



## U.S. EPA Templates for Creating a National GHG Inventory System Manual

### 5. Key Category Analysis



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## **Introduction to Template 5. Key Category Analysis**

In the U.S. EPA's *Templates for Creating a National GHG Inventory System Manual*, this is Template 5. Its purpose is to help you, the National Inventory Coordinator (NIC) or key category analysis (KCA) lead, prepare your country's national GHG inventory. You may use this template with the U.S. EPA's KCA software tool, which is also in the U.S. EPA's [Toolkit for Building National GHG Inventory Systems](#) ("Toolkit"). Alternatively, you may use this template with other software or by following the guidance in the 2006 IPCC Guidelines.<sup>1</sup> This template facilitates development of key category analysis consistent with future reporting requirements under the Enhanced Transparency Framework<sup>2</sup> (ETF) for National GHG Inventories. The template and tool also accommodate use of flexibility in meeting this requirement (e.g., using a lower threshold in identifying key categories).

The concept of "key categories" aims to help countries prioritize resources for improving national greenhouse gas (GHG) inventories over time and reduce uncertainties.<sup>3</sup> Key categories make the greatest contribution to the overall level of national emissions in terms of magnitude. When an entire time series of emission estimates is prepared, key categories can also be identified as those categories that have the largest influence on the trend of emissions over time.<sup>4</sup> In addition, per the 2006 IPCC Guidelines, conducting a key category analysis reflecting relative uncertainty assessments may identify additional key categories (e.g., smaller but more uncertain sources will appear to contribute more to the national total than they would without considering uncertainty).

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<sup>1</sup> The IPCC Inventory Software also performs KCA. The steps in this template will be different from either of these approaches since the template follows the structure of the EPA KCA software tool.

<sup>2</sup> See 18/CMA.1, Modalities, Procedures and Guidelines (MPGs), Annex Chapter II, [Section C.2 Methods and E.1 Reporting guidance](#) for National Greenhouse Gas Inventory Report (available at <http://unfccc.int/decisions>).

<sup>3</sup> The *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* refer to "key source categories." Subsequent IPCC Guidelines changed this to "key categories" because sinks in addition to sources are also included in the analysis.

<sup>4</sup> The 2006 IPCC Guidelines for National Greenhouse Gas Inventories defines a key category as a "category that is prioritized 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." See Chapter 4, "Methodological Choice and Identification of Key Categories," for more information: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.



The results of the KCA provide a country with a list of their most important inventory categories. The KCA helps the country prioritize efforts in improving the GHG inventory over time. To improve the national inventory, it may be necessary to consider applying more accurate or higher tier methodologies, collect more detailed activity data, or develop country-specific emission factors. These activities all require additional resources, and it is not possible to make improvements for every inventory category at once. The KCA provides an important input to the national inventory improvement plan (see Template 7. National Inventory Improvement Plan). Adding the KCA to a National Communication or Biennial Update Report improves the transparency of the reporting and builds capacity for required reporting of key categories in future reporting under the ETF.

This template uses the IPCC methodologies to determine key categories: Approach 1 and Approach 2. Approach 1 assesses the relevance of each category compared to total national emissions in the current year (“level assessment”), and its influence on the overall trend when comparing the current year and the base year (“trend assessment”). Approach 2 also performs the level and trend assessments, but in doing so considers the category’s uncertainty assessment. In the Approach 1 methodology, key categories are identified using a pre-determined cumulative emissions threshold, where key categories are those that sum to 95% of the total level when summed together in descending order of magnitude.<sup>5</sup>

The Approach 2 methodology can be used if a country has quantified emission and removal category uncertainty. Similar to Approach 1, first, the level or trend assessment is performed, taking uncertainty into account. Then, categories are sorted by a decreasing order of magnitude. When applying Approach 2, those categories that cumulatively account for 90 per cent of emissions are considered key categories. For future reporting under the ETF, a developing country that needs flexibility due to its capacity, in meeting this requirement have the flexibility to instead provide, at a minimum, a qualitative discussion of uncertainty for key categories, using the IPCC guidelines (e.g., expert judgement), where quantitative input data are unavailable to quantitatively

