

CHAPTER 4

METHODOLOGICAL CHOICE AND IDENTIFICATION OF KEY CATEGORIES

[Parts shaded in grey – the unchanged text from the 2006 IPCC Guidelines]

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4 METHODOLOGICAL CHOICE AND IDENTIFICATION OF KEY CATEGORIES

4.1 INTRODUCTION

[Elaboration of section 4.1 of the 2006 IPCC Guidelines].

This chapter addresses how to decide on methods to apply and in using key category analysis¹ to inform this choice. Methodological choice for individual source and sink categories is important in managing and where possible reducing the overall inventory uncertainty. Generally, inventory uncertainty is lower when emissions and removals are estimated using the most rigorous methods provided for each category or subcategory in the sectoral volumes of the 2006 IPCC Guidelines and its 2019 Refinement. However, these methods generally require more extensive resources for data collection, so it may not be feasible to use more rigorous method for every category of emissions and removals. It is therefore *good practice* to identify those categories that have the greatest contribution to overall inventory uncertainty in order to make the most efficient use of available resources. It is also important to identify categories that contribute significantly to the national totals to ensure that they are compiled accurately and that the data needed to update their estimates is sufficiently maintained. It is *good practice* for each country to identify its national *key categories* in a systematic and objective manner. By identifying these *key categories* in the national inventory, inventory compilers can prioritise their efforts and improve their overall estimates.

4.1.1 Definition

[Update of the section 4.1.1 of the 2006 IPCC Guidelines].

Key categories are inventory categories which individually, or as a group of categories (for which a common method, emission factor and activity data are applied) are prioritised within the national inventory system because their estimates have a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the level of uncertainty in emissions or removals. Whenever the term *key category* is used, it includes both source and sink categories.

4.1.2 Purpose of the key category analysis

[Elaboration of the section 4.1.2 of the 2006 IPCC Guidelines].

Key category analysis helps the National Inventory Arrangements (see Section 1.5 of Chapter 1) identify the priority categories for which methods, activity data, emission factors and other parameters should be considered for regular update, more rigorously checked and reviewed and, where necessary or possible, improved.

- **Regular update:** Making sure the methods, data flows and country-specific emission factors are kept up to date and available for important regular estimate updates.
- **More rigorous checking and review:** Making sure that specific QA/QC activities are implemented for *key categories*. It is *good practice* to give additional attention to *key categories* with respect to quality assurance and quality control (QA/QC) as described in Chapter 6, Quality Assurance/Quality Control and Verification, and in the sectoral volumes.
- **Improvement:** Improving accuracy of estimates and reducing overall uncertainty using higher tiered (more accurate) methods. In general, more detailed higher tier methods should be selected for *key categories*. Inventory compilers should use the category-specific methods presented in sectoral decision trees in Volumes 2-5. For most sources/sinks, higher tier (Tier 2 and 3) methods are suggested for *key categories*, although this is not always the case. For guidance on the specific application of this principle to *key categories*, it is *good practice* to refer to the decision trees and sector-specific guidance for the respective category and additional *good practice guidance* in chapters in sectoral volumes. In some cases, inventory compilers may be unable to adopt a higher tier method due to lack of resources. This may mean that they are unable to collect the required data for a higher tier or are unable to determine country specific emission factors and other data needed for Tier 2 and 3 methods. In these cases, although this is not accommodated in the category-specific decision trees, a Tier 1 approach can be used, and this possibility is identified in Figure 4.1 of the 2006 IPCC Guidelines. It

¹ In Good Practice Guidance for National Greenhouse Gas Inventories (GPG2000, IPCC, 2000), the concept was named 'key source categories' and dealt with the inventory excluding the LULUCF Sector.

should in these cases be clearly documented why the methodological choice was not in line with the sectoral decision tree. Any *key categories* where the good practice method cannot be used should have priority for future improvements.

It is *good practice* for each country to identify and communicate its national *key categories* in a systematic and objective manner as presented in this chapter. Such a process will help countries to prioritise available resources for (key) category methods, data sources and assumptions and will lead to improved inventory quality, as well as greater confidence in the estimates that are developed.

4.1.3 General approach to identify key categories

[Elaboration of the section 4.1.3 of the 2006 IPCC Guidelines].

Key category analysis should be applied in all circumstances of inventory compilation no matter how simple or basic the inventory is. A category can be identified as a key for different reasons. These include:

- **Level:** Their absolute level of contribution to the overall GHG totals for a particular year of interest.
- **Trend:** Their change across a time series. Particularly important for categories that are showing increasing or decreasing emissions or removal trends across a time series.
- **Uncertainty:** If the contribution of a category's uncertainty to total inventory uncertainty in a particular year, or the trend uncertainty is high then the category should be identified as key.
- In addition to making a **quantitative determination** of *key categories*, it is *good practice* to consider the qualitative criteria for identifying categories that are likely to need prioritised attention (e.g. expected significant trends, categories not estimated or with suspected high uncertainty) as described in more detail in Section 4.3.3.

Section 4.3 presents the detailed methodology for the above cases of *key category* analysis under two approaches. Approach 1 where *key category* analysis is done without incorporating uncertainties and approach 2 where information on uncertainties is included.

As explained in section 4.1.2 above, the main objective of *key category* analysis is to identify and prioritise *key categories* within the inventory management system. Therefore, it is helpful to consolidate the different analysis of the level and trend into a single summary list of key categories. This makes engagement with key stakeholders easier and communication of the *key categories* priorities possible.

Guidance on reporting and documentation of the *key category* analysis is provided in Section 4.5. Section 4.6 gives examples for *key category* identification.

4.2 GENERAL RULES FOR IDENTIFICATION OF KEY CATEGORIES

[Update of the section 4.2 of the 2006 IPCC Guidelines].

The following guidance describes additional *good practice* in determining the appropriate level of disaggregation of GHG estimates to identify *key categories*, additional to those presented in the 2006 IPCC Guidelines. The results of the *key category* analysis will be most useful for prioritising data gathering and estimation activities if the analysis is done at a level of aggregation aligned with Countries use of methods, data sources and assumptions. Disaggregation to very low levels of subcategories that are all covered by a single method and use of emission factor should be avoided since it will split an important aggregated category into many small subcategories that may be no longer considered as *key*. Countries should establish their own aggregations or disaggregation of categories accordingly and considering the guidance provided below. Countries using Approach 2 will need to align the level of aggregation with that used for the uncertainty analysis. This will be facilitated by an approach, which aggregated/disaggregated based on methodology and in particular uncertainties. The following principals can be followed in designing the analysis and in choosing the level of aggregation or disaggregation for key categories:

- **IPCC Categories:** All relevant sectors and categories should be included in the key category analysis. Countries should consider also including memo items such as international aviation and biomass burning in their key category analysis to ensure that the calculations for these items are considered when designing

improvement activities. The analysis should be performed at the level of categories or subcategories at which the IPCC methods are applied in the inventory. Over time, as estimates are updated/refined and higher tier approaches applied to categories and/or subcategories, the aggregations for key category analysis will change. Countries can consider the disaggregation of categories and subcategories by fuel or other relevant activity differentiators (e.g. livestock/management types etc.) where activity data, assumptions and/or emission factors are from different sources and/or uncertainties are likely to be significantly different. For Approach 2, possible cross-correlations between categories and/or subcategories should be taken into account when considering category aggregation². When using Approach 2, the assumptions about such correlations should be the same when assessing uncertainties and identifying key categories (see Chapter 3, Uncertainties).

- **Regional disaggregation:** Countries may want to subdivide by region in exceptional cases where regional differences in methods applied are significant. Where this is needed, a regional tag can be added to the IPCC category group column (see Tables 4.2 and 4.3).
- **Individual gas level:** All direct GHGs should be included in the key category analysis. Generally, each greenhouse gas emitted from each category should be considered separately, unless the same method, data sources and assumptions are applied and uncertainties are similar across gases or linked. For example, CO₂, methane (CH₄) and nitrous oxide (N₂O) from road transport using a tier 1 default methodology would all be treated separately due to the different levels of uncertainty in the default EFs. However, where a tier 2 method is applied to estimate emissions for methane (CH₄) and nitrous oxide (N₂O) using country-specific measurement data the CO₂-equivalent³ estimates for methane (CH₄) and nitrous oxide (N₂O) could be aggregated in the *key category* analysis. This aggregation helps to promote the importance of the combined impacts of methane (CH₄) and nitrous oxide (N₂O) with the new tier 2 methodology. In cases where a common model and assumptions are applied for analysis of all chemical species of hydrofluorocarbons (HFCs) from refrigeration or air conditioning, these gases could be aggregated as HFC CO₂-equivalent emissions. If precursor gases for CO₂ (e.g. CO and NMVOC) are included in the national totals as CO₂-equivalent emissions they should also be included in the KCA as with any other gas. Precursor gases that cannot be converted to CO₂-equivalent emissions cannot be included in the quantitative *key category* analysis but could be included in the qualitative analysis. It is not possible to include gases, which cannot be converted to CO₂-equivalent since the analysis is performed using CO₂-equivalent emissions.
- **Emissions and removals:** If data are available, the *key category* analysis should be performed for emissions and removals separately within a given category or for different pools. For example, the land use categories and the pool estimates can include emissions and removals that may cancel or almost cancel at the aggregated level for the category resulting in an aggregated net estimate that does not qualify as a *key category* despite the components (emissions and removals separately) being significant. This separation of emissions and removals is also important where methods, data sources and assumptions are different for estimating emissions and removals for a category or for different pools. Similar considerations may apply in the Energy and IPPU (Industrial Processes and Product Use) Sectors, for example, in a situation where CO₂ is being captured for storage.
- Indirect N₂O emissions from deposition of NO_x and other nitrogen compounds from categories other than AFOLU (Agriculture, Forestry and Other Land Use) Sectors are included in the *key category* analysis in category 5A, Indirect N₂O emissions from the atmospheric deposition of nitrogen in NO_x and NH₃.

