Tracking NDC mitigation commitments under the ETF Webinar Series

24 July 2024-

Elements of Projections of GHG emissions and removals:

CTF Tables 6-12

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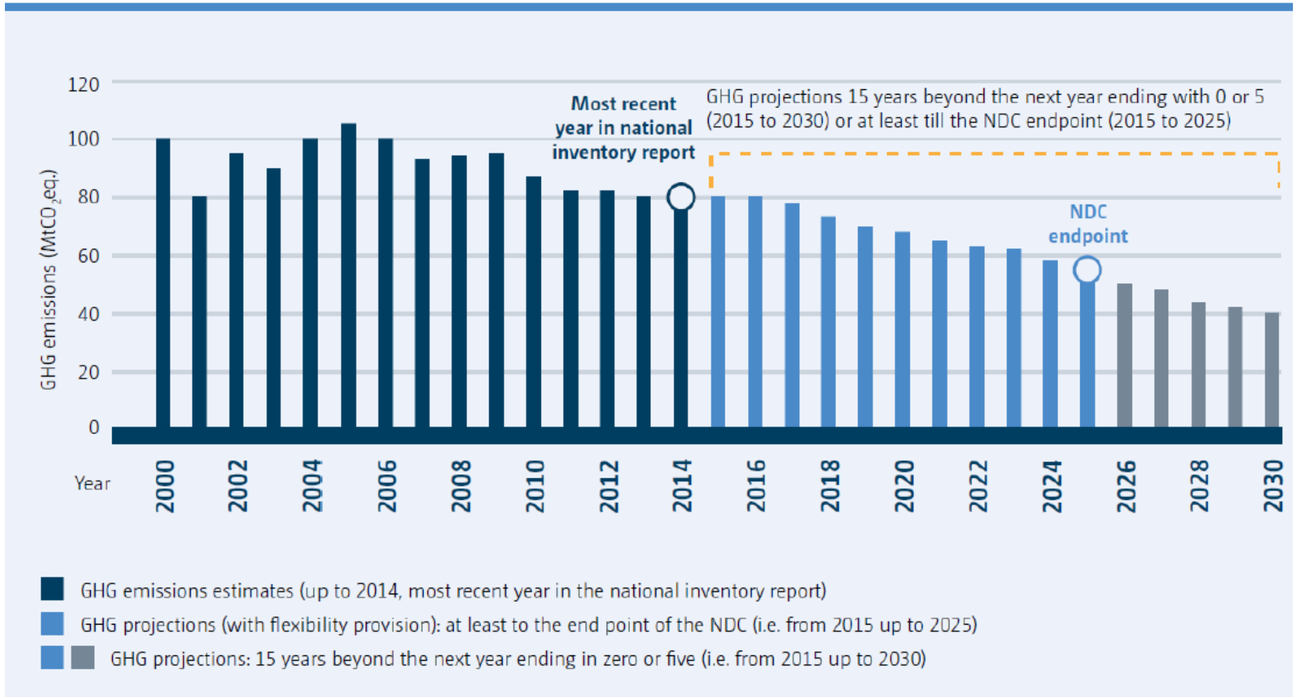
IMPORTANCE OF DEVELOPING PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS

- Greenhouse gas projections are an estimate of a country's future GHG emissions based on a set of assumptions.
- Having an understanding of how GHG emissions might develop in the future can help a country to:
  - Establish a baseline scenario and define a GHG reduction target, e.g., under a
  - Nationally Determined Contribution (NDC),
  - Understand if they are on track to meeting an existing GHG reduction target,
  - Estimate the impacts of mitigation measures on future GHG emissions



Source: UNFCCC CGE Training Material

IMPORTANCE OF DEVELOPING PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS

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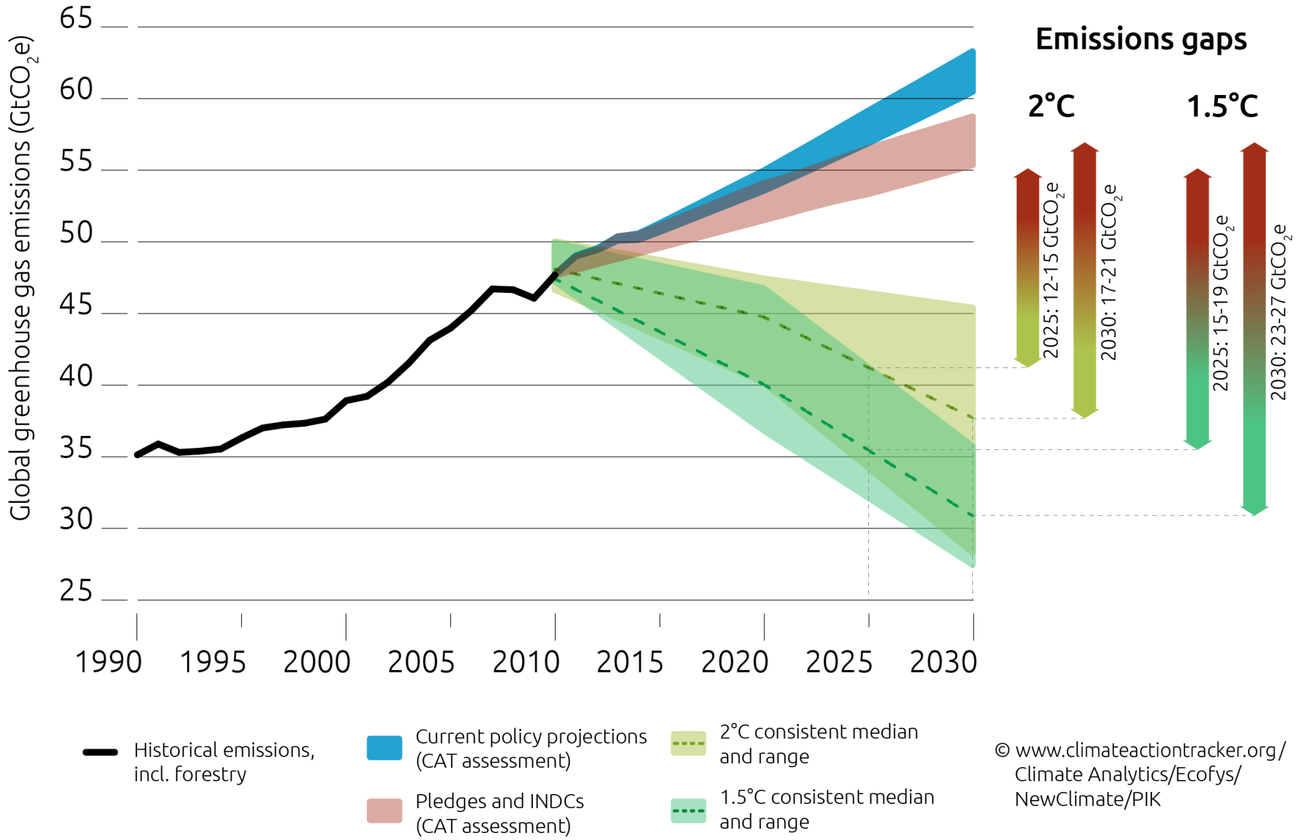
- One of the most important objectives of any emission projection is the assessment of the influence of existing and additional policies and measures (PAMs).