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<sup>5</sup> For future reporting under the ETF, developing countries have the flexibility to identify key categories using a threshold between 85-95%, instead of the 95% in the 2006 IPCC guidelines. If flexibility is applied, countries will need to state this clearly within the inventory report, including concisely clarifying the relevant capacity constraints and indicate estimated time frames for improvements to address those constraints. The EPA Toolkit aims to help countries address capacity constraints triggering the need to use flexibility provisions and facilitate continuous improvement. For more information on specific flexibility provisions in reporting national GHG inventories, see chapter 2 of <https://unfccc.int/sites/default/files/resource/ETF%20Handbook-first%20edition%20June%202020-for%20costing.pdf>.



estimate uncertainties. Where this flexibility is applied, the country is encouraged to provide a quantitative estimate of uncertainty for all source and sink categories of the GHG inventory. Developing countries using flexibility to meet this reporting requirement will be unable to apply Approach 2, but can still identify additional key categories using qualitative approaches as outlined in the 2006 IPCC Guidelines.

To complete this template, you will perform the steps enumerated below by following the instructions above each table in this template. Green text is used throughout the template and its tables to provide instructions and guidance. Where it appears in a table, replace it with country-specific information.

***When the tables are complete, delete the green text throughout this template. You may use the remaining text or tables for reporting or for your National GHG Inventory System Manual.***

Step	Purpose
1. Determine if Approach 2 can be applied to more comprehensively identify key categories. If you have quantitative uncertainty assessments for all inventory emission and removal categories, collate uncertainty assessment of emission estimates by category,	You will require these core data for the KCA. Compile as much quantitative data as possible, and fill the gaps with recommended default values from 2006 IPCC Guidelines, and expert judgment and elicitation. This will allow you to conduct uncertainty analysis.
2. Download the latest version of the key category software from the <a href="#">Toolkit</a>	You may use this software to perform the KCA.
3. a. Complete the Approach 1 key category "current year level assessment" for magnitude  b. If your country has GHG inventories for more than one year, complete the Approach 1 key category "base year level assessment" and "trend assessment"	The output from this will provide a list of the key categories in terms of size of their contribution to the national total. You may then prioritize the improvement of these categories in the inventory development plan to improve their accuracy and reduce uncertainty.  The output from this will provide a list of the key categories in terms of size of their contribution to the national total, and in terms of trend (increasing or decreasing).
4. a. If your country also has uncertainty assessments, complete the Approach 2 key category "current year level assessment"	The output from this will produce a list of key categories according to the contribution of their emissions and uncertainty to the national total. Note in the ranking that Approach 2 produces, smaller but more uncertain sources will appear to contribute more to the national total than they would if using Approach 1. Note some categories identified using Approach 2 will be the same as those identified using Approach 1 level assessment.



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| <p>b. If your country has uncertainty estimates and a GHG inventory for more than one year, complete the Approach 2 key category “base year level assessment” and “trend assessment”</p> | <p>The output from this will produce a list of key categories according to the contribution of their emissions, trends, and uncertainty to the national total. Note in the ranking that Approach 2 produces, smaller but more uncertain sources will appear to contribute more to the national total than they would if using Approach 1. Note some categories identified using Approach 2 will be the same as those identified using Approach 1 trend assessment.</p> |
| <p>5. Document your KCA methodologies in your inventory report</p>   | <p>Keeping a record of the work that has been done is important to ensure transparency.</p>  |
| <p>6. Identify and apply improvements to your inventory report</p>   | <p>As part of the overall GHG inventory improvement plan, aim to regularly review estimates of uncertainty, in particular for key categories and especially if trends, technologies, or management practices are changing.</p>   |
| <p>7. Provide any additional information</p>   | <p>This will contribute to transparency in reporting.</p>  |
| <p>8. Complete the "References" section</p>  | <p>This will contribute to transparency in reporting.</p>  |

## Key Category Analysis

### **STEP 1: Compile uncertainty estimates. If you have not quantified uncertainties, proceed to STEP 2 and skip STEP 5 and 6.**

