

# HANDBOOK FOR REVIEW OF NATIONAL GHG INVENTORIES

## CHAPTER VII : WASTE SECTOR ISSUES

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## Introduction

1. This section provides introductory information on the Waste sector and a series of tables to guide the reviewer through the technical review of each major source category in the Waste sector. The tables are necessarily detailed reflecting the complexity of estimating and reporting emissions from waste.
2. The guidance is for use by experts during an annual technical review. The overall aim is to help review experts in performing their tasks, avoid duplication of efforts, and promote consistency in the different types of reviews of national greenhouse gas (GHG) inventories (desk, centralized and in-country review teams) for the technical review of GHG inventories. The guidance presented in this document for the review of emissions is independent of which review approach is taken (i.e., desk, centralized or in-country).
3. The guidance presented in the tables in this handbook is not intended as a checklist where the team must complete all the questions but rather as reference manual for the reviewers. Each of the tables and to a large extent the questions may be used independently. Questions relevant for checking cross cutting issues like choice of Tier, uncertainty and QA/QC are provided once in the Chapter III general review tables.
4. The Waste sector comprises three major source categories: Solid Waste Disposal on Land, Wastewater Handling, and Incineration. Each major source category is divided into sub-categories that enable account to be taken of different waste attributes and different waste management characteristics and approaches. Solid Waste Disposal on Land is divided into managed waste disposal on land, and unmanaged waste disposal sites. Wastewater Handling is divided into industrial wastewater, and domestic and commercial wastewater. Incineration is divided into waste of biogenic origin, and waste made up of plastics and other non-biogenic materials. Definitions for each major source category are included in the tables.
5. Although the Waste sector consists of a small number of major source categories, methodologies for estimating greenhouse gas emissions are relatively complex and in some cases default methods are not fully developed in the IPCC Guidelines or IPCC good practice guidance, there is the potential for double counting of emissions due to overlaps with other sectors, and input data generally have large uncertainties (for example, see IPCC good practice guidance, Table 5.2, p.5.12) Several important issues concerning the reporting of emissions from the Waste sector are addressed below with more specific references in the tables.

### Solid Waste Disposal on Land

6. The key parameters for estimating emissions from all Waste sector source categories are the quantity of carbon contained in the waste and the fate and availability of that carbon - in the biodegradation process ( $\text{CH}_4$ ) or the incineration process ( $\text{CO}_2$ ). Most solid waste contains a mixture of biogenic and non-biogenic components, and the carbon in the non-biogenic waste is generally not available in solid waste disposal sites and does not give rise to any emissions. By contrast, when the non-biogenic waste is combusted or incinerated emissions of  $\text{CO}_2$  and  $\text{N}_2\text{O}$  result.
7. The relevant parameters for solid waste are degradable organic carbon (DOC) and the fraction of DOC dissimilated (DOCf). Both the IPCC default method and the First Order Decay (FOD) method require estimates of these parameters as inputs. The IPCC Guidelines provide default values for DOC based on waste type and lists default average values for countries and regions. A single default value of 0.77 for DOCf is provided in the IPCC

Guidelines. The IPCC good practice guidance (p.5.9) points out that 0.77 is appropriate if lignin C is excluded, but a value in the range 0.5-0.6 should be used if lignin C is included. Neither the IPCC Guidelines nor the IPCC good practice guidance give DOCf values based on waste type.

8. When the FOD method is used, the IPCC good practice guidance (p.5.7) states that, “it is usually necessary to include data for 3 to 5 half lives in order to achieve an acceptably accurate rate”. Where data on waste types is unavailable, a default value of fourteen years should be assigned to the half life. This requires an assessment of waste composition, different DOC values for different wastes, and different DOCf values for different wastes. The use of a value for DOCf within the default range will in some cases lead to an overestimate of emissions and in other cases, an underestimate. Where the FOD method is used, the parameter values for DOC and DOCf need to be examined carefully. Indicative values for organic carbon content (DOC) and the biodegradable organic fraction for various wastes are included in Cossu, Andreottola and Muntoni (1996) (see paragraph 104).