Once the level of aggregation has been resolved, the inventory compiler should determine if certain components (e.g. subcategories/gases/pools/sinks/sources) are particularly significant and further disaggregated, if appropriate. Usually, for this purpose, the components can be ranked according to their contribution to the aggregate key category. Those subcategories that contribute together more than 60 percent to the key category should be treated as particularly significant. Table 4.1 provides suggested aggregation levels with guidance on subdivisions that could be considered that relate to methods, data sources and assumptions for which estimation methods are provided in the sectoral volumes.

² In practice, the effect of correlations for key category analysis should be taken into account in the disaggregation level used for the Approach 2 assessment (for more advice on correlations in uncertainty analysis, see Chapter 3.)

³ The methodology is also applicable for other weighting scheme, but for the derivation of threshold for Approach 1 and 2 and for the examples in Section 4.5 CO₂-equivalent values were calculated using the global warming potentials (GWP) over a 100 year horizon of the different greenhouse gases, provided by the IPCC in its Second Assessment Report (SAR).

TABLE 4.1
SUGGESTED AGGREGATION LEVEL OF ANALYSIS FOR APPROACH 1^a

Source and Sink Categories to be Assessed in Key Category Analysis		Gases to be Assessed separately ^c	Category aggregation/disaggregation Considerations ⁴
Category Code ^b	Category Title ^b		
Energy			
1A1 & 1A2	Energy and manufacturing Industry Fuel Combustion Activities	CO ₂ , N ₂ O, CH ₄	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors (e.g. energy balances and default or average country specific emission factors) with similar uncertainties can be aggregated. Common reasons for disaggregation can include differences in uncertainty for estimates of emissions for different fuels (disaggregation by main fuel type) or the application of tier 2 or 3 methods for categories or sub-categories.
1A3a	Fuel Combustion Activities - Transport - Civil Aviation	CO ₂ , N ₂ O, CH ₄	Disaggregation could be considered where data for different fuels is sourced from different data providers and different methods are used for small and major airports.
1A3b	Fuel Combustion Activities - Transport - Road transportation	CO ₂ , N ₂ O, CH ₄	Disaggregate by fuel if fuel data is sourced from different data providers and likely to have different levels of accuracy.
1A3c	Fuel Combustion Activities - Transport - Railways	CO ₂ , N ₂ O, CH ₄	Disaggregation could be considered where data (e.g. on fuels) is sourced from different data providers and different methods are used for different types of transport
1A3d	Fuel Combustion Activities - Transport - Water-borne Navigation	CO ₂ , N ₂ O, CH ₄	Disaggregation could be considered where data (e.g. on fuels) is sourced from different data providers and different methods are used for different types of transport.
1A3e	Fuel Combustion Activities - Transport - Other Transportation	CO ₂ , N ₂ O, CH ₄	Disaggregation could be considered where data (e.g. on fuels) is sourced from different data providers and different methods are used for different types of transport.
1A4	Fuel Combustion Activities - Other Sectors	CO ₂ , N ₂ O, CH ₄	
1A5	Fuel Combustion Activities - Non-Specified	CO ₂ , N ₂ O, CH ₄	
1B	Fugitive emissions from fuels	CO ₂ , CH ₄	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity

⁴ Only disaggregate further by subcategory, fuel and/or gas where activity data and emission factors are from different sources and/or uncertainties are significantly different.

			data and emission factors (e.g. energy balances or industry data and default or average country specific emission factors) with similar uncertainties can be aggregated. Common reasons for disaggregation can include differences in uncertainty for estimates of emissions for different parts of fuel exploration and distribution, technologies or the application of tier 2 or 3 methods for categories or sub-categories.
1C	Carbon Dioxide Transport and Storage	CO ₂	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors (e.g. energy balances or industry data and default or average country specific emission factors) with similar uncertainties can be aggregated.
1	Miscellaneous	CO ₂ , CH ₄ , N ₂ O	Assess whether other sources in the Energy Sector not listed above should be included. Key category analysis has to cover all emission sources in the inventory. Therefore, all categories not presented above should be either aggregated with some other category, where relevant, or assessed separately.
Industrial Processes and Product Use			
2A1	Mineral industry - Cement Production	CO ₂	
2A2	Mineral Industry - Lime Production	CO ₂	Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated. Common reasons for disaggregation can include the application of tier 2 or 3 methods for categories or sub-categories.
2A3	Mineral Industry - Glass Production	CO ₂	Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated. Common reasons for disaggregation can include the application of tier 2 or 3 methods for categories or sub-categories.

TABLE 4.1 (CONTINUED)
SUGGESTED AGGREGATION LEVEL OF ANALYSIS FOR APPROACH 1 ^a

Source and Sink Categories to be Assessed in Key Category Analysis		Gases to be Assessed separately	Category aggregation/disaggregation Considerations
Category Code ^b	Category Title ^b		
2A4	Mineral Industry - Other Process Uses of Carbonates	CO ₂	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
2B1	Chemical Industry - Ammonia Production	CO ₂	
2B2	Chemical industry - Nitric Acid Production	N ₂ O	
2B3	Chemical industry - Adipic Acid Production	N ₂ O	
2B4	Chemical industry - Caprolactam, Glyoxal and Glyoxylic Acid Production	N ₂ O	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
2B5	Chemical industry - Carbide Production	CO ₂ , CH ₄ ,	
2B6	Chemical industry - Titanium Dioxide Production	CO ₂	
2B7	Chemical Industry - Soda Ash Production	CO ₂	
2B8	Chemical Industry - Petrochemical and Carbon Black Production	CO ₂ , CH ₄	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
2B9	Chemical Industry - Fluorochemical Production	HFCs, PFCs, SF ₆ , and other halogenated gases should be aggregated.	If this category is key, the inventory compiler should determine which subcategories/gases (e.g., HFC-23 from HCFC-22 production) are significant.
2B10	Chemical Industry – Hydrogen Production	CO ₂	
2C1	Metal Industry - Iron and Steel Production	CO ₂ , CH ₄	
2C2	Metal Industry - Ferroalloys Production	CO ₂ , CH ₄	
2C3	Metal Industry - Aluminium Production	PFCs should be aggregated., CO ₂	PFCs should be assessed jointly. CO ₂ should be assessed separately.

2C4	Metal Industry - Magnesium Production	CO ₂ SF ₆ , PFCs, HFCs, other halogenated gases should be aggregated.	Methods for HFCs, PFCs and other halogenated gases are only provided at Tier 3 level. If they are not included in the inventory it is good practice to use qualitative considerations (see section 4.3.3.).
2C5	Metal Industry - Lead Production	CO ₂	
2C6	Metal Industry - Zinc Production	CO ₂	
2C7	Metal Industry – Rare Earths	CO ₂ , PFCs	PFCs should be assessed jointly. CO ₂ should be assessed separately.
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
2E	Electronics Industry	SF ₆ , PFCs, HCFs, other halogenated gases can be aggregated.	If this category is key, the inventory compiler should determine which subcategories are significant.
2F1	Product Uses as Substitutes for Ozone Depleting Substances - Refrigeration and Air Conditioning	HFCs and PFCs can be aggregated.	These categories should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
2F2	Product Uses as Substitutes for Ozone Depleting Substances - Foam Blowing Agents	HFCs can be aggregated.	
2F3	Product Uses as Substitutes for Ozone Depleting Substances - Fire Protection	HFCs, PFCs can be aggregated.	
2F4	Product Uses as Substitutes for Ozone Depleting Substances - Aerosols	HFCs, PFCs can be aggregated.	
2F5	Product Uses as Substitutes for Ozone Depleting Substances - Solvents	HFCs, PFCs can be aggregated.	
2F6	Product Uses as Substitutes for Ozone Depleting Substances - Other Applications	HFCs, PFCs can be aggregated.	
2G	Other Product Manufacture and Use	SF ₆ , and PFCs can be aggregated N ₂ O treated separately	All PFC gases and SF ₆ should be assessed jointly. If this category is key, the inventory compiler should determine which subcategories are significant. N ₂ O should be assessed separately.
2	Miscellaneous	CO ₂ , CH ₄ , N ₂ O should be assessed separately HFCs, PFCs and SF ₆ , other halogenated	Assess whether other sources in the Industrial Processes and Product Use Sector not listed above should be included. Key category analysis should cover all emission sources in the inventory. Therefore, all categories not presented above should be either

		gases can be aggregated	aggregated with some other category, where relevant, or assessed separately.
Agriculture, Forestry and Other Land Use			
3A1 & 3A2	Livestock: Enteric Fermentation	CH ₄	If there are differences in the data sources, assumptions applied and uncertainties for the different animal types and or management/feed practices then these should also be disaggregated.
3A2	Livestock: Manure Management	CH ₄ , N ₂ O	If there are also differences in the data sources, assumptions applied and uncertainties for the different animal types and or management practices then these should also be disaggregated.
3B1a	Forest Land Remaining Forest Land	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be also assessed separately.
3B1b	Land Converted to Forest Land	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B2a	Cropland Remaining Cropland	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B2b	Land Converted to Cropland	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B3a	Grassland Remaining Grassland	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.