- The main question here will be whether or not these policies and measures deliver the emission reductions they aim to and whether or not the combination of policies and measures will bring the targets into reality.



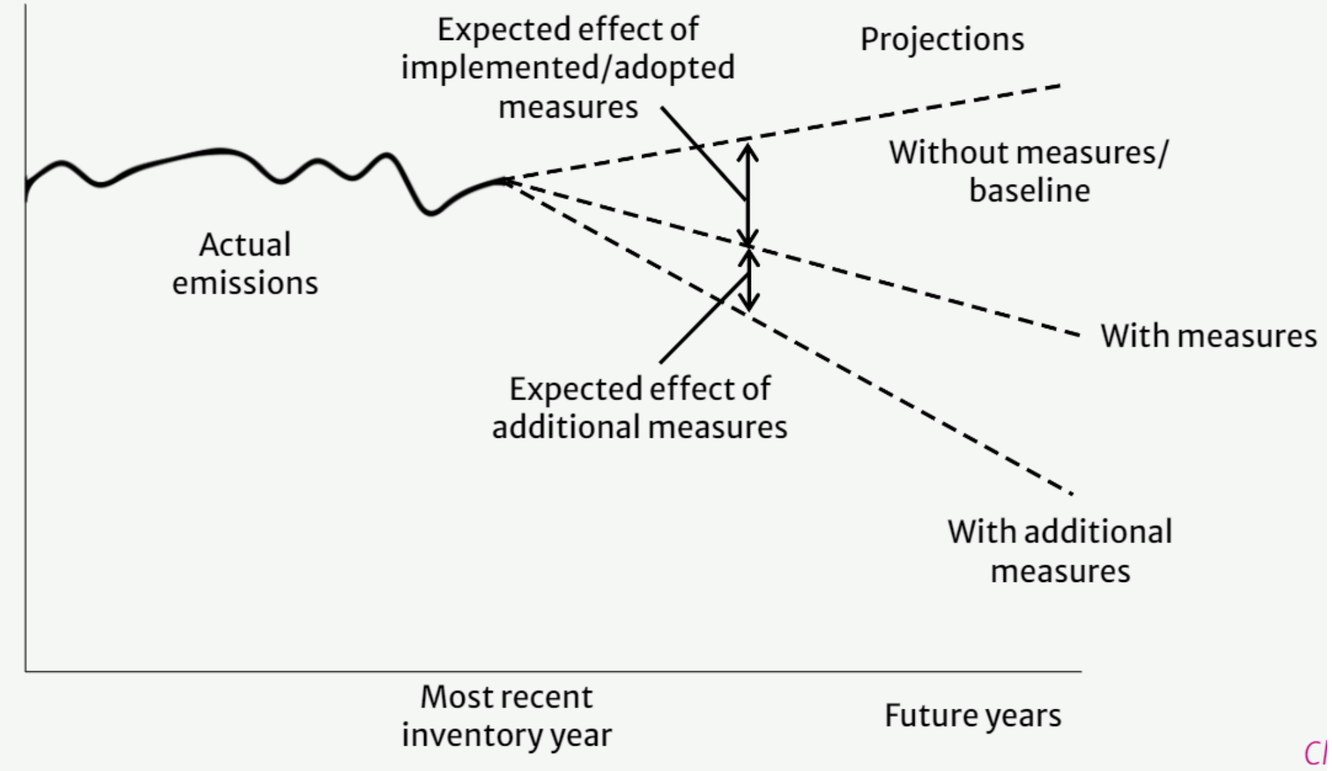
Scenarios as basis for developing and defining GHG projections

Assessing potential developments of GHG emissions in the future requires an understanding of “what the future might be like”, To understand this different scenarios are created to envisage how the future might look like. Three common scenarios are usually created .

1. Without measures (WOM): it is assumed that none of the existing or additional policies and measures are implemented from a chosen base year.