9. Moisture content, organic carbon content and biodegradable fraction in different waste components:

Waste component	kg H <sub>2</sub> O/kg wet component	Organic carbon content (kg C/kg dry component)	kg biodegradable C/kg C
Food waste	0.6	0.48	0.8
Yard waste	0.5	0.48	0.7
Paper and cardboard	0.08	0.44	0.5
Plastics and rubber	0.02	0.7	0.0
Textiles	0.1	0.55	0.2
Wood	0.2	0.5	0.5
Glass	0.03	0.0	0.0
Metals	0.03	0.0	0.0

Source: Cossu, R., Andreottola, G. and Muntoni, A. (1996), ‘Modelling Landfill Gas Production’ in Landfilling of Waste: Biogas (1996), Christensen, T.H., Cossu, R. and Stegmann, R. (eds), Chapman & Hall, pp.236-268.

10. In countries where no organized solid waste collection or disposal takes place in rural areas, the population considered should include only the urban population (IPCC Guidelines, Vol.3, p.6.6). Where representative updated national data are available, these data should be used.

### Wastewater Handling

11. Emission estimates for wastewater handling are based on three key parameters, the organic load of the wastewater (measured as either BOD or COD), the maximum methane potential of the organic component of the wastewater, and the methane conversion factor (MCF). The MCF for wastewater is not to be confused with the methane correction factor that is relevant to the adjustment to emissions from solid waste disposal sites dependent on waste management practices. The MCF is an estimate of the fraction of BOD or COD that will ultimately degrade anaerobically (IPCC good practice guidance, p.5.17) and indicates the

extent to which the maximum methane producing potential will be realised in each of the wastewater and sludge handling systems that are used.

12. The MCF that is used is an important indicator of: (i) the extent to which wastewater handling has accounted for the fact that some wastewater is treated aerobically and, (ii) the extent to which wastewater handling has accounted for different sludge disposal practices (IPCC good practice guidance, 5.17). Sludge disposed to landfills should be accounted for under solid waste disposal sites (IPCC good practice guidance, p.5.18; IPCC Guidelines, Vol.3, p.6.21), sludge used in agriculture should be accounted for in the agriculture sector (IPCC good practice guidance, p.5.18), and sludge incinerated or combusted as part of an energy recovery system should be reported in the energy sector (IPCC good practice guidance, p.5.25; IPCC Guidelines, Vol.3, p.6.21). In all cases the MCF needs to be adjusted accordingly to ensure that emissions are not overestimated or double-counted. The allocation of emissions between sectors could create confusion and this emphasises the need for the derivation of the MCF to be explained.

13. In many countries, some industrial wastewater is treated at municipal wastewater treatment plants. If it is released into the domestic sewer system, the emissions should be covered there. Emissions from industrial wastewater should be accounted for in the estimates for domestic and commercial wastewater (IPCC good practice guidance, p.5.19). Activity data for industrial wastewater needs to reflect the proportion that is treated at municipal wastewater treatment plants. Descriptions of the adjustments to industrial wastewater are needed for inventory reviews.

#### Incineration

14. Reporting of emissions from waste incineration distinguishes between emissions from biogenic sources and, plastics and other non-biogenic sources. CO<sub>2</sub> emissions from the source categories Solid Waste Disposal on Land and Incineration should only be included if they derive from non-biological or inorganic waste sources. (Common Reporting Format (CRF) p. 62). CO<sub>2</sub> emissions from biogenic sources are reported but are not included in the totals whereas N<sub>2</sub>O and CH<sub>4</sub> emissions are included in the totals. All emissions from non-biogenic sources are included in the totals. Estimates of stored carbon in the energy sector require adjustment to account for CO<sub>2</sub> emissions from non-biogenic sources. Where the waste is incinerated as part of an energy recovery system, the emissions should be reported in the energy sector (IPCC good practice guidance, p.5.25). Activity data needs to be disaggregated into biogenic and non-biogenic waste with these wastes allocated between incineration as a disposal option and incineration as part of an energy recovery system.

