

Climate Change Expert Group
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Reporting national GHG inventories through Common Reporting Tables (CRTs)

An assessment of CRT reporting options through worked examples

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Foreword

This document was prepared by the OECD and IEA Secretariats in response to a request from the Climate Change Expert Group (CCXG) on the United Nations Framework Convention on Climate Change (UNFCCC). The Climate Change Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy-makers and other decision-makers. Authors work with the CCXG to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the CCXG. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

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Abstract

Reporting national GHG inventories through Common Reporting Tables (CRTs): An assessment of CRT reporting options through worked examples

The Modalities, Procedures and Guidelines (MPGs) included in Decision 18/CMA.1 adopted at COP24 in 2018 require all Parties to the Paris Agreement to report national greenhouse gas (GHG) inventories using “common reporting tables” (CRTs). The same decision requests the Subsidiary Body for Scientific and Technological Advice (SBSTA) is to develop CRTs for consideration and adoption by COP26. This paper focuses on key issues related to the potential structure of the CRTs and approaches to filling them in. The paper assesses different CRT reporting scenarios through worked examples. Overall, the paper finds that all the tables contained in the set of Common Reporting Formats (CRFs) currently in use by Annex I Parties provide a valuable starting point for the development of CRTs. A number of improvements and adjustments, however, need to be applied to current CRFs to better reflect reporting guidance outlined in the MPGs. This paper finds that it is important to ensure that the CRTs are designed in a way that allows for a reporting that is as standardised as possible. This may include allowing for the use of standardised reporting elements (e.g. notation keys) and amending the tables according to a new, commonly agreed structure to allow for the reporting of new reporting elements. Using a common format while also facilitating standardised reporting can positively affect a number of processes, including the technical expert review and automated processing of information, thereby promoting transparency, comparability and consistency of GHG-inventory reporting.

JEL Classification: F53, Q54, Q56, Q58

Keywords: climate change, transparency, reporting, emissions, GHG inventories

Résumé

Communication des inventaires nationaux des GES à l'aide de tableaux communs (CRT) : évaluation des options de notification des CRT à partir d'exemples pratiques

Conformément aux modalités, procédures et lignes directrices figurant dans la Décision 18/CMA.1 adoptée à la COP24 en 2018, toutes les Parties à l'Accord de Paris sont tenues de communiquer leurs inventaires nationaux des gaz à effet de serre (GES) à l'aide de « tableaux communs pour la communication électronique des informations » ou CRT. Cette même décision charge l'Organe subsidiaire de conseil scientifique et technologique (SBSTA) d'élaborer des CRT destinés à être examinés et adoptés à la COP26. Ce document se penche sur les principaux enjeux en rapport avec la structure potentielle des CRT et les méthodes pour les remplir. Différents scénarios de notification à l'aide de CRT sont évalués à partir d'exemples concrets. Globalement, il apparaît que tous les tableaux contenus dans l'ensemble de cadres communs de présentation (CRF) aujourd'hui utilisés par les Parties visées à l'Annexe I offrent un point de départ utile pour l'élaboration de CRT. Les CRF actuels doivent néanmoins faire l'objet d'un certain nombre d'améliorations et d'ajustements afin qu'ils correspondent mieux aux orientations concernant la notification qui figurent dans les modalités, procédures et lignes directrices. Le constat fait dans ce document est qu'il importe de veiller à ce que les CRT soient conçus de façon à permettre une notification aussi uniformisée que possible. Cela passe éventuellement par la possibilité de recourir à des éléments de notification standardisés (clés de notation, par exemple) et par la modification des tableaux en fonction d'une nouvelle structure définie d'un commun accord pour permettre la notification de nouveaux éléments. Le fait d'utiliser un cadre commun et de faciliter en outre une notification uniformisée peut être bénéfique pour plusieurs processus, dont l'examen technique par des experts et le traitement automatisé des informations, et favoriser ainsi la transparence, la comparabilité et la cohérence des inventaires des GES.

Classification JEL : F53, Q54, Q56, Q58

Mots-clés : changement climatique, transparence, notification, émissions, inventaires GES

Table of contents

Foreword	3
Acknowledgments	4
Abstract	5
Résumé	6
List of Acronyms	10
Executive Summary	11
1. Introduction	14
2. Overview of reporting requirements and approaches	15
Overview of reporting requirements under the ETF	15
Current reporting approaches	18
Reporting processes and available tools	23
3. Options for the development of CRTs	27
Criteria for testing CRT options	27
Open questions and potential options for the development of CRTs	28
Overview assessment of options for CRT reporting	42
4. Worked examples	46
Scenario 1: Reporting sectoral background data tables	46
Scenario 2: Reporting a reference year	49
Scenario 3: Reporting on GHG trends in the summary tables	50
Scenario 4: Reporting on new categories from the IPCC 2019 Refinement	52
Scenario 5: Reporting on the use of flexibility: footnotes vs documentation boxes	57
Scenario 6: Applying a lower insignificance level (flexibility option in §32 of the MPGs)	61
Scenario 7: Applying a lower KCA threshold of no lower than 85% (flexibility option in §25 of the MPGs)	66
Scenario 8: Not reporting certain gases (flexibility options in §48 of the MPGs)	67
Scenario 9: Reporting a shorter time series (flexibility options in §57 and §58 of the MPGs)	72
Scenario 10: Reporting on the use of flexibility as per paragraph 6 of the MPGs (Annex to decision 18/CMA.1)	76

5. Conclusion 79

Annex A. Developing criteria for testing CRT options 83

Promoting principles outlined in the MPGs and in the Paris Agreement	83
Facilitating automated assessment and the technical expert review	84
Allowing for relevant reporting tools to be prepared in time to facilitate reporting the first BTR	85
Allowing including new categories and gases from subsequent versions or refinements of the 2006 IPCC Guidelines where Parties wish to include them on a voluntary basis	85

References 87

Tables

Table 1. Summary of reporting requirements for national GHG inventories under the ETF and relevant experience	16
Table 2. Mandatory reporting elements of national GHG inventories	19
Table 3. Overview of CRF tables currently required to be reported by Annex I Parties	22
Table 4. GHG inventories: where and how is flexibility available?	35
Table 5. Overview of CRT reporting options and assessment against a given set of criteria	43
Table 6 Overview of scenarios used to develop the worked examples	46
Table 7. Option 2: Worked example of a tabular format for the reporting of information on the use of flexibility	77
Table 8. Overview of the advantages and disadvantages of different possible CRT reporting approaches	82

Figures

Figure 1. Sectoral background data table for CH ₄ emissions from manure management (cattle only) using Tier 1	47
Figure 2. Sectoral background data table for CH ₄ emissions from manure management (cattle only) using Tier 2	48
Figure 3. Header indicating reference year is automatically generated	49
Figure 4 The Party indicates its reference year in a documentation box	50
Figure 5 Columns on the “Base year” and “Change from base to the latest reported year” in the summary sheets of the current CRF	51
Figure 6 Base year and trend columns deleted from the summary tables	51
Figure 7 Table – “Base year” column deleted, the table on trend retained and renamed into “Change in % between first reported year to the latest reported year”	52
Figure 8 Unfilled category “Other” in the sectoral background table for category 2.B Chemical industry of the IPPU sector	53
Figure 9 Unfilled category “Other” in the sectoral report table for category 2.B Chemical industry of the IPPU sector	54
Figure 10 Reporting Hydrogen Production using the category 2.B.10 “Other” in the sectoral report table	55
Figure 11 CRF 2(II) Sectoral report for industrial processes and product use, emissions of HFCs, PFCs, SF ₆ and NF ₃ with three further gases from the IPCC 2019 Refinement included (CF ₃ I, CH ₂ Br ₂ , CHCl ₃)	56
Figure 12 A documentation box with guidance text is provided where countries can report their use of flexibility provisions	58
Figure 13 A documentation box is used to indicate the use of flexibility, documentation box is filled	59
Figure 14 Custom footnote used to indicate use of flexibility	60
Figure 15. Option 1: Using a “flexibility” notation key (e.g. “FLEX”) to indicate when emissions were not estimated because flexibility was used	62
Figure 16 Option 2: Using both the “not estimated” and the “flexibility” notation keys (e.g. “NE, FL”) in those cases in which emissions were not estimated because flexibility was used.	63
Figure 17. Option 3: Using only the notation key “NE” and to provide further information on the potential use of flexibility in the documentation box of the CRT	64
Figure 18. Option 4: Using only the notation key “NE” and to provide further information on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables)	65
Figure 19 Summary overview for key categories in the current CRF	66

Figure 20 Indicating that a KCA threshold of 85% has been used	66
Figure 21 Option 2.1 Deleting empty columns, table 2(II)	68
Figure 22. Option 2.2 Deleting empty rows and columns, table 2(II)	69
Figure 23 Option 3 Leaving cells empty, table 2(I)	70
Figure 24 Option 4 Using a notation key, table 2(I)	71
Figure 25 Excel files generated when information for the years 2020 and 2021 is reported	72
Figure 26 Option 1 Columns are included only for those years reported (2020-2021)	73
Figure 27–Option 2.1 Columns are generated for all years from 1990 to n-2, cells are left empty where years are not reported	74
Figure 28 Option 2.2: Columns are generated for all years from 1990 to n-2, years not reported are filled with a notation key	75
Figure 29. Option 3: Reporting on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables)	78

List of Acronyms

BR	Biennial Report
BUR	Biennial Update Report
CCXG	Climate Change Expert Group
COP	Conference of the Parties
CRT	Common Reporting Table
CRF	Common Reporting Format
ETF	Enhanced Transparency Framework
GHG	Greenhouse Gas
GST	Global Stocktake
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MPGs	Modalities, Procedures and Guidelines
NC	National Communication
NDC	Nationally Determined Contribution
NID	National Inventory Document
NIR	National Inventory Report
OECD	Organisation for Economic Co-Operation and Development
UNFCCC	United Nations Framework Convention on Climate Change
SBSTA	Subsidiary Body for Scientific and Technological Advice
TER	Technical Expert Review

Executive Summary

The Modalities, Procedures and Guidelines (MPGs), adopted in Katowice in 2018 and contained in the annex to decision 18/CMA.1, require all Parties to report information on national greenhouse gas (GHG) inventories using “common reporting tables” (CRTs). These tables are to be used starting with the submission of the first Biennial Transparency Report (BTR), due by December 2024. Information to be included in CRTs would be mostly quantitative, although some tables may include limited qualitative information on approaches and methodologies adopted in estimating national GHG emissions. The CRTs are to be accompanied by a National Inventory Document (NID) in which Parties are to report, *inter alia*, more detailed qualitative information on the preparation of GHG inventories. Decision 18/CMA.1 requests the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop CRTs for consideration and adoption by COP26, now deferred to 2021. Since the adoption of the MPGs, Parties have been negotiating the CRTs; a number of sticking points in relation to structure and reporting modalities of the CRTs remain unresolved. Such sticking points are both technical and political. Technical issues mostly relate to limited reporting capacity in many developing countries due to data availability. The inclusion of flexibility provisions in the MPGs helped address some of these issues. Political issues include how specific provisions outlined in the MPGs are to be reflected in the tables.

This paper aims at advancing the transparency discussions on the reporting of GHG inventories. To do so, the paper focuses on key issues related to the potential structure of the CRTs and approaches to filling them in. The paper assesses different CRT reporting scenarios (e.g. how to report on GHG trends in the summary tables) through worked examples, each proposing a different reporting approach. Country-specific challenges and issues related to filling in the tables, such as data availability and data collection challenges are not discussed in this paper. The issues outlined in the paper build upon current experiences of Parties’ reporting of national GHG inventories, discussions held within negotiations’ sessions and Parties’ submissions to the Subsidiary Body for Scientific and Technological Advice (SBSTA) on the matter of CRTs in September 2019. The worked examples developed show how CRTs could potentially be filled in with relevant information by Parties, under different situations. To provide suggestions for a potential way forward in the climate negotiations, the paper assesses the different CRT worked examples against a set of criteria. The first four assessment criteria are based on the reporting principles laid out in the MPGs; the remaining four have been developed by the authors based on lessons learned from current reporting practice. The criteria assess to which extent different CRT reporting options:

- Provide a common format for reporting (Decision 18/CMA.1, §12.a);
- Facilitate improved reporting and transparency over time (Annex to decision 18/CMA.1, Section I, §3.a);
- Promote transparency, accuracy, completeness, consistency and comparability (TACCC) (Annex to decision 18/CMA.1, Section I, §3.d);
- Ensure that Parties maintain at least the current frequency and quality of reporting (Annex to decision 18/CMA.1, Section I, §3.f);
- Facilitate machine readability and/or automatised assessment;
- Facilitate the technical expert review:

- Limit the scope and complexity of changes compared to the current reporting tables so to allow for relevant reports to be prepared in time to facilitate reporting the first Biennial Transparency Report (BTR);
- Allow for the inclusion of new categories and gases from subsequent versions or refinements of the IPCC 2006 Guidelines where Parties wish to include them on a voluntary basis.

Understanding all Parties current reporting experience is important when considering key issues related to designing and reporting national GHG inventories using CRTs. Indeed, the MPGs request the SBSTA to develop CRTs “taking into account the existing [...] common reporting formats” (CRFs). The only CRFs available to date are those that Annex I Parties currently use to report on national GHG inventories. The CRF tables are publicly available in an Excel-readable format and comprise a total of 48 tables. Most CRF tables include a documentation box, in which Parties provide further information on, e.g. specific use of individual notation keys or specific information on activity data. Under the current reporting framework, the CRF tables are automatically generated by Parties’ inputting of information such as calculated GHG emissions and activity data into the CRF Reporter software. The CRF Reporter includes a number of functions that significantly facilitate reporting by Parties. For example, a number of the tables contained in the set of CRFs are filled in automatically by the CRF Reporter (e.g. summary and trend tables), on the basis of information reported by Parties in sectoral background tables, which have to be filled in by Parties themselves.

Non-Annex I Parties’ current experience in using common reporting tabular formats and common reporting tools is more limited than that of Annex I countries, primarily as the current reporting guidelines do not require the use of either. Rather, guidelines for the preparation of non-Annex I Parties’ National Communications (NCs) and Biennial Update Reports (BURs) *encourage* non-Annex I Parties to use reporting tables included in the annexes to the respective guidelines. Yet, tabular formats used by non-Annex I Parties to report on national GHG inventories vary across Parties in terms of structure, level of detail and sectors and categories included. Under the current reporting framework, non-Annex I Parties do not use the CRF Reporter, and rely on different software to prepare their national GHG inventories. A minority of Non-Annex I Parties rely on the use of the IPCC Inventory Software, whose tools and functions are more limited than the CRF Reporter and produces tables that are less complex than the CRFs.

Party submissions to SBSTA on the issue of CRTs highlight some convergences as well as some sticking points. In terms of convergence, most Parties agree that the current CRF tables represent a good starting point for the development of CRTs. In terms of sticking points, there are a number of these that relate to the format and structure of the CRTs. One key sticking point relates to how a “common” reporting table can also apply the flexibility provisions laid out in the MPGs for those developing countries that need it in the light of their capacities. Such flexibility provisions were included in the MPGs to compensate for the increased stringency of reporting guidelines outlined in the MPGs compared to current guidelines for non-Annex I Parties’ reporting. Building upon the sticking points identified, this paper analyses reporting scenarios that illustrate how CRTs could potentially be structured or filled in according to different reporting scenarios. Each scenario includes a number of worked examples that present a number of options for reporting using different approaches. The scenarios analysed and related reporting options are as follows:

- **Reporting and/or indicating the NDC reference year (when applicable):** Options assessed include (1) including a dedicated column to the CRTs or (2) indicating the reference year in a documentation box;
- **Reporting on GHG trends in the summary tables:** Options assessed include (1) not including information on trends in the CRTs (as the current field “base year” would no longer apply under the ETF) or (2) calculating a trend using the information on the earliest year reported and the latest year reported or the average annual percentage change in emissions over the years reported.

- **Reporting on new categories of emission sources from the 2019 IPCC Refinement:** Options assessed include reporting on new categories using the category “other” under inventory sectors, and amending tables so to include new gases identified in the IPCC 2019 refinement.
- **How to apply flexibility within CRTs:** Options assessed include (1) transparently indicating the use of flexibility through a flexibility notation key (e.g. “FLEX”) and/or by providing information in a documentation box/footnote; or (2) hiding or deleting rows and columns that would otherwise be left empty.
- **How to report on the use of flexibility:** Options assessed include, *inter alia*, (1) reporting on the use of flexibility using either a tabular format that could also be potentially added to the set of CRTs, or (2) including such information in the set of CRTs.

Each worked example is assessed against the above-mentioned criteria. Accordingly, this paper finds that it would be important to ensure that the CRTs allow for a reporting that is as standardised as possible. This would facilitate the review process and automated processing of information, thereby promoting transparency and consistency of reporting, which, in turn, can facilitate generating inputs for the Global Stocktake. Further qualitative information and explanations that cannot be easily standardised and thus included in the CRTs could be included either in a documentation box/footnote or in the text of the National Inventory Document (NID). Further, it would be useful for Parties to use a common set of tables, which would include detailed tables such as sectoral background tables, which already allow Parties to report according to their own reporting capacities. Indeed, a number of minor adjustments could be implemented in CRTs so to better reflect new reporting options introduced by the MPGs, e.g. by adding new rows/columns, where relevant, for the reporting of new gases.

With regards to the operationalisation of flexibility, the paper concludes that a greater number of the criteria are satisfied by the use of a standardised element to highlight where flexibility has been used, i.e. a “flexibility” notation key than by the deletion of empty rows and/or columns. The notation key would indicate cells where a GHG value has not been reported due to the use of flexibility where a Party needs it in light of its capacities. Further information on the specific use of flexibility options by those developing country Parties that need it in the light of their capacities can be provided in a number of ways. These include providing additional information through the use of documentation boxes, footnotes, or common tables to be included in the common set of CRTs. The latter option, in particular, could consider adding a “flexibility” section to the “completeness table” currently included in the set of CRFs where Annex I Parties provide further information on the specific use of notation keys. This paper also suggests that CRTs could potentially include an overview table that allows Parties to report information on the use of flexibility as mandated by paragraph 6 of the MPGs. This paper finds that there are significant drawbacks to operationalising flexibility options through the deletion of rows and columns that are left empty due to the use of flexibility by those developing country Parties that need it in the light of their capacities. This is because the deletion of rows and columns of the CRTs would lead to tables from different countries having different sizes. This could have significant negative repercussions on automated processing and aggregation of data, as well as on comparability, transparency and consistency. This, in turn, would render the Technical Expert Review more difficult by increasing effort on the side of the technical experts. Parties have advanced different opinions as to whether deleting rows and columns is compliant with the concept of common reporting tables. Views seem to differ with regards to whether only the reporting tables agreed by SBSTA should be common or whether they still need to be common when they are submitted to the UNFCCC. The majority of Parties is of the view that this approach would be inconsistent with the MPGs as it would result in submitting a set of tables that are not common across Parties. While the tables submitted to the UNFCCC would clearly not be common where rows and columns are deleted, this paper assesses the options of deleting rows and columns for the purpose of generating a more detailed understanding of its implications.

1. Introduction

Article 13.7(a) of the Paris Agreement requires (“shall”) all Parties to regularly provide a national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases (Paris Agreement, 2015^[1]). The Modalities, Procedures and Guidelines (MPGs), contained in the Annex to decision 18/CMA.1 and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) in 2018, define the rules for reporting and reviewing information that Parties are to submit under the Enhanced Transparency Framework (ETF) of the Paris Agreement (UNFCCC, 2019^[2]). The MPGs delineate the reporting provisions in relation to, inter alia, national inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases.

Decision 18/CMA.1 requests the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop, pursuant to the MPGs, “common reporting tables” (CRTs) for the electronic reporting of information on national greenhouse gas (GHG) inventories (Decision 18/CMA.1, §12a) (UNFCCC, 2019^[2]). Such tables are to be considered and adopted by the CMA at its third session at COP26. CRTs are to reflect the guiding principles of the MPGs. These include ensuring that Parties maintain at a minimum the frequency and quality of reporting of their respective obligations under the Convention (i.e. the principle of “no backsliding”) and allowing for the implementation of flexibility for those developing country Parties that need it in the light of their capacities, pursuant to Article 13.2 of the Paris Agreement (UNFCCC, 2019^[2]; Paris Agreement, 2015^[1]).

The MPGs request the SBSTA to develop CRTs “taking into account the existing [...] common reporting formats” (Decision 18/CMA.1, §12.a) (UNFCCC, 2019^[2]). These refer to the CRF tables currently used under the UNFCCC for the reporting of national GHG inventories by Annex I Parties. Most Parties agree that current CRFs represent a good starting point for the development of CRTs. However, since the beginning of the negotiations on CRTs in 2018, several key issues and sticking points related to the design and structure of CRTs remain unresolved. For example, Parties have not yet agreed on how to apply flexibility provisions used by those developing country Parties that need it in the light of their capacities in a reporting table that is “common”.

This paper explores key issues and presents options for the reporting of information of national anthropogenic emissions using CRTs.¹ To do so, the paper provides an overview of current approaches in reporting national GHG inventories, including on reporting tools currently used by Parties to fill in reporting tables (Section 2). The paper then presents and discusses minimum reporting requirements under the ETF as well as key sticking points of the development of CRTs for national GHG inventories. Options to resolve these sticking points are discussed against a set of criteria developed building upon guiding principles of the MPGs, UNFCCC processes and lessons learned from current reporting experience (Section 3). The options are illustrated and supported by worked examples for different reporting scenarios (e.g. different capacity limitations requiring flexibility options) (Section 4). Conclusions are presented in Section 5.

¹ Specific challenges and issues related to the content of the tables (e.g. data availability and data collection challenges) are not discussed in this paper.

2. Overview of reporting requirements and approaches

The Enhanced Transparency Framework (ETF) of the Paris Agreement introduces a common reporting framework for all Parties to the Paris Agreement (Paris Agreement, 2015^[1]; UNFCCC, 2019^[2]). Under current reporting arrangements, Annex I and non-Annex I Parties prepare national GHG inventories according to separate reporting guidelines and formats. There are several software available to Parties to prepare national GHG inventories. Annex I Parties, for example, use the CRF Reporter software to produce CRFs for national GHG emissions reporting.

Understanding Parties' current experience in reporting information on national GHG inventories is critical to advance discussions to develop CRTs. In particular, it would be important for developing country Parties to understand Annex I Parties' experience with the filling in of CRFs and the use of the CRF Reporter software, as both are accepted as a starting point for CRTs. For this purpose, this section first provides an overview of reporting requirements and formats under the ETF. Secondly, the section explores current tools and software available to Parties to report on national GHG inventories.