3B3b	Land Converted to Grassland	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B4ai	Peatlands Remaining Peatlands	CO ₂ , N ₂ O	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B4aii	Flooded land remaining Flooded land	CO ₂ , CH ₄	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B4b	Land Converted to Wetlands	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B5a	Settlements Remaining Settlements	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3B5b	Land Converted to Settlements	CO ₂	Where possible, assess emissions, removal and carbon stock change separately. If there are differences in the data sources, assumptions applied and uncertainties for different pools (biomass, DOM, mineral soils, organic soils) then these should be assessed separately.
3C1	Biomass Burning	CH ₄ , N ₂ O	Where countries estimate CO ₂ emissions from biomass burning separately from those associated to carbon stock change, they may wish to separate CO ₂ emissions from biomass burning under a key category 3C1.
3C2	Liming	CO ₂	
3C3	Urea Application	CO ₂	
3C4	Direct N ₂ O Emissions from Managed soils	N ₂ O	If there are differences in the data sources, assumptions applied and uncertainties for different pools (mineral soils, organic soils) then these should be assessed separately.
3C5	Indirect N ₂ O Emissions from Managed soils	Indirect N ₂ O	If there are differences in the data sources, assumptions applied and uncertainties for different pools (mineral soils, organic

			soils) then these should be assessed separately.
3C6	Indirect N ₂ O Emissions from Manure Management	Indirect N ₂ O	
3C7	Rice Cultivations	CH ₄	
3D1	Harvested Wood Products	CO ₂	Use of key category analysis is optional.
3	Miscellaneous	CO ₂ , CH ₄ , N ₂ O	Assess whether other sources or sinks in the AFOLU Sector not listed above should be included. Key category analysis has to cover all emission sources and sinks in the inventory. Therefore, all categories not presented above should be either aggregated with some other category, where relevant, or assessed separately.
Waste			
4A	Solid Waste Disposal	CH ₄	This category should be disaggregated according to methods, data sources, assumptions applied and know or likely differences in uncertainty. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated. E.g. if there are significant differences in methodology and uncertainty for different types of solid waste disposal (managed and unmanaged sites) these should be disaggregated.
4B	Biological Treatment of Solid Waste	CH ₄ , N ₂ O	
4C	Incineration and Open Burning of Waste	CO ₂ , N ₂ O, CH ₄	
4D	Wastewater Treatment and Discharge	CH ₄ , N ₂ O	If there are differences in data sources, assumptions applied and uncertainties for different types of wastewater treatment (domestic or industrial wastewater and or different discharge routes) these should be disaggregated. Estimates compiled from a common set of activity data and emission factors with similar uncertainties can be aggregated.
4	Miscellaneous	CO ₂ , CH ₄ , N ₂ O	Assess whether other sources in the Waste Sector not listed above should be included. <i>Key category</i> analysis has to cover all emission sources in the inventory. Therefore, all categories not presented above should be either aggregated with some other category, where relevant, or assessed separately.
5A	Indirect N ₂ O Emissions from the atmospheric deposition of nitrogen in NO _x and NH ₃	Indirect N ₂ O	
5B	Other	CO ₂ , N ₂ O, CH ₄ , SF ₆ , PFCs, HCFs	Include sources and sinks reported under 5B. <i>Key category</i> assessment has to cover all emission sources in the inventory. Therefore, all categories not presented above should be either aggregated with

			some other category, where relevant, or assessed separately.
<p>^a In some cases, inventory compilers may modify this list of IPCC categories to reflect particular national circumstances.</p> <p>^b The categories should include the respective codes and be consistent with the IPCC terminology.</p> <p>^c All the gases in this column are to be assessed separately unless stated otherwise where gases can be assessed jointly. There may also be some new gases other than those listed here, and those should be assessed separately.</p> <p>^d In the quantitative key category analysis, conversion of forest (deforestation) is spread out under the different land-use change categories. Countries should identify and sum up the emission estimates associated with forest conversion to any other land category and compare the magnitude to the smallest category identified as key. If its size is larger than the smallest category identified as key, it should be considered key.</p>			

4.3 METHODOLOGICAL APPROACHES TO IDENTIFY KEY CATEGORIES

No refinement.

4.3.1 Approach 1 to identify key categories

[Update/Elaboration of the section 4.3.1 of the 2006 IPCC Guidelines].

Approach 1 to identify *key categories* assesses the influence of various categories of sources and sinks on the *level*, and possibly the *trend*, of the national greenhouse gas inventory. When the inventory estimates are available for several years, it is *good practice* to assess the contribution of each category to both the level and trend of the national inventory. If only a single year's inventory is available, a level assessment should be performed.

Approach 1 can readily be accomplished using a spreadsheet analysis. Tables 4.2 and 4.3 in the following sections illustrate the format of the analysis. Separate tables are suggested for the level and trend assessments because it is necessary to sort the results of the analysis according to two different columns. It is more difficult to track the process if the analyses are combined in the same table. In Table 4.2, columns A through C and Table 4.3 A through D are inputs of the national inventory data. Section 4.5 illustrates the application of the Approach 1 to the Finnish inventory.

LEVEL ASSESSMENT

The contribution of each source or sink category to the total national inventory level is calculated according to Equation 4.1:

EQUATION 4.1

LEVEL ASSESSMENT (APPROACH 1)

Key category level assessment = | source or sink category estimate | / total contribution

$$L_{x,t} = \frac{|E_{x,t}|}{\sum_i E_{i,t}}$$

Where:

$L_{x,t}$ = level assessment for source or sink x in latest inventory year (year t).

$|E_{x,t}|$ = absolute value of emission or removal estimate of source or sink category x in year t

$\sum_i E_{i,t}$ = total contribution, which is the sum of the absolute values of emissions and removals in year t calculated using the aggregation level chosen by the country for key category analysis. Because both emissions and removals are entered with positive sign⁵, the total contribution/level can be larger than a country's total emissions less removals.⁶

Key categories according to Equation 4.1 are those that, when summed together in descending order of magnitude, add up to 95 percent of the sum of all $L_{x,t}$.

Table 4.2 presents a spreadsheet that can be used for the level assessment. An example of the use of the spreadsheet is given in Section 4.5.

⁵ Removals are entered as absolute values to avoid an oscillating cumulative value $L_{x,t}$ as could be the case if removals were entered with negative signs, and thus to facilitate straightforward interpretation of the quantitative analysis.

⁶ This equation can be used in any situation, regardless of whether the national greenhouse gas inventory is a net source (as is most common) or a net sink.

218

TABLE 4.2 SPREADSHEET FOR THE APPROACH 1 ANALYSIS – LEVEL ASSESSMENT						
A	B	C	D	E	F	G
IPCC Category group	Greenhouse Gas	Latest Year Estimate [in CO ₂ -eq. units] $E_{x,t}$	Absolute Value of Latest Year Estimate $ E_{x,t} $	Level Assessment $L_{x,t}$	Cumulative Total of Column E	Rank of Absolute Value of Latest Year Estimate Column D
Total			$\sum_i E_{i,t} $	1		

219 Where:

- 220 Column A: = description of IPCC category group (see section 4.2 above);
- 221 Column B: = greenhouse gas from the category;
- 222 Column C: = value of emission or removal estimate of category x in latest inventory year (year t)
- 223 in CO₂-equivalent units;
- 224 Column D: = absolute value of emission or removal estimate of category x in year t ;
- 225 Column E: = level assessment following Equation 4.1;
- 226 Column F: = cumulative total of Column E;
- 227 Column G: = rank of Absolute Value of Latest Year Estimate Column D.

228 Inputs to Columns A-C will be available from the inventory. The total of Column C presents the net emissions and

229 removals unless emissions and removals are presented separately. In Column D, absolute values are taken from

230 each value in Column C. The sum of all entries in Column D is entered in the total line of Column D (note that

231 this total may not be the same as the total net emissions and removals). In Column E, the level assessment is

232 computed according to Equation 4.1. Once the entries in Column E are computed, the categories in the table should

233 be sorted in descending order of magnitude according to Column E. After this step, the cumulative total summed

234 in Column E can be calculated into Column F. *Key categories* are those that, when summed together in descending

235 order of magnitude, add up to 95 percent of the total in Column F. Where the method is applied correctly, the sum

236 of entries in Column E must be 1. The rationale for the choice of the 95 percent threshold for the **Approach 1**

237 builds on Rypdal and Flugsrud (2001) and is presented in *GPG2000*, Section 7.2.1.1 in Chapter 7.

238 It is also *good practice* to examine categories identified between threshold of 95 percent and 97 percent carefully

239 with respect to the qualitative criteria (see section 4.3.3).