- ✦ *Before starting a KCA, if quantified, compile assessments of uncertainties for all reported emission and removal categories. The uncertainty assessments should be based on underlying uncertainties of activity data, emissions factors, and other key parameters (e.g., stock change factors). Clear instructions about how to gather this information are available in Volume 1, Chapter 4 “Methodological choice and identification of key categories,” of the 2006 IPCC Guidelines.<sup>6</sup> Default values of uncertainties for emission factors are normally provided for all default emission factors in the IPCC Guidelines. Guidance is sometimes given for uncertainties associated with activity data.*
- ✦ *Fill any gaps using your own judgment or input from independent experts, i.e., experts not involved with compiling the inventory. If possible, verify estimates of uncertainties with sector or pollutant experts and refine if necessary.*

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<sup>6</sup> See [https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1\\_Volume1/V1\\_4\\_Ch4\\_MethodChoice.pdf](https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_4_Ch4_MethodChoice.pdf)



**STEP 2: Download the latest version of the key category software from the [Toolkit website](#)**

- ⊕ *If you are using the EPA software, download or update the EPA key category software from the [Toolkit website](#) by right-clicking on the Excel file and selecting “save as...” Once the Excel document is saved, double-click the file to open it and begin the KCA, following the instructions in the software.*
- ⊕ *Save copies of the file as different versions for draft and final analyses by inserting the date or version number at the end of the file name (e.g., “KCA Tool v2.xls”).*
- ⊕ *You may also use the 2006 IPCC Guidelines inventory software, which has a KCA module in it, or build your own spreadsheet(s) that follow the methodologies in the 2006 IPCC Guidelines.*

**STEP 3: Complete the Approach 1 key category current year level assessment**

- ⊕ *Complete Table 5-1, below, using the results from the KCA you performed in Step 2. This table will be a record of the results of the IPCC Approach 1 key category level assessment for the most recent or current year (e.g., 2019). Add as many rows to the table as necessary to provide detailed information for each category.*
- ⊕ *If or when the inventory is updated, update the KCA.*

**Table 5-1: Key Categories Based on Contribution to Total National Emissions in [year, e.g., 2019]\***

IPCC Category Code	IPCC Category	Gas	Current Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to National Emissions	Cumulative Per Cent of National Emissions

\*Represents results from the “Key Category Tier 1 Level Assessment for the Current Year” sheet in the EPA KCA tool.

**STEP 4: Complete the Approach 1 key category base year level assessment and trend assessment**

- ⊕ *Complete this step if your country has GHG inventories with a time series of more than one year.*
- ⊕ *If your country has a GHG inventory for only one year, proceed to Step 5.*



### STEP 4.1: Base year level assessment

- Complete Table 5-2, below, using the results from the "Key Category Tier 1 Level Assessment for the Base Year " sheet in the EPA KCA tool (step 5 of 11). This table will be a record of the results of the IPCC Approach 1 key category level assessment for the base year, e.g., 2000.
- Enter the first inventory category identified as a key category (highlighted in green in the table on this sheet in the software) and include its GHG type (e.g. gas), emission estimate, "level assessment" (or contribution to national emissions), and cumulative percentage. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 95% of national emissions.
- Add as many rows to the table as necessary to provide detailed information for each category.
- If or when the inventory is updated, update the KCA.

**Table 5-2: Key Categories Based on Contribution to Total National Emissions in Base Year [year, e.g., 2000]\***

IPCC Category Code	IPCC Category	Gas	Base Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to National Emissions	Cumulative Per Cent of National Emissions

\*Represents results from the "Key Category Tier 1 Level Assessment for the Base Year" sheet in the EPA KCA tool.

### STEP 4.2: Trend assessment

- Conduct the trend assessment using both the base year estimates and current estimates. The trend assessment identifies categories whose trends which differ significantly from the trend of the total inventory, regardless of whether the category's trend is increasing or decreasing, or it is a sink or source. Categories with trends that diverge the most from the total trend should be identified as key when this difference is weighted by the level of emissions or removals of the category in the base year. The IPCC defines the "inventory category trend" as the change in net emissions from the base year to the current year, as a



percentage of current year net emissions from that inventory category. The “total trend” is the percentage change in total inventory net emissions from the base year to the current year.

