHG projections, limited resources combined with limited experience and time can make it difficult to prepare projections with a high level of detail. In this case, countries should make the most of what is available, focusing on those categories that are most relevant to national GHG emissions or carbon sinks. Categories can be considered relevant when they account for a large proportion of historical emissions in recent years or because there is a strongly increasing trend.

It is appropriate to start with a simple or sectoral approach and design an improvement plan that allows outlining a path toward where efforts will be focused in the future; this is aligned with flexibility mechanisms under the PA. Improvements may include estimating projections for new categories or increasing the level of detail of those previously incorporated.

It is key to document the results obtained, as well as the challenges encountered in the process of developing projections, so that they are incorporated into the improvement plan of the BTRs and serve as a roadmap for future updates. These improvements require investment of time, human, and financial resources, so long-term planning is fundamental.

While all countries in the region have experience in reporting (within their national GHG inventories NDC or BURs), it is crucial to increase transparency, which implies greater openness, communication, and mutual responsibility. Increasing transparency does not seek to judge how well or poorly countries have implemented their mitigation measures, but to have sufficient information to identify how to improve results to meet the PA, through sharing information and participating in verification processes that are developed in a non-punitive and non-intrusive manner, generating mutual and shared trust.

Climate transparency has numerous national benefits that can help Parties achieve the Sustainable Development Goals (SDGs). The case studies of countries presented in the document show some approaches that have been used in the region, presenting how projection estimation systems can provide key elements for decision-making on climate commitments not only for BTRs but also to align BTRs and LTS. Laying the necessary foundations to access climate finance instruments and carbon markets.

Increasing transparency within projection estimation, and in general, a better documentation system, provides relevant information for decision-makers and other stakeholders on how to assess progress and identify opportunities to improve climate action and shows with solid data the needs for support and capacity strengthening, which will encourage the participation of other actors to accompany countries in their development.

Recommendations

1. Define a Roadmap for BTR Submission

Countries must identify the reporting requirements of the BTRs and design a roadmap based on available information to ensure timely and accurate submission of reports.

2. Identify Gaps and Leverage Opportunities

Identifying gaps and opportunities is crucial to applying flexibility mechanisms. Some of this information has been previously addressed in the BUR, which are a fundamental starting point.

3. Integrate Transparency into Policy Instruments and Strengthen Monitoring Systems

Supplementing climate policy systems, MRV, or other monitoring instruments with transparency elements will allow building upon existing information and adding additional requirements established in the PA. This may include an integrated reporting system that can provide coherence and foster synergies between different reporting systems.

4. Build a Comprehensive Reporting System

Establishing a system that combines information on historical GHG emissions (and black carbon for some countries), sectoral mitigation measures, and climate commitments for 2030 and 2050 will be a fundamental tool for transparent and consistent reporting. This will generate benefits in terms of time and resources, such as reducing duplication of reporting structures.

5. Improve Projection Estimation with a Progressive Approach

Projection estimation can begin with a simple model that can be developed with internal resources, where the documentation process and continuous improvement play a crucial role in progressively increasing the level of certainty.

6. Ensure Technical and Financial Sustainability

It is important to consider the technical and financial sustainability of the tool to be used in the BTR, considering its cyclical updating nature.

7. Strengthen Collaboration with Universities and Research Centers

A success will be to establish long-term collaboration links with universities or research centres, which will promote the existence of specialized human resources and provide consistency to estimation processes.

8. Ensure Early Integration of Data Experts

Historical activity data used for GHG inventories and future projection data may come from the same source or require input from experts involved in data processing; integrating specialists from early stages of projection construction can facilitate the development process.

9. Coordinate International and National Reports

The connection between international reports on progress under the PA through the ETF's and national climate reports and other reports means that governments can facilitate cooperation between institutions to streamline and standardize complementary processes to improve data exchange and coherence.

10. Link Indicators and Models to Strengthen Reported Information

Linking previously used indicators, models, or projections can enhance complementarity, reliability, and coherence of the reported information.

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Annex 1: NDC main points in Latin America and the Caribbean

Antigua & Barbuda

Target type

Goals and actions not related to GHG.

Aim

86% renewable energy generation from local resources in the electricity sector, 100% of all new vehicle sales will be electric vehicles.