#### Conclusions

15. The availability of waste management infrastructure, waste management policies and environmental regulations are significant determinants of emissions from waste. In developed countries, it is expected that the majority of the population would be served by managed waste disposal sites, wastewater treatment plants and waste incinerators. The majority of waste generated in developed countries should be explicitly accounted for in the inventory. Dependent on the emphasis of waste management policies, the allocation of waste between management options is expected to alter the distribution of GHGs emitted between categories. For example, in some countries policies emphasise the withdrawal of organic waste from solid waste disposal sites and diverting this waste to composting whereas in other countries there is a greater emphasis on incineration as a waste management option. Where CH<sub>4</sub> is generated, energy recovery has become increasingly important. In developing countries and

EITs, as economic conditions improve it is expected that infrastructure development will lead to more active management of the waste generated.

16. Methane recovery from landfill gas collection systems offers a significant potential for subtractions from gross emissions. Methane recovery is the amount of CH<sub>4</sub> generated at solid waste disposal sites that is recovered and burned in a flare or energy recovery device.

**Table 6.A.1: Managed Waste Disposal on Land**

Source category		6.A.1 Managed Waste Disposal on Land - Overview	
<b>Definition</b>		Includes solid waste disposal sites that are actively managed and controlled either by municipal authorities, contractors to municipal authorities, or private sector landfill disposal. Includes municipal solid waste comprising solid waste generated by households, solid waste generated by commercial operators (cafes, restaurants, supermarkets, etc.), solid waste generated by municipal (local government) operations, and industrial organic solid waste.	
<b>Potential Key Issues:</b>		Transparency of allocation of waste between managed and unmanaged sites. Derivation of emission estimates for CO <sub>2</sub> . Estimates of methane recovery. Clear specification of the methodology used, method parameters, and source of activity data. Consistency in the time series.	
<b>General References</b>		IPCC Guidelines: Workbook (Vol. 2; pp.6.1-6.10) and Reference Manual (Vol. 3; pp.6.2-6.13 ). IPCC good practice guidance (GPG), pp.5.5-5.13.	
Source Category		6.A.1 Managed Waste Disposal on Land - Details	
Detailed Review Element	GHG	Questions	Elaboration/Clarification
Methodology- General	CH <sub>4</sub>	Is the same method used for all managed solid waste disposal sites in the category?	The two methods for estimating emissions, IPCC default and FOD, can yield quite different estimates. Each time series should be derived from the same method (IPCC GPG, p.5.10).
		Are the method parameters specified?	Different methods can be used for different sub-categories of sites but this must be documented.
		Are the sources of the method parameters clearly specified?	Note that the IPCC Guidelines do not classify methodological tiers for the Waste Sector. Methodological tiers are defined in the IPCC good practice guidance (Chap.5, sect. 5.1.1.1).
		Is the fraction of MSW disposed to managed sites consistent with other information on waste disposal provided?	If the IPCC default method is used, the Party's estimate should be reproducible from the additional information provided.  An explanation of the fate of any wastes disposed of in unmanaged sites assists in understanding overall waste management practices and emission sources.
		Does the oxidation factor differ from the IPCC default value? If the value is different, is an explanation provided?	Oxidation factors different from zero for other than well-managed sites where 0.1 is reasonable require an explanation (IPCC GPG, p.5.10).
Methodology- FOD	CH <sub>4</sub>	If the FOD method is used, are several half-lives and k	If a FOD method is used, refer to the documentation box for summary explanation