- Complete Table 5-3, below, using the results from the “Key Category Tier 1 Trend Assessment” sheet in the EPA KCA tool (step 7 of 11). This table will be a record of the results of the IPCC Approach 1 key category trend assessment for the period from the base to the current year, e.g., 2000-2017.
- Enter the first inventory category identified as a key category (highlighted in green in the table on this sheet in the software) and include its GHG type, its base year and current year estimates, “trend assessment” (or contribution to the trend), and cumulative percentage. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of these categories should account for at least 95% of the total national trend in emissions.
- Add as many rows to the table as necessary to provide detailed information for each category.
- If or when the inventory is updated, update the KCA.

**Table 5-3: Key Categories Based on Contribution to Overall Trend in National Net Emissions\***

IPCC Category Code	IPCC Category	Gas	Base Year Emissions (Gg CO <sub>2</sub> Eq.)	Current Year Emissions (Gg CO <sub>2</sub> Eq.)	Contribution to Trend	Cumulative Contribution to Trend

\*Represents results from the “Key Category Tier 1 Trend Assessment” sheet in the EPA KCA tool.

**STEP 5: Complete the Approach 2 key category current year level assessment with uncertainty**

- Table 5-4 is for only those countries that have estimated the uncertainty associated with national emissions and removals estimates.
- Complete Table 5-4, below, using the level assessment results from the “Key Category Tier 2 Level Assessment for the Current Year” sheet in the EPA KCA tool (Step 9 of 11). This table will be a record of the results of the IPCC Approach 2 key category level assessment for the most recent or current year (e.g., 2019).





- ⊕ Enter the first inventory category identified as a key category (highlighted in green in the table on this sheet in the software) and include its GHG type (e.g. gas), relative level assessment with uncertainty, and cumulative percentage. Continue to add the next inventory categories until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 90% of national emissions.
- ⊕ Add as many rows to the table as necessary to provide detailed information for each category.
- ⊕ When the inventory is updated, update the KCA.

**Table 5-4: Key Categories Based on Contribution to Total National Emissions with Uncertainty in [year, e.g., 2019]\***

IPCC Category Code	IPCC Category	Gas	Level Assessment with Uncertainty	Relative Level Assessment with Uncertainty	Cumulative Per Cent of National Emissions

\*Represents results from the “Key Category Tier 2 Level Assessment for the Current Year” sheet in the EPA KCA tool.

**STEP 6: Complete the Approach 2 key category base year level assessment and trend assessment with uncertainty**

- ⊕ Tables 5-5 and 5-6 are for only those countries that have both 1) estimated the uncertainty associated with national emissions and removal estimates, and 2) prepared GHG inventories for more than one year.

**STEP 6.1: Base year level assessment with uncertainty**

- ⊕ Complete Table 5-5 using the results from the "Key Category Tier 2 Level Assessment for the Base Year" sheet in the EPA KCA tool (step 8 of 11). This table will be a record of the results of the IPCC Approach 2 key category level assessment for the base year (e.g., 2000).
- ⊕ Enter the first inventory category identified as a key category (highlighted in green in the table on this sheet in the software) and include its GHG type (e.g. gas), level assessment with uncertainty, and relative level assessment with uncertainty. Continue to add



*the next inventory categories until all categories that are highlighted in green (identified as key) are entered. The cumulative total of the level assessment amounts for these categories should account for at least 90% of national emissions.*

- ⊕ *Add as many rows to the table as necessary to provide detailed information for each category.*
- ⊕ *When the inventory is updated, update the KCA.*

**Table 5-5: Key Categories Based on Contribution to Total National Emissions with Uncertainty in Base Year [year, e.g., 2000]\***

IPCC Category Code	IPCC Category	Gas	Level Assessment with Uncertainty	Relative Level Assessment with Uncertainty	Cumulative Per Cent of National Emissions

\*Represents results from the “Key Category Tier 2 Level Assessment for the Base Year” sheet in the EPA KCA tool.