2. With existing measures (WEM): A WEM projection encompasses currently adopted policies and measures at the time of the projection compilation and that following these adopted policies and measures can be assumed to be implemented in the projected years.

3. With additional measures (WAM): A WAM scenario encompasses in addition to currently adopted policies and measures (as in the WEM scenario) also planned policies and measures that have not been adopted yet, but are expected to be adopted and implemented from a specific future year onwards.



Difference between implemented, adopted, and planned polices and measures

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

1. **Implemented** policies and measure are those to which one or more of the following may apply: national legislation is in force; one or more voluntary agreements have been established; financial resources have been allocated; human resources have been mobilized.

2. **Adopted** are those in relation to which an official government decision has been made and there is a clear commitment to proceed with implementation.

3. **Planned** are those for which options are under discussion and have a realistic chance of being adopted and implemented in the future.

WEM and WAM (Example)

WEM and WAM hypothetical example

Energy Efficiency regulations are planned to be adopted in 2015 and will be implemented in 2018.

In a projection submission in 2013, this measure will be planned and would be part of the WAM scenario.

In a projection submitted in 2017 this measure is adopted and will be implemented in 2018. This measure would be part of the WEM scenario and takes effect in projected years after 2018.

Modelling Emission Projections

- Every emission projection starts with two main elements:

1. A historic starting point. This is a well-defined inventory of emissions from a historic period of time (e.g. GHG emissions reported for 1990 – 2015) with a suitable level of sectoral disaggregation.

2. One or more (scenario) sets of projected parameters/variables and assumptions. These parameters and assumptions are applied to “modify” the historical activity data and emission factors and provide projected activity data and emission factors to estimate emissions for future years consistent with the historic inventory starting point.

Parameters and assumptions - Examples

Parameters

- Population growth and structure;
- Gross domestic product growth rates;
- Tax rates;
- International fossil fuel prices (coal, gas, oil);
- International, regional or domestic carbon prices or taxes;
- Heating degree days;
- Passenger-kilometres;
- Currency exchange rates, etc.
- Fuel consumption (energy demand by fuel type) by mode

Assumptions

- Structure of the domestic economy:
  - Increase or decrease in manufacturing (production) activities;
  - Increase or decrease in services;
  - Increase or decrease in agricultural activities.
- Technological development trends:
  - Energy efficiency improvements of products and services;
  - Development of carbon capture and storage infrastructure;
  - Increase in electric vehicles and development of supporting infrastructure.
- The development of energy markets and the impact on GHG emissions:
  - Regulation or deregulation of domestic energy markets and the electricity market in
  - particular;
  - Exports and imports of primary or transformed energy;
  - Availability of natural gas;
  - Development and introduction of renewable energy;
  - Future developments in nuclear power (e.g. time needed for the set-up or shutdown of nuclear power plants).

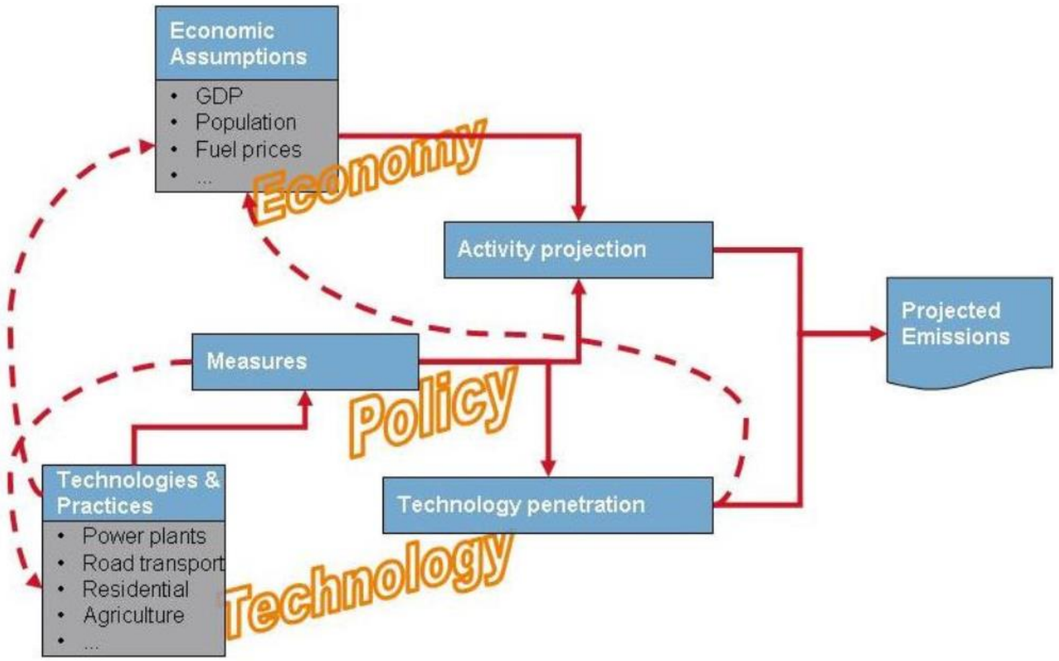
Modelling Emission Projections

» A greenhouse gas emission projection consists of a series of consecutive steps dealing with respectively developments in the economy, the technology and in policy:

1. the (expected) development of the economy, reflecting the changes in extent to which each relevant activity in the country is occurring
2. the (expected) development of technology or practices, reflected in changes to emission factors (emissions per unit of activity)
3. the (expected) policy measures with effects on both the development of the activity data and the possible changes in emission factors by influencing the development and penetration of specific technologies into the national economy