240 The level assessment should be performed for the base year of the inventory and for the latest inventory year (year

241 t). If estimates for the base year have changed or been recalculated, the base year analysis should be updated. Key

242 category analysis can also be updated for other recalculated years. In many cases, however, it is sufficient to derive

243 conclusions regarding methodological choice, resource prioritisation or QA/QC procedures without an updated

244 key category analysis for the entire inventory time series. Any category that meets the threshold for the base year

245 or the most recent year should be identified as *key*. However, the interpretation of the results of the key category

246 analysis should take longer time series than the most recent year into account if key category analyses are available.

247 This is because some categories having emissions/removals that fluctuate from year to year may be identified as

248 *key categories* in one year but not in the next year. Therefore, for categories between thresholds of 95 and 97

249 percent it is suggested to compare the most recent key category analysis with the assessments for three or more

250 previous years. If a category has been *key* for all or most previous years according to the either level or trend

251 assessments or both (the two assessments should be considered separately), they should be identified as *key* in the

252 latest year estimate except in cases where a clear explanation can be provided why a category may no longer be

253 *key* in any future years. These additional categories should be addressed in the reporting table for *key categories*

254 by using a column for comments (see Table 4.4 and reporting table for *key categories* in Section 4.4 for more

information). The qualitative criteria presented in Section 4.3.3 may also help to identify which categories with fluctuating emissions or removals should be considered as *key categories*.

TREND ASSESSMENT⁷

The purpose of the trend assessment is to identify categories that may not be large enough to be identified by the level assessment, but whose trend contributes significantly to the trend of the overall inventory and should therefore receive particular attention. The Trend Assessment can be calculated according to Equation 4.2 if more than one year of inventory data are available.

EQUATION 4.2
TREND ASSESSMENT (APPROACH 1)

$$T_{x,t} = \frac{E_{x,t} - E_{x,0}}{\sum_i E_{i,t} - \sum_i E_{i,0}}$$

Where:

$T_{x,t}$ = trend assessment of source or sink category x in year t as compared to the base year (year 0);

$E_{x,0}$ & $E_{x,t}$ = value of emission or removal estimate of source or sink category x in year 0 and year t ;

$\sum_i E_{i,t}$ & $\sum_i E_{i,0}$ = total inventory estimates in years t and 0, respectively.

The trend assessment of a category refers to the change in the source or sink category emissions or removals over time compared to the total trend. This is computed as an absolute value for source or sink category x by subtracting the value of the base year (year 0) estimate from the value of the latest inventory year (year t) estimate and dividing this by the overall difference between the target year (year t) and the base year (year 0) total inventories (the inventory trend). The percentage contribution of category x for year t to the trend is then calculated by dividing $T_{x,t}$ by the sum of the trend assessment of all categories of the inventory.

The trend assessment then sorts categories by magnitude (highest to lowest) of their contribution to the trend, regardless whether category trend is increasing or decreasing, or a category is a sink or source. Categories whose cumulative percentage contribution is greater than 95% should be identified as *key*.

Table 4.3 outlines a spreadsheet that can be used for the Approach 1 Trend Assessment.

TABLE 4.3
SPREADSHEET FOR THE APPROACH 1 ANALYSIS – TREND ASSESSMENT

A	B	C	D	E	F	G	H
IPCC Category group name	Greenhouse Gas	Base Year Estimate $E_{x,0}$	Latest Year Estimate $E_{x,t}$	Trend Assessment $T_{x,t}$	% Contribution to Trend	Cumulative Total of Column F	Rank of trend assessment Column E
Total		$\sum_i E_{i,0}$	$\sum_i E_{i,t}$	$\sum_i T_{i,t}$	1		

⁷ Subsection will be elaborated for an appropriate country example (Iceland, Brazil, Finland etc.) once approach for trend and KCA ranking is agreed.

Where:

Column A : = description of IPCC category group (see section 4.2 above);

Column B: = greenhouse gas from the category;

Column C : = base year estimate of emissions or removals from the national inventory data, in CO₂-equivalent units. Sources and sinks are entered as real values (positive or negative values, respectively);

Column D : = latest year estimate of emissions or removals from the most recent national inventory data, in CO₂-equivalent units. Sources and sinks are entered as real values (positive or negative values, respectively);

Column E: = trend assessment from Equation 4.2;

Column F: = percentage contribution of the category to the total of trend assessments in last row of Column E, i.e., $T_{x,t} / \sum_y T_{y,t}$;

Column G : = cumulative total of Column F, calculated after sorting the entries in descending order of magnitude according to Column F;

Column H: = rank of the trend assessment value (column E).

The entries in Columns A, B and D should be identical to those in Columns A, B and C in the Table 4.2, for the Approach 1 analysis - Level Assessment. The base year estimate in Column C is always entered, while the latest year estimate in Column D will depend on the year of analysis. The value of $T_{x,t}$ (which is always positive) should be entered in Column E for each category of sources and sinks, following Equation 4.2, and the sum of all the entries entered in the total line of the table. The percentage contribution of each category to the total of Column E should be computed and entered in Column F. The categories (i.e., the rows of the table) should be sorted in descending order of magnitude, based on Column F. The cumulative total of Column F should then be computed in Column G. Key categories are those that, when summed together in descending order of magnitude, add up to more than 95 percent of the total of Column F. An example of Approach 1 analysis for the level and trend is given in Section 4.5.

The trend assessment treats increasing and decreasing trends similarly. However, for the prioritisation of resources, there may be specific circumstances where countries may not want to invest additional resources in the estimation of *key categories* with decreasing trends. Underlying reasons why a category showing strong decreasing trend could be *key* include activity decrease, mitigation measures leading to reduced emission factors or abatement measures (e.g., F-gases, chemical production) changing the production processes. In particular, for a long-term decline of activities (not volatile economic trends) and when the category is not *key* from the level assessment, it is not always necessary to implement higher tier methods or to collect additional country-specific data if appropriate explanations can be provided why a category may not become more relevant again in the future. This could be the case e.g., for emissions from coal mining in some countries where considerable number of mines are closed or where certain production facilities are shut down. Regardless of the method chosen, countries should endeavour to use the same method for all years in a time series, and therefore it may be more appropriate to continue using a higher tier method if it had been used for previous years.

For other reasons of declining trends such as the introduction of abatement measures or other emission reduction measures, it is important to prioritise resources for the estimation of such categories that were identified as *key* in the trend assessment. Irrespective of the methodological choice, inventory compilers should clearly and precisely explain and document categories with strongly decreasing trends and should apply appropriate QA/QC procedures.

KEY CATEGORY ANALYSIS FOR A SUBSET OF INVENTORY ESTIMATES

The IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF, IPCC, 2003) provided guidance on how to conduct a key category analysis using a stepwise approach, identifying first the *key* (source) categories for the inventory excluding LULUCF (Land Use, Land-Use Change and Forestry), and secondly repeating the key category analysis for the full inventory including the LULUCF categories to identify additional *key categories*. This two-step approach is now integrated into one general approach. However, inventory compilers may still want to conduct a key category analysis using a subset of inventory estimates. For example inventory compilers may choose to include only emission sources in order to exclude the effects of removals from the level assessment or in order to exclude the influence of different trends for carbon fluxes from the other emission trends (see examples in Tables 4.7 and 4.8). It is *good practice* to document the subsets the analysis was performed for and the differences in results comparing with an integrated analysis.

4.3.2 Approach 2 to identify key categories

No refinement.

4.3.3 Qualitative criteria to identify key categories

[Update of section 4.3.3 of the 2006 IPCC Guidelines].

In some cases, the results of the Approach 1 or Approach 2 analysis of *key categories* may not identify all categories that should be prioritised in the inventory system. If quantitative key category analysis has not been carried out due to lack of completeness in the inventory, it is *good practice* to use qualitative criteria to identify *key categories*. The criteria below address specific circumstances that may not be readily reflected in the quantitative assessment. These criteria should be applied to categories not identified in the quantitative analysis, and if additional categories are identified they should be added to the list of *key categories*. It is particularly important to consider these criteria if the trend assessment has not been compiled. Although it is important to implement a trend assessment as part of *good practice* if data are available, early identification using qualitative criteria could be used until such assessment is available. Followings are the examples of points in qualitative criteria.

- *Mitigation techniques and technologies*: If emissions from a category have decreased or removals have increased through the use of climate change mitigation techniques, it is *good practice* to identify such categories as *key*. This will ensure that such categories are prioritised within the inventory and that better quality estimates are prepared to reflect the mitigation effects as closely as possible. It will also ensure that the methods used are transparent with respect to mitigation which is important for assessing inventory quality.
- *Expected growth*: The inventory compiler should assess which categories should be designated as *key* because they are likely to show substantial increase of emissions or decrease of removals in the future. The inventory compiler may use expert judgement to make this determination. It is encouraged to identify such categories as *key*.
- *No quantitative assessment of Uncertainties performed*: Where Approach 2 including uncertainties in the key category analysis is not used, inventory compilers are still encouraged to identify categories that are assumed to contribute most to the overall uncertainty as *key*, because the largest reductions in overall inventory uncertainty can be achieved by improving estimates of categories having higher uncertainties. The qualitative consideration should take into account whether any methodological improvements could reduce uncertainties significantly. This could, for example, be applied to a small net flux results from the subtraction of large emissions and removals, which can imply a very high uncertainty.
- *Completeness*: Neither the Approach 1 nor the Approach 2 gives correct results if the inventory is not complete. The analysis can still be performed, but there may be *key categories* among those are not estimated. In these cases, it is *good practice* to examine qualitatively potential *key categories* that are not yet estimated quantitatively by applying the qualitative considerations above. The inventory of a country with similar national circumstances can also often give good indications on potential *key categories*. Chapter 2, Approaches to Data Collection, gives suggestions for methods to approximate activity data that can be used to compile preliminary estimates of emissions/removals from a category. This preliminary analysis can be used to conclude whether a category potentially can be *key* and prioritise data collection of this category.