**STEP 6.2: Trend assessment with uncertainty**

- ⊕ *Conduct the trend assessment using both the base year estimates and current estimates.*
- ⊕ *Complete Table 5-6, below, using the results from the "Key Category Tier 2 Trend Assessment" sheet in the EPA KCA tool (step 10 of 11). This table will be a record of the results of the IPCC Approach 2 key category trend assessment with uncertainty for the period from the base to the current year, e.g., 2000-2019.*
- ⊕ *Enter the first inventory category identified as a key category (highlighted in green in the table on this sheet in the software) and include its GHG type (e.g. gas), trend assessment with uncertainty, relative level assessment with uncertainty, and cumulative per cent of national emissions. Continue to add the next inventory category until all categories that are highlighted in green (identified as key) are entered. The cumulative total of these categories should account for at least 90% of the total national trend in emissions.*
- ⊕ *Add as many rows to the table as necessary to provide detailed information for each category.*
- ⊕ *When the inventory is updated, update the KCA.*



**Table 5-6: Key Categories Based on Contribution to Overall Trend in National Net Emissions with Uncertainty**

IPCC Category Code	IPCC Category	Gas	Trend Assessment with Uncertainty	Relative Trend Assessment with Uncertainty	Cumulative Per Cent of National Emissions

\*Represents results from the “Key Category Tier 2 Trend Assessment” sheet in the EPA KCA tool.

### STEP 7: Key Categories Identified using Qualitative Criteria

- Quantitative approaches may not identify all key categories. It is considered good practice to use qualitative criteria to identify key categories. Further, if a country has been unable to apply Approach 2, or there are known categories that are excluded from the inventory due to use of flexibilities in light of capacities (e.g. fluorinated emissions), it is good to review the inventory and consider qualitative criteria to identify any additional key categories. Refer to the 2006 IPCC Guidelines, Volume 1, Chapter 4 for more information on qualitative criteria, but the criteria include completeness (e.g. consider categories not estimated that could be significant), lack of quantified uncertainty assessment (e.g. consider if methods and data currently used to estimate emissions include significant uncertainties), and mitigation effects (e.g. use of mitigation techniques will impact category emissions over time, and method should be reviewed to better reflect mitigation effects, etc.).

Table 5-7: Key Categories identified using Qualitative Criteria

IPCC Category Code	IPCC Category	Gas	Criteria
			e.g. completeness

### STEP 8: Report KCA methodology used

- Refer to the 2006 IPCC Guidelines for a detailed description of the methodologies.
- Note in your inventory report(s) the methodologies you used to perform KCA.



**STEP 9: Record potential improvements to the GHG inventory identified as a result of the KCA**

- ⊕ *Check the IPCC Tier of the method used to estimate emissions or removals from each key categories, and examine the quality and accuracy of the activity data, emission factors, and model used to estimate emissions or removals. If Tier 1 methods were used to estimate emissions or removals from a key category, examine ways to use higher tier approaches to improve accuracy and reduce uncertainty.*
- ⊕ *Record suggested improvements to the inventory in Table 5-7, below.*
- ⊕ *Add as many rows to the table as necessary to provide detailed information for each category.*

**Table 5-8: Improvements to the GHG inventory**

Improvement #	Sector	Source Category and IPCC Tier Used	Potential Improvement	Steps Needed to Implement This Improvement
1				
2				

**STEP 9: Provide any additional information**

- ⊕ *In addition to the quantitative approaches described above, countries may also identify key categories using qualitative approaches (e.g., changing trends due to mitigation activities) by using expert judgment consistent with guidance from the 2006 IPCC Guidelines.*
- ⊕ *You may add more detailed qualitative or quantitative results here, including the output tables from the EPA KCA tool.*

**STEP 10: Add references**

- ⊕ *Add any additional references to material used in the analysis, and the methodological approaches you used.*
- ⊕ *In particular, add references to the sources of uncertainty data you used.*