Explore the emissions reduction potential in the waste sector and the emissions reduction potential in the agriculture, forestry, and other land use (AFOLU) sector.

Projections

It uses its 2006 net GHG emissions as the reference year for its NDC. The 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories are used to quantify GHG emissions.

The country does not reference any projection for GHG modelling, nor the methodology used for it.

Date

09/2/2021

Argentina

Target type

Fixed level target.

Aim

Commits to an unconditional economy-wide net emissions cap of 349 $MtCO_2e$ in 2030.

Projections

The unconditional 2030 target is based on 2016 as the baseline year for emissions. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

The projection of emissions and removals for 2030 was carried out using a simplified model consistent with the methodology and sources of emissions and removals estimated in the INGEI 2016. For all sectors, a unified percentage of economic growth was used, which is in line with the recovery of the country and a sustained increase in the population.

Date

11/2/2021

Bahamas

Target type

Emissions reduction target below the usual level.

Aim

It commits to reducing its emissions by 30% by 2030 compared to BAU, conditional on international support. It also commits to having at least 30% renewable energy in its energy mix by 2030 and those electric and hybrid vehicles represent 35% and 15% of vehicle sales respectively by 2030.

Projections

The reference year for the target is 2030 and the target is expressed in relation to a BAU scenario for that year and in relation to the reference emissions of 2010. The BAU emissions projections have been calculated based on the policies in force since 2013 Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

It does not specify the methodology used to estimate the projections.

Date

11/7/2022

Barbados

Target type

Emissions reduction target below the usual level.

Aim

The aspirational goal is to achieve a fossil fuel-free economy and reduce GHG emissions in all sectors as close to zero as possible by 2030.

The unconditional target of a 35% reduction in BAU emissions in 2030 and a 70% reduction in BAU emissions in 2030 is conditional on international support. The conditional contribution of updating absolute emissions reductions below the base year 2008 is 1,459 Gg of CO_2e (2030). Total economy wide BAU emissions projections are 1,958 Gg CO_2e by 2030, respectively.

Projections

BAU emissions projections have been calculated based on policies in force in 2008. The reference years for the target are 2025 and 2030 and are expressed in relation to BAU for those years.

It does not specify the methodology used to estimate the projections.

Date

7/30/2021

Belize

Target type

Emissions reduction target below the usual level.

Aim

It commits to mitigation objectives and actions in the AFOLU, energy, transport, and waste sectors, which are estimated to avoid 5.6 $MtCO_2e$ cumulatively during 2021-2030, and a set of interventions to increase resilience and adaptation..

Projections

The emissions projections in the BAU scenario are based on data collected in the fourth GHG inventory that reports emissions through 2018. The emissions projections for the FOLU sector specifically are projections based on the 2019 Belize FOLU sector GHG inventory for actions in the energy sector, baseline emissions are estimated according to the Baseline Energy Scenario (BES) in IRENA's ReMAP.

The assumptions underlying the future projections of the impacts of NDC implementation are set out in the FAO, IRENA, and Vivid Economics reports, but the methodologies used are not described.

Date

09/01/2021

Bolivia

Target type

Does not apply.

Aim

It is committed to adopting sectoral measures in the energy, forestry, water, and agricultural sectors.

Projections

Everything remains the same according to CAIT data (Climate Watch Data) for 2018. The Third National Communication (CN3) includes historical emissions until 2008, so to establish the BAU scenario it was necessary to use data from the CAIT Climate Data Explorer. It does not specify the methodology used to estimate the projections.

Date

04/15/2022

Brazil

Target type

Absolute emissions reduction or limitation target relative to a base year.

Aim

It commits to reduce emissions from 2005 levels by 37% in 2025 and by 50% in 2030.The objectives will be translated into policies and measures that will be detailed and implemented by the Brazilian federal government.

Projections

Absolute objectives for the entire economy, consistent with the sectors present in the National Inventory of Greenhouse Gas Emissions for 2025 and 2030, always compared with 2005. The quantification of the reference indicator is based on the total net greenhouse gas emissions greenhouse gas (GHG) in the reference year 2005 reported in the “National Inventory of Anthropogenic Emissions by Sources and Eliminations by Sinks of Greenhouse Gases not controlled by the Montreal Protocol”. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories. It does not specify the methodology used to estimate the projections .