4.4 REPORTING AND DOCUMENTATION

[Elaboration of the section 4.4 of the 2006 IPCC Guidelines].

It is *good practice* to clearly document the results of the key category analysis in the inventory report. This information is essential for explaining the choice of method for each category. In addition, inventory compilers should list the criteria by which each category was identified as *key* (e.g., level, trend, or qualitative), and the method used to conduct the quantitative key category analysis (e.g., Approach 1 or Approach 2). Tables 4.2 and 4.3 should be used to record the results of the key category analysis. Table 4.4 should be used to present a summary of the key category analysis. The notation keys: L = *key category* according to level assessment; T = *key category* according to trend assessment; and Q = *key category* according to qualitative criteria; should be used to describe the assessment method used. The Approach used to identify the *key category* should be included as L1, L2, T1 or T2. In the column for comments, reasons for a qualitative assessment can be provided.

TABLE 4.4 SUMMARY OF KEY CATEGORY ANALYSIS				
Quantitative method used: Approach 1/Approach 1 and Approach 2				
A	B	C	D	E
IPCC Category Code	IPCC Category	Greenhouse Gas	Identification criteria	Comments

Key category analysis is designed to inform the National Inventory Arrangements and various stakeholders on the priorities for regular update and improvement of the inventory. Therefore, the detailed analysis can be aggregated into a single informative list of the categories identified as key and why as suggested above in Table 4.4. In addition, inventory compilers could consider a means of prioritisation using category rankings across the different analysis. Ideally, this summary should also highlight the tier at which the estimates are estimated to give an indication of the scope for further improvement (see Table 4.4a).

TABLE 4.4A KEY CATEGORIES RANKS					
A	B	C	D	E	F
IPCC Category group	Greenhouse Gas	Method (Tier)	Latest Year Estimate [in CO ₂ -eq. units]	Level Assessment Rank (If Key category)	Trend Assessment Rank (If Key category)

4.5 EXAMPLES OF KEY CATEGORY ANALYSIS

[Elaboration of the section 4.5 of the 2006 IPCC Guidelines].

The application of the Approach 1 and 2 to the Finnish greenhouse gas inventory for the reporting year 2003 is shown in Tables 4.5 to 4.11. Both the level and the trend assessment were conducted using estimates of emissions, removals and uncertainties from the national inventory of Finland (Statistics Finland, 2005). Although a qualitative assessment was not conducted in this example, it was not anticipated that additional categories would have been identified.

The results of the Approach 1 Level Assessment are shown in Table 4.5 with *key categories* in bold. The results of the Approach 1 Trend Assessment are shown in Table 4.6, with *key categories* in bold. Tables 4.7 and 4.8 present an Approach 1 Level and Trend *key category* analysis using a subset of emissions and removals. In this example, it was decided to include other categories (reported in Tables 4.5 and 4.6) than CO₂ from category 3B (Land). The results of Approach 2 Level and Trend Assessments are provided in Tables 4.9 and 4.10. Table 4.11 finally summarises the results of the *key category* analysis.

TABLE 4.5 EXAMPLE OF APPROACH 1 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	GHG	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ -eq)	$L_{x,t}$	Cumulative Total of Column F
3B1a	Forest land remaining Forest land	CO ₂	-21 354	21 354	0.193	0.193
1A1	Energy Industries: Solid	CO ₂	17 311	17 311	0.157	0.350
1A3b	Road Transportation	CO ₂	11 447	11 447	0.104	0.454
1A1	Energy Industries: Peat	CO ₂	9 047	9 047	0.082	0.536
1A1	Energy Industries: Gas	CO ₂	6 580	6 580	0.060	0.595
1A4	Other Sectors: Liquid	CO ₂	5 651	5 651	0.051	0.646
1A2	Manufacturing Industries and Construction: Solid	CO ₂	5 416	5 416	0.049	0.695
1A2	Manufacturing Industries and Construction: Liquid	CO ₂	4 736	4 736	0.043	0.738
1A1	Energy Industries: Liquid	CO ₂	3 110	3 110	0.028	0.767
3B3a	Grassland Remaining Grassland	CO ₂	2 974	2 974	0.027	0.793
3C4	Direct N ₂ O Emissions from managed soils	N ₂ O	2 619	2 619	0.024	0.817
4A	Solid Waste Disposal	CH ₄	2 497	2 497	0.023	0.840
1A2	Manufacturing Industries and Construction: Gas	CO ₂	2 174	2 174	0.020	0.859
3A1	Enteric Fermentation	CH ₄	1 537	1 537	0.014	0.873
1A2	Manufacturing Industries and Construction: Peat	CO ₂	1 498	1 498	0.014	0.887
2B2	Nitric Acid Production	N ₂ O	1 396	1 396	0.013	0.900
1A5	Non-Specified: Liquid	CO ₂	1 083	1 083	0.010	0.909
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	830	830	0.008	0.917
1A3e	Other Transportation	CO ₂	651	651	0.006	0.923
3C5	Indirect N ₂ O Emissions from managed soils	N ₂ O	592	592	0.005	0.928

TABLE 4.5 (CONTINUED) EXAMPLE OF APPROACH 1 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	GHG	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ -eq)	$L_{x,t}$	Cumulative Total of Column F
2F1	Refrigeration and Air Conditioning	HFCs, PFCs	578	578	0.005	0.933
3B4ai	Peatlands remaining Peatlands	CO₂	547	547	0.005	0.938
1A3d	Water-borne Navigation	CO₂	519	519	0.005	0.943
1A3b	Road Transportation	N₂O	516	516	0.005	0.948
2A2	Lime Production	CO₂	513	513	0.005	0.952
2A1	Cement Production	CO ₂	500	500	0.005	0.957
3A2	Manure Management	N ₂ O	461	461	0.004	0.961
1A5	Non-Specified: Gas	CO ₂	363	363	0.003	0.964
1A3a	Civil Aviation	CO ₂	316	316	0.003	0.967
1A4	Other Sectors: Biomass	CH ₄	307	307	0.003	0.970
3C2	Liming	CO ₂	277	277	0.003	0.972
1A1	Energy Industries: Peat	N ₂ O	226	226	0.002	0.975
1A4	Other Sectors: Gas	CO ₂	225	225	0.002	0.977
3A2	Manure Management	CH ₄	222	222	0.002	0.979
3B2a	Cropland Remaining Cropland	CO ₂	211	211	0.002	0.980
2	Miscellaneous	CO ₂ , HFCs, PFCs, SF ₆	168	168	0.002	0.982
1A1	Energy Industries: Solid	N ₂ O	162	162	0.001	0.983
2A3 and 2A4	Limestone and Dolomite Use ^a	CO ₂	148	148	0.001	0.985
1A3c	Railways	CO ₂	134	134	0.001	0.986
1A4	Other Sectors: Peat	CO ₂	131	131	0.001	0.987
4D	Wastewater Treatment and Discharge	CH ₄	128	128	0.001	0.988
4D	Wastewater Treatment and Discharge	N ₂ O	102	102	0.001	0.989
3C1	Biomass Burning	CO ₂	91	91	0.001	0.990
1A2	Manufacturing Industries and Construction: Solid	N ₂ O	90	90	0.001	0.991
1A2	Manufacturing Industries and Construction: Biomass	N ₂ O	81	81	0.001	0.992
1A1	Energy Industries: Biomass	N ₂ O	80	80	0.001	0.992
1B2aii	Oil - Flaring ^b	CO ₂	63	63	0.001	0.993
2F4	Aerosols	HFCs	63	63	0.001	0.994
1A4	Other Sectors: Biomass	N ₂ O	61	61	0.001	0.994
1B2b	Fugitive Emissions from Fuels - Natural gas	CH ₄	52	52	0.000	0.995