		values specified? Are the k values consistent with the half-lives specified?	and the Party's NIR for more detailed explanation. Achievement of acceptably accurate results requires data on waste composition and specification of different half-lives for different components of the waste stream (IPCC GPG, p.5.7). Time-lags summarised as half-lives and k values should be reported in the additional information table. Reported k values can be checked with $k=\ln 2/t_{1/2}$ where $t_{1/2}$ is the half life (IPCC GPG, p.5.7). A default k value of 0.05 is provided in the IPCC GPG, p.5.7.
Methodology- MCF	CH <sub>4</sub>	Is the reported MCF consistent with the characterisation as managed waste disposal?	The MCF used for managed waste disposal is generally accepted to be 1 (IPCC Guidelines, p.6.8; IPCC GPG, p.5.9). If the MCF is less than 1, an explanation is required. Composting, a mainly aerobic process, is an example of carefully managed waste disposal on land where the MCF would be less than 1.
Degradable Organic Carbon (DOC)	CH <sub>4</sub>	<p>Is the DOC value a default value or country specific?</p> <p>If a default value is used, is the value for that country or region, or for a similar country or region?</p> <p>If the default value used is for a similar country or region, is an explanation of the similarities provided?</p> <p>If a country specific DOC value is used, are the survey data and sampling results reported?</p>	<p>Ensure that DOC is not confused with DOC<sub>f</sub>.</p> <p>Default values for DOC are provided in the IPCC Guidelines. Reported values for DOC are expected to be within the range of values in the IPCC Guidelines (Vol. 3, Table 6-1, pp.6.6-6.7). Average values outside this range need to be explained.</p> <p>Where a default value is not provided for a country or region, it is acceptable to use a default value for a similar country or region, and the reason for the choice of default needs to be explained. Default DOC values for countries and regions are provided in the IPCC Guidelines, Table 6-1.</p>
Degradable Organic Carbon (DOC) and FOD	CH <sub>4</sub>	If the FOD method is used, are different DOC values used for different half-lives?	Note that DOC is used in calculating the methane generation potential used in FOD methods. Wastes with different half-lives will have different DOC values. DOC values for different waste types are specified in the IPCC Guidelines (Vol.3, Table 6-3). Indicative values for different waste types are shown in note 1 below.

Fraction dissimilated DOC (DOC <sub>f</sub> )	CH <sub>4</sub>	<p>Is the value for DOC<sub>f</sub> a default value or country specific value?</p> <p>Have different DOC<sub>f</sub> values been used for wastes with different half-lives?</p> <p>If different DOC<sub>f</sub> values have been used, is the source of these values clearly specified?</p>	<p>Ensure that DOC<sub>f</sub> is not confused with DOC.</p> <p>If lignin C is <b>included</b> in DOC the preferred value for DOC<sub>f</sub> is within the range 0.5 to 0.6 (IPCC GPG, Chap. 5, p.5.9).</p> <p>If lignin C is <b>not included</b> in DOC, the IPCC Guidelines default value of 0.77 is reasonable (IPCC GPG, Chap.5, p.5.9).</p> <p>Where lignin C is included in DOC, Parties implementing the IPCC GPG should recalculate the full time series using the revised value for DOC<sub>f</sub>.</p> <p>Unlike DOC, country or region specific default values are not provided in the IPCC Guidelines or the IPCC GPG.</p> <p>Note that DOC<sub>f</sub> is used in calculating the methane generation potential used in FOD models.</p>
Methodology- General	CO <sub>2</sub>	<p>Is any information provided on the composition of the non-biogenic material that is combusted?</p>	<p>CO<sub>2</sub> emissions are reported if combustion is used as a management practice at solid waste disposal sites. CO<sub>2</sub> emissions from non-biogenic sources are included in the totals.</p> <p>Information on the composition of non-biogenic waste will assist in determining whether there has been double counting between sectors if the C is fossil-fuel derived (for example, waste oil, plastics).</p> <p>Refer to CRF Table Summary 3 for summary information on the methodology used.</p> <p>Refer to the documentation box for summary explanation and the Party's NIR for more detailed explanation.</p>
Activity Data	All	<p>Do the activity data relate to the total population or the urban population?</p> <p>If the activity data are default, does the default relate to that country or region?</p> <p>If the activity data default does not relate to that country or region, are the reasons for the choice explained?</p>	<p>The main reference for information on activity data is the NIR (estimated, survey data, type of survey, frequency of collection).</p> <p>Where a default value is not provided for a country or region, it is acceptable to use a default value for a similar country or region (IPCC GPG, p.5.8). Default values are provided in the IPCC Guidelines (Vol.3, Table 6-1, pp.6.6-6.7). The reason for the choice of default needs to be explained (e.g. similar geography, population density, etc – see IPCC GPG, p.5.8).</p> <p>Note that the default values provided for developing countries and EITs do not</p>