Date

4/7/2022

Chile

Target type

Fixed level target and trajectory target.

Aim

Commits to a GHG emissions budget that does not exceed 1,100 $MtCO_2eq$ between 2020 and 2030, with a maximum (peak) of GHG emissions by 2025, and a GHG emissions level of 95 $MtCO_2eq$ by 2030. It includes a Black Carbon objective in terms of reducing at least 25% of total black carbon emissions by 2030, compared to 2016.

Projections

Chile's contribution does not consider a reference year, but rather a time horizon (2020-2030) and a target year (2030). Therefore, the objective is not related to the first year or the reference. The economy-wide mitigation target set 2025 as the peak year for emissions, representing a shift from an increasing trend of GHG emissions to a decreasing trajectory of emissions from that peak.

The projection consisted of a modelling of two scenarios: i) the first that projects national GHG emissions with current policies and actions (until May 2019), and ii) a neutrality scenario that includes measures and considerations that can lead to Chile to achieve GHG neutrality in 2050.

Date

9/4/2020

Colombia

Target type

Fixed level target.

Aim

It commits to a maximum of 169.44 $MtCO_2e$ in 2030 (equivalent to a 51% reduction compared to BAU) and to reduce black carbon emissions by 40% compared to 2014 in 2030.

Projections

For the BAU scenario, the reference used is the period 2010-2014 for the projection from 2015 to 2030. Emission reductions associated with mitigation measures that began to be implemented before January 1, 2015, are considered as part of the reference scenario. Colombia establishes a list of characteristics considered for the projections but does not define a global or sector methodology for the estimation.

Date

12/29/2020

Costa Rica

Target type

Fixed level target.

Aim

It commits to a net emissions limit of 9.11 $MtCO_2e$ by 2030 and a maximum net emissions budget of 106.53 $MtCO_2e$ from 2021 to 2030.

Projections

The 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories are used to quantify GHG emissions. Within the Energy sector, the country uses a TIME methodology for projections and plans to expand to more sectors with a new model.

Date

12/28/2020

Cuba

Target type

Goals and actions not related to GHG.

Aim

It commits to generating 24% of electricity from renewable sources and increasing forest cover to 33% by 2030, along with additional measures in the energy, transport, and agriculture sectors.

Projections

Cuba uses non-GHG indicators to measure its goals by sector but maintains a reference year depending on the indicator and the sector: Energy – 2014, transportation – 2018, FOLU – 2019, Livestock – 2020 (In the case of livestock, it uses a GHG-intensive indicator, considers a BAU scenario with reduction goals from 2020 to 2030). It does not specify the base year of calculation, nor the methodology to estimate the BAU scenario.

Date

09/17/2020

Dominica

Target type

Absolute emissions reduction or limitation target relative to a base year.

Aim

It commits to reducing its greenhouse gas emissions by 45% below 2014 levels by 2030.

Projections

Dominica has a total reduction in GHG emissions with a baseline in 2014, except for forest carbon sequestration which has a baseline in 2018. To quantify GHG emissions they use the Intergovernmental Panel on Climate Change (IPCC) Guidelines. of 2006 for the National Greenhouse Gas Inventories.

Two methods were used to calculate CO_2 emissions: the Reference Approach and the Sector Approach. The BAU scenario was based on emissions changes from 2000 to 2005 as a starting point and the sectoral emissions projections after 2014 were derived from the application of the energy intensity value for each of the mitigation measures according to the year of the report.

It does not specify the methodology used to estimate the projections.

Date

7/4/2022

Dominican Republic

Target type

Emissions reduction target below the usual level.

Aim

Commits to reduce emissions by 27% (7% unconditional to internal finances and 20% conditional on external finances) by 2030 compared to BAU.

Projections

A BAU scenario projected to the year 2030 is considered, taking the year 2010 as a reference. To calculate the projections, the Dominican Republic used the LEAP-IBC 2020.1.0.7 tool (32 bits) for the sectors where it had sufficient information. The 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories are used to quantify GHG emissions.

Date

12/28/2020

Ecuador

Target type

Emissions reduction target below the usual level.