TABLE 4.5 (CONTINUED) EXAMPLE OF APPROACH 1 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	GHG	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ -eq)	$L_{x,t}$	Cumulative Total of Column F
1A1	Energy Industries: Gas	N ₂ O	51	51	0.000	0.995
1A3b	Road Transportation	CH ₄	47	47	0.000	0.995
1A4	Other Sectors: Liquid	N ₂ O	47	47	0.000	0.996
1A2	Manufacturing Industries and Construction: Liquid	N ₂ O	41	41	0.000	0.996
2G	Other Product Manufacture and Use	N ₂ O	40	40	0.000	0.997
1A1	Energy Industries: Biomass	CH ₄	31	31	0.000	0.997
1A1	Energy Industries: Liquid	N ₂ O	30	30	0.000	0.997
1A2	Manufacturing Industries and Construction: Peat	N ₂ O	29	29	0.000	0.997
1A4	Other Sectors: Solid	CO ₂	25	25	0.000	0.998
2F2	Foam Blowing Agents	HFCs	25	25	0.000	0.998
2G	Other Product Manufacture and Use	SF ₆	22	22	0.000	0.998
2A3 and 2A4	Soda Ash Use ^a	CO ₂	20	20	0.000	0.998
1A2	Manufacturing Industries and Construction: Gas	N ₂ O	19	19	0.000	0.998
1A2	Manufacturing Industries and Construction: Biomass	CH ₄	19	19	0.000	0.999
1A1	Energy Industries: Solid	CH ₄	16	16	0.000	0.999
1A4	Other Sectors: Liquid	CH ₄	15	15	0.000	0.999
1B2a	Fugitive Emissions from Fuels – Oil	CH ₄	10	10	0.000	0.999
2C1	Iron and Steel Production	CH ₄	9	9	0.000	0.999
1A5	Non-Specified: Liquid	N ₂ O	9	9	0.000	0.999
1A1	Energy Industries: Gas	CH ₄	9	9	0.000	0.999
3C1	Biomass Burning	CH ₄	8	8	0.000	0.999
1A1	Energy Industries: Peat	CH ₄	7	7	0.000	0.999
1A2	Manufacturing Industries and Construction: Liquid	CH ₄	7	7	0.000	0.999
1A1	Energy Industries: Liquid	CH ₄	7	7	0.000	0.999
1A3e	Other Transportation	CH ₄	6	6	0.000	1.000
1A2	Manufacturing Industries and Construction: Gas	CH ₄	6	6	0.000	1.000
3	Miscellaneous	CH ₄	6	6	0.000	1.000
2B8	Petrochemical and Carbon Black Production	CH ₄	5	5	0.000	1.000
1A3e	Other Transportation	N ₂ O	5	5	0.000	1.000
1A3d	Water-Borne Navigation	CH ₄	5	5	0.000	1.000

TABLE 4.5 (CONTINUED) EXAMPLE OF APPROACH 1 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	GHG	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ -eq)	$L_{x,t}$	Cumulative Total of Column F
1A3a	Civil Aviation	N ₂ O	4	4	0.000	1.000
1A3d	Water-Borne Navigation	N ₂ O	4	4	0.000	1.000
4	Miscellaneous	N ₂ O	3	3	0.000	1.000
1A2	Manufacturing Industries and Construction: Peat	CH ₄	3	3	0.000	1.000
1A2	Manufacturing Industries and Construction: Solid	CH ₄	2	2	0.000	1.000
1A5	Non-Specified: Liquid	CH ₄	2	2	0.000	1.000
1A5	Non-Specified: Gas	N ₂ O	2	2	0.000	1.000
1A4	Other Sectors: Peat	N ₂ O	2	2	0.000	1.000
1A4	Other Sectors: Gas	N ₂ O	1	1	0.000	1.000
1A4	Other Sectors: Peat	CH ₄	1	1	0.000	1.000
1A3c	Railways	N ₂ O	1	1	0.000	1.000
3C1	Biomass Burning	N ₂ O	1	1	0.000	1.000
1A4	Other Sectors: Solid	CH ₄	1	1	0.000	1.000
1A5	Non-Specified: Gas	CH ₄	0.4	0.4	0.000	1.000
1A4	Other Sectors: Solid	N ₂ O	0.3	0.3	0.000	1.000
1A3a	Civil Aviation	CH ₄	0.3	0.3	0.000	1.000
1A4	Other Sectors: Gas	CH ₄	0.3	0.3	0.000	1.000
1A3c	Railways	CH ₄	0.2	0.2	0.000	1.000
Total			67 729	110 438	1	
^a Example was based on 2003 inventory of Finland, and therefore glass production could not be separated as recommended in these <i>Guidelines</i> . This does not affect categories identified as <i>key</i> . ^b Example was based on 2003 inventory of Finland, and therefore flaring was separated from other fugitive emissions from oil (1B2a). According to these <i>Guidelines</i> , all emissions under 1B2a should be treated together in key category analysis. This would not affect categories identified as <i>key</i> in this example.						

TABLE 4.6 EXAMPLE OF APPROACH 1 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	Greenhouse Gas	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend Assessment $E_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
3B1a	Forest Land remaining Forest Land	CO ₂	-23 798	-21 354	0.078	0.147	0.147
1A1	Energy Industries: Solid	CO ₂	9 279	17 311	0.042	0.079	0.227
1A3b	Road Transportation	CO ₂	10 800	11 447	0.040	0.076	0.302
1A4	Other Sectors: Liquid	CO ₂	6 714	5 651	0.040	0.075	0.378
1A2	Manufacturing Industries and Construction: Solid	CO ₂	6 410	5 416	0.038	0.072	0.450
3B3a	Grassland Remaining Grassland	CO ₂	-1 071	2 974	0.037	0.069	0.519
1A1	Energy Industries: Peat	CO ₂	3 972	9 047	0.035	0.066	0.585
1A1	Energy Industries: Gas	CO ₂	2 659	6 580	0.029	0.054	0.639
4A	Solid Waste Disposal	CH ₄	3 678	2 497	0.028	0.053	0.692
3C4	Direct N ₂ O Emissions from managed soils	N ₂ O	3 513	2 619	0.024	0.046	0.738
1A2	Manufacturing Industries and Construction: Liquid	CO ₂	4 861	4 736	0.022	0.042	0.780
3B2a	Cropland Remaining Cropland	CO ₂	1 277	211	0.017	0.031	0.811
3A1	Enteric Fermentation	CH ₄	1 868	1 537	0.012	0.022	0.833
2B2	Nitric Acid Production	N ₂ O	1 595	1 396	0.009	0.017	0.849
1A2	Manufacturing Industries and Construction: Gas	CO ₂	2 094	2 174	0.008	0.016	0.865
1A2	Manufacturing Industries and Construction: Peat	CO ₂	1 561	1 498	0.007	0.014	0.879
2A1	Cement Production	CO ₂	786	500	0.006	0.012	0.891
3C2	Liming	CO ₂	618	277	0.006	0.012	0.903
1A1	Energy Industries: Liquid	CO ₂	2 607	3 110	0.006	0.012	0.914
2F1	Refrigeration and Air Conditioning	HFCs, PFCs	0	578	0.006	0.011	0.925
3C5	Indirect N ₂ O Emissions from managed soils	N ₂ O	735	592	0.005	0.009	0.934
3A2	Manure Management	N ₂ O	623	461	0.004	0.008	0.942
1A3b	Road Transportation	N ₂ O	160	516	0.003	0.006	0.948
1A3e	Other Transportation	CO ₂	644	651	0.003	0.005	0.953
3B4ai	Peatlands Remaining Peatlands	CO ₂	503	547	0.002	0.003	0.956
3C1	Biomass Burning	CO ₂	180	91	0.002	0.003	0.959
1A3a	Civil Aviation	CO ₂	320	316	0.001	0.003	0.962
1A3c	Railways	CO ₂	191	134	0.001	0.003	0.965
1B2aii	Flaring ^b	CO ₂	123	63	0.001	0.002	0.967

TABLE 4.6 EXAMPLE OF APPROACH 1 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	Greenhouse Gas	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend Assessment $E_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
2G	Other Product Manufacture and Use	SF ₆	87	22	0.001	0.002	0.969
1A4	Other Sectors: Biomass	CH ₄	282	307	0.001	0.002	0.971
4D	Wastewater Treatment and Discharge	CH ₄	153	128	0.001	0.002	0.973
4D	Wastewater Treatment and Discharge	N ₂ O	133	102	0.001	0.002	0.974
1A4	Other Sectors: Gas	CO ₂	98	225	0.001	0.002	0.976
3A2	Manure Management	CH ₄	215	222	0.001	0.002	0.977
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	640	830	0.001	0.002	0.979
1A3b	Road Transportation	CH ₄	90	47	0.001	0.002	0.981
1A2	Manufacturing Industries and Construction: Biomass	N ₂ O	111	81	0.001	0.002	0.982
2	Miscellaneous	CO ₂ , HFCs, PFCs, SF ₆	68	168	0.001	0.001	0.983
1A1	Energy Industries: Biomass	N ₂ O	10	80	0.001	0.001	0.985
1A2	Manufacturing Industries and Construction: Solid	N ₂ O	108	90	0.001	0.001	0.986
2F4	Aerosols	HFCs	0	63	0.001	0.001	0.987
1A2	Manufacturing Industries and Construction: Peat	N ₂ O	56	29	0.001	0.001	0.988
2G	Other Product Manufacture and Use	N ₂ O	62	40	0.000	0.001	0.989
1A5	Non-Specified: Gas	CO ₂	222	363	0.000	0.001	0.990
1B2b	Fugitive Emissions from Fuels - Natural Gas	CH ₄	4	52	0.000	0.001	0.991
1A4	Other Sectors: Peat	CO ₂	123	131	0.000	0.001	0.992
1A1	Energy Industries: Solid	N ₂ O	85	162	0.000	0.001	0.993
1A5	Non-Specified: Liquid	CO ₂	734	1083	0.000	0.001	0.993
2A2	Lime Production	CO ₂	383	513	0.000	0.001	0.994
1A4	Other Sectors: Liquid	N ₂ O	56	47	0.000	0.001	0.995
1A1	Energy Industries: Biomass	CH ₄	2	31	0.000	0.001	0.995
1A1	Energy Industries: Gas	N ₂ O	18	51	0.000	0.000	0.996
2F2	Foam Blowing Agents	HFCs	0	25	0.000	0.000	0.996
1A1	Energy Industries: Peat	N ₂ O	141	226	0.000	0.000	0.997
1A4	Other Sectors: Solid	CO ₂	33	25	0.000	0.000	0.997
1A4	Other Sectors: Biomass	N ₂ O	56	61	0.000	0.000	0.997
3C1	Biomass Burning	CH ₄	16	8	0.000	0.000	0.998