		<p>If the activity data are country specific, are the data derived from a survey? What type of survey is used (mail, telephone, e-mail, etc.) and by whom is the survey conducted?</p> <p>If the data are obtained from a survey, are all managed sites included or a sample only?</p> <p>Is any information provided on the frequency of data collection?</p> <p>If data are not collected each year, how are the data adjusted during years when surveys are not conducted?</p>	<p>include the rural population (IPCC Guidelines, Vol.3, p.6.6).</p> <p>Note that explicit account does not need to be taken of closed sites because both methods depend on yearly waste disposal. Waste present in closed sites should have been accounted for (IPCC GPG, p.5.10).</p>
Completeness	All	<p>Are all managed waste disposal sites included?</p> <p>Are any industrial sites included?</p> <p>Is methane recovered reported?</p> <p>Are any sources included that should not be included?</p>	<p>Data on industrial sites can be difficult to obtain due to confidentiality or other reasons. Therefore data sources need to be documented</p> <p>Sludge from wastewater handling is often disposed of to solid waste sites. Emissions from this sludge should be included under this category and not 6.B Wastewater Handling (IPCC GPG; p.5.18).</p>
Recalculations/ Consistent time series	All	<p>Are the recalculations due to a change in method, a change in parameter values, or a change in allocation of a source?</p> <p>If the recalculations are due to a change in method, has the full time series been recalculated?</p> <p>If the recalculations are due to a change in parameter values, does this change affect the full time series?</p> <p>If the recalculations are due to a change in allocation, does this change affect the full time series?</p>	<p>If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.</p> <p>If there has been a change to the method (from IPCC default to FOD), estimates should be recalculated for all years in the time series (IPCC GPG, p.5.10).</p> <p>The differences between the IPCC default method and FOD method mean that the methods should not be mixed (IPCC GPG, p.5.10).</p>

Uncertainty	All	<p>Has any qualitative and/or quantitative assessment of uncertainty been reported?</p> <p>What gases are included in the uncertainty analysis? Priority needs to be given to the gas that contributes the majority of emissions from the source.</p> <p>Are the uncertainties used in the analysis based on expert judgment, sampling and empirical analysis, or uncertainty ranges for other countries or regions?</p>	<p>Refer to the NIR for explanations of qualitative and/ or quantitative assessments of uncertainty and explanations.</p> <p>Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC GPG. See IPCC GPG, Chap. 6, for explanations of quantitative uncertainty analysis.</p> <p>Default uncertainty ranges are provided in the IPCC GPG (p.5.12).</p>
Reporting and documentation	All	<p>Does the documentation explain the allocation of waste between managed sites, unmanaged sites and incineration?</p> <p>Does the documentation indicate whether model parameters are subjected to periodic reviews?</p> <p>If the FOD method is used, are historical data on waste quantities and composition documented?</p>	<p>All country specific references relevant to the inventory should be available. It should be possible to reproduce the inventory from the documentation provided.</p> <p>Documentation of changes over time in model parameters is essential to the assessment of changes in emissions over time.</p>
QA/QC	All	<p>Have different methods to estimate emissions been used to enable comparison of results and identification of discrepancies?</p> <p>Are activity data changes over time consistent with national waste management policies?</p> <p>Has the data obtained from primary sources (e.g., surveys) been consistently evaluated with regards to data obtained from secondary sources?</p> <p>Have activity data been compared to countries or regions with similar national circumstances?</p>	<p>The IPCC Default method assumes that all potential CH<sub>4</sub> is released in the year the waste is disposed of (IPCC GPG, p.5.5). All other things equal, estimates from the IPCC default method will be higher than those from the FOD method.</p> <p>National waste management policies can lead to significant changes in the quantity and composition of waste disposed of at managed sites.</p>