Overview of reporting requirements under the ETF

According to the MPGs, all Parties shall provide “a national inventory report of anthropogenic emissions by sources and removals by sinks of GHGs” (Annex to decision 18/CMA.1, Section I, §10.a) (UNFCCC, 2019^[2]). National inventory reports are to consist of a National Inventory Document (NID) and the CRTs (Annex to decision 18/CMA.1, Section II, §38) (UNFCCC, 2019^[2]). The MPGs set several requirements for GHG inventory reporting for all Parties.

Table 1 below presents (i) an overview of these reporting requirements (which lay out both qualitative and quantitative information to be reported) as well as (ii) an overview of how these requirements differ from the reporting guidelines under the Convention. Overall, new reporting requirements for national GHG inventory reports laid out in the MPGs reinforce and enhance the current reporting framework (see page 18), particularly for developing country Parties.

The increased stringency in reporting inventory requirements for developing country Parties is balanced by the availability of flexibility options for some reporting provisions outlined in the MPGs. Paragraph 4 of the MPGs states that, per Article 13.2 of the Paris Agreement, the ETF “shall provide flexibility options to those developing country Parties who need them in the light of their capacity” (Annex to decision 18/CMA.1, Section I, §4) (UNFCCC, 2019^[2]). The MPGs reflect such flexibility, and indicate specific reporting provisions to which flexibility can be applied by developing country Parties that need flexibility in the light of their capacities. Flexibility may therefore apply to, e.g. gases reported, key category and uncertainty analyses, the quality assurance/quality control (QA/QC) plan, etc. These flexibility options are listed in Table 4 in Section 3.

Table 1. Summary of reporting requirements for national GHG inventories under the ETF and relevant experience

Reporting element under the ETF	Requested (“should”) or required (“shall”) under the ETF?	Is this information, or similar information already covered in reporting Biennial Report, Biennial Update Report and National Communication guidelines for developed country or developing country Parties?
Information on methods and cross-cutting elements		
Methods used, including the rationale for the choice of methods, references and sources of information used for the emission factors and activity data used to compile the GHG inventory (<i>Annex to decision 18/CMA.1, Section II, §39</i>)	Required	Developed – yes (“shall”) Developing – yes, to a lesser extent (“encouraged”)
Information on the category and gas, and the methodologies, emission factors and activity data used at the most disaggregated level (<i>Annex to decision 18/CMA.1, Section II, § 40</i>)	Required, but with qualifier “to the extent possible”.	Developed – yes (“shall” use the 2006 IPCC Guidelines) Developing –yes, to a lesser extent (“should” use the Revised IPCC 1996 Guidelines (NC guidelines) and inventories updates in BURs “should contain updated data on activity levels” and “are encouraged to include [...] the sectoral report tables”.
Description of key categories, including information on the approach used for their identification, and on the level of disaggregation used (<i>Annex to decision 18/CMA.1, Section II, § 25 and 41</i>)	Required, with flexibility provided on the threshold used for defining key categories	Developed – yes (“NIR shall include”) Developing – yes, to a lesser extent (“are encouraged to”)
Individual and cumulative percentage contributions from key categories (<i>Annex to decision 18/CMA.1, Section II, § 25 and 42</i>)	Required, with flexibility provided on the threshold used for defining key categories	Developed – yes (“All Parties shall estimate and report the individual and cumulative percentage contributions of key categories”) Developing – yes, to a lesser extent (“are encouraged to”)
Report recalculations including explanatory information and justifications for recalculations with an indication of relevant changes and their impact on the emission trends (<i>Annex to decision 18/CMA.1, Section II, § 26–28 and 43</i>)	Required	Developed – yes (“shall”) Developing – no specific reporting requirement
Results of the uncertainty analysis as well as methods used (<i>Annex to decision 18/CMA.1, Section II, § 29 and 44</i>)	Required, with flexibility provided	Developed – yes (“shall”) Developing – yes, , to a lesser extent (“encouraged to apply the IPCC Good Practice Guidance” and “encouraged to provide information on the level of uncertainty associated with data and their underlying assumptions, and to describe the methodologies used, if any, for estimating uncertainties”)
Information on the reasons for lack of completeness (<i>Annex to decision 18/CMA.1, Section II, § 30-33 and 45</i>)	Required	Developed – yes (“should [...] explain the reasons for [...] exclusions” of sources and sinks not included in the inventory Developing – yes, to a lesser extent (“should use the notation keys”)
QA/QC plan and information on QA/QC procedures (<i>Annex to decision 18/CMA.1, Section II, § 34-36 and 46</i>)	Required, with flexibility provided	Developed – yes (“shall”) Developing – yes, to a lesser extent (“encouraged to apply the IPCC Good Practice Guidance”)
Sectors and gases		
Estimates of emissions and removals for all categories, gases and carbon pools considered in the GHG inventory throughout the reported period on a gas-by-gas basis in units of mass at the most disaggregated level (<i>Annex to decision 18/CMA.1, Section II, §47</i>)	Required	Developed – yes (“shall report a national inventory [...] of all GHG”, “should be presented on a gas-by-gas basis”) Developing – yes (“ shall, as appropriate and to the extent possible provide its national inventory, on a gas-by-gas basis”)
Report seven gases (<i>Annex to decision 18/CMA.1, Section II, §48</i>)	Required, with flexibility provided	Developed – yes (“shall”) Developing – yes, but partially (“shall, as appropriate and to the extent possible provide its national inventory [...], estimates of anthropogenic emissions” of CO ₂ , CH ₄ and N ₂ O and “are encouraged” to provide information on HFCs, PFCs, SF ₆ and NF ₃

Reporting element under the ETF	Requested (“should”) or required (“shall”) under the ETF?	Is this information, or similar information already covered in reporting Biennial Report, Biennial Update Report and National Communication guidelines for developed country or developing country Parties?
Each Party reporting HFCs, PFCs, SF ₆ and NF ₃ shall report actual emissions of the gases, providing disaggregated data by chemical and category (<i>Annex to decision 18/CMA.1, Section II, §49</i>)	Required for those Parties reporting on HFCs, PFCs, SF ₆ and NF ₃	Developed – yes (“shall report actual emissions of HFCs, PFCs, SF ₆ and NF ₃ , providing disaggregated data by chemical and category in units of mass”) Developing – yes, to a lesser extent (“are encouraged, as appropriate, to provide information” on HFCs, PFCs, SF ₆ and NF ₃)
Report the following sectors: energy, industrial processes and product use, agriculture, LULUCF and waste, according to the IPCC guidelines referred to in paragraph 20 above (<i>Annex to decision 18/CMA.1, Section II, §50</i>)	Required	Developed – yes, indirectly (“shall” use the 2006 IPCC Guidelines) Developing – yes, to a lesser extent (“should” use the Revised IPCC 1996 Guidelines)
Information on the following precursor gases CO, NO _x , NMVOCs, as well as sulphur oxides (<i>Annex to decision 18/CMA.1, Section II, §51</i>)	Requested (“should”)	Developed – yes (“should provide information on” CO, NO _x , NMVOCs and SO _x) Developing – yes, to a lesser extent (“are encouraged, as appropriate, to report on” CO, NO _x , NMVOCs. SO _x may be included)
Each Party may report indirect CO ₂ from the atmospheric oxidation of CH ₄ , CO and NMVOCs (<i>Annex to decision 18/CMA.1, Section II, §52</i>).	Requested (“may”)	Developed – yes (“may report”) Developing – no specific mention
International aviation and marine bunker fuel emissions as two separate entries (<i>Annex to decision 18/CMA.1, Section II, §53</i>)	Requested (“should”)	Developed – yes (“International aviation and marine bunker fuel emissions [...] should be reported separately”) Developing – yes, to a lesser extent (“should, to the extent possible, and if disaggregated data are available, report emissions from international aviation and marine bunker fuels separately in their inventories)
Clearly indicate how feedstocks and non-energy use of fuels have been accounted for in the inventory (<i>Annex to decision 18/CMA.1, Section II, §54</i>)	Requested (“should”)	Developed – yes (“Information on how and where feedstocks and non-energy use of fuels have been reported in the inventory”) Developing - no specific mention
Information on the approach taken for estimating emissions and subsequent removals from natural disturbance (ND) on managed lands, and how it is consistent with IPCC guidance, as appropriate (<i>Annex to decision 18/CMA.1, Section II, §55</i>).	Required, for parties addressing ND on managed lands in GHG inventory.	Developed – no Developing – no
Supplementary information on emissions and removals from harvested wood product (HWP)s estimated using the production approach (<i>Annex to decision 18/CMA.1, Section II, §56</i>)	Required, for parties using an approach to reporting emissions and removals from HWP	Developed – yes (“The SBSTA invited Parties in a position to do so to voluntarily report on harvested wood products in their national inventories in a manner consistent with current UNFCCC reporting guidelines”). Developing – yes, to a lesser extent (same as above)
Time series		
Consistent annual time series starting from 1990 (<i>Annex to decision 18/CMA.1, Section II, §57</i>)	Required, with flexibility provided	Developed – yes Developing – yes, to a lesser extent (“encouraged to provide a consistent time series back to the years reported in the previous NCs” in BURs)
The latest reporting year shall be no more than two years prior to the submission of its NID (<i>Annex to decision 18/CMA.1, Section II, §58</i>)	Required, with flexibility provided	Developed – yes Developing – no

Source: (Rocha, 2019^[3]), based on (UNFCCC, 2019^[2]), (UNFCCC, 2003^[4]), (UNFCCC, 2012^[5]), (UNFCCC, 2006^[6])

Current reporting approaches

The reporting of national GHG inventories is already mandatory for all Parties under the UNFCCC.² Article 12 of the UNFCCC requires (“shall”) all Parties to the Convention to communicate “a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases [...], to the extent [their] capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties” (UNFCCC, 1992_[7]). Reporting requirements for GHG inventories vary substantially between Annex I and non-Annex I Parties, with requirements for Annex I Parties being more stringent in terms of, e.g. gas coverage, frequency of reporting and reporting methodologies (see Table 2).³ For example, Annex I Parties are to report national GHG inventories annually, while non-Annex I Parties are mandated to report national GHG inventories every two years as part of their BURs. Previous CCXG analysis exploring Parties’ reporting experience shows that in practice, due to capacity constraints, some non-Annex I Parties have not fulfilled current reporting arrangements (Ellis et al., 2018_[8]; Briner and Moarif, 2017_[9]; Ellis and Moarif, 2015_[10]). For example, with regards to the frequency of submission, some non-Annex I national inventory reports have been submitted up to 10 years apart (Ellis et al., 2018_[8]).

Under current reporting arrangements, Annex I Parties are required to submit to the UNFCCC annual GHG inventories that “shall” consist of a National Inventory Report (NIR) and Common Reporting Format (CRF) tables. NIRs primarily contain descriptive information on, e.g. methodologies and institutional arrangements underlying national GHG inventories.⁴ The NIR thus provides broader qualitative information related to GHG inventories, whereas the CRF tables focus on quantitative data. National GHG inventories are also included in a summarised format in Annex I Parties’ National Communications (NCs) and Biennial Reports (BRs). Non-Annex I Parties are required to submit their GHG inventories as part of their NCs and Biennial Update Reports (BURs). Some non-Annex I Parties submit, as part of their BUR submissions, NIRs as a stand-alone document. UNFCCC guidelines for the preparation of BURs state that non-Annex I Parties’ NIRs should consist of a summary or an update of the information on emission factors and activity data used in their estimation of emissions to be included in non-Annex I NCs (UNFCCC, 2012_[5]).

While reporting of national GHG inventories is mandatory for all Parties, reporting formats of quantitative data on national GHG emissions vary across Parties. Annex I Parties are required to report information on national GHG emissions using a common reporting format, the CRF tables. Non-Annex I Parties, in contrast, are given more leeway in terms of the reporting format. To provide context to the basis on which CRTs are being developed, this section explores reporting formats currently in use by Annex I and non-Annex I Parties.

² As Parties are currently reporting GHG inventories under the Convention, this section refers to the current country groupings of Annex I and non-Annex I Parties, which no longer apply under the MPGs.

³ Annex I of decision 24/CP.19 defines the reporting guidelines on annual GHG inventories for Annex I Parties, hereinafter referred to as the UNFCCC Inventory Reporting Guidelines. Decisions 17/CP.8 and decision 2/CP.17 provide guidelines for the development of Non-Annex I Parties’ NCs and BURs respectively, and include indications on the preparation of annual GHG inventories.

⁴ The updated UNFCCC reporting guidelines on annual inventories, following incorporation of the provisions of decision 14/CP.11, set out the outline for NIRs. Accordingly, NIRs are to provide an overview of trends, methodologies for each category, data used, QA/QC, improvement plan and to some extent also emissions data (SBSTA, 2006_[24]).

Table 2. Mandatory reporting elements of national GHG inventories

Reporting Element	Annex I (NIR)	Non-Annex I (NC)	Non-Annex I (BUR)
Gas coverage	CO ₂ , CH ₄ ; N ₂ O; PFCs; HFCs; SF ₆ ; NF ₃	CO ₂ , CH ₄ ; N ₂ O	CO ₂ , CH ₄ ; N ₂ O*
Years covered	Annual series, from base year to N-2	1994 or 1990 in NC1 and 2000 in NC2; LDCs can select years at their discretion. Time series not required.	At least N-4. Time series not required.
Methodologies	2006 IPCC Guidelines	No requirement (Should use Revised 1996 IPCC Guidelines)	No requirement (Should use Revised 1996 IPCC Guidelines, GPG and Uncertainty Management in National GHG Inventories, and the GPG for LULUCF)
Frequency	Annual (by 15 April, for N-2)	No requirement	No requirement
Common reporting format	Common Reporting Format (CRF) Tables	No requirement (Encouraged to use tables in Annex 3A.2 of IPCC GPG for LULUCF and sectoral tables from 1996 IPCC guidelines)	No requirement (Encouraged to use tables in Annex 3A.2 of IPCC GPG for LULUCF and sectoral tables from 1996 IPCC guidelines)

Note: * Guidelines for BURs cross-reference guidelines for NCs.

Source: Based on (Ellis and Moarif, 2015_[10]), expanded by Authors

Annex I Parties' reporting format: Common Reporting Format (CRF) tables

National GHG inventories are submitted by Annex I Parties annually and are prepared following reporting guidelines agreed by the COP, and contained in annex I to decision 24/CP.19 (UNFCCC, 2013_[11]). CRF tables that shall be included in Annex I Parties' annual GHG inventory submissions to the UNFCCC are included in annex II to decision 24/CP.19 (UNFCCC, 2013_[11]). Such tables are generated by the CRF Reporter software and shall be submitted electronically, "with a view to facilitating the processing of the inventory information by the Secretariat" (UNFCCC, 2013_[11]). Since 2015, national GHG estimates are prepared by Annex I Parties following the methodologies laid out in the 2006 IPCC guidelines (IPCC, 2006_[12]).

The CRF tables structure national GHG inventories around five sectors: (1) Energy, (2) Industrial Processes and Product Use (IPPU), (3) Agriculture, (4) Land Use, Land-use Change and Forestry (LULUCF), and (5) Waste. Each sector includes a number of categories and sub-categories of GHG emissions and removals. The CRF tables currently in use were updated in 2015 to accommodate the 2006 IPCC guidelines⁵, and the sectors, categories and sub-categories included in the CRF tables largely correspond to those identified by the 2006 IPCC guidelines, yet presenting some differences. For example, emissions from Agriculture and LULUCF are reported in two separate sub-tables in the CRF tables, whereas they are combined in the category AFOLU in the 2006 IPCC guidelines (Jeffery et al., 2018_[13]).

The CRF tables reported by Annex I Parties are made available by the UNFCCC Secretariat in an Excel-readable format and comprise a total of 48 tables spread across 71 Excel sheets (UNFCCC, 2020_[14]).

⁵ The transition from Revised 1996 IPCC Guidelines to the 2006 IPCC Guidelines includes improvements that relate to general guidance on e.g. data collection, use of key category analysis and methodological choice. Key structural changes pertain to the restructuring of the sectoral classification. In particular, categories 2 (Industrial Processes) and 3 (Solvent and Other Product Use) of the 1996 Guidelines were combined in the new category Industrial Processes and Product Use (IPPU). The Land-Use, Land-Use Change, and Forestry (LULUCF) category and the Agriculture category were combined in the new category Agriculture, Forestry and Other Land-Use (LULUCF).

Table 3 at page 22 provides an overview of the CRF tables currently in use. The 48 CRF tables vary among themselves in terms of structure and level of detail of the information required. Each table allows for the reporting of specific information and elements. In particular:

- **“Sectoral summary” tables** (tables 1 to 5) provide an overview of GHG emissions of all five sectors. Sectoral summary tables organise GHG emission data by category/sub-category on a gas-by-gas basis reported in mass unit (kilotonnes).
- **“Sectoral background data” tables** (tables 1.A(a) to 5.D) include background data and parameters used for the calculation of GHG emissions of each category and sub-category. These tables allow Parties to report information on activity data and emissions as well as on other parameters such as operational conditions or specific national characteristics (e.g. typical animal mass of dairy cattle).
- **Cross-cutting tables** (tables 6-10) provide other complementary information to the national GHG inventory. These include:
 - A cross-sectoral report (table 6), in which Parties provide information on indirect emissions of N₂O and CO₂ for each sector;
 - A summary overview of key categories (table 7), which lists key categories⁶ of GHG emissions and removals and an overview of information on, e.g. criteria used for key source identification;
 - A recalculation table (table 8), which allows Parties to report on recalculated emissions in accordance with paragraphs 16-18 of the UNFCCC reporting guidelines on annual GHG inventories (Annex I to Decision 24/CP.19)
 - A completeness table (table 9), which allows Parties to report on information on the use of the notation keys “NE” and “IE”;
 - An emissions trends table (table 10), which provides an overview of emissions trends per sector and category expressed in terms of both units of mass (kilotonnes) and CO₂ equivalent, from 1990 to latest reported year.
- **“Summary report” tables** (i.e. Summary 1-3) provide an overview of aggregate GHG emissions per category and sub-category on a gas-by-gas basis and as CO₂ equivalent for different GHGs using the IPCC Global Warming Potential values. Summary table 3, in particular, provides an overview of methods (e.g. tier used)⁷ and emission factors used for each category and greenhouse gas.

Most CRF tables include a documentation box, which is to be used to “provide cross-references to detailed explanations in the NIR, or any other information, as specified in those boxes” and any qualitative explanation “should” be provided mainly through the NIR, rather than in the CRF tables (UNFCCC, 2013_[11]). Besides, the UNFCCC reporting guidelines on national GHG inventories provide some discretion to Annex I Parties in the compilation of CRF tables. Based on decision 24/CP.19 (UNFCCC, 2013_[11]), these include:

⁶ As defined by the IPCC, “a key category is one that is prioritised within the national inventory system because its estimate has a significant influence on a country’s total inventory of greenhouse gases in terms of the absolute level, the trend, or the uncertainty in emissions and removals. Whenever the term key category is used, it includes both source and sink categories.” (IPCC, 2006_[12])

⁷ The IPCC has classified the methodological approaches used to estimate national GHG emissions in three different Tiers.

- When filling in the CRF tables, Annex I Parties “should” use notation keys⁸ where methodological or data gaps exist;
- If/When data is not available due to confidentiality issues, Parties are allowed to report information on GHG emissions at a less disaggregated level;
- Annex I Parties can estimate and report emissions and removals for source or sink categories that are not included in the 2006 IPCC Guidelines under the subcategory “Other”, for which they have to describe such sources or sinks and information on methodologies used. CRF tables for those categories in which these provisions are applied could differ across Parties, as one or more lines would be added to the table, corresponding to the new categories voluntarily included.

Importantly, CRF tables are submitted by Annex I Parties to the UNFCCC via the CRF Reporter. CRF tables in the form of MS Excel files (in the file format .xls) are uploaded to the UNFCCC website separately from NIRs. Most Annex I Parties include in their NIRs simplified versions of the summary and sectoral report tables contained in the CRFs. Such tables, whose format is at Parties’ discretion, are considerably less detailed and more approachable for a non-expert reader.

⁸ Notation keys available to Parties are as follows: “NO” (not occurring) for categories under a source or sink that does not occur within the Party’s territory; “NE” (not estimated) for activity data and/or emissions by sources and removals which have not been estimated but for which a corresponding activity may occur within a Party; “NA” (not applicable) for activities under a given source or sink category that do occur within a Party but that do not result in emissions or removals of a specific gas; “IE” (included elsewhere) for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory; “C” (confidential) for emissions by sources and removals by sink of GHGs whose reporting could lead to the disclosure of confidential information. (Annex I to decision 24/CP.19, §37) (UNFCCC, 2013^[11]).