TABLE 4.6 EXAMPLE OF APPROACH 1 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	Greenhouse Gas	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend Assessment $E_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
1A2	Manufacturing Industries and Construction: Liquid	N ₂ O	39	41	0.000	0.000	0.998
1A4	Other Sectors: Liquid	CH ₄	19	15	0.000	0.000	0.998
1A2	Manufacturing Industries and Construction: Biomass	CH ₄	20	19	0.000	0.000	0.998
4	Miscellaneous	N ₂ O	8	3	0.000	0.000	0.998
2A3 and 2A4	Limestone and Dolomite Use ^a	CO ₂	99	148	0.000	0.000	0.999
1A1	Energy Industries: Liquid	N ₂ O	26	30	0.000	0.000	0.999
1A3d	Water-borne Navigation	CH ₄	8	5	0.000	0.000	0.999
2A3 and 2A4	Soda Ash Use ^a	CO ₂	18	20	0.000	0.000	0.999
1A3d	Water-borne Navigation	CO ₂	361	519	0.000	0.000	0.999
1A2	Manufacturing Industries and Construction: Liquid	CH ₄	9	7	0.000	0.000	0.999
1A2	Manufacturing Industries and Construction: Gas	N ₂ O	17	19	0.000	0.000	0.999
1A1	Energy Industries: Solid	CH ₄	9	16	0.000	0.000	0.999
1A2	Manufacturing Industries and Construction: Solid	CH ₄	4	2	0.000	0.000	0.999
1A1	Energy Industries: Gas	CH ₄	4	9	0.000	0.000	1.000
1A4	Other Sectors: Solid	CH ₄	2	1	0.000	0.000	1.000
1A2	Manufacturing Industries and Construction: Peat	CH ₄	4	3	0.000	0.000	1.000
1A3e	Other Transportation	N ₂ O	5	5	0.000	0.000	1.000
2C1	Iron and Steel Production	CH ₄	5	9	0.000	0.000	1.000
3	Miscellaneous	CH ₄	5	6	0.000	0.000	1.000
1A3a	Civil Aviation	N ₂ O	4	4	0.000	0.000	1.000
3C1	Biomass Burning	N ₂ O	2	1	0.000	0.000	1.000
1A3e	Other Transportation	CH ₄	5	6	0.000	0.000	1.000
1A1	Energy Industries: Liquid	CH ₄	6	7	0.000	0.000	1.000
1B2a	Fugitive Emissions from Fuels - Oil	CH ₄	8	10	0.000	0.000	1.000
1A3c	Railways	N ₂ O	2	1	0.000	0.000	1.000
1A4	Other Sectors: Peat	CH ₄	1	1	0.000	0.000	1.000
1A4	Other Sectors: Gas	N ₂ O	1	1	0.000	0.000	1.000
1A4	Other Sectors: Peat	N ₂ O	1	2	0.000	0.000	1.000

TABLE 4.6 EXAMPLE OF APPROACH 1 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 (with key categories in bold)							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	Greenhouse Gas	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend Assessment $E_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
2B8	Petrochemical and Carbon Black Production	CH ₄	4	5	0.000	0.000	1.000
1A2	Manufacturing Industries and Construction: Gas	CH ₄	5	6	0.000	0.000	1.000
1A4	Other Sectors: Solid	N ₂ O	0.5	0.3	0.000	0.000	1.000
1A1	Energy Industries: Peat	CH ₄	5	7	0.000	0.000	1.000
1A5	Non-Specified: Gas	N ₂ O	1	2	0.000	0.000	1.000
1A3a	Civil Aviation	CH ₄	0.4	0.3	0.000	0.000	1.000
1A3c	Railways	CH ₄	0.2	0.2	0.000	0.000	1.000
1A5	Non-Specified: Liquid	N ₂ O	6	9	0.000	0.000	1.000
1A4	Other Sectors: Gas	CH ₄	0.1	0.3	0.000	0.000	1.000
1A3d	Water-borne Navigation	N ₂ O	3	4	0.000	0.000	1.000
1A5	Non-Specified: Gas	CH ₄	0.3	0.4	0.000	0.000	1.000
1A5	Non-Specified: Liquid	CH ₄	2	2	0.000	0.000	1.000
Total			47 604	67 729	0.531	1	
^a Example was based on 2003 inventory of Finland, and therefore glass production could not be separated as recommended in these <i>Guidelines</i> . This does not affect categories identified as <i>key</i> . ^b Example was based on 2003 inventory of Finland, and therefore flaring was separated from other fugitive emissions from oil (1B2a). According to these <i>Guidelines</i> , all emissions under 1B2a should be treated together in key category analysis. This would not affect categories identified as <i>key</i> in this example.							

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TABLE 4.7 EXAMPLE OF APPROACH 1 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 USING A SUBSET (CO₂ from category 3B was excluded from the analysis). Only key categories are presented.						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	Greenhouse Gas	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ eq)	$L_{x,t}$	Cumulative Total of Column F
1A1	Energy Industries: Solid	CO ₂	17 311	17 311	0.203	0.203
1A3b	Road Transportation	CO ₂	11 447	11 447	0.134	0.337
1A1	Energy Industries: Peat	CO ₂	9 047	9 047	0.106	0.443
1A1	Energy Industries: Gas	CO ₂	6 580	6 580	0.077	0.520
1A4	Other Sectors: Liquid	CO ₂	5 651	5 651	0.066	0.586
1A2	Manufacturing Industries and Construction: Solid	CO ₂	5 416	5 416	0.063	0.650
1A2	Manufacturing Industries and Construction: Liquid	CO ₂	4 736	4 736	0.055	0.705
1A1	Energy Industries: Liquid	CO ₂	3 110	3 110	0.036	0.742
3C4	Direct N ₂ O Emissions from managed soils	N ₂ O	2 619	2 619	0.031	0.772
4A	Solid Waste Disposal	CH ₄	2 497	2 497	0.029	0.802
1A2	Manufacturing Industries and Construction: Gas	CO ₂	2 174	2 174	0.025	0.827
3A1	Enteric Fermentation	CH ₄	1 537	1 537	0.018	0.845
1A2	Manufacturing Industries and Construction: Peat	CO ₂	1 498	1 498	0.018	0.863
2B2	Nitric Acid Production	N ₂ O	1 396	1 396	0.016	0.879
1A5	Non-Specified: Liquid	CO ₂	1 083	1 083	0.013	0.892
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	830	830	0.010	0.901
1A3e	Other Transportation	CO ₂	651	651	0.008	0.909
3C5	Indirect N ₂ O Emissions from Managed Soils	N ₂ O	592	592	0.007	0.916
2F1	Refrigeration and Air Conditioning	HFCs, PFCs	578	578	0.007	0.923
1A3d	Water-borne Navigation	CO ₂	519	519	0.006	0.929
1A3b	Road Transportation	N ₂ O	516	516	0.006	0.935
2A2	Lime Production	CO ₂	513	513	0.006	0.941
2A1	Cement Production	CO ₂	500	500	0.006	0.947
3A2	Manure Management	N ₂ O	461	461	0.005	0.952
.....						
Total			85 352	85 352	1	

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TABLE 4.8 EXAMPLE OF APPROACH 1 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 USING A SUBSET (CO₂ from category 3B was excluded from the analysis). Only key categories are presented.							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	GHG	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend assessment $T_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
1A1	Energy Industries: Solid	CO ₂	9 279	17 311	0.086	0.194	0.194
1A1	Energy Industries: Peat	CO ₂	3 972	9 047	0.060	0.135	0.329
1A1	Energy Industries: Gas	CO ₂	2 659	6 580	0.048	0.107	0.436
1A4	Other Sectors: Liquid	CO ₂	6 714	5 651	0.035	0.078	0.514
1A2	Manufacturing Industries and Construction: Solid	CO ₂	6 410	5 416	0.033	0.074	0.588
4A	Solid Waste Disposal	CH ₄	3 678	2 497	0.028	0.062	0.650
3C4	Direct N ₂ O Emissions from Managed Soils	N ₂ O	3 513	2 619	0.023	0.052	0.702
1A3b	Road Transportation	CO ₂	10 800	11 447	0.023	0.051	0.752
1A2	Manufacturing Industries and Construction: Liquid	CO ₂	4 861	4 736	0.016	0.036	0.788
3A1	Enteric Fermentation	CH ₄	1 868	1 537	0.010	0.023	0.811
2F1	Refrigeration and Air Conditioning	HFCs, PFCs	0	578	0.008	0.018	0.830
2B2	Nitric Acid Production	N ₂ O	1 595	1 396	0.008	0.017	0.846
3C2	Liming	CO ₂	618	277	0.007	0.015	0.861
2A1	Cement Production	CO ₂	786	500	0.006	0.014	0.876
1A2	Manufacturing Industries and Construction: Peat	CO ₂	1 561	1 498	0.005	0.012	0.888
1A2	Manufacturing Industries and Construction: Gas	CO ₂	2 094	2 174	0.005	0.011	0.899
1A3b	Road Transportation	N ₂ O	160	516	0.005	0.010	0.909
3C5	Indirect N ₂ O Emissions from Managed Soils	N ₂ O	735	592	0.004	0.009	0.919
3A2	Manure Management	N ₂ O	623	461	0.004	0.009	0.928
1A5	Non-Specified: Liquid	CO ₂	734	1 083	0.003	0.006	0.934
3C1	Biomass Burning	CO ₂	180	91	0.002	0.004	0.938
1A3e	Other Transportation	CO ₂	644	651	0.002	0.004	0.942
1A4	Other Sectors: Gas	CO ₂	98	225	0.001	0.003	0.946
1A3c	Railways	CO ₂	191	134	0.001	0.003	0.949
1A5	Non-Specified: Gas	CO ₂	222	363	0.001	0.003	0.952
.....							
Total			70 692	85 352	0.445	1	