**Table 6.A.2: Unmanaged Waste Disposal on Land: Overview**

Source category		6.A.2 Unmanaged Waste Disposal on Land	
Definition	Includes solid waste disposal sites that are not actively managed and controlled. These comprise unmanaged-deep solid waste disposal sites (≥5metres waste) and unmanaged-shallow solid waste disposal sites (<5metres waste). The depth of the waste disposal site determines the methane correction factor that reflects the lower methane generating potential of unmanaged sites.		
Potential Key Issues:	Transparency of allocation of waste between managed and unmanaged sites. Derivation of emission estimates for CO <sub>2</sub> . Reporting of estimates of methane recovery and documentation of data sources. Clear specification of the methodology used, method parameters, and source of activity data. Mixing of methods in a single time series.		
General References	IPCC Guidelines: Workbook (Vol. 2; pp.6.1-6.10) and Reference Manual (Vol. 3; pp.6.2-6.13 ). IPCC good practice guidance (GPG), pp.5.5-5.13.		
Source category		6.A.2 Unmanaged Waste Disposal on Land - Details	
Detailed Review Element	GHG	Questions	Elaboration/Clarification
Methodology-General	CH <sub>4</sub>	Are unmanaged sites categorised? Is the same method used for all unmanaged sites?	The two methods (IPCC Default and FOD) for estimating emissions can yield quite different estimates. Each time series should be derived from the same method (IPCC GPG, p.5.10).
		If different methods are used for different categories, are reasons provided?	Different methods can be used for different sub-categories of sites but this must be documented.
		Are the method parameters specified? Are the sources of the method parameters clearly specified?	Note that the IPCC Guidelines do not classify methodological tiers for the Waste Sector. Methodological tiers are defined in the IPCC good practice guidance (Chap.5, sect. 5.1.1.1).
			Refer to CRF Table Summary 3 for summary information on the methodology used.
			If the IPCC default method is used, the Party’s estimate should be reproducible from the additional information provided.
	Is the fraction of MSW disposed to unmanaged sites consistent with other information on waste disposal provided?	The fraction of waste disposed to unmanaged sites should be consistent with the fractions disposed to managed sites and/or incinerated.	
	Is the reported MCF consistent with the characterisation as unmanaged waste disposal? Does the oxidation factor differ from the IPCC default value? If the value is different, is an explanation provided?	The MCF used for unmanaged waste disposal is dependent on the depth of the site (IPCC Guidelines, p.6.8; IPCC GPG, p.5.9). Deep sites have a MCF of 0.8, shallow sites 0.4, and uncategorised sites 0.6. An explanation is required if different values are used. Oxidation factors different from zero for unmanaged sites require an explanation	