» **Emission projection models combine the information from the historic inventory with available assumptions and understanding of future developments in the economy, the technology and policy to provide an estimate of the emissions that would result if all assumptions and understanding will become a reality**

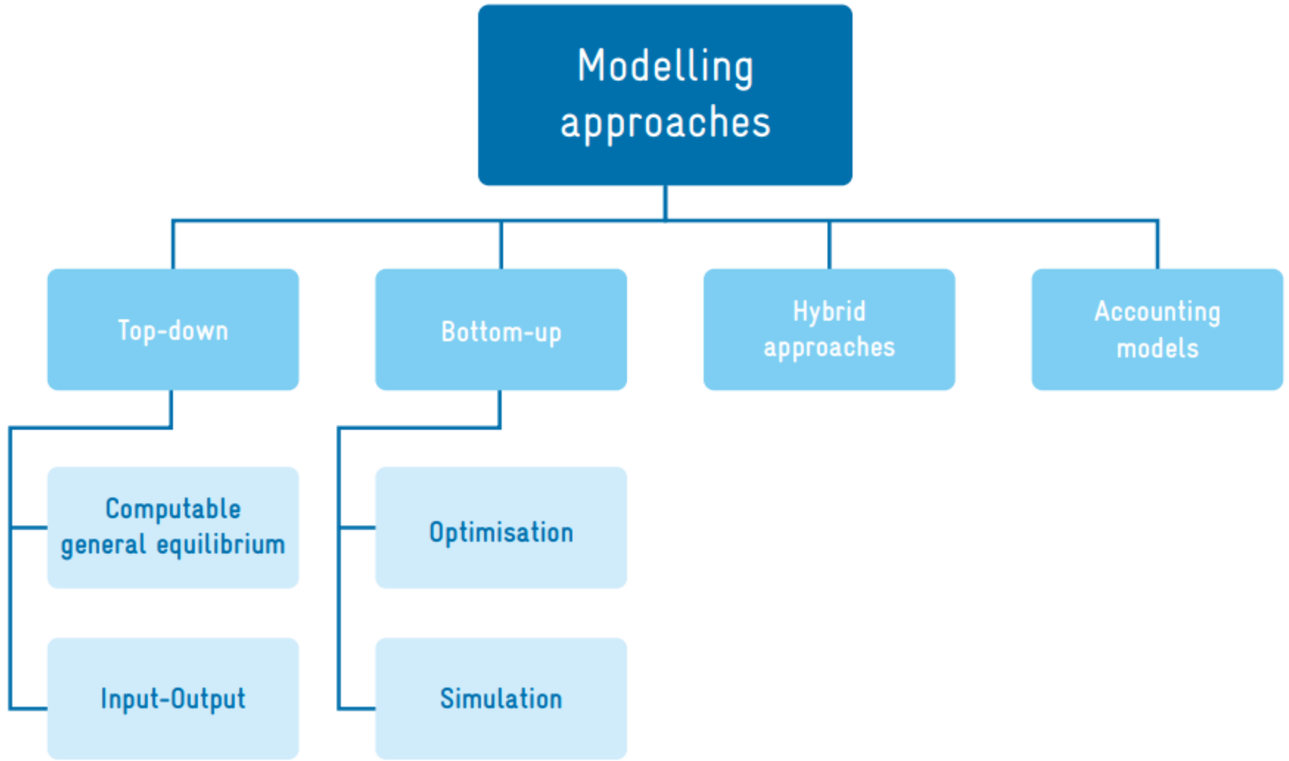
Modelling Emission Projections



- Policy module, provides the information on what policies and measures are assumed to be in place in the years of the projection;
- Economy module, estimate projected activity data for all years in the projection;
- Technology module, performs the actual emission calculations, based on the projected activity rates for one or more economic scenario and the assumed policies in place for one or more policy scenarios