Table 3. Overview of CRF tables currently required to be reported by Annex I Parties

TABLE 1 : Sectoral Report for Energy	
Sectoral background data for energy	TABLE 1.A(a) Fuel combustion activities sectoral approach
	TABLE 1.A(b) CO ₂ from fuel combustion activities
	TABLE 1.A(c) Comparison of CO ₂ emissions from fuel combustion
	TABLE 1.A(d) Feedstock, reductants and other non-energy use of fuels
	TABLE 1.B.1 Solid fuels
	TABLE 1.B.2 Oil, natural gas and other emissions from energy production
	TABLE 1.C CO ₂ transport and storage
	TABLE 1.D International aviation and international navigation (international bunkers) and multilateral operations
TABLE 2 (I) and (II) : Sectoral Report for Industrial Processes and Product Use (IPPU)	
Sectoral background data for IPPU	TABLE 2(I).A-H Emissions of CO ₂ , CH ₄ and N ₂ O
	TABLE 2(II).B-H Sources of fluorinated substances
TABLE 3 : Sectoral Report for Agriculture	
Sectoral background data for agriculture	TABLE 3.A Enteric fermentation
	TABLE 3.B(a) CH ₄ emissions from manure management
	TABLE 3.B(b) N ₂ O Emissions from Manure Management
	TABLE 3.C Rice cultivation
	TABLE 3.D Direct and indirect N ₂ O emissions from agricultural soils
	TABLE 3.E Prescribed burning of savannahs
	TABLE 3.F Field burning of agricultural activities
	TABLE 3.G-I CO ₂ emissions from liming, urea application and other carbon containing fertilizers
TABLE 4 : Sectoral Report for Land Use, Land-use Change and Forestry (LULUCF)	
Sectoral background data for LULUCF	TABLE 4.1 Land transition matrix
	TABLE 4.A Forest Land
	TABLE 4.B Cropland
	TABLE 4.C Grassland
	TABLE 4.D Wetlands
	TABLE 4.E Settlements
	TABLE 4.F Other land
	TABLE 4.A Forest land
	TABLE 4(I) Direct nitrous oxide (N ₂ O) emissions from nitrogen (N) inputs to managed soils
	TABLE 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils
	TABLE 4(III) Direct nitrous oxide (N ₂ O) emissions from nitrogen (N) mineralization/immobilization associated with loss/gain of soil organic matter resulting from change of land use or management of mineral soils
	TABLE 4(IV) Indirect nitrous oxide (N ₂ O) emissions from managed soils
	TABLE 4(V) Biomass burning
	TABLE 4.G Harvested wood products
	TABLE 5 : Sectoral report for waste
Sectoral background data for waste	TABLE 5.A Solid waste disposal
	TABLE 5.B Biological treatment of solid waste
	TABLE 5.C Incineration and open burning of waste
	TABL 5.D Wastewater treatment and discharge
TABLE 6 : Cross-sectoral report: Indirect emissions of N ₂ O and CO ₂	
TABLE 7 : Summary overview for key categories	
TABLE 8 : Recalculation	
TABLE 9 : Completeness – Information on notation keys	
TABLE 10 : Emission trends (one sheet per greenhouse gas and one sheet for aggregate GHG emissions)	
SUMMARY 1.A : Summary report for national greenhouse gas inventories (in kt)	
SUMMARY 2 : Summary report for national GHG inventories in CO ₂ equivalent	
SUMMARY 3 : Summary report for methods and emissions factors used	

Non-Annex I Parties' current reporting format

Guidelines for the preparation of national GHG inventories as part of non-Annex I Parties' NCs and BURs do not mandate the use of CRF tables. However, guidelines for the preparation of non-Annex I Parties' NCs outlined in the annex to decision 17/CP.8 encourage non-Annex I Parties to report national GHG inventories using tables 1 and 2 included in the annex to the decision (UNFCCC, 2003^[4]). Such tables consist of two summary tables that provide an overview of GHG emissions and removals by sector/category and greenhouse gas.⁹ The sectoral structure of these tables follows that of the Revised 1996 IPCC guidelines.¹⁰ Further, BUR guidelines encourage non-Annex I Parties “to include, as appropriate and to the extent that capacities permit [...] tables included in annex 3A.2 to the IPCC Good Practice Guidance for LULUCF and the sectoral report tables annexed to the Revised 1996 IPCC Guidelines” (UNFCCC, 2012^[5]). Tables included in annex 3A.2 to the IPCC GPG for LULUCF are dedicated to the reporting of emissions and removals of CO₂ and non-CO₂ gases from LULUCF. These tables allow for the reporting of detailed information on background data such as “annual change in carbon stocks in living biomass” (IPCC, 2003^[15]).

Indeed, most non-Annex I Parties who have submitted a NC and/or a BUR to the UNFCCC provide information on national GHG emissions using a tabular format. Some Non-Annex I Parties include tabular formats consistent with what is included in the guidelines for the preparation of BURs and NCs from non-Annex I Parties. However, other non-Annex I Parties have developed their own reporting tables to include further information relevant to national contexts that goes beyond what is strictly required by the reporting guidelines of BURs and NCs from non-Annex I Parties. As a result, significant variance in terms of structure and level of detail of the tabular formats included by Non-Annex I Parties in their submissions to the UNFCCC can be observed. Most non-Annex I Parties only include summary tables of national GHG inventories (e.g. Lebanon's BUR3) (Government of Lebanon, 2019^[16]). Some non-Annex I Parties include in their submissions also sectoral report tables, which provide a more detailed overview of specific sectors.

Tabular formats used to report information on GHG emissions by non-Annex I Parties also vary in terms of sectors and categories included. This is mainly because the use of 2006 IPCC Guidelines is not mandatory for the development of non-Annex I Parties' national GHG inventories, and most non-Annex I Parties still use of the Revised 1996 IPCC Guidelines (Ellis et al., 2018^[8]). For example, Thailand's national GHG inventory contained in the country's BUR2 is presented in a tabular format and includes the six sectors identified in the Revised 1996 IPCC Guidelines (Government of Thailand, 2017^[17]), whereas Nigeria's GHG inventory included in the country's BUR1 is structured around the four sectors of the 2006 IPCC Guidelines (Government of Nigeria, 2018^[18]). Most non-Annex I Parties provide tabular formats containing information of national GHG inventories in a PDF format. Only Ecuador's NIR submissions include reporting tables in the form of MS Excel files (in the file format .xls) (Government of Ecuador, 2017^[19]).

Reporting processes and available tools

The preparation of national GHG inventories is often a decentralised process, carried out by a range of different ministries, agencies and officers. While institutional arrangements and national processes for the preparation of the inventory could change significantly across countries, four different phases of the process can be identified: (i) definition of the methodologies, data and assumptions, (ii) data collection, (iii)

⁹ Table 1 includes emissions and removals of CO₂, CH₄, N₂O, CO, NO_x, NMVOCs, SO_x and table 2 includes emissions from HFCs, PFCs and SF₆. (Annex to decision 17/CP.8) (UNFCCC, 2003^[4])

¹⁰ See footnote 5

data processing and emissions calculation and (iv) preparation, review and finalisation of the report. When defining the bases for calculation, a Party will review IPCC methodological guidance and identify relevant sources of activity data and emission factors. This phase would include the identification of key categories and the selection of methods for the estimation of GHG emissions. The second phase of data collection usually involves liaising with different data providers to obtain relevant information.¹¹ Data processing entails the estimations of emissions and removals and performs sanity checks to verify calculations. Finally, preparation of the report entails archiving and disseminating relevant data and documentation and, importantly, completing the reporting tables.

There are different tools available to Parties to facilitate the preparation of national GHG inventories and, in particular, to complete the required or requested reporting tables. For the development of CRF tables, Annex I Parties rely on the CRF Reporter software¹². For the development of tables consistent with the annex to decision 17/CP.8, some non-Annex I Parties rely on the IPCC Inventory Software. Notably, the CRF Reporter does not allow for the calculation of GHG emissions (i.e. phase iii). On the other hand, the IPCC Inventory Software is a calculating tool and allows Parties to estimate national GHG emissions. However, many Annex I Parties rely on national ad-hoc software to calculate national GHG emissions. This is because the IPCC Software was made available only in 2012 and presents limited functions (see subsection titled The IPCC Inventory Software). Also, some Parties may need more complex and ad-hoc functions (e.g. for the estimation of FOLU emissions) to report national GHG inventories, which are not available on the IPCC Software. These countries may be, therefore, using national software as well. Importantly, the IPCC Software does not generate outputs that can be directly fed into the CRF Reporter. At present, no tool exists which allows both calculating GHG emissions and reporting them into the CRF reporter. Developing such a tool may be helpful, particularly for developing countries with limited technical capacity and tools. Institutional arrangements and resources are currently being put in place to facilitate work on this matter between the UNFCCC and the IPCC.

The CRF Reporter

The CRF Reporter is a web-based software developed by the UNFCCC Secretariat to facilitate the reporting of national GHG inventories by Annex I Parties. It forms part of the official reporting process, as paragraph 53 of Decision 24/CP.19 mandates that Parties “should” submit their CRF tables, generated by the CRF Reporter software, via the UNFCCC submission portal, with a view to facilitating the processing of the inventory information by the secretariat (Decision 24/CP.19, §53) (UNFCCC, 2013^[11]). While this means that the use of the CRF Reporter software is not strictly mandatory, it is used by all Annex I Parties. The CRF Reporter provides for a user-friendly interface through which Parties can compile and report information on GHG emissions and removals and activity data. The CRF Reporter ensures that the structure of inventories and reporting requirements defined in the UNFCCC reporting guidelines on annual GHG inventories are met, and it follows the structure and format of the CRF tables annexed to decision 24/CP.19 (UNFCCC, 2013^[11]).

The CRF Reporter generates the Party’s set of CRF tables as well as an XML-file which contains all information submitted in a fully machine-readable format. Each set of CRF tables contains one xlsx-file for each year of the time series reported (e.g. 1990-2018). Annex I Parties submit their NIR and CRF tables through the submission module embedded within the CRF Reporter. The XML-file is also provided to the UNFCCC Secretariat, where it is fed into a data warehouse system. Information in this data warehouse system can be used for a number of purposes. These include the availability of GHG data in the systems

¹¹ This phase may be particularly challenging for some countries, as activity data may not be necessarily available to inventory compilers. Such issues are nevertheless not further explored in this paper.

¹² See (UNFCCC, 2018^[28])

and tools facilitating the review of Annex I Parties' national GHG inventories as well as further data processing and/or sharing. As an example, the UNFCCC's GHG Data Interface¹³ allows viewing and downloading the GHG inventory data reported by Annex I countries.

Data entered in the CRF Reporter can be either a number or a notation key. To facilitate reporting, the CRF Reporter allows for the full implementation of reporting provisions outlined in the UNFCCC reporting guidelines on annual GHG inventories. Key data-entry functions made available to Parties by the CRF Reporter are:

- **Automatic filling in of tables:** While the CRF Reporter generates a large number of tables, some of them do not have to be filled in by the users themselves. Summary tables, sectoral summary tables and some cross-cutting tables are mostly populated automatically drawing from data included in, e.g. background data tables. Parties are allowed to insert data (e.g. GHG emissions and activity data) manually in a limited number of white-coloured cells. Some values are automatically calculated based on other information filled into the software, e.g. implied emission factors. These are indicated by green cells. The automatic completion of tables is based on a bottom-up approach, aggregating GHG emissions filled in by the user at the category level as appropriate for the sectoral report tables and the summary tables.
- **Inclusion of extra categories:** For most categories, Parties are allowed to manually add and name country-specific sub-categories, which would then be reflected in the exported CRF tables;
- **Completion of documentation boxes:** The CRF Reporter allows for the provision of comments to a given category or sub-category that apply to all or some reporting years to be reflected in the documentation box of the corresponding table.
- **Inclusion of comments to specific data cells:** Parties can likewise add comments to specific data cells, which are then reflected in the CRF "completeness table" (Table 9), which allows Parties to provide further information where the notation keys "NE"¹⁴ and "IE"¹⁵ have been used.

Data entry into the CRF Reporter can be done in three main ways. Users can enter data manually into the software itself. A more efficient option is exporting relevant tables from the CRF Reporter into an .xls format, copying relevant data into and uploading it into the CRF Reporter. A third option is importing an XML-file with the relevant data into the CRF Reporter. Most Annex I Parties have developed national systems which, after the national GHG inventory has been compiled, generate an XML-file for this purpose.

Importantly, the CRF Reporter allows for the storage of multiple versions of Parties' submissions, and it carries out some quality assurance (QA) and quality control (QC) checks on the data provided. The quality assurance function of the CRF Reporter includes several tools. Among others, the completeness check verifies that all required data has been entered. The consistency check allows users to update all the calculated values in a given year. QA/QC is a fundamental part of the reporting process. The reporting guidelines for the preparation of Annex I annual inventories require ("shall") Annex I Party to elaborate an inventory QA/QC plan and implement general inventory QC procedures (Annex I to decision 24/CP.19, §19) (UNFCCC, 2013^[11]). QA/QC checks are particularly relevant in the context of the review process.¹⁶ During the review, other tools facilitate the assessment of the CRF data by presenting and visualising time

¹³ See https://di.unfccc.int/time_series.

¹⁴ Not estimated. See footnote 8 for further information.

¹⁵ Included elsewhere. See footnote 8 for further information.

¹⁶ National GHG inventories submitted by Annex I Parties are reviewed under the UNFCCC using the UNFCCC guidelines for the review of inventories prepared by Annex I Parties included in decision 13/CP.20 (UNFCCC, 2003^[25]; UNFCCC, 2015^[26])

series data (including where recalculations took place), and allowing to query different variables (e.g. emissions, IEF, AD, etc.). Such data is available in the tools not only for the Party under review but for all Parties who have submitted their CRFs, thus facilitating benchmarking, e.g. with regards to emission factors. The use of these tools, enabled by data being made available in a machine-readable format through the reporting with the CRF reporter, helps increase the efficiency and effectiveness of reviews considerably.

Experience shows that updating the CRF Reporter can take considerable time and needs to be well managed and resourced. The CRF Reporter was originally designed to facilitate reporting compliant with the Revised IPCC 1996 Guidelines and updated later, to allow Annex I Parties to report in line with the IPCC 2006 Guidelines from 2015 onwards.¹⁷ For this purpose, the CRF Reporter was updated, including with regards to categories and gases. A number of technical issues (e.g. with regards to incorrect aggregation) emerged as Parties aimed to generate CRFs for their 2015 GHG inventory submissions which caused delays in Annex I Parties' reporting, allowing a number of reviews of Annex I Parties GHG inventory reports foreseen for 2015 to only take place in 2016. Should future updates of the CRF Reporter be used for reporting under the ETF, the duration of the updating process needs to be carefully considered, so the updated tool is ready in time to allow reporting of the first BTR 31 December 2024 at the latest.

The IPCC Inventory Software

The IPCC Inventory Software is an Access-based software programmed to assist Non-Annex I Parties in both estimating and reporting data on national GHG emissions, ensuring that all the reporting elements included in the annex to decision 17/CP.8 are included. In addition, the software allows exporting tables consistent with the format and structure of those contained in the annex to decision 17/CP.8.

The IPCC Software allows users to fill out the 2006 IPCC Guidelines category worksheets with activity and emission factor data. It also supports functions related to administration of data and quality control checks, including completeness, value check, tools for uncertainty analysis and reference approach. The software implements the 2006 IPCC guidelines, but it can also be used to report following the tables included in the annex to decision 17/CP.8. Data entry in worksheets follows the structure of the 2006 IPCC Guidelines, e.g. in terms of sectoral categorisation. Unlike the CRF Reporter, the IPCC Software allows for the calculation of GHG emissions. For this purpose, it provides default data (e.g. default emission factors) from the 2006 IPCC Guidelines while also allowing users to use country-specific information.

A minority of Non-Annex I Parties rely on the use of the IPCC Inventory Software to prepare their national GHG inventories. However, recent experience shows that Parties do not use the IPCC software to produce the summary table (i.e. tables 1 and 2 included in the annex of decision 17/CP.8), but rather to fill in the sectoral report tables. This is because Parties find that for some sectors, LULUCF in particular, reporting through the IPCC Software may be cumbersome, and prefer to use national systems.

The IPCC Inventory Software holds potential for improvements, and to date, a number of limitations can be observed, which refrain a larger number of Parties to use the software to report and prepare national GHG inventories. In particular, the software does not allow for the preparation of reporting tables that provide an overview of a country's national inventory time series.

¹⁷ Paragraph 3 of Decision 24/CP.19 (UNFCCC, 2013_[11]) mandates that Annex I Parties report national GHG inventories in line with the 2006 IPCC Guidelines from the 2015 submission onwards.

3. Options for the development of CRTs

This section explores open questions and sticking points that surround work on CRT tables and presents reporting options available to Parties in the use of CRTs. Such options are assessed against eight criteria, developed building upon the reporting requirements under the ETF (see Table 1 at page 16), the reporting principles laid down in the MPGs, as well as lessons learned from current reporting practices. To make this discussion more tangible, a number of scenarios and worked examples are used. To facilitate readability, these are presented in section 4.¹⁸

Criteria for testing CRT options

The use of CRTs by Parties as part of their reporting of national GHG inventories under the Paris Agreement is to serve a number of purposes (e.g. tracking of global GHG emissions) and support a number of processes (e.g. technical expert review). The MPGs and the Paris Agreement, as well as insights from review processes and mechanisms such as the Global Stocktake (GST), can offer several indications on how the CRTs can be useful in the UNFCCC context and beyond. Building upon these insights, eight assessment criteria are developed to help understand whether different reporting options enhance the role and usefulness of CRTs. The first four criteria are reporting principles set out in decision 18/CMA.1, the remaining criteria have been proposed and developed by the authors of this paper, and relate to lessons learned from current reporting practices. The criteria developed are as follows:

- Providing a common format for reporting (Decision 18/CMA.1, §12.a);
- Facilitating improved reporting and transparency over time (Annex to decision 18/CMA.1, Section I, §3.a);
- Promoting transparency, accuracy, completeness, consistency and comparability (TACCC) (Annex to decision 18/CMA.1, Section I, §3.d);
- Ensuring that Parties maintain at least the current frequency and quality of reporting (Annex to decision 18/CMA.1, Section I, §3.f);
- Facilitating machine readability and/or automatised assessment;
- Facilitating the technical expert review;

¹⁸ To facilitate reading experience, it is suggested that anytime a scenario is presented, the reader goes to section 4 to explore the worked examples used to illustrate the scenario. A hyperlink to the scenarios is included in the PDF version of this document. A hyperlink back to the relevant discussions in section 3 is likewise included under each scenario presented in section 4.

- Limiting the scope and complexity of changes compared to the current reporting tables so to allow for relevant reporting tools (hereinafter referred to as “CRT Reporter”) to be prepared in time to facilitate reporting the first BTR¹⁹;
- Allowing for the inclusion of new categories and gases from subsequent versions or refinements of the IPCC 2006 GL where Parties wish to include them on a voluntary basis.²⁰

These criteria are interconnected, and several groups can be distinguished. Some relate directly to the format of CRTs, like the first criterion of “providing a common format for reporting”. The second to the fourth criterion all relate to how the CRTs can ensure a certain level of reporting quality in some form. “Allowing including new categories and gases from subsequent versions or refinements of the IPCC 2006 GL”, “facilitating the TER”, and “facilitating machine readability and/or automatized assessment” all feed into promoting the criteria related to the quality of reporting. The criterion “limiting the scope and complexity of changes compared to the current reporting tables so to allow for relevant reporting tools to be prepared in time to facilitate reporting the first BTR” does so as well, but with the very specific focus of enabling timely reporting of the first BTR. Annex A provides further background on key issues and documents that supported the development of these criteria.

Open questions and potential options for the development of CRTs

Paragraph 125 of the SBSTA report published in June 2019, invites Parties to submit by 30 September 2019 their views on, *inter alia*, the CRTs for the electronic reporting of national GHG inventories (SBSTA, 2019_[20]). As of June 2020, ten Parties and/or Party groups have submitted their views on this matter. This sub-section discusses open questions with regards to the development of CRTs. These stem from Party positions as well as from requirements outlined in decision 18/CMA.1 (UNFCCC, 2019_[21]). Party positions are presented as part of the discussion of each open question. The open questions, as well as potential options for implementation, are discussed using a number of worked examples. For this purpose, reporting tables using the existing CRFs as a starting point will be adjusted and filled. Not all criteria are relevant for all implementation options; only the criteria most relevant for each option will be discussed. Table 5 further below provides an overview of the assessment for each criterion.

Overall structure and content of the CRTs

The vast majority of Parties agrees that current CRF tables provide a good starting point for the development of CRTs. The June 2019 SBSTA report notes that “existing guidelines and tables, including those for GHG inventories [...] offer a good starting point for the work referred to in paragraph 115 above”, i.e. on CRTs for the reporting of national GHG inventories (SBSTA, 2019_[20]). Yet, a minority of Parties have suggested that two completely different sets of CRTs are needed for developed and developing country Parties, primarily as a result of widely different reporting capacities. This view does not seem to be consistent with Article 13 of the Paris Agreement and with the very mandate given by the COP to the SBSTA to develop *common* reporting tables and is therefore not further explored in this paper.

Parties advance different views about what constitutes *common* reporting tables. The majority of Parties is of the view that a common reporting format means starting with tables which are common and submitting tables which are common. Only a minority of Parties considers that using a common reporting format would mean starting with a common reporting format but allow submitting it to the UNFCCC in an amended form (e.g. by deleting rows or columns which remain empty where a Party uses flexibility in light of their capacities). This means that Parties can have different views on whether an option for the development of

¹⁹ To be submitted by 31 December 2024.

²⁰ This criterion is considered to be of lower relevance than the others.

CRTs fulfils the assessment related to providing a common format for reporting. To reflect ongoing discussions and to fully represent Parties' views, this paper discusses views advanced by some Parties that relate to options of using a set of common reporting tables developed by SBSTA, but allowing to submit to the UNFCCC tables that might not be considered as common, e.g. via the deletion of rows and columns. This approach, nevertheless, hinders transparency and consistency of reporting.

Defining a common set of CRTs: Sectoral background data tables and tables for indirect GHGs

An open question relates to whether all the 48 CRF tables currently in use by Annex I Parties are to be considered when developing CRTs. A minority of Parties is of the view that only high-level summary tables (e.g. summary tables and sectoral report tables) are to be mandatory for the reporting of national GHG inventories by developing country Parties. Further, some developing country Parties feel that sectoral background data tables are not to be mandatory for them, arguing that completion of sectoral background data tables constitutes a burden for developing country Parties, due to their limited reporting capacity.

Arguably, the information to be included in sectoral background data tables is necessary to the estimation of national GHG emissions following the IPCC guidelines, and would therefore be available to any Party that is preparing its national GHG inventory, regardless of the format. Paragraph 40 of the MPGs also stipulates that "Each Party shall provide information on the category and gas, and the methodologies, emission factors and activity data used at the most disaggregated level, to the extent possible [...]" (Annex to decision 18/CMA.1, Section II, §40) (UNFCCC, 2019^[21]). The level of detail of the information that Parties are to include in their background tables depends on Parties' capacity, and on the IPCC methodologies' approach adopted. In particular, according to the IPCC 2006 Guidelines, the higher the Tier methods adopted to estimate emissions of a given category, the more background data is needed. For example, to report on manure management CH₄ emissions from dairy cattle using Tier 1, a Party is likely to need only background data information on population size and temperature or climate zone data. If a Party wishes to use higher Tiers, it might need background data information on manure characteristics as, e.g. volatile solids daily excretion (IPCC, 2006). [Scenario 1 explores two worked examples](#) to illustrate this point (see page 46).

In light of these considerations, it would be useful for all Parties to complete as appropriate and include in the common set of CRTs sectoral background data tables. Ensuring that all Parties work with and submit a complete set of reporting tables would be consistent with the mandate of developing a common format for reporting, and would enhance consistency and comparability of reporting across Parties. Furthermore, the provision of background sectoral data would enhance transparency, accuracy and completeness of reporting.

One Party group mentions in its submissions that tables for indirect GHGs are not to be mandatory for all Parties. In the current CRFs, there are no tables that allow Parties to report exclusively on indirect GHGs. Rather, the reporting of indirect gases takes place as part of these tables in which direct GHGs are reported. Furthermore, reporting of indirect GHGs is already not mandatory, as according to paragraph 52 of the MPGs, Parties "may" report indirect CO₂, and indirect GHGs are not included in national totals (Annex to decision 18/CMA.1, Section II, §52) (UNFCCC, 2019^[21]).²¹ Therefore, a Party not reporting indirect GHGs can currently simply use the notation key "NE" (not estimated) and provide explanations (either in the NIR and/or in Table 9 of the current CRFs) of why these emissions have not been estimated. The same approach could be used under the ETF and within CRTs.

²¹ In particular, paragraph 52 of the MPGs further states that "for Parties that decide to report indirect CO₂, the national totals shall be presented with and without indirect CO₂ (UNFCCC, 2019^[21]).