Aim

9% compared to the trend scenario for 2025 and an additional 11.9% with international support.

Projections

For the BAU scenario, they used the following reference years:

- Base year 2010 for the Energy, Agriculture, Industrial Processes and Waste sectors.

- Base year 2008 for the Land Use, Land Use Change and Forestry sector.

For both the base scenario and the reference level, an ex-ante analysis has been established, that is, a base representation of the future, based on the information existing at the time of the projection. Different methodologies by sector: LEAP (energy), GACMO (IPPU and waste), Excel Sheet for Agriculture. The LULUCF sector is not included.

Date

3/29/2019

El Salvador

Target type

Emissions reduction target below the usual level.

Aim

It commits to reduce its annual emissions for the energy sector between 640 $ktCO_2e$ (unconditional) and 819 $ktCO_2e$ (conditional) in relation to BAU by 2030 and, for the period 2035-2040, to reduce its accumulated emissions in the AFOLU sector since 2015 by 50 $MtCO_2e$ (conditional).

Projections

The BAU scenario has projections starting from the reference year 2019. To calculate the target, the BAU Scenario was compared with both a high-intensity decarbonization scenario and a low-intensity decarbonization scenario, considering economic growth.

The 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories are used to quantify GHG emissions.

It does not specify the methodology used to estimate the projections.

Date

1/4/2022

Guatemala

Target type

Emissions reduction target below the usual level.

Aim

It commits to reduce its emissions by 11.2% (unconditional) and 22.6% (conditional) by 2030 compared to BAU.

Projections

Business as Usual projections until 2023 based on the 2016 National GHG Inventory updated and reported in the Third National Communication on Climate Change.

The data from the historical series of emissions from the national GHG inventories 1990-2018 were used, with which a baseline was prepared taking the year 2015 as a reference and with the projections of the BAU scenario to 2030. It uses the Intergovernmental Panel on Climate Change (IPCC) of 2006.) Guidelines for national greenhouse gas inventories.

The BAU scenario projections are linear and cover the period 2019-2030. Emissions and removals were projected for each category and, in some cases, for some subcategories of the inventory. Subsequently, these projections were added to obtain values by sector (LULUCF, Energy, Agriculture, Waste) and finally, at the national level.

Date

5/23/2022

Guaiana

Target type

Does not apply.

Aim

Guiana does not define a specific objective; however, it defines LULUCF's commitments to remain a carbon neutral country.

Projections

Not specified.

Date

5/20/2016

Haiti

Target type

Emissions reduction target below the usual level.

Aim

It is committed to reducing its GHG emissions by 6.32% (unconditional) and 25.5% (conditional) compared to the BAU scenario for 2030.

Projections

Typical reduction of projected emissions for 2030, based on the reference year 2000. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

Present the considerations and assumptions considered for the projections. It does not specify the methodology used to estimate the projections.

Date

6/1/2022

Honduras

Target type

Emissions reduction target below the usual level.

Aim

It commits to reducing emissions by 16% (excluding LULUCF) by 2030, compared to the BAU scenario, along with non-GHG sectoral targets.

Projections

Honduras' contribution is based on a reduction in GHG emissions estimated in the 2030 BAU scenario, with an implementation period of 2012-2030. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

The BAU scenario has been estimated based on i) an update of the INGEI of the Third National Communication of Honduras and the first biennial update report; and ii) ad-hoc models and projections for estimating the BAU scenario. For the energy sectors, the LEAP model is used, for the rest of the sectors it estimates the BAU scenario based on the projection of activity variables and using the same methodology as the GHG inventory for Honduras.

Date

5/19/2021

Jamaica

Target type

Emissions reduction target below the usual level.

Aim

Commits to reducing emissions by 25.4% (unconditional) and 28.5% (conditional) compared to business as usual in 2030.

Projections

The reference year for the target is 2030 and typical emissions have been calculated based on policies in force in 2005. It uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

The main sectors considered are Energy: Reference emissions in the energy sector were calculated using the Long-Term Energy Alternatives Planning System (LEAP) model. LULUCF: With projections for the period to 2030, the historical trends reported in this document are considered, as well as Jamaica's agricultural production objectives set out in Vision 2030 Jamaica. The specific methodology is not described.