Choosing a projections' modelling tool

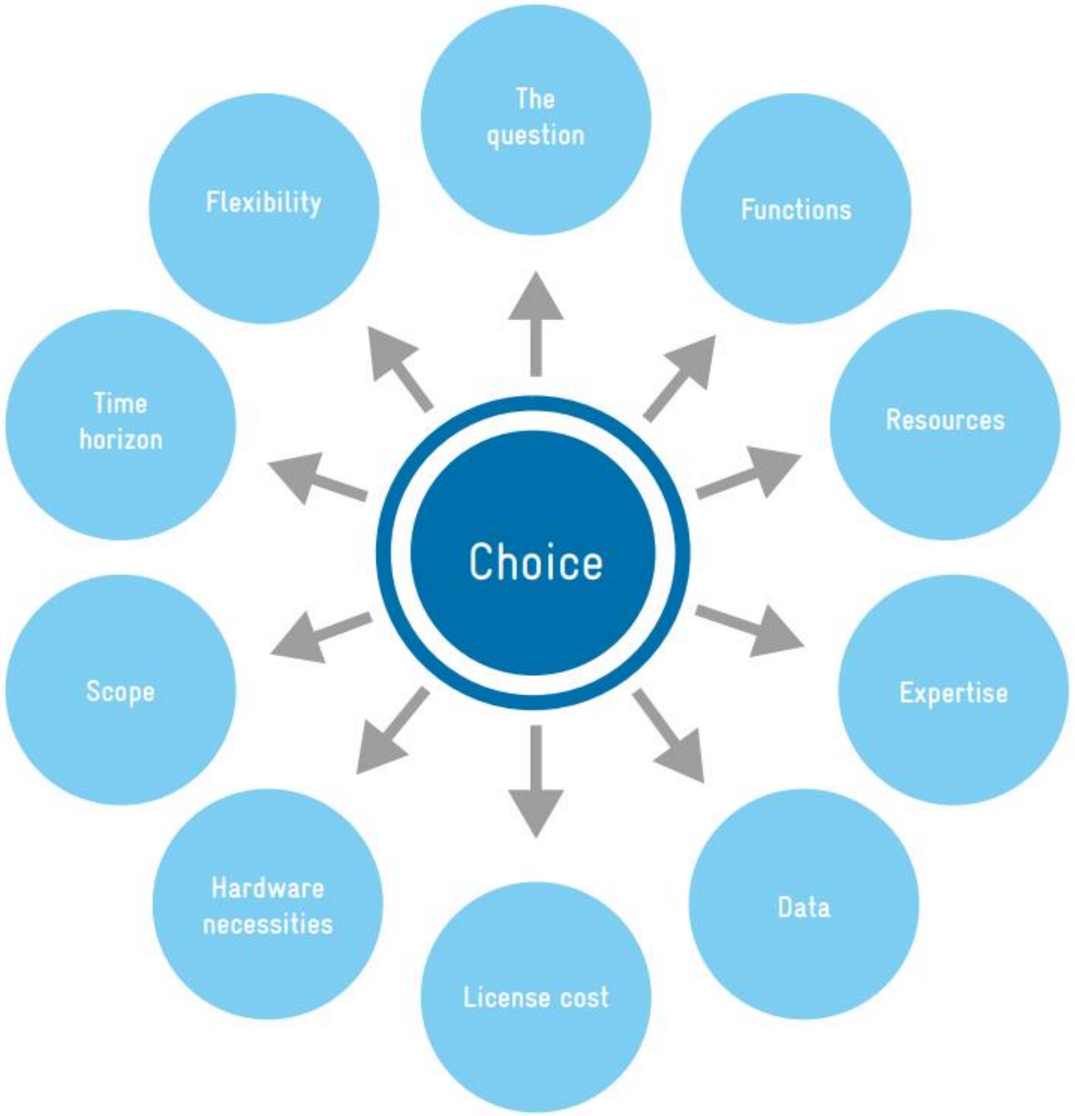
- **Top-down models** evaluate the system from aggregate economic
- **Bottom-up models** consider technological options or project-specific climate change mitigation policies.



Source: Partnership on Transparency in the Paris Agreement

Choice of the Model

- There is no **“best model”**.
- The choice of model needs to consider a wide range of factors concerning what the users aim to achieve by using the model



Comparison of models' Functionality

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		GACMO	PROSPECTS	LEAP	TIMES
FUNCTIONALITY	Coverage of emission sources	High-level	Mid / High-level	More detailed, particulary for energy sector	Detailed focus on energy sector
	Breadth/ granularity of technology	Mid breadth / limited granularity	Low-Mid	Low to high (user defined)	High
	Sectoral interlinkages	No	Energy supply and demand	Energy and some material flows	Energy and some material flows
	Temporal granularity	2020, 2025, 2030, 2050	Annual to 2050	Annual, unlimited timeframe. Within-year breakdown for seasonal and hourly variations.	Annual / multi-year time steps. Within-year breakdown for seasonal and hourly variations.
	Representation of costs	Yes (limited variation over time)	No	Yes (annual variation)	Yes
	Optimisation functionality	No	No	Within electricity supply sector	Yes, within energy system
	Summary	Low	Low	Mid	High

Source https://newclimate.org/

Comparison of models' Accessibility

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		GACMO	PROSPECTS	LEAP	TIMES
ACCESSIBILITY	Platform	Excel, open-source	Excel, open-source	Windows relational database; requires licence	Windows; requires licence (for GAMS)
	User fee	Free	Free; optional use of IEA input data requires licence	Free to certain users in low & middle-income countries; fee charged for others	Fee charged for GAMS license and user tools (e.g. interface)
	User guidance	Limited	Limited	Extensive	Limited
	User community	Limited	None	Extensive	Mid
	Language options	English	English	Multiple: English, French, Spanish, Chinese, Portuguese + others under development	English
	Ease of navigation	High	Mid	High	Mid

Comparison of models' Analytical options

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		GACMO	PROSPECTS	LEAP	TIMES
ANALYTICAL OPTIONS	Scenario building and analysis	Limited to BAU and one alternative	Facilitates multi-scenario analysis (simulation possible)	Facilitates multi-scenario analysis and simulation	Facilitates multi-scenario analysis and simulation
	Assessment of non -climate SD impacts	None	None (energy security indicators under development)	Air pollution-related impacts on health and agriculture; energy security indicators	Energy security indicators
	Analysis of carbon pricing policies	No	No	In energy sector	In energy sector
	Analysis of other policy instruments	No	Limited to simple representation of emission standards or national/sector carbon budgets	Limited to emission standards for some technologies or national/sector carbon budgets	Emission standards, carbon budgets and additional flow constraints
	Linkages to other models	Low granularity limits linkage options	Yes, soft links to sector deep-dive modules and SD impact assessments	Yes, with API (programming code), or soft-links via Excel	High granularity facilitates many options for hard and soft links
	Summary	**Analytical options limited to specific abatement measures**	**Facilitates multi-scenario analysis; deep-dive analysis requires links to other tools**	**Facilitates multi-scenario analysis and energy sector planning**	**Extensive analysis of energy sector and options for linking to other tools**

Source https://newclimate.org/

Key Messages

- In a nutshell, projections are an outlook or forecast of future GHG emissions and removals. They are **key indicators used for tracking progress** based on underlying assumptions, parameters and policy choices. Projections are not aiming to ascertain what will happen in the future but what is the possible range of future outcomes in terms of the GHG emissions and removals