Indicating and reporting a reference year

Paragraph 57 of the MPGs provides Parties who need it in light of their capacities the flexibility options to report a shorter time series²², including, among other, at least the “reference year/period for its NDC under Article 4 of the Paris Agreement” (Annex to decision 18/CMA.1, Section II, §57) (UNFCCC, 2019^[2]). The reference year/period for the NDC is not clearly defined by any decision. Some Parties understand the reference year/period mentioned in §57 of the MPGs to be the year which Parties have used as a basis for the projections in their NDC (e.g. using 2010 GHG emissions to project up to 2030). Others consider this to be the same as their target year (e.g. 2030) or period (e.g. 2021-2030). A number of options exist on how to present emission trends in the CRTs. These options are illustrated as [worked examples in Scenario 2](#) (see page 49):

- **Option 1: Including a “reference year” column in the summary tables.** Where the reference year/period is the timeframe used as a basis for the NDC projections, it makes sense to include this information in the GHG inventory reporting in case of recalculations. In principle, column(s) headed “reference year” could be provided in the summary tables, using an automatised function of the CRT to generate such columns as needed. This might be needed, as not all Parties might consider having a reference year and/or there might be reference periods spanning several years.
- **Option 2: Indicating the reference year in a documentation box.** This solution would not require automatisation. The documentation box could include clear guidance to indicate which year(s) are considered as reference years and to indicate what the Party understands to be a reference year/period. This is less transparent than using dedicated columns with headers indicating reference years/periods and is not a machine-readable solution. Tool-based solutions allowing Parties to generate additional columns for reference years as appropriate might however take valuable time to set-up.

As there is no common definition of “reference year” and the reference year does currently not have a clear function in BTR reporting, the need for an automatised function might be considered less pressing. In addition to these considerations, it might be helpful to have the meaning of the term “reference year” in this context further specified by SBSTA, to ensure that a common interpretation is applied.

Presenting GHG emission trends

Summary tables presenting GHG trends in the current CRFs (CRF Tables 10s1 to 10s6) include columns related to GHG emissions in the “base year” and the percentage change between GHG emissions in the base year and latest reporting year. The concept of “base year” under the ETF no longer applies, and the approach to presenting GHG emission trends in the current CRFs would therefore need to be changed. This is because GHG-related mitigation targets in Parties’ NDCs vary in type and the concept of a base year – i.e. a historic year in relation to which emission levels the mitigation target is set – only applies to some target types.

Indeed, measuring the percentage change of national GHG emissions across a given timeframe can be helpful as a very general indication of trend, which is, however, not the same as progress tracking. Progress tracking relies on information specifically geared towards a determined target. Even under the Kyoto Protocol, where all Parties have the same type of target and a defined base year, the indication of

²² In relation to time series, paragraph 57 of the MPGs state that “each Party shall report a consistent annual time series starting from 1990” (Annex to decision 18/CMA.1, Section II, §57) (UNFCCC, 2019^[2]).

trend in the CRF was not suited for progress tracking.²³ Progress tracking towards NDC targets under the Paris Agreement is to take place through the structured summaries (UNFCCC, 2019^[2]). In light of these considerations, there are two options related to the availability of GHG trends in CRTs are discussed (these are illustrated in [worked examples in Scenario 3](#), page 50):

- **Option 1: Not including information on trends in the CRTs, i.e. deleting the columns titled “base year” and “% change to latest reporting year”.** This would be less transparent than the current approach. While progress tracking information is presented in the structured summary, it would be done at an aggregated level only. Having information on trends at the category level provides helpful information to reviewers. This option would test negatively against the criteria “ensuring that Parties maintain at least the current frequency and quality of reporting”, as Parties currently report on base year and percentage change. This option would, however, work in favour of allowing relevant reporting tools to be prepared in time for the first BTR, as changes to be applied to the current CRF Reporter software would be limited to deleting the relevant columns.
- **Option 2: Including general information on the trend, by using information reported on the earliest year reported and the latest year reported.** This would still allow showing a general trend while avoiding having to define what a base year is and differentiating between Parties for which the concept of a base year applies to their NDC and others where the concept does not apply. Different options for trends to be calculated exist, e.g. the percentage change between the earliest year reported and the latest year reported or the average annual percentage change in emissions over the years reported. While this information would not be comparable between Parties where different starting and ending years are used, it would provide reviewers with a general indication of trend per category based on the information available. The information provided in this column would constitute a very simple indication of trend over the time series, without any reference to mitigation targets set and their type. Including such a column could potentially motivate reporting of a longer time series to gain a better understanding of the long-term trend. This would, however, only be feasible based on certain changes to the CRF Reporter. For example, as the earliest and latest year reported are not in defined columns, the tool would have to identify the relevant years before being able to make the calculation. This option would test positively against the criteria of “Facilitating the TER”, but would test negatively against “promoting TACCC”, as the resulting trends, relating to different time periods, are not comparable among countries. The option would also require adding further automatised functions to the CRT reporting and thus score negatively against “allowing relevant reporting tools to be prepared in time for the first BTR”.

Having comparable trend values among Parties, despite different time series being reported would considerably facilitate the TER. Using different types of trends (e.g. overall percentage change and annual average percentage change) over different timeframes (e.g. earliest/latest reporting year, reference year (if applicable) to latest reporting year, most recent 5 years (if applicable), most recent 10 years (if applicable)) could help in this situation. Such an approach might overburden the CRT and might not be implementable in the time remaining. Consideration could, however, be given to including such trend calculations in the set of tools prepared by the UNFCCC Secretariat for the purposes of supporting reviews.

²³ The Kyoto Protocol’s targets are related to commitment periods (2008-2012 for the first KP period and 2013-2020 for the second) and total allowable emissions in that period are (among other) based on base year emissions calculated using a defined set of accounting rules and then fixed in Parties’ Initial Reports (UNFCCC, 2020^[27]). Depending on the accounting rules and on any recalculations done, the base year emissions in Parties’ Initial Reports can deviate slightly from base year emissions reported by Parties in the CRFs. This and the fact that the KP targets relate to a time period, the % change in emissions between the base year and the latest reporting year does not allow precise progress tracking.

Where such tools could not be prepared in time for the first TER, they could still be valuable in the years to come. While frequent updating of the CRT-Reporter does not seem desirable based on previous experiences, such tools could be updated more easily and frequently based on lessons learned during the first TER.

Sectoral structure of CRTs: Agriculture and LULUCF vs AFOLU

A minority of Parties has suggested that CRTs present a greater or perfect match between CRF categories/sub-tables and the 2006 IPCC Guidelines tables and therefore that Agriculture and LULUCF are reported in the same AFOLU category.²⁴ This is because an increasing number of developing country Parties is adopting the 2006 IPCC Guidelines to report national GHG inventories. In particular, a number of developing country Parties that use the IPCC Software to estimate national GHG emissions using the 2006 IPCC Guidelines adopt reporting tables that follow the sectoral structure of such guidelines, i.e. they report on agriculture and LULUCF jointly. Some developing country Parties have noted in their submissions that it could be cumbersome for these developing country Parties to modify the sectoral structure of their reports.

According to the MPGs, Parties are to report on Agriculture and LULUCF separately. Paragraph 20 of the MPGs requires (“shall”) all Parties to use the 2006 IPCC Guidelines for the development of national GHG inventories. Paragraph 50 of the MPGs also requires (“shall”) all Parties to report the following sectors: energy, IPPU, agriculture, LULUCF and waste (Annex to decision 18/CMA.1, Section II, §50) (UNFCCC, 2018). Furthermore, according to the MPGs, for Parties to perform the key category analysis and to apply the significance threshold (§25 and §32 of the MPGs), data from agriculture and LULUCF categories is needed separately (Annex to decision 18/CMA.1, Section II, §25 and §32) (UNFCCC, 2019_[2]). This is in line with current reporting of GHG inventories under the Convention by Annex I Parties, that is, Parties are using the 2006 IPCC Guidelines but continue to report on those Agriculture and LULUCF separately in current CRF tables.

Adapting to the IPCC 2019 Refinement

Voluntary reporting on new categories introduced by the 2019 Refinement is possible with limited effort. Paragraph 20 of the Annex to Decision 18/CMA.1 mandates the use of the 2006 IPCC Guidelines as well as any subsequent version or refinement of the IPCC guidelines agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) (UNFCCC, 2019_[2]). While the 2019 IPCC Refinement has not yet been adopted by the CMA, designing CRTs that allow including newly added categories, where Parties consider them relevant, could be considered to also promote completeness and improved reporting over time as required by Annex to decision 18/CMA.1, Section I, §3.a and d (UNFCCC, 2019_[2]). With regards to completeness, the IPCC 2019 refinement introduces a number of new categories, methodologies for additional gases which were generally already reported (e.g. CO₂ from underground mining) and new gases (all of which are fluorinated GHGs, e.g. HFCs and PFCs used in the electronics industry). There are a number of options for accommodating these when using the existing CRFs as basis. These options are illustrated as [worked examples in Scenario 4](#), see page 52. Please note that all options are to some extent dependent on the 2019 IPCC Refinement being adopted by CMA:

²⁴ The IPCC 2006 Guidelines’ AFOLU categories 3A (Livestock) and 3B (Land) can be clearly separated into the Agriculture and LULUCF tables of the CRFs. However, some sub-categories of the IPCC 2006 Guidelines’ AFOLU category 3C (Aggregate sources and non-CO₂ emissions sources on land) combine data from both the Agriculture and LULUCF sectors. This issue has been discussed in literature. For further info see (Jeffery et al., 2018_[29])

- **Option 1: Reporting on new categories (with regards to gases already included in the 2006 IPCC Guidelines) using the category “Other”.** This indeed enhances completeness. It however also reduces machine readability, as the category names reported under “Other” are not standardised. In principle, standardisation could be achieved by providing drop-down menus with the names of the new categories under the 2019 IPCC Refinement in an updated version of the CRF reporter. This will not be officially possible as long as the 2019 IPCC Refinement has not been adopted by CMA. This option would test positively against the criteria “Providing a common format for reporting”, as the CRTs would not have to be edited according to reporting guidelines. This option would also facilitate improved reporting and transparency over time, as well as promote TACCC. A standardised and common reporting format would, in turn, facilitate the TER. On the other hand, and in the absence of a drop-down menu to select the chosen category, this option would test negatively against the “Facilitating machine readability” criteria. This is because the category titles would change based on the new category that a Parties decides to report on (see page 24).
- **Option 2: Tables could be amended to allow for the voluntary reporting on new gases identified in the 4th and 5th IPCC Assessment Reports and included in the 2019 refinement.** This particularly applies to the sectoral report for IPPU (table 2(II)) on emissions of HFCs, PFCs, SF₆ and NF₃. This table presents individual gases in columns. As reporting on new gases included in the 2019 refinement would happen on a voluntary basis, clear guidance would need to be provided in the CRT reporter that reporting on these gases is not obligatory. Such updating would only be feasible once the 2019 refinement was accepted by the CMA. Also, to ensure transparency, Parties would need to provide information that emissions of these gases have been reported on a voluntary basis. This option would test negatively against the “Providing a common format for reporting” and “Allowing relevant reporting tools to be developed in time for the first BTR” criteria. This is because tables would substantially change across countries depending on whether or not new gases are being reported. Further, amending tables so to allow for the reporting of new gases, while ensuring that this option is voluntary, may render the development of a reporting software more complex. This option would, however, test positively against the criteria of “Facilitating improved reporting and transparency over time” and against “facilitating machine readability and/or automated assessment”, as the new reporting fields would be standardised.

Other matters

Beyond the specific issues discussed above, the current CRF tables could be further enhanced with regards to the requirement of promoting TACCC. Annex I Parties, based on their annual reporting experience, are aware of a number of smaller changes which could be beneficial. These include adding a column with total emissions in CO₂-eq. to all sectoral overview tables, deleting categories which do not apply from existing drop-down lists, deleting the columns for implied emission factors from the table presenting the reference approach in the energy sector, etc. Minor adjustments to facilitate the usability of the CRF Reporter may also be beneficial. These could include facilitating entering and editing of the information provided through the software, e.g. automatically generating gases in the sectoral hierarchy instead of Parties having to add them manually. So far, SBSTA has not made a request to Parties to submit information on suggested improvements to the CRF and/or the CRF Reporter. While such changes would necessitate different levels of effort for implementation with regards to the CRF Reporter, there might not be sufficient time available to implement these changes, if their discussion does not take place as part of the process for agreeing on CTF tables.

Applying flexibility to the CRTs

This section discusses options available to those Parties that need flexibility in the light of their capacities to apply flexibility to the CRTs when applicable. Based on Parties' submissions and discussions held during the negotiations, this paper identifies two broad approaches to the application of flexibility provisions in the context of CRTs: (a) transparently indicating in CRTs where flexibility options have been used through the use of a specific notation key, documentation boxes, footnotes and other dedicated areas within the CRTs and (b) deleting rows and columns where information is not reported due to the use of flexibility provisions. With regards to this second approach, Parties have advanced different opinions as to whether it is compliant with the concept of common reporting tables. Based on their submissions, Parties seem to interpret this criterion in different ways. Views seem to differ with regards to whether only the reporting tables agreed by SBSTA need to be common or whether they still need to be common when they are submitted to the UNFCCC. While the tables submitted to the UNFCCC would clearly not be common where rows and columns are deleted and thus hinder transparency of reporting, this paper assesses this approach for the purpose of generating a more detailed understanding of its implications.

The paper assesses the reporting options identified under each approach against the criteria laid out in the first part of this section (see page 27). Table 4 summarises the provisions where and how flexibility is available to developing country Parties that need it in the light of their capacities in preparing their GHG inventories, and how these provisions could be applied within CRTs.

Table 4. GHG inventories: where and how is flexibility available?

Informational or methodological element	Provision	How flexibility can be applied (only by developing country Parties that need it in the light of their capacities)	How flexibility can be applied within CRTs (only by developing country Parties that need it in the light of their capacities)
Key Category Analysis (KCA)	Each Party shall identify key categories using KCA consistent with IPCC guidelines, i.e. using a 95% threshold ¹ for identifying key categories	Flexibility to identify key categories using a threshold no lower than 85%, in place of the 95% threshold defined in the IPCC guidelines	Adding a specific column to specify threshold used for KCA in Table 7 of the CRFs.
Uncertainty assessment	Each Party shall quantitatively estimate and qualitatively discuss the uncertainty, as well as estimate the trend uncertainty of the emission and removal estimates for all source and sink categories	Flexibility to provide, at a minimum, a qualitative discussion of uncertainty for key categories	N/A to CRTs and therefore not discussed in this document.
Insignificance threshold	Each Party may use the notation key “NE” when the estimates of emissions of a category would be considered insignificant, that is, likely below 0.05% of national total and 500 kt CO ₂ eq, whichever is lower	Flexibility to instead consider emissions category insignificant if its level of emissions is likely below 0.1% of national total and 1000kt CO ₂ eq, whichever is lower	At least four options are identified: (1) Using a flexibility notation key; (2) Using both a “not estimated” and a “flexibility” notation key; (3) Using either “not estimated” or “flexibility” notation key and provide more info in a documentation box; (4) Using either “not estimated” or “flexibility” notation key and provide more information in Table 9 of CRFs
Quality assurance/quality control (QA/QC)	Each Party shall elaborate an inventory QA/QC plan in accordance with the 2006 IPCC guidelines, and implement and provide information on general inventory QC procedures	Developing country Parties using flexibility are instead “encouraged” to do so	N/A to CRTs and therefore not discussed in this document.
Reported greenhouse gases	Each Party shall report seven gases (CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ and NF ₃)	Flexibility to instead report at least three gases (CO ₂ , CH ₄ and N ₂ O) as well as any of the additional four gases (HFCs, PFCs, SF ₆ and NF ₃) that are included in the Party’s NDC under Article 4 of the PA, are covered by an activity under Article 6 of the PA, or have been previously reported	At least four options are identified: (1) CRF Reporter not generating empty rows/columns; (2) Manually deleting empty rows/columns; (3) Retaining empty rows/columns; (4) Using “not estimated” notation key; (5) Using “flexibility” notation key.
Time series	Each Party shall report a consistent annual time series starting from 1990; the latest reporting year shall be no more than two years prior to the submission of its national inventory reports	Flexibility to instead report data covering, at a minimum, the reference year/period for its NDC and, in addition, a consistent annual time series from at least 2020 onwards; latest reporting year three years prior to the submission of their national inventory reports	At least two options are identified: (1) Including only the years reported in the summary tables; (2) Including columns also for the years that are not being reported and either (a) leave these empty or (b) use “flexibility” notation key.

Note: ¹An inventory category is referred to as “key category” if (under current definitions) it contributes to more than 95% of a country’s total GHG emissions level, trend or uncertainty (based on an uncertainty analysis), when summed up in descending order of magnitude.

Source: (Rocha, 2019^[3])

Transparently indicating in CRTs if and where flexibility options have been used through the use of notation keys, documentation boxes or footnotes

Parties suggest various options for indicating in the CRTs the use of flexibility options. In many cases, this is suggested in the form of a combination of a standardised element (e.g. a notation key) and explanatory qualitative information. Where cells in the CRT are not filled in due to the use of flexibility (e.g. not reporting specific gases or certain reporting years) one option mentioned by a number of Parties and Party groups is the use of a new notation key to denote the use of flexibility (suggestions include F, FX or FLEX). Such a notation key would ensure that cells are not left empty, and would also ensure that there is a distinction between cells which are not filled as a result of flexibility and cells that would otherwise contain a zero or a “NE” (not estimated).

The expert review team needs to understand in detail where flexibility has and has not been used. This is because paragraph 149(e) of the Annex to Decision 18/CMA.1 mandates that expert review teams are not to review a Party’s determination to use a flexibility option or their capacity to report without this option (UNFCCC, 2019^[2]). To provide additional information, various Parties suggest using as a complement to the notation key, either footnotes, documentation boxes and/or explanations in the NID. Mostly Parties suggest that such information consists of references to the flexibility options used.

In principle, both footnotes, as well as documentation boxes, can be used to transparently present additional information on the use of flexibility options used. The current CRF tables already include footnotes and documentation boxes. In the CRFs, standard footnotes are mainly used to provide reporting guidance to Parties, and these can be found below the reporting tables. Furthermore, Parties can insert custom footnotes to provide explanations on information reported. Custom footnotes always relate to a specific cell only - not for the table as a whole. Documentation boxes are also placed below the reporting tables and can and are often used by Parties to present concise information on issues like the scope of specific categories, specific estimation approaches, or references to where more information is provided (e.g. the NIR). The documentation boxes include guidance on which information to include (where appropriate) with regards to the specific reporting table under which they are placed.²⁵

Using documentation boxes to provide further information on flexibility used would enable the established and distinct functions of the footnotes being focused on providing guidance and information on specific cells to be maintained, and the documentation box providing additional information helping to understand better the information in a specific CRF table in general. Nevertheless, using a custom footnote for a specific cell (as opposed to the sheet as a whole) could still allow for transparent reporting.²⁶ Both options would not require any changes to the CRF reporter, but neither would be machine-readable. These options are explored in [worked examples in Scenario 5](#) at page 57.

While the use of notation keys, footnotes or documentation boxes to indicate the use of flexibility can be adapted to numerous reporting scenarios, some issues that relate to the use of flexibility may need further considerations and different solutions. These issues include the application of flexibility when performing and reporting on the key category analysis, and not estimating emissions due to the adoption of lower insignificance thresholds.

Key category analysis

Paragraph 25 of the MPGs allows Parties that need it in light of their capacities to use a threshold of 85% (as opposed to 95%) for the key category analysis (Annex to decision 18/CMA.1, Section II, §25) (UNFCCC, 2019^[2]). There are a number of options available to Parties to indicate if such flexibility has

²⁵ When using documentation boxes, Parties replace the guidance text with their own explanations.

²⁶ Experience from inventory reviews indicate that documentation boxes might be slightly more transparent as the information is provided in one place as opposed to several footnotes relating to several specific cells.

been adopted in the light of their capacities. A number of Party submissions have suggested simply adding a cell to Table 7 of the CRF. This table is currently used by Parties to provide a summary of the methodologies used to perform key category analysis and in which each Party could note the threshold they have used. Such an approach would ensure transparent reporting and promote consistency and comparability across countries. With a view to improving over time, Parties could, when presenting key categories in their NID, also indicate which additional categories would have been identified as key categories had a 95% threshold been used.²⁷ Because of the ease of readability and accessibility of the information presented in such a way, this option would also facilitate the technical expert review. Were a dropdown menu to be used offering Parties to choose a threshold between 85% and 95%, the information provided by Parties could be machine-readable. [Worked examples in Scenario 6](#) at page 60 show how this could be implemented.

Emissions that are not estimated

Flexibility can be applied by those developing countries that need it in the light of their capacity to a specific use of the notation key “NE” (not estimated). Paragraph 31 of the MPGs states that Parties shall use the notation key “NE” (not estimated) for emissions that have not been estimated “but for which a corresponding activity may occur within a Party” (Annex to decision 18/CMA.1, Section II, §31) (UNFCCC, 2019_[2]). Further, Paragraph 32 of the MPGs allows (“may”) all Parties to use the notation key “NE” when the emission estimates are considered insignificant as below a certain threshold (Annex to decision 18/CMA.1, Section II, §32) (UNFCCC, 2019_[2]).²⁸ Paragraph 32 also allows those developing country Parties that need flexibility in the light of their capacities to have the flexibility to instead use a higher threshold to consider emissions insignificant and therefore to not estimate them (“NE”) (Annex to decision 18/CMA.1, Section II, §32) (UNFCCC, 2019_[2]).²⁹

It would be helpful for reporting options to distinguish between a situation where emissions were not estimated because flexibility was used by those developing country Parties that need it in the light of their capacities or whether these emissions were not estimated because the NE provision was applied. Such a distinction would promote transparency and consistency of reporting, and to facilitate the review of information. There are several options available to Parties to indicate where flexibility is applied to the provision specified in paragraph 32 (significance threshold). These options are illustrated in [worked examples of Scenario 7](#) (see page 66). The options include:

- **Option 1: Using solely a “flexibility” notation key (e.g. “FLEX”) to indicate when emissions were not estimated because flexibility was used.** This option would allow readers and reviewers to clearly determine where a Party that needs flexibility in the light of its capacity has not estimated emissions due to the use of flexibility and thus of a higher insignificance threshold. This option would, however, not allow readers to discern whether emissions were not estimated because of the application of a higher significance threshold as a result of flexibility allowed by paragraph 32 of the MPGs or because of the application of flexibility to other reporting provisions (e.g. partial gas coverage as per paragraph 48 of the MPGs). For this reason, this option would only partially test positively against “Promoting

²⁷ This option is further discussed in (Rocha, 2019_[3]).