Date

1/7/2020

México

Target type

Emissions reduction target below the usual level.

Aim

It commits to reduce its emissions by 35% (unconditional) and 40% (conditional) by 2030 compared to BAU.

Projections

Mexico is committed to reducing its emissions compared to its projected baseline in 2030. The implementation period of the NDC is from 2020 to 2030, and the policies implemented are considered based on data from 2013. It integrates its National Inventory of Greenhouse Gases Greenhouse and Composite Emissions (INEGyCEI), with the IPCC 2006 methodologies and its 2019 Refinement.

It does not specify the methodology used to estimate the projections.

Date

11/17/2022

Nicaragua

Target type

Emissions reduction target below the usual level.

Aim

It commits to sectoral targets in energy, industrial processes and product use, and forestry sectors, estimated at 69 $MtCO_2e$ in 2030 or a 10% reduction compared to BAU (77 $MtCO_2e$).

Projections

Business As Usual Model for the goals calculated from the base year 2000.

It does not specify the methodology used to estimate the projections.

Date

12/23/2020

Panama

Target type

Emissions reduction target below the usual level.

Aim

Commits to reduce emissions from the energy sector by at least 11.5% by 2030 and at least 24% by 2050 compared to the baseline, representing up to 10 $MtCO_2e$ during 2022-2030 and 60 $MtCO_2e$ during 2022 -2030.

Projections

Panama uses two types of projections by sector. The contribution of the Energy sector of Panama considers as a reference point a BAU scenario of greenhouse gas emissions from this sector projected to the year 2050, taking 2022 as a reference year. For the LULUCF sector, the commitment does not consider a reference point. comparative in terms of GHG but does consider 2050 as the target year with the reference year 2021 for a GHG-free goal. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories. It does not specify the methodology used to estimate the projections.

Date

12/27/2020

Paraguay

Target type

Emissions reduction target below the usual level.

Aim

Commits to reduce GHG emissions by 10% (unconditional) and 20% (conditional) by 2030 compared to BAU.

Projections

The BAU scenario was calculated using 2014 as the reference year for the calculation, with the target set for 2030. It uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories. Paraguay used two methodologies to estimate the BAU scenario: "Cobb Douglas" type theoretical model using the Feasible Generalized Least Squares method (top-down approach). General Equilibrium Model, for more detailed projections of the Energy Sector (bottom-up approach) using LEAP software.

Date

7/15/2021

Perú

Target type

Fixed level target.

Aim

It commits to limit its GHG emissions to a maximum level of 208.8 $MtCO_2e$ (unconditional) and 179.0 $MtCO_2e$ (conditional) in 2030.

Projections

Based on the analysis of our GHG emission sectors, which included the projection of sectoral scenarios. GHG emissions, which included the projection of sectoral scenarios. These scenarios were determined taking into consideration the dynamics of each of the sectors and based on the information from the sources and categories reported in our INGEI. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

It does not specify the methodology used to estimate the projections.

Date

12/18/2020

Saint Kits and Nevis

Target type

Absolute emissions reduction or limitation target relative to a base year.

Aim

It commits to reducing its CO_2 emissions by 61% by 2030 compared to 2010 levels.

Projections

The mitigation target is 2010 greenhouse gas emissions. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories. It does not specify the methodology used to estimate the projections.

Date

10/25/2021

St. Lucia

Target type

Absolute emissions reduction or limitation target relative to a base year.

Aim

Commits to reducing greenhouse gases by 37 $GgCO_2e$, compared to 2010 emissions. In terms of percentage decrease, up to approximately 7% reduction in GHG emissions in the energy sector by 2030, compared to emissions in 2010. In absolute terms, emissions from the energy sector in 2010 were 505 $GgCO_2e$, which will be reduced to 468 $GgCO_2e$ in 2030.

Projections

The reference year used in Saint Lucia's updated NDC is 2010. It uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories. The country plans to become a BAU reference scenario target, so now it does not present projections.

Date

01/27/2021

St. Vicent and the Grenadines

Target type

Emissions reduction target below the usual level.