- Projections are used as a reference in setting a baseline scenario target in the NDCs, that is a commitment to reduce emissions relative to a projected baseline emissions scenario (commonly known as business as usual scenario or sometimes a without measure scenario). Baseline projection is an important element of tracking progress towards implementing and achieving NDCs

Table 6: Summary of GHG Emissions and Removals

Summary of greenhouse gas emissions and removals in accordance with the common reporting table 10 emission trends – summary
According to paragraph 91 of the MPGs, each Party that submits a stand-alone national inventory report shall provide a summary of its GHG emissions and removals. This information shall be provided for those reporting years corresponding to the Party's most recent national inventory report, in a tabular format

- Each Party, that submits a stand-alone national inventory report, **shall** provide a **summary of its GHG emissions and removals.**

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

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

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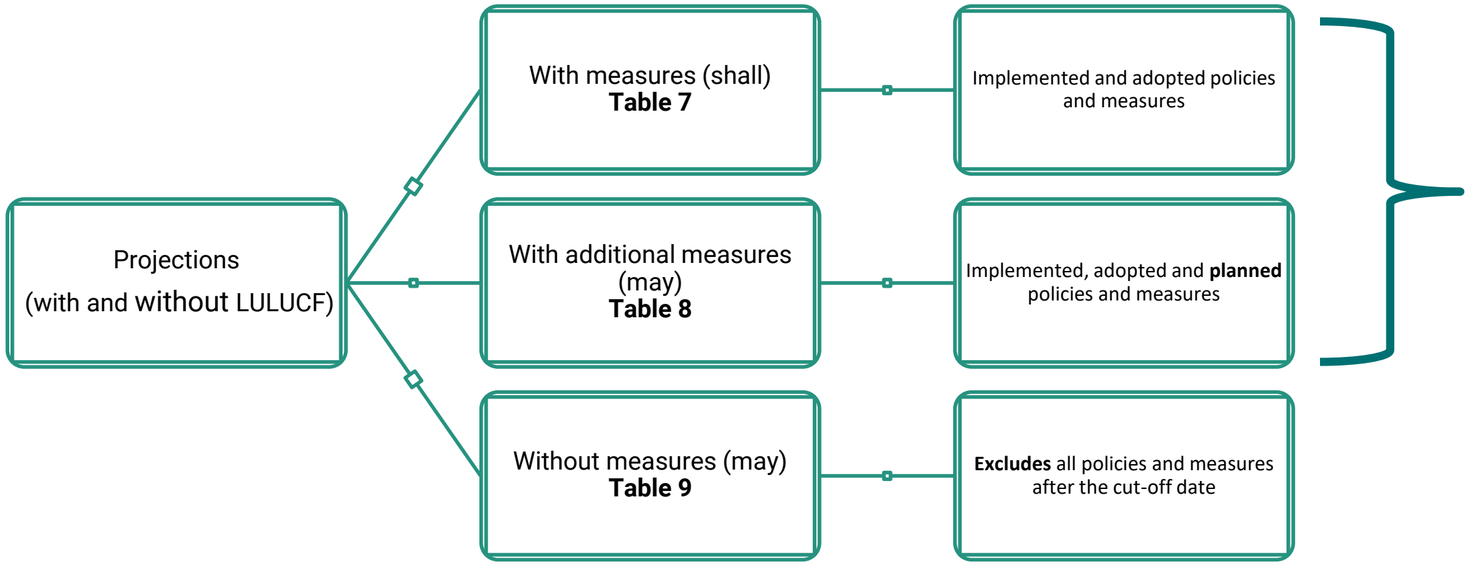
CTF Tables for projections of GHG emissions



It needs to be clear which measures reported under table 5 are included in which of the scenarios

- Not all measures may be included, as some may not be quantifiable
- Estimated future impacts of individual measures may not add up to scenario results due to interactions between measures