²⁸ In particular, the MPGs state that estimates are to be considered insignificant in terms of level “if the likely level of emissions is below 0.05 per cent of the national total GHG emissions, excluding LULUCF and 500 kilotonnes of carbon dioxide equivalent (kt CO₂ eq), whichever is lower”. (Annex to decision 18/CMA.1, Section II, §32) (UNFCCC, 2018).

²⁹ In particular, the MPGs state that those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, and 1000 kt CO₂ eq, whichever is lower. (Annex to decision 18/CMA.1, Section II, §32) (UNFCCC, 2018).

TACCC". This option would nevertheless test positively against the "Providing a common format for reporting" and "Facilitating improved reporting over time" criteria. This option would likewise only partially facilitate the TER and machine readability, as it would not allow third parties to understand to which provision flexibility was applied.

- **Option 2: Using both the "not estimated" and the "flexibility" notation keys (e.g. "NE, FL") in those cases in which emissions were not estimated because flexibility was used.** This option would facilitate the readability of the reporting tables and would allow readers and reviewers to easily identify where a higher significance threshold was applied due to the use of the flexibility. This option would test positively against all the criteria used in this paper (with the exception of allowing for the voluntary reporting using 2019 IPCC Guidelines).
- **Option 3: Using only the notation key "NE" or "FLEX" and to provide further information on the use of flexibility in the documentation box of the CRT and/or in the body of the NID.** This option would allow Parties to provide more information on the use of flexibility (e.g. motivation), thus testing positively, albeit partially, against "Promoting TACCC". On the other hand, this option would also render readability of tables more cumbersome, with potentially negative repercussions also on machine readability and on the TER.
- **Option 4: Using only the notation key "NE" or "FLEX" and to provide further information on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables).** This option also allows for the provision of further information on the use of flexibility, but with potentially negative repercussions on machine readability. However, if a standardised text label to highlight the use of flexibility (e.g. "Party has applied flexibility to insignificance threshold" to be selected from a drop-down menu) is agreed upon and included in the table, machine readability would be facilitated.

Importantly, current reporting experience from Annex I Parties, show that emissions from certain categories are at times not estimated – and thus marked as "NE"—not because these fall below the insignificance threshold, but instead because data is not available. Under current reporting guidelines, information on the use of NE "shall" be provided in the completeness table (Table 9 of the current CRFs). This practice is not specified in the MPGs, but Parties may wish to continue using a completeness table to clarify such information. Not estimating emissions due to unavailability of data is not necessarily eligible for the application of flexibility, if it does not fall within a specific flexibility provision as specified in the MPGs and as indicated in Table 4. For example, the MPGs give the flexibility to those developing countries that need it in the light of their capacity to not report emissions of certain gases, namely HFCs, PFCs, SF₆ and NF₃. A Party that does not report on CO₂ emissions from, e.g. post-mining activities due to unavailability of data cannot claim the use of flexibility, because the MPGs do not include a flexibility provision that allows Parties to not report on CO₂. It is important for the CRTs to consider this case and to ensure that it is possible to determine when emissions were not estimated due to the application of flexibility. Any of the options outlined above would allow third parties to make this distinction.

Operationalising flexibility through the deletion of rows and columns

There are different views from Parties relating to the appropriateness of deleting or retaining rows and columns from CRFs where information is not being reported due to the use of flexibility by those developing country Parties that need it in the light of their capacities. A minority of country groupings suggest that, where information is not reported due to a Party using a flexibility option in light of its capacities, relevant cells or columns could be deleted. This approach could specifically apply to flexibility provisions that allow for the reporting of a shorter time series and for the reporting of limited gas coverage. A number of Parties in contrast state they do not consider deleting rows/columns consistent with TACCC and with the SBSTA mandate of developing a *common* reporting format.

In general, deleting rows and/or columns could either mean that such rows/columns are not generated at all (by the CRT Reporter) or that they are generated, left empty and then deleted manually by Parties. The current CRF Reporter already reacts to information not being reported. Looking at the issue of reporting on a shorter time series, it is worth noting that the CRF Reporter creates an Excel file for each year reported on. Where specific years are not reported, the CRF Reporter simply does not create an Excel file for those years. Also, within the Excel files, in the cross-cutting worksheets which show the time series (summary tables 10, sheets 1-6), columns are at present only generated for the years reported. This is, of course, based on the current status, where all Annex I Parties have the same reporting requirements with regards to the time series. The year in which a GHG inventory is submitted currently dictates the time series to be covered (e.g. in 2020, the years 1990-2018 have to be included). Only generating columns for years actually reported, might need updating. [Worked examples in Scenario 8](#) (see page 67) explores these concepts through worked examples.

With regards to not reporting gases, the situation is different. The current CRF tables present greenhouse-gases in columns in (a) the sectoral tables, (b) the summary tables and (c) the tables on trends per gas.³⁰ Five options are considered with regards to dealing with cells which are not filled with values due to flexibility options being used in light of a Parties capacities. These options are explored through [worked examples in Scenario 9](#) (see page 72).

- **Option 1: Empty rows/columns are not generated by the CRT reporter.** When the CRT software is being developed, it could potentially be done so in such a way to ensure that empty rows and columns are not “exported”. However, while this is technically feasible, it might be complex to implement and thus take time. Where rows and/or columns are not generated as information is not supplied, the XML file generated by the CRT Reporter would still be fully machine-readable and could thus be used without problems to provide data for the GST, the GHG data interface³¹ and/or for review tools. Considering the XML file only, a common reporting format is used. However, the CRT tables generated would then differ between Parties, so aiming to evaluate these files in an automatised manner (e.g. by research institutions outside of the UNFCCC), would need an enhanced effort, as evaluation tools would need to consider any potential options for rows/columns not being included in the CRT files. This would also reduce the effectiveness of assessing CRT tables manually as part of a review and might lead to increased effort on the side of the Party being reviewed, as members of the expert review team might ask more questions for clarification. In summary, the option scores negatively on providing a common format for reporting, facilitating TACCC and the TER, as well as limiting changes to allow the CRT reporter to be prepared in time for the first BTR. The options scores neutral against machine readability.
- **Option 2: The rows/columns are generated by the CRT Reporter and deleted manually by Parties before submission to the UNFCCC.** This approach would still yield fully machine-readable information as the XML-file generated with the CRTs would not be changed. Again, considering the XML file only, it can be claimed that a common reporting format is used. Issues with the CRT tables as such not being common among Parties, issues related to transparency for stakeholders without access to the UNFCCC Secretariat’s data warehouse system and issues related to the review would however apply as with Option 1. Furthermore, manual deletion could lead to errors, further reducing transparency. In summary, the option scores negatively on providing a common format for reporting, facilitating TACCC and the TER. The

³⁰ An exception is the table on GHG trends related to F-Gases (Table 10s5) where species of F-gases are presented in rows.

³¹ It is important to note that the current GHG data interface does not present all information reported in CRFs, for example information on activity data and implied emission factors reported in some IPPU sectoral background tables.

options scores neutral against machine readability and as well as limiting changes to allow the CRT reporter to be prepared in time for the first BTR.

- **Option 3: Empty rows / columns are retained.** This option would be more transparent and better facilitate reviews than options 1 and 2, while also facilitating improved reporting over time, as cells yet to be filled remain visible. However, room for improvement with regards to transparency remains, as there can be various reasons for an empty cell, e.g. emissions not estimated for reasons other than flexibility options used in light of a Parties capacity, emissions not occurring, etc. The option scores positively against providing a common reporting format, facilitating the TER as well as limiting changes to allow the CRT reporter to be prepared in time for the first BTR. It scores neutral against the remaining criteria.
- **Option 4: Empty rows/columns are filled with a notation key indicating the use of flexibility.** This approach would best facilitate transparency, effective reviews as well as improved reporting over time as a clear reason is provided why no value is reported while all cells for which no value is reported due to the use of flexibility are still visible. The option scores positively against providing a common reporting format, facilitating the TER, facilitating improved reporting over time as well as limiting changes to allow the CRT reporter to be prepared in time for the first BTR. It scores neutral against the remaining criteria.
- **Option 5: Empty rows/columns are by default filled with the notation key NE unless the Party changes this.** This option avoids empty cells. At the same time, the risk arises that, where cells should have been filled with another notation key, e.g. NO or NA, but have been left empty erroneously, are automatically filled with NE, and the error is not noticed. This could lead to a number of cells being incorrectly filled with NE, which renders the reporting less transparent. It thus scores negatively against promoting TACCC, facilitating the TER and limiting changes to allow the CRT reporter to be prepared in time for the first BTR.

There might be a number of reasons that some developing country Parties advance the possibility of deleting rows and columns. These Parties may feel that the submission of empty tables or of tables that are filled with, e.g. “not estimated” or “flexibility” notation keys may have negative political repercussions at both the national and the international level. This is because, in these Parties’ views, it may lead third parties to think that not enough effort was put into the reporting of national GHG inventories whereas, in fact, not reporting of certain elements was due to limited reporting capacity. A possible solution to address these concerns would be that of deleting columns and rows that are left empty due to the application of such flexibility in the body of the NID and/or BTR. NID and BTRs are the documents that are most often read by civil society and non-experts and thus benefit from more concise quantitative information supporting a clear narrative. On the other hand, CRTs –whose structure would be left intact—would be used primarily by the TERs, who will not review information not reported due to the use of flexibility, and by research institutions for statistical and computational purposes. The approach would be in line with the current practice among many Annex I countries, who tend to focus on the more recent years of the time series in the NIR, simply due to practical considerations around presenting a time series of more than 20 years in a tabular format.³² With the current reporting, the set of CRFs and NIRs can be seen as complementing each other, the CRF providing detailed information in a common format and the NIR spelling out the narrative behind that information.

³² Decision 24/CP.19, II.G.2. § 48 (UNFCCC, 2018_[28]) acknowledges this issue by requiring that, among other, the NIR should “[...] cover the base year, the most recent 10 years and any previous years since the base year ending with 0 or 5 (1990, 1995, 2000, etc.).”

Reporting on the use of flexibility

The MPGs do not provide any specific guidance to Parties in relation to where or how the use of flexibility, capacity constraints and estimated time frames for improvements are to be reported. Paragraph 6 of the MPGs requires (“shall”) developing country Parties that need flexibility in the light of their capacities to “clearly indicate the provision to which flexibility is applied” (Annex to decision 18/CMA.1) (UNFCCC, 2019^[2]). In doing so, Parties are also to “concisely clarify capacity constraints [...] and provide self-determined estimated time frames for improvements in relation to those capacity constraints” (Annex to decision 18/CMA.1) (UNFCCC, 2019^[2]). Providing clear information on the use of flexibility is key to enhance the transparency of reporting and to facilitate the review of information provided by Parties. The latter point is of particular relevance considering that the TER is not to review a Party’s determination to use a flexibility option or their capacity to report without this option (UNFCCC, 2019^[2]). Reporting on the use of flexibility is a separate issue from operationalising flexibility within the CRT tables, which is discussed above.

There are at least three options, two of which already explored in (Rocha, 2019^[3]), which could be available to Parties to report on different informational elements related to the use of flexibility as mandated by paragraph 6 of the MPGs. Where appropriate, some of these options are also illustrated as [worked examples in Scenario 10](#) (see page 76).

- **Option 1: Reporting on the use of flexibility in a narrative format within the NID.** Parties may decide to include paragraphs and sentences which provide information on, e.g. capacity constraints and self-determined estimated time frames for improvements where appropriate and relevant within the body of the NID. This option would allow Parties to provide detailed information on the use of flexibility, and to contextualise it in broader national circumstances. However, this option could lead to some information to be potentially overlooked as reviewers and readers would need to cross-reference information contained in the NID with what is being reported in the CRTs. Given the often significant length of NIRs, with most documents currently submitted by Annex I Parties exceeding 600 pages, it may be difficult for readers and reviewers to easily identify where this information is provided within the document. This is particularly true considering that, without agreed guidelines on the detailed structure of the NID, different countries may be including this information in different chapters or sections. This being considered, this option is deemed to test negatively against the criterion of providing a common format for reporting and criterion of facilitating the TER. This option would test negatively against the “comparability” aspect of promoting TACCC, but could potentially help to promote “transparency”, “accuracy” and “completeness” aspects of the same criterion.
- **Option 2: Reporting on the use of flexibility using a (common) reporting table.** The use of a tabular format to report information on the use of flexibility in accordance with paragraph 6 of the MPGs has been suggested by a number of Parties and Party groups as part of their submission to the SBSTA. In particular, one Party group suggests using the table additionally to information on flexibility provided in each chapter of the BTR, and another group suggest using a table as part of each chapter, meaning there would be one flexibility table for the GHG inventory chapter, for progress towards the NDC, etc. Tabular formats for the reporting of informational elements related to the use of flexibility could be designed either at Parties’ discretion and included in the body of the NID only or could be designed in a common format and included in the set of CRTs as well as, potentially, in the body of the NID. The use of tabular formats for the reporting on the use of flexibility would significantly facilitate the review of information, as it would provide reviewers with a clear overview of whether and where flexibility has been used by those developing country Parties that need it in the light of their capacities. The use of a table would therefore test positively against criterion “facilitating the TER”. Furthermore, a *common* flexibility table that is also included within the set of CRTs would promote, in addition to facilitating the TER, the “comparability” aspect of the criterion

“promoting TACCC” for reasons already discussed in section 3. A common reporting table would therefore test positively against criteria “providing a common format for reporting”, “facilitating the TER” and the “comparability” aspect of “promoting TACCC”.

- **Option 3: Reporting on the use of flexibility in a completeness table with information on notation keys** (e.g. Table 9 of current CRF tables). This option would only be viable if Parties were to indicate the use of flexibility within CRT tables with a “flexibility” notation key (discussed in page 36 of section 3. and in scenario 8).

Overview assessment of options for CRT reporting

This section has identified a number of options for reporting using CRTs and discussed their performance against a given set of criteria. Table 5 provides a summary of the key elements and options discussed thus far and provides a more comprehensive assessment of each option as assessed against each criterion. For this purpose, a semi-quantitative scoring approach (-- to ++, 0 meaning “neutral” or “no impact”) has been used. CRT reporting options have been grouped by topic.

Table 5. Overview of CRT reporting options and assessment against a given set of criteria

	Criteria stemming from reporting principles set out in decision 18/CMA.1				Criteria developed by the authors stemming from experience			
	Providing a common format for reporting	Facilitating improved reporting and transparency over time	Promoting TACCC ^a	Ensuring that parties maintain at least the current frequency and quality of reporting	Facilitating the technical expert review	Facilitating machine readability and/or automatised assessment	Allowing relevant reporting tools to be prepared in time to facilitate reporting the first BTR ^b	Allowing including subsequent versions or refinements of the 2006 IPCC GL
A. Showing a GHG trend in the summary tables								
Deleting “base year” and “% change” columns	0	-	0	-	0	0	+	N/A
Deleting “base year” column, instead of presenting “% change between base year and latest reporting year” presenting a trend calculated using the earliest and the most recent year reported on	0	0	-	0	+	0	-	N/A
B. Reporting the reference year / period of the NDC								
Allowing Parties to generate additional column(s) headed “reference year(s)” through the CRT reporter	-	0	++	0	++	++	-	N/A
Reporting in a documentation box which year(s) are reference year(s) for the Party’s NDC and how the Party defines reference year	0	0	+	0	0	-	++	N/A
C. Facilitating the transition to future GHG inventory guidance								
Reporting new categories under “Other”	++	+	+	0	+	-	++	++
Voluntary Reporting on new gases	--	+	0	0	0	+	--	++
D. Dealing with cells not filled due to using a flexibility option^c								
Empty rows / columns are deleted – automatically by the CRT reporter	--	--	-	0	--	0	--	N/A

	Criteria stemming from reporting principles set out in decision 18/CMA1				Criteria developed by the authors stemming from experience			
	Providing a common format for reporting	Facilitating improved reporting and transparency over time	Promoting TACCC ^a	Ensuring that parties maintain at least the current frequency and quality of reporting	Facilitating the technical expert review	Facilitating machine readability and/or automatised assessment	Allowing relevant reporting tools to be prepared in time to facilitate reporting the first BTR ^b	Allowing including subsequent versions or refinements of the 2006 IPCC GL
Empty rows / columns are deleted – full tables are generated by the CRT reporter, Parties delete manually	--	--	--	0	--	0	0	N/A
The cells are left empty	++	+	0	0	+	0	+	N/A
A notation key is used to indicate where a cell in the CRT is not filled as flexibility was used (not to report years, not to report gases, use lower significance threshold)	++	++	++	0	++	0	+	N/A
All empty cells are automatically filled with the notation key NE	++	+	--	0	--	0	-	N/A
E. Where the flexibility option^c related to the key category analysis threshold is used								
A box is added to indicate which threshold was used for the KCA	++	++	++	++	++	++	-	N/A
F. Where the flexibility option^c to use a lower significance threshold is used								
Use FLEX notation key	++	++	+	0	+	+	++	N/A
Using FLEX / NE together	++	++	++	0	++	++	++	N/A
NE only	++	-	-	0	-	++	++	N/A
NE only, add info in documentation box or NID	+	++	+	0	+	+	++	N/A
Using NE only + providing information providing information in table 9	++	++	++	0	+	+	++	N/A
G. Reporting on the use of flexibility								
Reporting on the use of flexibility in a narrative format within the NID	--	+	+	0	--	--	++	N/A
Reporting on the use of flexibility using a (common) reporting table	+(+)	++	++	0	++	+(+)	(-)	N/A

	<i>Criteria stemming from reporting principles set out in decision 18/CMA1</i>				<i>Criteria developed by the authors stemming from experience</i>			
	Providing a common format for reporting	Facilitating improved reporting and transparency over time	Promoting TACCC^a	Ensuring that parties maintain at least the current frequency and quality of reporting	Facilitating the technical expert review	Facilitating machine readability and/or automatised assessment	Allowing relevant reporting tools to be prepared in time to facilitate reporting the first BTR^b	Allowing including subsequent versions or refinements of the 2006 IPCC GL
Reporting on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables).	++	++	++	0	++	++	-	N/A

Note: (a) Transparency, Accuracy, Consistency, Comparability and Completeness;

(b) Due by 31 December 2024;

(c) As provided by the MPGs to those developing Parties who need it in light of their capacities.

Source: Authors

4. Worked examples

This section presents and briefly discusses a number of worked examples used to illustrate the CRT reporting options highlighted in section 3. Table 6 below shows an overview of the scenarios used to develop the worked examples. These worked examples aim to illustrate how sticking points in the current international discussions can be addressed. Scenarios 3 and 4 are used to illustrate how CRFs are currently being filled in, so to shed light on current reporting practices and on related issues that have been raised during the international climate negotiations. The scenarios and the worked examples presented here are only to accompany discussions outlined in section 3; the latter provide crucial background information to the full understanding of the worked examples.³³

Table 6 Overview of scenarios used to develop the worked examples

	No	Scenario
Scenarios related to general issues	1	Reporting sectoral background data tables
	2	Reporting a reference year
	3	Reporting on GHG trends in the summary tables
	4	Reporting on new categories from the 2019 Refinement
Scenarios related to flexibility options	5	Reporting on the use of flexibility: footnotes vs documentation boxes
	6	Applying a lower insignificance level (flexibility option in §32 of the MPGs)
	7	Applying a lower KCA threshold of no lower than 85% (flexibility option in §25 of the MPGs)
	8	Not reporting certain gases (flexibility options in §48 of the MPGs)
	9	Reporting a shorter time series (flexibility options in §57 and §58 of the MPGs)
	10	Reporting on the use of flexibility as per paragraph 6 of the MPGs (Annex to decision 18/CMA.1)

Scenario 1: Reporting sectoral background data tables

[\(back to Section 3\)](#)

The reporting of sectoral background data is an important component of transparency of reporting and completeness. Furthermore, sectoral background data is key to allow for the estimation of emissions from categories and sectors. These two worked example reflect current reporting practices and show two background data tables for CH₄ emissions from manure management filled-in by two different Parties that use different Tiers (Tier 1 in Figure 1 and Tier 2 in Figure 2, respectively). The level of detail in which information in sectoral background data tables is to be reported is therefore conditional to Parties' capacities. Parties using lower Tier methods can provide only the background information that is needed for the estimation of emissions according to the methodologies adopted.

³³ It is therefore advisable to readers to first read section 3. Under each scenario, a "back to section 3" hyperlink is included to bring readers back to the relevant discussions in section 3.

Figure 1. Sectoral background data table for CH₄ emissions from manure management (cattle only) using Tier 1TABLE 3.B(a) SECTORAL BACKGROUND DATA FOR AGRICULTURE
CH₄ Emissions from Manure Management
(Sheet 1 of 1)Year 2022
Submission 2024
Country Party A

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION						IMPLIED EMISSION FACTORS CH ₄ (kg CH ₄ /head/yr)	EMISSIONS CH ₄ (kt)	
	Population size (1000s)	Allocation by climate region ⁽¹⁾			Typical animal mass (average) (kg)	VS ⁽²⁾ daily excretion (average) (kg dm/head/day)			CH ₄ producing potential (Bo) ⁽²⁾ (average) (m ³ CH ₄ /kg VS)
		Cool	Temperate	Warm					
		(%)							
1. Cattle									
<i>Option A:</i>									
Dairy cattle ⁽²⁾	5674	65	35	NO	480	NA	NA	19.12	108.49
Non-dairy cattle	2345	65	35	NO	280	NA	NA	1.00	2.36
<i>Option B:</i>									
Mature dairy cattle									
Other mature cattle									
Growing cattle									

Note: Based on real Annex I Party reporting.

Source: Authors

Figure 2. Sectoral background data table for CH₄ emissions from manure management (cattle only) using Tier 2

TABLE 3.B(a) SECTORAL BACKGROUND DATA FOR AGRICULTURE
 CH₄ Emissions from Manure Management
 (Sheet 1 of 1)

Year 2022
 Submission 2024
 Country Party B

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION							IMPLIED EMISSION FACTORS CH ₄ (kg CH ₄ /head/yr)	EMISSIONS CH ₄ (kt)
	Population size (1000s)	Allocation by climate region ⁽¹⁾			Typical animal mass (average) (kg)	VS ⁽²⁾ daily excretion (average) (kg dm/head/day)	CH ₄ producing potential (Bo) ⁽²⁾ (average) (m ³ CH ₄ /kg VS)		
		Cool	Temperate	Warm					
		%							
1. Cattle									
<i>Option A:</i>									
Dairy cattle ⁽³⁾	4325	95	5	NO	670.44	4.20	0.24	21.68	93.77
Non-dairy cattle	1051	95	5	NO	382.31	1.58	0.24	7.71	64.18
<i>Option B:</i>									
Mature dairy cattle									
Other mature cattle									
Growing cattle									

Note: Based on real Annex I Party reporting.
 Source: Authors

Scenario 2: Reporting a reference year

[\(back to Section 3\)](#)

This worked example³⁴ shows how the reference year(s) for the NDC could be indicated in the CRTs.³⁵ Two options are presented:

- **Option 1:** The CRT reporter automatically generates a header indicating the relevant reference year(s). The Party is asked to specify the reference year at data entry (Figure 3).
- **Option 2:** The Party indicates the reference year in a documentation box (Figure 4).