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TABLE 4.9 EXAMPLE OF APPROACH 2 LEVEL ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 The aggregation level used is country-specific, and does not represent recommended aggregation level. Only <i>key categories</i> are presented.						
A	B	C	D	E	F	G
IPCC Category Code	IPCC Category	GHG	$E_{x,t}$ (Gg CO ₂ -eq)	$ E_{x,t} $ (Gg CO ₂ eq)	$LU_{x,t}$	Cumulative Total of Column F
3B1a	Forest Land Remaining Forest Land: carbon stock change in biomass	CO ₂	-21 354	21 354	0.23	0.23
3C4	Direct N ₂ O Emissions from Managed Soils: Agricultural Soils	N ₂ O	2 608	2 608	0.18	0.41
3B3a	Grassland Remaining Grassland: net carbon stock change in mineral soils	CO ₂	2 907	2 907	0.09	0.50
3C5	Indirect N ₂ O Emissions from Managed Soils	N ₂ O	592	592	0.06	0.56
1A3b	Road Transportation: Cars with Catalytic Converters	N ₂ O	410	410	0.05	0.61
2B2	Nitric Acid Production	N ₂ O	1 396	1 396	0.04	0.66
3B2a	Cropland Remaining Cropland: net carbon stock change in organic soils	CO ₂	1 324	1 324	0.04	0.70
3B4ai	Peatlands Remaining Peatlands	CO ₂	547	547	0.04	0.73
3B2a	Cropland Remaining Cropland: net carbon stock change in mineral soils	CO ₂	-1 113	1 113	0.03	0.77
4A	Solid Waste Disposal	CH ₄	2 497	2 497	0.03	0.80
1A	Fuel Combustion Activities: Liquid	CO ₂	27 640	27 640	0.02	0.82
1A	Fuel Combustion Activities: Solid	CO ₂	22 753	22 753	0.02	0.85
1A	Fuel Combustion Activities: Peat	CO ₂	10 676	10 676	0.02	0.87
3A1	Enteric Fermentation	CH ₄	1 537	1 537	0.01	0.88
1A4	Other Sectors: Biomass	CH ₄	307	307	0.01	0.90
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	830	830	0.01	0.91

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TABLE 4.10 EXAMPLE OF APPROACH 2 TREND ASSESSMENT FOR THE FINNISH GHG INVENTORY FOR 2003 The aggregation level used is country-specific, and does not represent recommended aggregation level. Only <i>key categories</i> are presented.							
A	B	C	D	E	F	G	H
IPCC Category Code	IPCC Category	GHG	$E_{x,0}$ (Gg CO ₂ -eq)	$E_{x,t}$ (Gg CO ₂ -eq)	Trend Assessment with Uncertainty $TU_{x,t}$	% Contribution to Trend	Cumulative Total of Column G
3C4	Direct N ₂ O Emissions from Managed Soils: Agricultural Soils	N ₂ O	3 486	2 608	5.42	0.24	0.24
3B3a	Grassland Remaining Grassland: net carbon stock change in mineral soils	CO ₂	-1 181	2 907	3.62	0.16	0.40
3B1a	Forest Land Remaining Forest Land: carbon stock change in biomass	CO ₂	-23 798	-21 354	2.71	0.12	0.52
3C5	Indirect N ₂ O Emissions from Managed Soils	N ₂ O	735	592	1.54	0.07	0.58
1A3b	Road Transportation: Cars with Catalytic Converters	N ₂ O	32	410	1.45	0.06	0.65
3B2a	Cropland Remaining Cropland: net carbon stock change in organic soils	CO ₂	1 813	1 324	1.21	0.05	0.70
4A	Solid Waste Disposal	CH ₄	3 678	2 497	1.20	0.05	0.75
2B2	Nitric Acid Production	N ₂ O	1 595	1 396	0.89	0.04	0.79
3B2a	Cropland Remaining Cropland: net carbon stock change in mineral soils	CO ₂	-535	-1 113	0.82	0.04	0.83
3B4ai	Peatlands Remaining Peatlands	CO ₂	503	547	0.36	0.02	0.85
3A2	Manure Management	N ₂ O	623	461	0.36	0.02	0.86
3A1	Enteric Fermentation	CH ₄	1 868	1 537	0.35	0.02	0.88
1A	Fuel Combustion Activities: Liquid	CO ₂	27 232	27 640	0.32	0.01	0.89
4D1	Domestic Wastewater Treatment and Discharge: densely populated areas	N ₂ O	84	66	0.20	0.01	0.90

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TABLE 4.11
SUMMARY OF KEY CATEGORY ANALYSIS FOR FINLAND
Quantitative method used: Approach 1 and Approach 2

A	B	C	D	E
IPCC Category Code	IPCC Category	Greenhouse gas	Identification criteria	Comments ^a
1A	Fuel Combustion Activities: Liquid	CO ₂	L2, T2	Aggr
1A	Fuel Combustion Activities: Solid	CO ₂	L2	Aggr
1A	Fuel Combustion Activities: Peat	CO ₂	L2	Aggr
1A1	Energy Industries: Solid	CO ₂	L1, T1	
1A1	Energy Industries: Peat	CO ₂	L1, T1	
1A1	Energy Industries: Gas	CO ₂	L1, T1	
1A1	Energy Industries: Liquid	CO ₂	L1, T1	
1A2	Manufacturing Industries and Construction: Solid	CO ₂	L1, T1	
1A2	Manufacturing Industries and Construction: Liquid	CO ₂	L1, T1	
1A2	Manufacturing Industries and Construction: Gas	CO ₂	L1, T1	
1A2	Manufacturing Industries and Construction: Peat	CO ₂	L1, T1	
1A3b	Road Transportation	CO ₂	L1, T1	
1A3b	Road Transportation	N ₂ O	L1, T1	
1A3b	Road Transportation: Cars with Catalytic Converters	N ₂ O	L2, T2	Aggr
1A3c	Railways	CO ₂		Tsub
1A3d	Water-borne Navigation	CO ₂	L1	
1A3e	Other transportation	CO ₂	L1, T1	
1A4	Other Sectors: Liquid	CO ₂	L1, T1	
1A4	Other Sectors: Gas	CO ₂		Tsub
1A4	Other Sectors: Biomass	CH ₄	L2	
1A5	Non-Specified: Liquid	CO ₂	L1	
1A5	Non-Specified: Gas	CO ₂		Tsub
2A1	Cement Production	CO ₂	T1	
2A2	Lime Production	CO ₂	L1	
2B2	Nitric Acid Production	N ₂ O	L1, L2, T1, T2	
2D	Non-Energy Products from Fuels and Solvent Use	CO ₂	L1, L2	
2F1	Refrigeration and Air Conditioning	HFCs, PFCs	L1, T1	
3A1	Enteric Fermentation	CH ₄	L1, L2, T1, T2	
3A2	Manure Management	N ₂ O	T1, T2	
3B1a	Forest Land Remaining Forest Land	CO ₂	L1, L2, T1, T2	
3B2a	Cropland Remaining Cropland	CO ₂	L2, T1, T2	
3B3a	Grassland Remaining Grassland	CO ₂	L1, T1	
3B3a	Grassland Remaining Grassland: net carbon stock change in mineral soils	CO ₂	L2, T2	Aggr
3B4ai	Peatlands Remaining Peatlands	CO ₂	L1, L2, T2	

TABLE 4.11 SUMMARY OF KEY CATEGORY ANALYSIS FOR FINLAND Quantitative method used: Approach 1 and Approach 2				
A	B	C	D	E
IPCC Category Code	IPCC Category	Greenhouse gas	Identification criteria	Comments^a
3C2	Liming	CO ₂	T1	
3C4	Direct N ₂ O Emissions from Managed Soils	N ₂ O	L1, T1	
3C4	Direct N ₂ O Emissions from Managed Soils: Agricultural Soils	N ₂ O	L2, T2	Aggr
3C5	Indirect N ₂ O Emissions from Managed Soils	N ₂ O	L1, L2, T1, T2	
3C1	Biomass Burning	CO ₂		Tsub
4A	Solid Waste Disposal	CH ₄	L1, L2, T1, T2	
4D1	Domestic Waste Water Treatment and Discharge: densely populated areas	N ₂ O	T2	Aggr
^a Tsub denotes a category that was only identified by trend assessment for a subset without category 3B. Level assessment of the subset did not identify additional categories when compared with Approach 1 analysis of the total inventory. Aggr denotes a category identified by Approach 2, where aggregation level has been different than in Approach 1.				

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