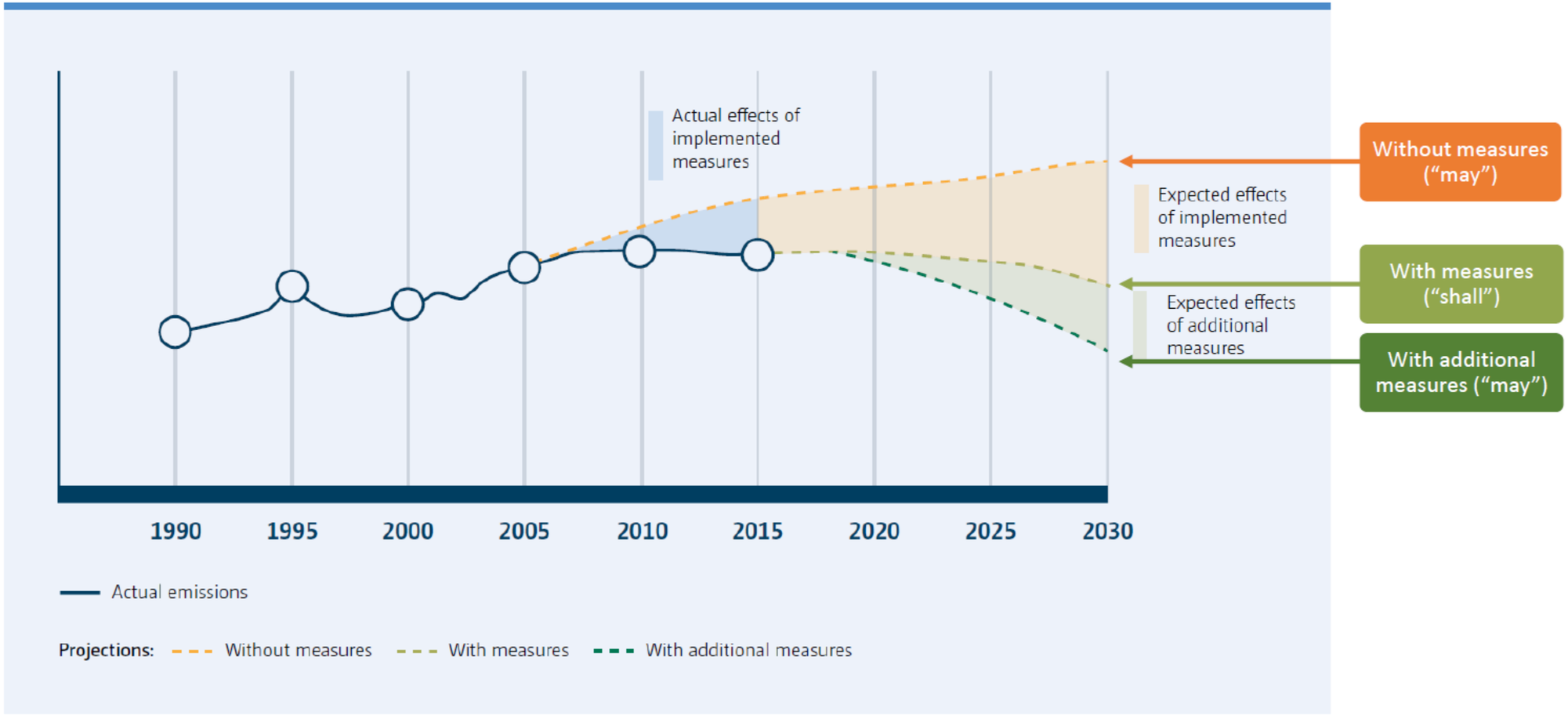
Projections of all indicators – Table 10

Key underlying assumptions and parameters used for projections – Table 11

On a sectoral basis and by gas, as well as for the national total, using a common metric consistent with that in the national inventory report.
•Relative to actual inventory data for preceding years.
•Reporting in graphical and tabular format.

IMPORTANT TO REMEMBER: Reporting **WEM** projections is mandatory **(“shall”)**, while reporting WOM and WAM projections is non-mandatory **(“may”).** Flexibility in reporting projections is available to those developing country Parties that need it in light of their capacities; they are encouraged to report these projections and can use less detailed methodology and coverage.

Linking actual emissions and projections



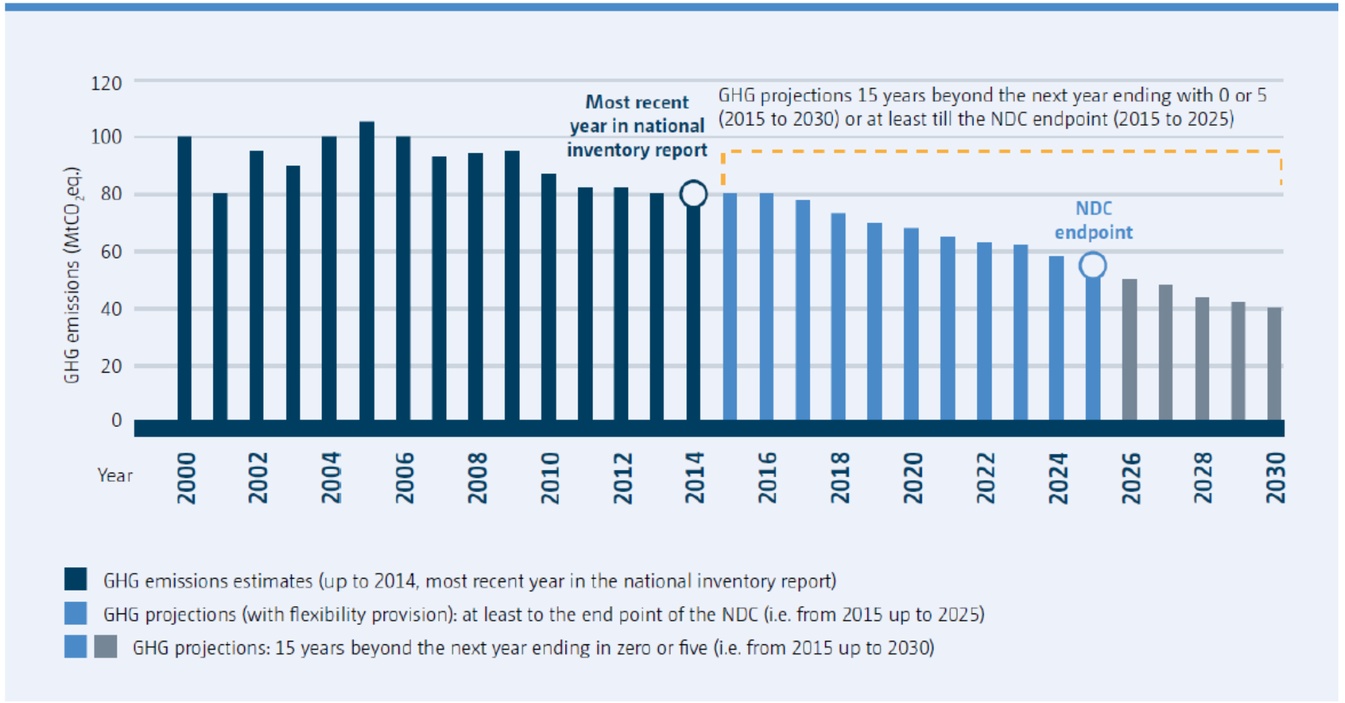
Source: UNFCCC CGE Training Material

Coverage of projections

The MPGs in chapter III.F, paragraphs 95, 97, 98 and 100 provide guidance on the organization of information on projections, including coverage in terms of sectors and gases and the time frame that the projections should cover.