Figure 3. Header indicating reference year is automatically generated

TABLE 10 EMISSION TRENDS		Inventory 2021	
Summary		Submission 2024v1	
(Sheet 6 of 6)		Example	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Reference year: 2010	2020	2021
	(kt CO ₂ eq)	(kt CO ₂ eq)	(kt CO ₂ eq)
Total (net emissions)⁽¹⁾			
1. Energy			
A. Fuel combustion (sectoral approach)			
1. Energy industries	33.44	33.33	33.22
2. Manufacturing indust	33.44	33.33	33.22
3. Transport	33.44	33.33	33.22
4. Other sectors	33.44	33.33	33.22
5. Other			

Source: Authors

³⁴ The worked example is based on data being reported only for the years 2010 (reference year), 2020 and 2021, which is in line with the flexibility options of para 57 and 58 of the MPGs. This is done with the sole purpose of keeping the example simple. All worked examples in this scenario use hypothetical data for the sole purpose of illustrating how tables can be filled. For this reason, within a specific reporting year, the same values are used for all categories shown. The worked examples in this scenario only show relevant elements of reporting tables as opposed to the full tables.

³⁵ Decision 18/CMA.1 in § 57 requires, among other, that Parties report at least (a) the reference year or period for the NDC. The decision does not specify what “reference year” means. This issue is discussed in Section 3, para 0.

Figure 4 The Party indicates its reference year in a documentation box

TABLE 10 EMISSION TRENDS		Inventory 2021	
Summary		Submission 2024v1	
(Sheet 6 of 6)		Example	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2020	2021
	(kt CO ₂ eq)	(kt CO ₂ eq)	(kt CO ₂ eq)
Total (net emissions) ⁽³⁾			
I. Energy			
A. Fuel combustion (sectoral approach)			
1. Energy industries	33.44	33.33	33.22
2. Manufacturing indus	33.44	33.33	33.22
3. Transport	33.44	33.33	33.22
4. Other sectors	33.44	33.33	33.22
5. Other			

Documentation box:

- 2010 is the reference year for our NDC.

Source: Authors

Scenario 3: Reporting on GHG trends in the summary tables

[\(back to Section 3\)](#)

In the current CRF, the summary tables showing time-series data include a column named “Base year” and “Change from the base to latest reporting year” (Figure 5). This worked example³⁶ considers the following options:

- **Option 1:** Not including information on trends in the CRTs, i.e. deleting the columns titled “base year” and “% change to latest reporting year”. (Figure 6)
- **Option 2:** Including general information on the trend, by calculating the % change in emissions between the earliest year reported and the latest year reported. This would entail deleting the column headed “Base year” and renaming the column headed “Change from the base to latest reporting year” into “Change from the first reporting year to the latest reporting year”.³⁷ (Figure 7)

³⁶ This worked example is based on data being reported only for the years 2020 and 2021, which is in line with the flexibility options of para 57 and 58 of the MPGs. This is done with the sole purpose of keeping the example simple. All worked examples in this scenario use hypothetical data for the sole purpose of illustrating how tables can be filled. For this reason, within a specific reporting year, the same values are used for all categories shown. The worked examples in this scenario only show relevant elements of reporting tables as opposed to the full tables.

³⁷ Other trends could of course be calculated, e.g. an average annual trend between the earliest and latest reporting year. This specific trend examples has been chosen for this worked example for the sole reason that the example only includes 2 reporting years (see explanation in footnote 36).

Figure 5 Columns on the “Base year” and “Change from base to the latest reported year” in the summary sheets of the current CRF

TABLE 10 EMISSION TRENDS				Year
SUMMARY				Submission
(Sheet 6 of 6)				Country
GREENHOUSE GAS EMISSIONS	Base year ⁽¹⁾	1990	(Years 1991 to latest reported year)	Change from base to latest reported year
	CO ₂ equivalent (kt)			(%)
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 ₂ O emissions without N ₂ O from LULUCF				
N ₂ O emissions with N ₂ O from LULUCF				
HFCs				
PFCs				
Unspecified mix of HFCs and PFCs				
SF ₆				
NF ₃				
Total (without LULUCF)				

Source: Authors

Figure 6 Base year and trend columns deleted from the summary tables

TABLE 10 EMISSION TRENDS			Inventory 2021
Summary			Submission 2024v1
(Sheet 6 of 6)			Example
GREENHOUSE GAS SOURCE AND SECTOR	2020	2021	
	(kt CO ₂ eq)	(kt CO ₂ eq)	
Total (net emissions) ⁽¹⁾			
I. Energy			
A. Fuel combustion (sectoral approach)			
1. Energy industries	33.33	33.22	
2. Manufacturing industries and construction	33.33	33.22	
3. Transport	33.33	33.22	
4. Other sectors	33.33	33.22	
5. Other			
B. Fugitive emissions from fuels			

Source: Authors

Figure 7 Table – “Base year” column deleted, the table on trend retained and renamed into “Change in % between first reported year to the latest reported year”

TABLE 10 EMISSION TRENDS		Inventory 2021	
Summary		Submission 2024v1	
(Sheet 6 of 6)		Example	
GREENHOUSE GAS SOURCE AND SECTOR	2020	2021	Change from first reported year to latest reported year
	(kt CO ₂ eq)	(kt CO ₂ eq)	%
Total (net emissions)⁽¹⁾			
1. Energy			
A. Fuel combustion (sectoral approach)			
1. Energy industries	33.33	33.22	-0.3%
2. Manufacturing industries and construction	33.33	33.22	-0.3%
3. Transport	33.33	33.22	-0.3%
4. Other sectors	33.33	33.22	-0.3%
5. Other			
B. Fugitive emissions from fuels			

Source: Authors

Scenario 4: Reporting on new categories from the IPCC 2019 Refinement

[\(back to Section 3\)](#)

This scenario explores how CRTs could facilitate voluntary reporting on new categories and new gases from the IPCC 2019 Refinement. Two options are considered:

- **Option 1:** Reporting on new categories (with regards to gases already included in the 2006 IPCC Guidelines) using the category “Other”. Figure 8 shows the current CRF sectoral background tables and sectoral report table for the IPPU sector. Figure 10 shows how this category is used to report the new category “Hydrogen Production” introduced by the IPCC 2019 Refinement under the IPPU sector.
- **Option 2:** Amending tables so to include new gases identified in the IPCC 2019 refinement. Figure 11 illustrates how three new gases (CF₃I, CH₂Br₂, CHCl₃)³⁸ can be added to CRF table 2(II).

³⁸ The IPCC 2019 Refinement introduces further new gases. These three have been chosen solely for illustrative purposes.

Figure 8 Unfilled category “Other” in the sectoral background table for category 2.B Chemical industry of the IPPU sector

TABLE 2(I).A-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE

Emissions of CO₂, CH₄ and N₂O

(Sheet 1 of 2)

Year

Submission

Country

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS ⁽²⁾			EMISSIONS					
	Production/Consumption quantity		CO ₂	CH ₄	N ₂ O	CO ₂		CH ₄		N ₂ O	
	Description ⁽¹⁾	(kt)				Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾	Emissions ⁽³⁾	Recovery ⁽⁴⁾
			(kt)								
A. Mineral industry											
1. Cement production	(e.g. cement or clinker production)										
2. Lime production											
3. Glass production											
4. Other process uses of carbonates											
a. Ceramics											
b. Other uses of soda ash											
c. Non-metallurgical magnesium production											
d. Other											
B. Chemical industry											
1. Ammonia production ⁽⁵⁾											
2. Nitric acid production											
e. Acrylonitrile											
f. Carbon black											
g. Other ⁽⁶⁾											
Drop-down list											
Styrene											
Other (please specify)											
10. Other (please specify)											

Source: Authors

Figure 9 Unfilled category “Other” in the sectoral report table for category 2.B Chemical industry of the IPPU sector

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 1 of 2)

Year
Submission
Country

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	HFCs ⁽¹⁾	PFCs ⁽¹⁾	Unspecified mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NMVOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
Total industrial processes												
A. Mineral industry												
1. Cement production												
2. Lime production												
3. Glass production												
4. Other process uses of carbonates												
B. Chemical industry												
1. Ammonia production												
2. Nitric acid production												
3. Adipic acid production												
4. Caprolactam, glyoxal and glyoxylic acid production												
5. Carbide production												
6. Titanium dioxide production												
7. Soda ash production												
8. Petrochemical and carbon black production												
9. Fluorochemical production												
10. Other (as specified in table 2(I).A-H)												

Source: Authors

Figure 10 Reporting Hydrogen Production using the category 2.B.10 “Other” in the sectoral report table

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE												Inventory 2021
(Sheet 1 of 2)												Submission 2024v1
												Example Party
GREENHOUSE GAS SOURCE	CO ₂	CH ₄	N ₂ O	HFC ₅ ⁽¹⁾	PFC ₅ ⁽¹⁾	Unspecified mix of HFC ₅ and PFC ₅ ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NM VOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
Total industrial processes												
A. Mineral industry												
1. Cement production												
2. Lime production												
3. Glass production												
4. Other process uses of carbonates												
B. Chemical industry												
1. Ammonia production												
2. Nitric acid production												
3. Adipic acid production												
4. Caprolactam, glyoxal and glyoxylic acid production												
5. Carbide production												
6. Titanium dioxide production												
7. Soda ash production												
8. Petrochemical and carbon black production												
9. Fluorochemical production												
10. Hydrogen Production	99.99											

Source: Authors

Figure 11 CRF 2(II) Sectoral report for industrial processes and product use, emissions of HFCs, PFCs, SF₆ and NF₃ with three further gases from the IPCC 2019 Refinement included (CF₃I, CH₂Br₂, CHCl₃)

TABLE 2(II) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE - EMISSIONS OF HFCs, PFCs, SF₆ AND NF₃ (Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HFC-23	HFC-32	HFC-41	HFC-O-Isomers	HFC-125	HFC-134a	HFC-152a	HFC-188	HFC-227ea	HFC-236fa	HFC-245fa	HFC-254ea	HFC-266ea	HFC-365mfc	Unspecified mix of HFCs ⁽¹⁾	Total HFCs	CF ₄	C ₂ F ₆	C ₃ F ₈	C ₄ F ₁₀	C ₆ F ₁₄	n-C ₈ F ₁₈	C ₈ F ₁₈	C ₁₀ F ₂₂	C ₁₂ F ₂₆	Unspecified mix of PFCs ⁽²⁾	Total PFCs	Unspecified mix of HFCs and PFCs ⁽³⁾	SF ₆	NF ₃	CF ₃ I	CH ₂ Br ₂	CHCl ₃												
	0															CO ₂ equivalent (kt)	0						CO ₂ equivalent (kt)	CO ₂ equivalent (kt)	0	0	0	0	0	0															
Total actual emissions of halocarbons (by chemical) and SF ₆																																													
B. Chemical industry																																													
1 Pharmaceutical production																																													
By-product emissions																																													

Unspecified mix of PFCs ⁽¹⁾	Total PFCs	Unspecified mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	CF ₃ I	CH ₂ Br ₂	CHCl ₃
CO ₂ equivalent (kt)	CO ₂ equivalent (kt)	CO ₂ equivalent (kt)	(t)	(t)	(t)	(t)	(t)

Source: Authors

Scenario 5: Reporting on the use of flexibility: footnotes vs documentation boxes

[\(back to Section 3\)](#)

This scenario presents worked examples³⁹ showing how Parties could indicate the use of flexibility on a specific CRT worksheet. Two options are considered:

- **Option 1:** A documentation box is used by the Party to indicate which flexibility options have been used. Figure 12 shows the guidance in the documentation box before it is filled in by a Party. Figure 13 shows the filled documentation box. This worked example shows what guidance on indicating flexibility in a documentation box might look like. When filling in the documentation box, Parties will delete the guidance text. The text in the standard footnotes (1)-(4) is part of the CRT and is intended to provide guidance to Parties in filling in the tables.
- **Option 2:** A custom footnote is used by the Party to indicate which flexibility options have been used (see Figure 14).

The worked examples are based on scenario 6, where a Party needing flexibility in light of its capacities reports a shorter time series based on flexibility options in paragraphs 57 and 58 of the MPGs (Annex to decision 18/CMA.1, Section II, §57 and §58) (UNFCCC, 2019^[2]).

³⁹ The worked examples are filled with hypothetical data, using the same values for all cells filled. The worked examples only show relevant elements of a CRF table rather than the full table.

Figure 12 A documentation box with guidance text is provided where countries can report their use of flexibility provisions

TABLE 10 EMISSION TRENDS Inventory 2021		
Summary	Submission 2024v1	
(Sheet 6 of 6)	Example	
GREENHOUSE GAS SOURCE AND SECTOR	2020	2021
Total (net emissions)⁽¹⁾		
1. Energy		
A. Fuel combustion (sectoral approach)		
1. Energy industries	33.33	33.33
2. Manufacturing industries	33.33	33.33
3. Transport	33.33	33.33

Documentation box:

- Parties should provide detailed explanations on emissions trends in chapter XX: Trends in Greenhouse Gas Emissions and, as appropriate, in the corresponding Chapters YY - ZZ of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NID if any additional information and further details are needed to understand the content of this table.
- Use the documentation box to provide explanations if potential emissions are reported.
- Parties who need it in light of their capacities using flexibility options granted by the Annex to Decision 18/CMA.1 can provide information on the specific flexibility options used in this documentation box.

Source: Authors

Figure 13 A documentation box is used to indicate the use of flexibility, documentation box is filled

TABLE 10 EMISSION TRENDS Inventory 2021		
Summary	Submission 2024v1	
(Sheet 6 of 6)	Example	
GREENHOUSE GAS SOURCE A	2020	2021
Total (net emissions)⁽¹⁾		
I. Energy		
A. Fuel combustion (sectoral approach)		
1. Energy industries	33.33	33.33
2. Manufacturing indus	33.33	33.33
3. Transport	33.33	33.33

Documentation box:		
<p>ExampleParty makes use of the flexibility option provided by para 57 of Decision 18/CMA.1 allowing Parties who need it in light of their capacities to report at a minimum, the reference year/period for its NDC under Article 4 of the Paris Agreement and, in addition, a consistent annual time series from at least 2020 onwards, and of flexibility option provided by para 58 of Decision 18/CMA.1, allowing Parties who need it in light of their capacities to have their latest reporting year as three years prior to the submission of their national inventory report.</p>		

Note: This example shows the documentation box filled in by the Party. The guidance text has been deleted.
 Source: Authors

Figure 14 Custom footnote used to indicate use of flexibility

TABLE 10 EMISSION TRENDS Inventory 2021		
Summary	Submission 2024v1	
(Sheet 6 of 6)	Example	
GREENHOUSE GAS SOURCE AND SECTOR	2020	2021
Total (net emissions)⁽¹⁾		
1. Energy		
A. Fuel combustion (sectoral approach)		
1. Energy industries	33.33 ⁽⁵⁾	33.33
2. Manufacturing industries and construction	33.33	33.33
3. Transport	33.33	33.33
4. Other sectors	33.33	33.33

⁽³⁾ In accordance with the UNFCCC Annex I inventory reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO₂ equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.

⁽⁴⁾ Includes net CO₂, CH₄ and N₂O from LULUCF.

Custom Footnotes

⁽⁵⁾ Example Party makes use of the flexibility option provided by para 57 of Decision 18/CMA.1 allowing Parties who need it in light of their capacities to report at a minimum, the reference year/period for its NDC under Article 4 of the Paris Agreement and, in addition, a consistent annual time series from at least 2020 onwards, and of flexibility option provided by para 58 of Decision 18/CMA.1, allowing Parties who need it in light of their capacities to have their latest reporting year as three years prior to the submission of their national inventory report.

Note: The text in the custom footnote (5) is not standard text, but would need to be developed by the Party. The text in the standard footnotes (1)-(4) is intended to provide guidance to Parties in filling in the tables. This footnote text is taken from the current CRTs and included here for purely illustrative purposes. The text in the documentation box is guidance text aiming to help Parties fill the documentation box as appropriate. In this worked example, the Party has not included any information in the documentation box.

Source: Authors

Scenario 6: Applying a lower insignificance level (flexibility option in §32 of the MPGs)

[\(back to Section 3\)](#)

This scenario illustrates four worked examples⁴⁰ showing different reporting options available to a Party that needs flexibility in the light of its capacity that applies flexibility to the provision of paragraph 32 of the MPGs (i.e. insignificance threshold). Accordingly, the Party applies a higher insignificance threshold for CH₄ and N₂O emissions from category 2D.1 (Lubricant use) and CO₂, CH₄ and N₂O emissions from category D.2 (Paraffin wax use). In addition, the Party does not report HFCs, PFCs, SF₆ and NF₃, based on the flexibility provision of paragraph 48 of the MPGs (i.e. gas coverage).

- **Option 1:** Using a “flexibility” notation key (e.g. “FLEX”) to indicate when emissions were not estimated because flexibility was used (Figure 15)
- **Option 2:** Using both the “not estimated” and the “flexibility” notation keys (e.g. “NE, FLEX”) in those cases in which emissions were not estimated because flexibility was used (Figure 16).
- **Option 3:** Using only the notation key “NE” and to provide further information on the potential use of flexibility in the documentation box of the CRT (Figure 17) and/or in the body of the NID.
- **Option 4:** Using only the notation key “NE” and to provide further information on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables) (Figure 18).

⁴⁰ This worked example is based on data being reported only for the years 2020 and 2021, which is in line with the flexibility options of para 57 and 58 of the MPGs. This is done with the sole purpose of keeping the example simple. All worked examples in this scenario use mock-up data for the sole purpose illustrating showing how tables can be filled and a trend is calculated. For this reason, within a reporting year, the same values are used for all categories shown. The worked examples in this scenario only show relevant elements of reporting tables as opposed to the full tables.

Figure 15. Option 1: Using a “flexibility” notation key (e.g. “FLEX”) to indicate when emissions were not estimated because flexibility was used

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 2 of 2)

Inventory 2022
Submission 2024 v1
Example Party

GREENHOUSE GAS SOURCE AND SINK C.	CO ₂	CH ₄	N ₂ O	HFCs ⁽¹⁾	PFCs ⁽¹⁾	Unspecifie d mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NMVOG	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
D. Non-energy products from fuels and solv	155.52	FLEX	FLEX						NA	NA	NA	NA
1. Lubricant use	147.40	FLEX	FLEX						NA	NA	NA	NA
2. Paraffin wax use	FLEX	FLEX	FLEX						NA	NA	NA	NA
3. Other	NA	NA	NA						NA	NA	NA	NA
E. Electronics industry				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Integrated circuit or semiconductor				FLEX	FLEX	FLEX	FLEX	FLEX				
2. TFT flat panel display				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Photovoltaics				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Heat transfer fluid				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Other (as specified in table 2(II))				FLEX	FLEX	FLEX	FLEX	FLEX				
F. Product uses as substitutes for ODS⁽²⁾				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Refrigeration and air conditioning				FLEX	FLEX	FLEX	FLEX	FLEX				
2. Foam blowing agents				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Fire protection				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Aerosols				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Solvents				FLEX	FLEX	FLEX	FLEX	FLEX				
6. Other applications				FLEX	FLEX	FLEX	FLEX	FLEX				
G. Other product manufacture and use				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Electrical equipment				FLEX	FLEX	FLEX	FLEX	FLEX				
2. SF ₆ and PFCs from other product use					FLEX	FLEX	FLEX					
3. N ₂ O from product uses												
4. Other												
H. Other (as specified in tables 2(I).A-H and 2(II))⁽³⁾												

⁽¹⁾ The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions.

⁽²⁾ ODS ozone-depleting substances.

Note: The documentation box of table 2(I) has been cut in this example for formatting purposes and to facilitate readability.

Source: Authors

Figure 16 Option 2: Using both the “not estimated” and the “flexibility” notation keys (e.g. “NE, FL”) in those cases in which emissions were not estimated because flexibility was used.

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 2 of 2)

Inventory 2022
Submission 2024 v1
Example Party

GREENHOUSE GAS SOURCE AND SINK C	CO ₂	CH ₄	N ₂ O	HFCs ⁽¹⁾	PFCs ⁽¹⁾	Unspecifie d mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NMVOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
D. Non-energy products from fuels and solv	155.52	NE, FLEX	NE, FLEX						NA	NA	NA	NA
1. Lubricant use	147.40	NE, FLEX	NE, FLEX						NA	NA	NA	NA
2. Paraffin wax use	NE, FLEX	NE, FLEX	NE, FLEX						NA	NA	NA	NA
3. Other	NA	NA	NA						NA	NA	NA	NA
E. Electronics industry				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Integrated circuit or semiconductor				FLEX	FLEX	FLEX	FLEX	FLEX				
2. TFT flat panel display				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Photovoltaics				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Heat transfer fluid				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Other (as specified in table 2(II))				FLEX	FLEX	FLEX	FLEX	FLEX				
F. Product uses as substitutes for ODS⁽²⁾				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Refrigeration and air conditioning				FLEX	FLEX	FLEX	FLEX	FLEX				
2. Foam blowing agents				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Fire protection				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Aerosols				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Solvents				FLEX	FLEX	FLEX	FLEX	FLEX				
6. Other applications				FLEX	FLEX	FLEX	FLEX	FLEX				
G. Other product manufacture and use				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Electrical equipment				FLEX	FLEX	FLEX	FLEX	FLEX				
2. SF ₆ and PFCs from other product use					FLEX	FLEX	FLEX					
3. N ₂ O from product uses												
4. Other												
H. Other (as specified in tables 2(I).A-H and 2(II))⁽³⁾												

⁽¹⁾ The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions.

⁽²⁾ ODS ozone-depleting substances.

Note: The documentation box of table 2(I) has been cut in this example for formatting purposes and to facilitate readability.