Aim

Aims to achieve an unconditional, economy-wide reduction in greenhouse gas (GHG) emissions of 22% compared to its business as usual (BAU) scenario by 2025. Baseline or base year: 2010 base year (407 Gg CO_2e eleven).

Projections

Saint Vincent and the Grenadines uses the base year 2010 with a BAU scenario through 2025. It uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

It does not specify the methodology used to estimate the projections.

Date

6/29/2016

Surinam

Target type

Goals and actions not related to GHG.

Aim

Commits to increasing efforts to achieve sustainable forests and ecosystems management and stabilization and minimization of deforestation. Degradation and protection of forests and wetlands. It is committed to increasing the share of renewable energies.

Projections

Suriname uses the reference year 2008 for GHG quantification but measures its objectives through sectoral policies and measures; and non-GHG renewable electricity targets. It does not specify the methodology used to estimate the projections.

Date

12/9/2019

Uruguay

Target type

Fixed level target.

Aim

It unconditionally commits not to exceed 9,267 Gg of CO_2 emissions, 818 Gg of methane emissions and 32 Gg of N_2O emissions by 2030, and to reduce HFC emissions by 10% in relation to BAU. Uruguay also commits to reduce its emissions by another 960 Gg of CO_2, 61 Gg of methane and 2 Gg of N_2O, and to reduce its HFC emissions by another 5%, conditional on international support.

Projections

For the reference year, the 2019 GHG emissions inventory is used, and the objectives are set in terms of absolute emissions and in relation to strategic sectors. Uses the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for national greenhouse gas inventories.

Although the country has projections set for 2030, it does not specify the methodology used to calculate the scenarios, only some characteristics and conditions that are considered when making the estimates.

Date

12/30/2022

Venezuela

Target type

Emissions reduction target below the usual level.

Aim

It is committed to reducing its emissions by 20% by 2030 compared to BAU.

Projections

Your objective is compared to a business as usual (BAU) scenario. Each reference year varies depending on the mitigation and adaptation activity/ strategy in each sector considered: Energy, Industry, Forestry and Waste.

It does not specify the methodology used to estimate the projections.

Date

11/9/2021

Source: Own elaboration based on (CAT, 2023) and (UNFCCC, 2023)

Annex 2: LTS main points in Latin America and the Caribbean

LTS submitted before January 2024.

Country	Aim	Includes models and projections to 2050	Publication date
Argentina	Achieve GHG emissions neutrality by 2050.	Not specified.	November 2022
Belice	Achieve net zero global emissions by 2050 (Belize is carbon negative at this point).	Sector projections in three BAU scenarios, High Ambition and Very High Ambition.	May 2023
Chile	Achieve and maintain carbon neutrality and move towards climate change resilience by 2050.	Use of carbon budgets. For the corresponding period between 2020 and 2050, the national indicative budget is estimated to be 2.6 billion tonnes of CO_2.	November 2021
Colombia	Achieve carbon neutrality by 2050, aligned with the NDC commitments.	Use of the GCAM model (Global Change Analysis Model) for energy, water, socioeconomic and territorial systems. The approach used to estimate deforestation pathways was basically to assume that the land use change sector generates the emissions or removals necessary to achieve, together with emissions from the other sectors, a trajectory that leads to carbon neutrality for 2050.	
Costa Rica	Costa Rica aspires to a decarbonized economy with zero net emissions in 2050.	An energy model with an optimization of the linear system called TIMES-CR.	

Country	Aim	Includes models and projections to 2050	Publication date
Guatemala	Meet the goals of the Paris Agreement 11% unconditional 11% conditional.	Sectoral projections of a baseline and MACC curves for selected mitigation measures.	
México	The GHG emissions reduction goal is to reduce 50% of national GHGs by 2050 below our emissions in 2000.	Modelling using the Economic Projection and Policy Analysis Model (EPPA) of the Massachusetts Institute of Technology and the electricity sector model (the Balmorel model) and from a land use model (CBM-CFS3 Carbon Budget Model).	November 2016
Uruguay	An aspirational scenario of CO_2 neutrality by 2050 and scenarios of stability in CH_4 and N_2O emissions.	The scenarios include GHG emissions from KEY categories that represent between 95 and 97% of the country's total emissions.	December 2021

Source: own elaboration based on(UNFCCC, 2023)

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