The following are mandatory (“shall”) reporting requirements:

- Beginning projections from the most recent inventory year and extending at least 15 years beyond the next year ending in zero or five (e.g. 2025, 2030).
- With flexibility: at least up to the end point of the NDC
- Reporting projections on a sectoral and on a gas-by-gas basis, as well as for the national with and without LULUCF;
- Using a common metric consistent with that in a Party’s national inventory report;
- Reporting of projections of key indicators to determine progress towards NDCs.



Source: UNFCCC CGE Training Material

Table 7,8,9

	Most recent year in the Party's national inventory report (kt CO^2 eq)$_c$	*Projections of GHG emissions and removals (kt CO2 eq)$_c$*		
	20XXX	**20X (0) (5)**	**20X (0) (5)**	**20X (0) (5)**
Sector [d]				
Energy				
Transport				
IPPU				
Agriculture				
LULUCF				
Waste				
Other (Specify)				
Gas				
CO2 emissions including net CO2 from LULUCF				
CO2 emissions excluding net CO2 from LULUCF				
CH4 emissions including CH4 from LULUCF				
CH4 emissions excluding CH4 from LULUCF				
N2O emissions including N2O from LULUCF				
N2O emissions excluding N2O from LULUCF				
HFCs				
PFCs				
SF6				
NF3				
Other (specify)				
Total with LULUCF				
Total without LULUCF				

a Each Party shall report projections pursuant to paras. 93-101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).
b Those developing country Parties that need flexibility in the light of their capacities with respect paras. 93-101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).
c Projections shall begin from the most recent year in the Party's national report and extend at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).
d In accordance with para. 82(f) of the MPGs

Projections are reported in 5-year steps in the CTF table

Full time series data can be reported in the BTR in tabular or graphical format, if desired

Separate CTF tables for each scenario:

- Table 7: 'with measures' scenario [shall]
- Table 8: 'with additional measures' [may]
- Table 9: 'without measures' [may]

Table 10: Projections of key indicators

Key indicator (s)[c]	*Unit as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of Key indicators*		
		20XX	**20X (0) (05)**	**20X (0) (05)**	**20X (0) (05)**
Key Indicators					

Note: The Party could add rows for each additional key indicator.

[a] Each Party shall report projections pursuant to paras. 93-101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).

[b] Those developing country Parties that need flexibility in the light of their capacities with respect paras. 93-101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).

[c] Each Party shall also provide projections of key indicators to determine progress towards its NDC under Article 4 of the Paris Agreement (para. 97 of the MPGs).

[d] Future years extended to at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).

Timelines need to be the same as for the projection's tables

Key indicator(s):[c]	Unit, as applicable	*Most recent year in the Party's national*	*Projections of key indicators* [d]		
		2021	*2025*	*2030*	*2035*
Total economy-wide greenhouse gas emissions and removals	kt CO2 eq	4881	4409	4086	3800
Solar Power Installation	Gigawatts (GW)	50	80	120	170
Electric Vehicle Adoption	Number of Electric Vehicle	50	100	200	400
Forest Cover Increase	Hectares (in thousands)	200	250	300	360

Table 11: Key underlying assumptions and parameters used for projections

Key underlying assumptions and parameter [c]	*Unit as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of underlying assumptions and parameters* [d]		
		20XX	20X (0) (05)	20X (0) (05)	20X (0) (05)
Key underlying assumptions/parameter					

Note: The Party could add rows for each additional key underlying assumptions and parameters.

a Each Party shall report projections pursuant to paras. 93-101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to r
(para. 92 of the MPGs).

b Those developing country Parties that need flexibility in the light of their capacities with respect to paragraphs 93-101 of the MPGs can instead report using a less detailed methodology c
of the MPGs).

c Information provided by each Party in describing the methodology used to develop the projections should include key underlying assumptions and parameters used for projections (e.g. g
growth rate/level, population growth rate/level) (para. 96(a) of the MPGs).

d Future years extended to at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to t
flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).

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

Key underlying assumptions and parameters:[c]	Unit, as applicable	*Most recent year in the Party's national inventory report, or the most recent year for which data is available*	*Projections of key underlying assumptions and parameters* [d]		
		2021	*2025*	*2030*	*2035*
Gross Domestic Product Growth Rate	Percentage (%)	3.5	4	4.5	5
Population Growth Rate	Percentage (%)	1.2	1.5	1.8	2
Energy Consumption per Capita	MWh per person	7.5	8	8.5	9

The table refers to the key parameters used for the calculation of projections of the 'with measures' scenario. Examples include:

- GDP development
- Population development
- Energy demand (total and/or by fuel)
- Number of households
- Energy prices

Table 12: Information necessary to track progress on the implementation and achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures

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

[a] Each Party with an NDC under Article 4 that consists of adaptation actions and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, para. 7, of the Paris Agreement shall provide the information necessary to track progress on the implementation and achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures (para. 78 of the MPGs).
[b] *In accordance with para. 78(a) of the MPGs.*
[c] In accordance with para. 78(b) of the MPGs.
[d] *In accordance with para. 78(c) of the MPGs.*

[e] *In accordance with para. 78(d) of the MPGs.*

Custom footnotes:
Documentation box:

Thank you for your attention!

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