Source: Authors

Figure 17. Option 3: Using only the notation key “NE” and to provide further information on the potential use of flexibility in the documentation box of the CRT

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 2 of 2)

Inventory 2022
Submission 2024 v1
Example Party

GREENHOUSE GAS SOURCE AND SINK C	CO ₂	CH ₄	N ₂ O	HFCs ⁽¹⁾	PFCs ⁽¹⁾	Unspecified mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NM VOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
D. Non-energy products from fuels and solvents	155.52	NE	NE						NA	NA	NA	NA
1. Lubricant use	147.40	NE	NE						NA	NA	NA	NA
2. Paraffin wax use	NE	NE	NE						NA	NA	NA	NA
3. Other	NA	NA	NA						NA	NA	NA	NA
E. Electronics industry				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Integrated circuit or semiconductor				FLEX	FLEX	FLEX	FLEX	FLEX				
2. TFT flat panel display				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Photovoltaics				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Heat transfer fluid				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Other (as specified in table 2(II))				FLEX	FLEX	FLEX	FLEX	FLEX				
G. Other product manufacture and use				FLEX	FLEX	FLEX	FLEX	FLEX				
1. Electrical equipment				FLEX	FLEX	FLEX	FLEX	FLEX				
2. SF ₆ and PFCs from other product use					FLEX	FLEX	FLEX					
3. N ₂ O from product uses												
4. Other												
H. Other (as specified in tables 2(I).A-H and 2(II))⁽³⁾												

⁽¹⁾ The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions. Data on

⁽²⁾ ODS ozone-depleting substances.

Documentation box:	
<ul style="list-style-type: none"> Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table. Parties who need it in light of their capacities using flexibility options granted by the Annex to Decision 18/CMA.1 should provide information on the specific flexibility options used in this documentation box. 	
Documentation box	<p>D.1 CH₄ and N₂O: ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1 allowing Parties who need it in light of their capacities to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, and 1,000 kt CO₂eq, whichever is lower.</p> <p>D.2 CO₂, CH₄, N₂O: ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1 allowing Parties who need it in light of their capacities to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, and 1,000 kt CO₂eq, whichever is lower.</p>

Note: The “Product uses as substitutes for ODS” category (F) has been cut in this example for formatting purposes and to facilitate readability.

Source: Authors

Figure 18. Option 4: Using only the notation key “NE” and to provide further information on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables)

TABLE 9 COMPLETENESS - INFORMATION ON NOTATION KEYS				Inventory 2022
(Sheet 1 of 1)				Submission 2024 v1
				Example Party
Sources and sinks not estimated ("NE") ⁽¹⁾				
GHG	Sector ⁽²⁾	Source/sink category ⁽²⁾	Explanation	
CO ₂	Industrial Processes and Product Use	D.2 Paraffin wax use	Emissions are less than the significance threshold. ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1, and thus consider emissions insignificant because below 0.1 per cent of the national total GHG emissions.	
CH ₄	Industrial Processes and Product Use	D.1 Lubricant use	Emissions are less than the significance threshold. ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1, and thus consider emissions insignificant because below 0.1 per cent of the national total GHG emissions.	
	Industrial Processes and Product Use	D.2 Paraffin wax use	Emissions are less than the significance threshold. ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1, and thus consider emissions insignificant because below 0.1 per cent of the national total GHG emissions.	
N ₂ O	Industrial Processes and Product Use	D.1 Lubricant use	Emissions are less than the significance threshold. ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1, and thus consider emissions insignificant because below 0.1 per cent of the national total GHG emissions.	
	Industrial Processes and Product Use	D.2 Paraffin wax use	Emissions are less than the significance threshold. ExampleParty makes use of the flexibility option provided by para 32 of Decision 18/CMA.1, and thus consider emissions insignificant because below 0.1 per cent of the national total GHG emissions.	
HFCs				
PFCs				
SF ₆				
Unspecified mix of				
NF ₃				
Sources and sinks reported elsewhere ("IE") ⁽³⁾				
GHG	Source/sink category	Allocation as per IPCC Guidelines	Allocation used by the Party	Explanation
CO ₂				
CH ₄				
N ₂ O				
HFCs				
PFCs				
SF ₆				
Unspecified mix of				
NF ₃				

⁽¹⁾ Clearly indicate sources and sinks which are considered in the 2006 IPCC Guidelines but are not considered in the submitted inventory. Explain the reason for not reporting these sources and sinks, in order to avoid arbitrary interpretations. An entry should be made for each source/sink category for which the notation key "NE" (not estimated) is entered in the sectoral tables.

⁽²⁾ Indicate omitted source/sink category.

⁽³⁾ Clearly indicate sources and sinks in the submitted inventory that are allocated to a sector other than that indicated by the 2006 IPCC Guidelines. Show the sector indicated in the 2006 IPCC Guidelines and the sector to which the source or sink is allocated in the submitted inventory. Explain the reason for reporting these sources and sinks in a different sector/category. An entry should be made for each source/sink for which the notation key "IE" (included elsewhere) is used in the sectoral tables.

Note: This table would have to be used in conjunction with the use of notation key “NE”, as shown in Figure 17

Source: Authors

Scenario 7: Applying a lower KCA threshold of no lower than 85% (flexibility option in §25 of the MPGs)

[\(back to Section 3\)](#)

This worked example presents an option for indicating that an 85% threshold has been used for the key category analysis, in line with the flexibility option provided by §25 of the MPGs to those developing countries who need it in light of the capacities (Annex to decision 18/CMA.1, Section II, §25) (UNFCCC, 2019^[2]). Figure 19 shows the CRF Table 7 providing a summary overview for key categories in its current format. Figure 20 presents the same table with the option to indicate the threshold value used for the key category analysis.

Figure 19 Summary overview for key categories in the current CRF

KEY CATEGORIES OF EMISSIONS AND REMOVALS	Gas	Criteria used for key source identification		Key category excluding LULUCF	Key category including LULUCF
		L	T		
<i>For example: 3.B Manure management</i>	CH ₄	X		X	

Note: L = Level assessment; T = Trend assessment.

⁽¹⁾ This table is filled automatically based on the IPCC Tier 1 methodology.

Source: Authors

Figure 20 Indicating that a KCA threshold of 85% has been used

KEY CATEGORIES OF EMISSIONS AND REMOVALS	Gas	Criteria used for key source identification		Key category excluding LULUCF	Key category including LULUCF
		L	T		
<i>Threshold used for the key category analysis</i>	85%				
3B. Land	CO ₂	X		X	X
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO ₂		X	X	X
1.A.3.b Road Transportation	CO ₂		X	X	X
3.D Agricultural Soils	CH ₄	X		X	X
5.A Solid Waste Disposal	CH ₄	X		X	

Source: Authors

Scenario 8: Not reporting certain gases (flexibility options in §48 of the MPGs)

[\(back to Section 3\)](#)

This scenario presents reporting by a Party that, in light of its capacities, applies flexibility to the provision of paragraph 48 of the MPGs (i.e. gas coverage) (Annex to decision 18/CMA.1, Section II, §48) (UNFCCC, 2019^[21]). Accordingly, the Party decides not to report on HFCs because data necessary to estimate emissions for these gases is not available and cannot be collected within the limited capacity available to the Party. The Party thus reports on the following gases: CO₂, CH₄ and N₂O as well as SF₆ from electrical equipment (the only source of SF₆ emissions within this Party's territory). The Party is aware that no emissions from electronic industry (category 2.E) are occurring, but HFC emissions occur for refrigeration, fire protection and air conditioning, foam blowing, aerosols and solvents occur (categories 2.F.1 and 2.F.3-2.F.5) and PFC emissions from fire protection (category 2.F.2). For this example, TABLE 2(I) Sectoral report for industrial processes and product use and TABLE 2(II) Sectoral report for industrial processes and product use - emissions of HFCs, PFCs, SF₆ and NF₃ are considered.

This scenario illustrates as worked examples, some of the options available to Parties that, in light of their capacities, decide to apply flexibility to the provision of paragraph 48 of the MPGs. These options are explained in depth in chapter 3. at page 39. Option 1 and Option 5 (Empty rows/columns are not generated by the CRT Reporter and Empty rows/columns are filled with a notation key indicating the use of flexibility, respectively) are not illustrated as worked examples in this scenario.

- **Option 1:** Empty rows/columns are not generated by the CRT Reporter (not illustrated)
- **Option 2:** The rows/columns are generated by the CRF reporter and deleted manually by Parties before submission to the UNFCCC
 - Option 2.1 Columns which are left empty are deleted (Figure 21)
 - Option 2.2 Rows and columns which are left empty are deleted (Figure 22)
- **Option 3:** Empty rows/columns are retained as they are, that is, cells relating to HFCs are left empty (Figure 23)
- **Option 4:** Empty rows/columns are filled with a notation key indicating the use of flexibility. In this case, a notation key is used to indicate HFCs and PFCs were not estimated due to the of flexibility in light of the Party's capacities (Figure 24)
- **Option 5:** Empty rows/columns are by default filled with the notation key NE unless the Party changes this. (Not illustrated)

Figure 21 Option 2.1 Deleting empty columns, table 2(II)

TABLE 2(II) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE - EMISSIONS OF HFCs, (Sheet 1 of 1)		Inventory 2021	
		Submission 2024v1	
		Example	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	SF ₆		
	(t)		
Total actual emissions of halocarbons (by chemical) and SF₆			
B. Chemical industry			
C. Metal industry			
E. Electronics industry			
F. Product uses as substitutes for ODS⁽²⁾			
1. Refrigeration and air conditioning			
2. Foam blowing agents			
3. Fire protection			
4. Aerosols			
5. Solvents			
6. Other applications			
G. Other product manufacture and use			
1. Electrical equipment			
2. SF ₆ and PFCs from other products		99.99	
4. Other			
H. Other (please specify)			
Total emissions⁽³⁾			
B. Chemical industry			
C. Metal production			
E. Electronics industry			
F. Product uses as substitutes for ODS			
G. Other product manufacture and use			
H. Other			

Source: Authors

Figure 22. Option 2.2 Deleting empty rows and columns, table 2(II)

TABLE 2(II) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE - EMISSIONS OF HFCs, PFCs, SF₆ AND NF₃	
(Sheet 1 of 1)	
	Inventory 2021
	Submission 2024v1
	Example
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ktCO₂e (t)
G. Other product manufacture and use	
1. Electrical equipment	
2. SF ₆ and PFCs from other produ	99.99
4. Other	
Total emissions⁽³⁾	
B. Chemical industry	
C. Metal production	
E. Electronics industry	
F. Product uses as substitutes for ODS	
G. Other product manufacture and use	99.99
H. Other	

Source: Authors

Figure 23 Option 3 Leaving cells empty, table 2(I)

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE											Inventory 2021	
(Sheet 2 of 2)											Submission 2024v1	
											Example	
GREENHOUSE	CO ₂	CH ₄	N ₂ O	HFC ₅ ⁽¹⁾	PFC ₅ ⁽¹⁾	Unspecified mix of HFC ₅ and PFC ₅ ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NM VOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
D. Non-energy products from fuels and solvent use												
1. Lubricant use												
2. Paraffin wax use												
3. Other												
E. Electronics industry												
1. Integrated circuit or semiconductor												
2. TFT flat panel display												
3. Photovoltaics												
4. Heat transfer fluid												
5. Other (as specified in table 2(II))												
F. Product uses as substitutes for ODS⁽²⁾												
1. Refrigeration and air conditioning												
2. Foam blowing agents												
3. Fire protection												
4. Aerosols												
5. Solvents												
6. Other applications												
G. Other product manufacture and use												
1. Electrical equipment												
2. SF ₆ and PFCs from other product use												

Source: Authors

Unclassified

Figure 24 Option 4 Using a notation key, table 2(I)

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE												Inventory 2021
(Sheet 2 of 2)												Submission 2024v1
												Example
GREENHOUSE	CO ₂	CH ₄	N ₂ O	HFCs ⁽¹⁾	PFCs ⁽¹⁾	Unspecified mix of HFCs and PFCs ⁽¹⁾	SF ₆	NF ₃	NO _x	CO	NMVOC	SO ₂
	(kt)			CO ₂ equivalent (kt)			(kt)					
D. Non-energy products from fuels and solvent use												
1. Lubricant use									NE	NE	NE	NE
2. Paraffin wax use									NE	NE	NE	NE
3. Other												
E. Electronics industry												
1. Integrated circuit or semiconductor				NO	NO	NO	NO	NO				
2. TFT flat panel display				NO	NO	NO	NO	NO				
3. Photovoltaics				NO	NO	NO	NO	NO				
4. Heat transfer fluid				NO	NO	NO	NO	NO				
5. Other (as specified in table 2(II))				NO	NO	NO	NO	NO				
F. Product uses as substitutes for ODS⁽²⁾												
1. Refrigeration and air conditioning				FLEX	FLEX	FLEX	FLEX	FLEX				
2. Foam blowing agents				FLEX	FLEX	FLEX	FLEX	FLEX				
3. Fire protection				FLEX	FLEX	FLEX	FLEX	FLEX				
4. Aerosols				FLEX	FLEX	FLEX	FLEX	FLEX				
5. Solvents				FLEX	FLEX	FLEX	FLEX	FLEX				
6. Other applications				FLEX	FLEX	FLEX	FLEX	FLEX				
G. Other product manufacture and use												
1. Electrical equipment				99.99	99.99	99.99	99.99	99.99				
2. SF ₆ and PFCs from other product use					NO	NO	NO					
3. N ₂ O from product uses												
4. Other												
H. Other (as specified in tables 2(I).A-H and 2(II))⁽³⁾												
				NO	NO	NO	NO	NO				

Source: Authors

Scenario 9: Reporting a shorter time series (flexibility options in §57 and §58 of the MPGs)

[\(back to Section 3\)](#)



This scenario explores flexibility options provided in paragraphs 57 and 58 of the MPGs (Annex to decision 18/CMA.1, section II, §57 and §58) (UNFCCC, 2019^[21]). These allow Parties to report a shorter time series, including at least (a) the reference year or period for the NDC (§ 57); (b) a consistent time series from 2020 onwards (§57); (c) the latest reporting year as three years prior to the submission of their national inventory report (§58).

In this scenario, the Party has previously reported on its GHG emissions for the years 2000, 2010 and 2015. In order to report on these years, it would have to conduct further data collection to allow recalculating GHG emission for these years in order to ensure consistency with data sources and methodologies used for the GHG inventory compilation for its first BTR. It, however, considers that it does not have the capacity to carry out such data collection and recalculation. Furthermore, it considers that it does not have the capacity to collect data for any additional years before 2020. The Party notices that the term “reference year or period for the NDC” is not defined and interprets the term “reference year” to mean target year, which in its case is 2030. Submitting its first BTR in 2024, it thus reports on the years 2020 and 2021.

Using the current CRF Reporter as a starting point, reporting years would feature in two forms. Firstly, Excel files are generated for all estimates pertaining to a specific year and secondly, the summary tables of each year (tables 10, sheet 1-6) show years in the form of a time series. If the CRT-Reporter (just as the CRF reporter) generates Excel files only for those years on which a Party reports, submitting GHG estimates for the years 2020 and 2021 would lead to the CRF reporter generating an Excel file for 2020 and one for 2021., see Figure 25. With regards to the years presented in the summary tables (table 10, sheet 1-6) two options are explored:

- **Option 1:** The summary tables include only the years reported (See Figure 26)
- **Option 2:** The summary tables include all years between 1990 and the year two years prior to the submission of the national inventory. Two further sub-options are explored: The cells related to the years not reported are:
 - **Option 2.1** Left empty (Figure 27) or
 - **Option 2.2** Filled with a notation key (Figure 28)

Figure 25 Excel files generated when information for the years 2020 and 2021 is reported

Name	Date modified	Type	Size
 ExampleParty_2024_2020	30/06/2020 18:01	Microsoft Excel W...	959 KB
 ExampleParty_2024_2021	30/06/2020 18:01	Microsoft Excel W...	955 KB

Source: Authors

Figure 26 Option 1 Columns are included only for those years reported (2020-2021)

TABLE 10 EMISSION TRENDS				Inventory 2021
Summary				Submission 2024v1
(Sheet 6 of 6)				Example
GREENHOUSE GAS SOURCE AND SECTOR	Base year	2020	2021	Change from base to latest reported year
	(kt CO ₂ eq)			%
Total (net emissions)⁽¹⁾				
1. Energy				
A. Fuel combustion (sectoral approach)				
1. Energy industries		To be filled	To be filled	
2. Manufacturing industries and construction		To be filled	To be filled	
3. Transport		To be filled	To be filled	
4. Other sectors		To be filled	To be filled	
5. Other		To be filled	To be filled	
B. Fugitive emissions from fuels				
1. Solid fuels		To be filled	To be filled	
2. Oil and natural gas and their emissions		To be filled	To be filled	
C. CO ₂ transport and storage				
2. Industrial Processes				
A. Mineral industry		To be filled	To be filled	
B. Chemical industry		To be filled	To be filled	
C. Metal industry		To be filled	To be filled	
D. Non-energy products from fuels and solvents		To be filled	To be filled	
E. Electronic industry		To be filled	To be filled	
F. Product uses as ODS substitutes		To be filled	To be filled	
G. Other product manufacture and use		To be filled	To be filled	
H. Other				
3. Agriculture				
A. Enteric fermentation		To be filled	To be filled	
B. Manure management		To be filled	To be filled	
C. Rice cultivation		To be filled	To be filled	
D. Agricultural soils		To be filled	To be filled	
E. Prescribed burning of savannahs		To be filled	To be filled	

Source: Authors

Figure 27–Option 2.1 Columns are generated for all years from 1990 to n-2, cells are left empty where years are not reported

TABLE 10 EMISSION TRENDS													Inventory 2021
Summary													Submission 2024v1
(Sheet 6 of 6)													Example Party
GREENHOUSE GAS SOURCE AND SECTOR	Base year ⁽¹⁾	1990	1991	1992	2016	2017	2018	2019	2020	2021	2022	Change from base to latest reported year	
	(kt CO ₂ eq)											%	
Total (net emissions)⁽²⁾													
1. Energy													
A. Fuel combustion (sectoral approach)													
1. Energy industries									To be filled	To be filled			
2. Manufacturing industries and construction									To be filled	To be filled			
3. Transport									To be filled	To be filled			
4. Other sectors									To be filled	To be filled			
5. Other									To be filled	To be filled			
B. Fugitive emissions from fuels													
1. Solid fuels									To be filled	To be filled			
2. Oil and natural gas and their emissions from energy production									To be filled	To be filled			
C. CO ₂ transport and storage													
2. Industrial Processes													

Source: Authors

Figure 28 Option 2.2: Columns are generated for all years from 1990 to n-2, years not reported are filled with a notation key

TABLE 10 EMISSION TRENDS								Inventory 2021				
Summary								Submission 2024v1				
(Sheet 6 of 6)								Example Party				
GREENHOUSE GAS SOURCE AND SECTOR	Base year ⁽¹⁾	1990	1991	1992	2016	2017	2018	2019	2020	2021	2022	Change from base to latest reported year
	(kt CO ₂ eq)											%
Total (net emissions)⁽²⁾												
1. Energy												
A. Fuel combustion (sectoral approach)												
1. Energy industries		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
2. Manufacturing industries and construction		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
3. Transport		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
4. Other sectors		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
5. Other		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
B. Fugitive emissions from fuels												
1. Solid fuels		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
2. Oil and natural gas and other emissions		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	To be filled	To be filled	FLEX	
C. CO ₂ transport and storage		FLEX	FLEX	FLEX	FLEX	FLEX	FLEX	FLEX			FLEX	
2. Industrial Processes												

Source: Authors

Scenario 10: Reporting on the use of flexibility as per paragraph 6 of the MPGs (Annex to decision 18/CMA.1)

[\(back to Section 3\)](#)

This scenario illustrates two of the three different options available to Parties that need flexibility in the light of their capacities to “clearly indicate the provision to which flexibility is applied” (Annex to decision 18/CMA.1), and to “concisely clarify capacity constraints [...] and provide self-determined estimated time frames for improvements in relation to those capacity constraints”, as mandated by paragraph 6 of the MPGs. Option 1 (Reporting on the use of flexibility in a narrative format within the NID) is not illustrated as a worked example.

In this scenario, a Party that needs flexibility in the light of its capacities applies flexibility as specified in paragraphs 32 (i.e. insignificance threshold), 48 (i.e. reported GHGs), 57 and 58 (time series) of Annex to decision 18/CMA.1 (UNFCCC, 2019^[2]). The two illustrated options are as follows:

- **Option 1:** Reporting on the use of flexibility in a narrative format within the NID (not illustrated)
- **Option 2:** Reporting on the use of flexibility using a (common) reporting table (Table 7)
- **Option 3:** Reporting on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables, in Figure 29)

The tabular format presented in option 2 could be either an example of a tabular format designed at Parties’ discretion or could be integrated as a common reporting table within the set of CRTs. The table presented in option 3 is based on Table 9: Completeness – Information on notation keys included in current CRFs. In this table, it would be useful for the information to be filled in in the columns “source/sink category” and “relevant provision/paragraph of Annex to decision 18/CMA.1”) to be standardised and selectable through of a drop-down menu.

Table 7. Option 2: Worked example of a tabular format for the reporting of information on the use of flexibility

	<i>Provision</i>	<i>Is flexibility in reporting applied?</i>	<i>If so, how?</i>	<i>Concise clarification of capacity constraints^g</i>	<i>Time frame for improvement^g</i>
Flexibility used in the preparation or provision of National inventory data	Key Category Analysis (Annex MPGs II para 25) ^a	NO			
	Uncertainty assessment (Annex MPGs II para 29) ^b	NO			
	Insignificance threshold (Annex MPGs II para 32) ^c	YES	Party has applied a lower significance threshold for the estimation of CH ₄ and N ₂ O from non-energy products from fuels and solvent use	Unavailability of data due to limited technical capacities.	Parties aims at lower insignificance threshold within next 3 years.
	Quality assurance/quality control (Annex MPGs II para 34) ^d	NO			
	Reported greenhouse gases (Annex MPGs II para 48) ^e	YES	Party has not reported HFCs, PFCs, SF ₆ and NF ₃ throughout	Unavailability of data due to limited technical capacities.	Party intends to include HFCs in next national inventory by collecting data in the refrigeration and air-conditioning sectors
	Time series (Annex MPGs II paras 57 & 58) ^f	YES	Party has not reported the following years: 1991 to 1999; 2001 to 2009 and 2011 to 2019.	Party has not been able to perform recalculation of historical data to accommodate change from 1996 Revised IPCC GLs to 2006 IPCC GLs due to limited staff capacity.	Next national inventory to include estimates for 2011 to 2019 data, following enhancement of inventory team capacity.

Note: ^a Flexibility available to identify key categories using a threshold no lower than 85%, in place of the 95% threshold defined in the 2006 IPCC guidelines.

^b Flexibility available to provide, at a minimum, a qualitative discussion of uncertainty for key categories

^c Flexibility available to use notation key "NE" for a category if its level of emissions is likely below 0.1% of the national total and 1000 kt CO₂ eq, whichever is lower

^d Developing country Parties using flexibility are encouraged to elaborate an inventory QA/QC plan in accordance with the 2006 IPCC guidelines and to implement and provide information on general inventory QC procedures

^e Flexibility to report at least three gases (CO₂, CH₄ and N₂O) as well as any of the additional four gases (HFCs, PFCs, SF₆ and NF₃) that are included in the Party's NDC under Article 4 of the PA, are covered by an activity under Article 6 of the PA, or have been previously reported

^f Flexibility to instead report data covering, at a minimum, the reference year/period for its NDC and, in addition, a consistent annual time series from at least 2020 onwards; latest reporting year three years prior to the submission of their NID

^g Parties shall concisely clarify capacity constraints and provide self-determined estimated time frames for improvements in relation to those capacity constraints in their Biennial Transparency Reports
Source: Rocha (2019), further expanded by authors

Figure 29. Option 3: Reporting on the use of flexibility in a completeness table with information on notation keys (e.g. Table 9 of current CRF tables)

TABLE 9 COMPLETENESS - INFORMATION ON NOTATION KEYS
(Sheet 1 of 1)

Inventory 2022
Submission 2024 v1
Example Party

Sources and sinks not estimated ("NE") ⁽¹⁾				
GHG	Sector ⁽²⁾	Source/sink category ⁽²⁾		Explanation
CO ₂				
NF ₃				
Sources and sinks reported elsewhere ("IE") ⁽³⁾				
GHG	Source/sink category	Allocation as per IPCC Guidelines	Allocation used by the Party	Explanation
CO ₂				
NF ₃				
Sources and sinks for which flexibility was applied ("FLEX") ⁽⁴⁾				
GHG	Source/sink category	Relevant provision / paragraph of Annex to decision 18/CMA.1	Coincise clarification of capacity constraints	Time frame for improvement
CO ₂	2D.2 Paraffin wax use	Insignificance threshold (paragraph 32)	Unavailability of data due to limited technical capacities.	Party aims at lower insignificance threshold within next 3 years.
CH ₄	2D.1 Lubricant use	Insignificance threshold (paragraph 32)	Unavailability of data due to limited technical capacities.	Party aims at lower insignificance threshold within next 3 years.
	2D.2 Paraffin wax use	Insignificance threshold (paragraph 32)	Unavailability of data due to limited technical capacities.	Party aims at lower insignificance threshold within next 3 years.
N ₂ O	2D.1 Lubricant use	Insignificance threshold (paragraph 32)	Unavailability of data due to limited technical capacities.	Party aims at lower insignificance threshold within next 3 years.
	2D.2 Paraffin wax use	Insignificance threshold (paragraph 32)	Unavailability of data due to limited technical capacities.	Party aims at lower insignificance threshold within next 3 years.
HFCs	All categories	Reported greenhouse gases (paragraph 48)	Unavailability of data due to limited technical capacities.	Party intends to include HFCs in next national inventory by collecting data in the refrigeration and air-conditioning sectors
PFCs	All categories	Reported greenhouse gases (paragraph 48)	Unavailability of data due to limited technical capacities.	Party aims at including PFCs within next 5 years.
SF ₆	All categories	Reported greenhouse gases (paragraph 48)	Unavailability of data due to limited technical capacities.	Party aims at including SF ₆ within next 5 years.
NF ₃	All categories	Reported greenhouse gases (paragraph 48)	Unavailability of data due to limited technical capacities.	Party aims at including NF ₃ within next 5 years.

⁽¹⁾ Clearly indicate sources and sinks which are considered in the 2006 IPCC Guidelines but are not considered in the submitted inventory. Explain the reason for not reporting these sources and sinks, in order to avoid arbitrary interpretations. An entry should be made for each source/sink

⁽²⁾ Indicate omitted source/sink category.

⁽³⁾ Clearly indicate sources and sinks in the submitted inventory that are allocated to a sector other than that indicated by the 2006 IPCC Guidelines. Show the sector indicated in the 2006 IPCC Guidelines and the sector to which the source or sink is allocated in the submitted inventory. Explain the reason for reporting these sources and sinks in a different sector/category. An entry should be made for each source/sink for which the notation key "IE" (included elsewhere) is used in the sectoral tables.

⁽⁴⁾ Clearly indicate Sources and sinks in the submitted inventory for which flexibility was applied. An entry should be made for each source/sink for which the notation key "FLEX" (flexibility) is used in the sectoral tables with. Provide a concise clarification of the capacity constraint underlying the need to apply flexibility, and an estimated time frame for improvement, as per mandated by paragraph 6 of the Annex to decision 18/CMA.1.

Note: For formatting reasons and to facilitate readability, some rows of the "Completeness" table, which are not relevant for the purpose of this worked example, have been cut out.
Source: Authors

5. Conclusion

This paper explored key issues and options for the reporting of information of national anthropogenic emissions using Common Reporting Tables (CRTs), as required by Article 13.7(a) of the Paris Agreement and the Modalities, Procedures and Guidelines (MPGs), contained in the annex to decision 18/CMA.1. Such issues include: (a) whether all Parties are to use a common set of tables and/or whether all tables have to be filled in by all Parties; (b) how to deal with values not reported due to developing country Parties using flexibilities in light of their capacities. The discussions laid out in this paper were supported by worked examples that illustrate how CRTs could be potentially filled in by Parties, considering different contexts and reporting profiles. These examples were then assessed against a set of eight criteria. The first four assessment criteria are based on the reporting principles laid out in the MPGs; the remaining four have been developed by the authors based on lessons learned from current reporting practice. The criteria assess to which extent different CRT reporting options:

- Providing a common format for reporting;
- Facilitating improved reporting and transparency over time;
- Promoting transparency, accuracy, completeness, consistency and comparability (TACCC);
- Ensuring that parties maintain at least the current frequency and quality of reporting;
- Facilitating the technical expert review;
- Facilitating machine readability and/or automatised assessment;
- Limiting the scope and complexity of changes compared to the current reporting tables to an extent which allows relevant reporting tools to be prepared in time to facilitate reporting the first Biennial Transparency Report (BTR);
- Allowing for the inclusion of new categories and gases from subsequent versions or refinements of the 2006 IPCC Guidelines where Parties wish to include them on a voluntary basis⁴¹.

There is broad agreement amongst Parties that the existing CRF tables used by Annex I Parties for their annual GHG reporting under the Convention are a good starting point for the development of CRTs. Based on the requirements of the current reporting framework under the UNFCCC, non-Annex I Parties do not have experience with using the CRF Reporter, the reporting process nor the use of a set of common reporting tables. In light of these considerations, this paper has provided additional information to help countries without experience of the CRF Reporter to understand it, its tables and the reporting process using the CRF reporter. Relevant points for the CRF Reporter include:

- Some tables (e.g. sectoral background tables, detailed sectoral tables) have to be directly filled in by Parties themselves; a larger number of tables are filled in automatically by the CRF reporter (e.g. high-level sectoral tables, summary tables using the data provided by the Party).
- Information to be inserted in sectoral background tables like activity data and emission factors is already available to Parties, as they have used it to estimate their emissions. There is

⁴¹ This criterion is considered to be of lower relevance than the others.

therefore no additional burden related to generating this data, although there may be an additional reporting burden in reporting such data.

- The full set of reporting tables generated by the CRF Reporter are generally not considered by a wider public. National Inventory Reports generally only include a small share of the information reported in the CRF, e.g. summary tables on trends. Mostly, the UNFCCC Secretariat and reviewers participating in the annual reviews of individual inventories of each Annex I Party will consider the full set of CRF tables.
- Annex I Parties continue to have room for improvement in their reporting and the current reporting requirements accommodate this. For example, not all Annex I Parties report all key categories using a Tier 2 approach, e.g. where relevant national-level emission factors are still under development. To enable improved reporting over time, Annex I Parties transparently report on their improvement planning.

Overall, the paper finds that all the tables currently contained in the set of CRFs provide a valuable starting point when developing CRTs. However, some improvements and adjustments would need to be applied to current CRFs (agreed in 2013) to better reflect reporting guidance outlined in the MPGs (agreed in 2018). The assessment conducted in this paper comes to the following conclusions:

- **Indicating and reporting a reference year.** A simple while transparent solution could be for Parties to report such information in a documentation box accompanying the CRT summary tables.
- **Presenting GHG emission trends.** A simple indication of trend could be generated automatically by the reporting software, considering the first year and the last year reported or the average annual percentage change in emissions over the years reported.
- **Adapting to the IPCC 2019 Refinement to accommodate voluntary reporting by Parties.** Where Parties voluntarily report new categories introduced by the IPCC 2019 Refinement, they can do so for the time being by using the category “Other” that already included in the CRF Reporter.
- **Transparently indicating in CRTs if and where flexibility options have been used.** Information on the specific flexibility options used within a specific worksheet can be conveyed either using documentation boxes, or custom footnotes – both functions are already available within the current CRF reporter. Use of flexibility could also be indicated through the use of a dedicated notation key (e.g. “FLEX”).
- **Using a lower threshold for the key category analysis (flexibility option in para 32 of the MPGs).** Adding a cell to Table 7 of the CRF, which is currently used by Parties to provide a summary of the methodologies used to determine the key category analysis, would enable Parties to indicate which threshold they have used for the key category analysis.
- **Not estimating emissions due to using a higher significance threshold (flexibility option in para 25 of the MPGs).** Developing country Parties that need flexibility in the light of their capacities and that decide to apply a lower insignificance threshold to certain categories may indicate such choice by using both the “not estimated” and a dedicated “flexibility” notation key (e.g. “NE, FLEX”).
- **Dealing with cells which remain empty as reporting years and/or gases are not reported (flexibility options in paras 48, 57 and 58 of the MPGs).** Developing country Parties that need flexibility in the light of their capacities can use a dedicated flexibility notation key (e.g. “FLEX”) to indicate cells for which a GHG value has not been reported due to the use of flexibility.
- **Reporting on the use of flexibility.** A comprehensive overview on flexibility options used, including a Party’s capacity limitations making the use of these flexibility options necessary

(for those developing country Parties who need it in the light of their capacities), can best be presented in an overview table added to the CRF or the National Inventory Document (NID).

A summary of selected options against the most relevant criteria is presented in Table 8. The assessment performed in this paper indicates that moderate updating of the current CRFs can allow Parties to accommodate reporting requirements and flexibility options available to those developing countries that need it in the light of their capacities stipulated by the ETF's MPGs. Moderate updating of current CRFs could also allow for the voluntary reporting of new categories added in the 2019 IPCC Refinement. Where flexibility options are used by those developing country Parties that need them in light of their capacities, TACCC can best be ensured by combining a dedicated notation key for flexibility with further information in footnotes or documentation boxes and an overview table on flexibility options used, capacity limitations and improvement planning either in the CRT or the NID. This paper also concludes that a common reporting format with transparent reporting on flexibility option used also best facilitates improvement over time.

Table 8. Overview of the advantages and disadvantages of different possible CRT reporting approaches

	To which reporting scenarios does this approach apply ?	How does this approach test positively against selected criteria?	How does this approach test negatively against selected criteria?
Reporting on the use of flexibility using a (common) tabular format	Reporting on the use of flexibility (paragraph 6 of the MPGs)	The use of a tabular format would promote transparency, and partially facilitate the TER. The use of a common tabular format would also promote comparability and consistency, significantly facilitate the TER and machine readability and/or automated assessment.	Reporting on the use of flexibility using a tabular format would not test negatively against the criteria. However, the use of a common tabular format, potentially to be filled in through a reporting software, may render the development of the latter cumbersome.
Using notation keys	Operationalising flexibility (e.g. gas coverage; insignificance threshold)	The use of a standardised element promotes readability, comparability and consistency, in turn facilitating the TER and machine readability and/or automated assessment.	In some cases (e.g. where flexibility is used to apply a lower insignificance threshold) the use of a flexibility notation key alone may not provide sufficient information to readers and/or reviewers.
Providing information in documentation boxes and/or footnotes	Operationalising flexibility; indicating a reference year.	This approach would promote transparency and completeness of reporting. It would allow for the relevant reporting software to be developed in time for the first BTR, as it demands minimal changes to current reporting tools.	This approach would render the TER more cumbersome, as reviewers would have to cross-reference information provided in the tables to what specified in the documentation box. This, in turn, may make comparability more difficult. Further, this approach would not allow for machine readability and/or automated assessment.
Amending tables to allow for the (voluntary) reporting of new elements	Facilitating the transition to future GHG inventory guidance; Reporting the reference year/period of the NDC; Indicating threshold for KCA; Operationalising flexibility (Completeness table).	Amending the table according to a new, commonly-agreed structure to allow for the reporting of new reporting elements (e.g. reference year/period of the NDC, when applicable), would ensure that a common format for reporting is used. This, in turn, would facilitate the TER and machine readability and/or automated assessment. This approach would also facilitate comparability and consistency across Parties.	Amending tables so to add e.g. new columns or reporting cells may render the development of a new reporting software more cumbersome. Further, if only some Parties use amended tables (e.g. tables that allow for the reporting of new gases according to the 2019 IPCC Refinement), this approach would not allow for the adoption of a common format for reporting, thus hindering comparability, the TER and automated assessment and machine readability.
Deleting rows and/or columns⁴²	Operationalising flexibility (gas coverage; time series; insignificance threshold); Showing a trend in the summary tables.	N/A	The manual deletion of rows and/or columns from tables would mean that output tables reported would not be common, which would also hinder machine readability and automated assessment. This approach would also hinder transparency of reporting, rendering the TER more cumbersome.

Source: Authors

⁴² Parties have advanced different opinions as to whether deleting rows and columns is compliant with the concept of common reporting tables. Based on their submissions, Parties seem to interpret this criterion in different ways. Views seem to differ with regards to whether only the reporting tables agreed by SBSTA should be common or whether they still need to be common when they are submitted to the UNFCCC. While the tables submitted to the UNFCCC would clearly not be common where rows and columns are deleted, this paper assesses the options of deleting rows and columns for the purpose of generating a more detailed understanding of its implications.

Annex A. Developing criteria for testing CRT options

Promoting principles outlined in the MPGs and in the Paris Agreement

In providing guidance for reporting under the ETF, decision 18/CMA.1 and the MPGs lay out a number of indications and principles that serve as a basis for the development of testing criteria (Paris Agreement, 2015^[1]; UNFCCC, 2019^[2]). Such indications and principles include:

- **Providing a common format for reporting (Decision 18/CMA.1, §12.a)**, i.e. ensuring that all Parties use the same set of tables to report national GHG inventories. Importantly, in accordance with paragraph 4 of the MPGs, which provides flexibility in reporting to those developing countries that need it in the light of their capacities, a common set of tables would have to accommodate some flexibility (UNFCCC, 2019^[2]).
- **Facilitating improved reporting and transparency over time (Annex to decision 18/CMA.1, Section I, §3.b)** (UNFCCC, 2019^[2]). This can be interpreted to mean that a reporting standard is set for each Party with regards to e.g. the scope and level of detail reported. All Parties can work towards such standard, and any reporting Party can continuously improve its reporting over time. Developing countries that cannot fulfil this standard from the start can work towards achieving it while using the flexibility options provided to those developing countries that need it in the light of their capacities by decision 18/CMA.1. It is important to note that all Parties continue to have room for improvement. There are examples of Annex I Parties reporting key categories using Tier 1 approaches⁴³, where studies to generate relevant national emission factors are ongoing or Annex I Parties not estimating smaller GHG sources or sinks where the relevant data is not yet available⁴⁴.
- **Promoting transparency, accuracy, completeness, consistency and comparability (TACCC) (Annex to decision 18/CMA.1, Section I, §3.d)**. In the context of GHG inventories, this could mean that the reporting promotes the understanding of:
 - Which activity data, emission factors and other relevant parameters have been used for each reporting year;
 - Which reported emissions stem from which category;
 - Understanding where there have been recalculations;
 - Whether or not all relevant categories have been reported on for each reporting year;
 - Where flexibility options have been used.

⁴³ The IPCC has classified the methodological approaches used to estimate national GHG emissions in three different Tiers. Tiers vary according to the amount of information that is needed, and to the degree of analytical complexity. Tier 1 requires the least amount of information and analytical complexity. (IPCC, 2006^[12])

⁴⁴ This specific issue is further in the sub-section “Emissions that are not estimated” at page 31.

- **Ensuring that Parties maintain at least the current frequency and quality of reporting (i.e. “no backsliding”) (Annex to decision 18/CMA.1, Section I, §3.f).** While CRTs would not directly specify the frequency of reporting, they can facilitate efficient reporting to avoid contributing to further delays in a resource-constrained situation.⁴⁵ This is particularly so if CRTs are designed in an accessible way, e.g. so to allow for the automatic filling in of certain tables (e.g. summary tables). Conversely, quality of reporting is clearly defined for national GHG inventories through the TACCC principles. This criterion would thus mean that Parties have to maintain at least the levels of transparency, accuracy, completeness, consistency and comparability they use in their reporting now.

Facilitating automated assessment and the technical expert review

Informing the GST⁴⁶ is among the aims of the framework for transparency of mitigation and support under the ETF (Paris Agreement, 2015^[1]), and aggregation of national GHG inventories are key at the international level to understand global GHG emission levels. In fact, paragraph 36 of decision 19/CMA.1 mandates that “the sources of input for the global stocktake will consider information at a collective level on: (a) The state of greenhouse gas emissions by sources and removals by sinks and mitigation efforts undertaken by Parties [...]”. (UNFCCC, 2018^[21]). In order to provide meaningful input to the GST with limited effort, the GHG inventory information needs to be reported in a format that allows for the automated processing of data and that is as accurate, complete, comparable and consistent as possible. Flexibility options mean that developing country Parties who make use of them in light of their capacities are likely to initially report less complete information. This will impact the ability to meaningfully aggregate data for the purposes of the GST. However, reporting can be expected to become more complete over time in line with MPG requirements related to the use of flexibility, and the CRTs can allow for the operationalisation of flexibility options in a way that does not hinder automated processing.

To facilitate improved reporting over time and to promote TACCC principles, the CRTs also need to facilitate the Technical Expert Reviews (TER) under the ETF. The more transparently information is reported, the easier it is to review. A common reporting format greatly contributes to such transparency, as reviewers will know where to look for which information. The efficiency of reviews can be further enhanced where tools can be used to conduct automated checks, evaluate data, e.g. by generating graphs, or compare data, e.g. with other GHG inventory submissions of the same Party with data reported by other Parties.

To allow for automated processing, as needed for aggregation purposes under the GST and for an effective and efficient review process, information needs to be provided in a format which can be easily read and

⁴⁵ For example, as indicated in section 2. , Parties currently report at different frequencies and, due to limited capacities, not all developing country Parties report a national GHG inventory every two years as mandated. For Annex I Parties, the requirement with regards to frequency can be interpreted to mean that reporting should continue to take place annually, despite the ETF mandating BTR reporting only every two years. With regards to non-annex I Parties, retaining the current reporting frequencies might mean reporting less frequently than every two years, which is not in line with the requirements of the ETF.

⁴⁶ The Paris Agreement foresees not only tracking progress towards individual Parties’ NDCs, but also towards collective progress, in the form of the GST. The GST is to periodically assess the collective progress towards the purpose of the Agreement and its long-term goals. Its outcome is to inform Parties in updating and enhancing their actions and support in accordance with the relevant provisions of the Agreement, as well as in enhancing international co-operation for climate action. The GST is to take place every five years, starting in 2023.

processed by a computer (“machine-readable”).⁴⁷ For this purpose, the data must be structured, meaning the data would need to be provided in a format that allows understanding what it “means”. Common formats and standardised data labels (e.g. notation keys) are therefore important. Examples include specifying IPCC category codes and names to identify the source / sink in question, identifying values in specific cells as emissions or activity data, identifying values as pertaining to a specific reporting year. The use of reporting software, such as the CRF Reporter, contributes to the generation of machine-readable information that can potentially be automatically processed.

Allowing for relevant reporting tools to be prepared in time to facilitate reporting the first BTR

The design of CRTs needs to consider the time needed for the updating and/or development of any relevant reporting tools provided at the international level, such as an update of the current CRF Reporter –carried out by the UNFCCC Secretariat— and/or of the IPCC Software, carried out by the IPCC. Having such tools available is vital, as they help considerably reduce Parties’ efforts in compiling and reporting information in a transparent and accurate manner. The time needed to successfully update such tools so to reflect agreed CRTs and related filling in options will, *inter alia*, depend on the type and extent of changes to be made.

The more extensive and complex those changes are, the more time will likely be needed. There can thus be a trade-off between desirable functions of tools and the additional time and/or resource needed to implement them. Considering the timeline set by the MPGs, updated tools would likely need to be ready by late 2023: paragraph 3 of decision 18/CMA.1 stipulates that the first BTR is due by 31 December 2024 at the latest (UNFCCC, 2019_[2]). At the same time, Annex I Parties will still have to submit their national GHG inventory under the UNFCCC by 15 April 2024, and to enhance efficiency, would ideally do so using the same tools as for the BTR. In order to allow for timely reporting, Parties will need several months to familiarise themselves with new tools, potentially adapting existing systems to it. Furthermore, some time might be needed to identify and fix smaller technical issues with software tools.

Allowing including new categories and gases from subsequent versions or refinements of the 2006 IPCC Guidelines where Parties wish to include them on a voluntary basis

Ideally, the CRTs could be designed so to facilitate the transition to future inventory guidance. The MPGs mandate which set of guidance are to be used by countries when drawing up their GHG inventories. In particular, the use of the IPCC 2006 Guidelines as well as any subsequent version or refinement of the IPCC guidelines agreed upon by CMA is mandatory for BTR reporting for all Parties (Annex to decision 18/CMA.1, Section II, §20) (UNFCCC, 2019_[2]).⁴⁸ This means that the CRTs to be developed need to be able to take into account subsequent versions or refinements of the 2006 IPCC Guidelines. A methodology report to refine the 2006 IPCC Guidelines (hereafter referred to as 2019 IPCC Refinement) has been adopted by the IPCC at its Plenary Session in May 2019 and remains to be adopted by the CMA. While the 2019 IPCC Refinement does not revise the 2006 IPCC Guidelines (to be used in conjunction with the

⁴⁷ Automated processing of information contained in CRT tables is particularly useful also outside of the UNFCCC context. A number of research institutes, think tanks and organisations (including the International Energy Agency) regularly process and analyse GHG data include in Annex I Parties’ CRF submissions.

⁴⁸ Each Party is furthermore encouraged to use the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Annex to decision 18/CMA.1, Section II, §20) (UNFCCC, 2019_[2]).

2006 IPCC Guidelines), it updates, supplements and/or elaborates the 2006 IPCC Guidelines where gaps or out-of-date science have been identified (Rocha, 2019^[3]). CRTs that accommodate the additions of the 2019 Refinement, e.g. newly added categories or additional gases for existing categories, could allow a complete reporting by Parties interested to report on such categories or gases on a voluntary basis until the use of the 2019 Refinement becomes mandated. Furthermore, this would enable a smoother transition towards the use of the 2019 Refinement once it is mandated, without the need to further update the CRTs.

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