			(IPCC GPG, p.5.10).
Methodology-FOD	CH <sub>4</sub>	If the FOD method is used, are several half-lives and k values specified? Are the k values consistent with the half-lives specified?	If a FOD method is used refer to the documentation box for summary explanation and the Party's NIR for more detailed explanation. Achievement of acceptably accurate results requires data on waste composition and specification of different half-lives for different components of the waste stream (IPCC GPG, p.5.7). Time-lags summarised as half-lives and k values should be reported in the additional information table. Reported k values can be checked with $k=\ln 2/t_{1/2}$ where $t_{1/2}$ is the half life (IPCC GPG, p.5.7). A default k value of 0.05 can be used where composition data are unavailable (IPCC GPG, p.5.7).
Degradable Organic Carbon (DOC)	CH <sub>4</sub>	<p>Is the DOC value a default value or country specific?</p> <p>If a default value is used, is the value for that country or region, or for a similar country or region?</p> <p>If the default value used is for a similar country or region, is an explanation of the similarities provided?</p> <p>If a country specific DOC value is used, are the survey data and sampling results reported?</p> <p>If the FOD method is used, are different DOC values used for different half-lives?</p>	<p>Ensure that DOC is not confused with DOC<sub>f</sub>.</p> <p>Default values for DOC are provided in the IPCC Guidelines. Reported values for DOC are expected to be within the range of values in the IPCC Guidelines (Vol. 3, pp.6.6-6.7). Average values outside this range need to be explained.</p> <p>Where a default value is not provided for a country or region, it is acceptable to use a default value for a similar country or region, and the reason for the choice of default needs to be explained.</p> <p>Default DOC values for countries and regions are provided in the IPCC Guidelines, Table 6-1.</p> <p>Note that DOC is used in calculating the methane generation potential used in FOD methods.</p> <p>Wastes with different half-lives will have different DOC values. DOC values for different waste types are specified in the IPCC Guidelines (Vol.3, Table 6-3). Indicative values for different waste types are shown in note 1 above.</p>
Fraction dissimilated DOC (DOC <sub>f</sub> )	CH <sub>4</sub>	<p>Is the value for DOC<sub>f</sub> a default value or country specific value?</p> <p>Have different DOC<sub>f</sub> values been used for wastes with different half-lives?</p>	<p>Ensure that DOC<sub>f</sub> is not confused with DOC.</p> <p>If lignin C is <b>included</b> in DOC the preferred value for DOC<sub>f</sub> is within the range 0.5 to 0.6 (IPCC GPG, Chap. 5, p.5.9).</p>

		<p>If different <math>DOC_f</math> values have been used, is the source of these values clearly specified?</p>	<p>If lignin C is <b>not included</b> in DOC, the IPCC1996 Revised Guidelines default value of 0.77 is reasonable (IPCC GPG, Chap.5, p.5.9).</p> <p>Where lignin C is included in DOC, Parties implementing the IPCC GPG should recalculate the full time series using the revised value for <math>DOC_f</math>.</p> <p>Unlike DOC, country or region specific default values for <math>DOC_f</math> are not provided in the IPCC Guidelines or the IPCC GPG.</p> <p>Note that <math>DOC_f</math> is used in calculating the methane generation potential used in FOD models.</p>
Methodology-General	CO <sub>2</sub>	<p>Is any information provided on the composition of the non-biogenic material that is burned in unmanaged sites?</p>	<p>CO<sub>2</sub> emissions from non-biogenic sources are included in the totals.</p> <p>Information on the composition of non-biogenic waste will assist in determining whether there has been double counting between sectors if the C is fossil-fuel derived (for example, waste oil, plastics).</p> <p>Refer to CRF Table Summary 3 for summary information on the methodology used.</p> <p>Refer to the documentation box for summary explanation and the Party's NIR for more detailed explanation.</p>
Activity Data	All	<p>Do the activity data relate to the total population or the urban population?</p> <p>If the activity data are default, does the default relate to that country or region?</p> <p>If the activity data default does not relate to that country or region, are the reasons for the choice explained?</p> <p>If the activity data are country specific, are the data derived from a survey?</p> <p>What type of survey is used (mail, telephone, e-mail, etc.) and by whom is the survey conducted?</p>	<p>The main reference for information on activity data is the NIR (estimated, survey data, type of survey, frequency of collection).</p> <p>Where a default value is not provided for a country or region, it is acceptable to use a default value for a similar country or region (IPCC GPG, p.5.8). Default values are provided in the IPCC Guidelines (Table 6-1, pp.6.6-6.7). The reason for the choice of default needs to be explained (e.g. similar geography, population density, etc – see IPCC GPG, p.5.8).</p> <p>Note that the default values provided for developing countries and EITs do not include the rural population (IPCC Guidelines, Vol.3, p.6.6).</p>

		<p>If the data are obtained from a survey, are all unmanaged sites included or a sample only?</p> <p>Is any information provided on the frequency of data collection?</p> <p>If data are not collected each year, how are the data adjusted during years when surveys are not conducted?</p>	
Completeness	All	<p>Are all unmanaged waste disposal sites included?</p> <p>Are any industrial sites included?</p> <p>Is methane recovered reported?</p> <p>Are any sources included that should not be included?</p>	<p>Data on industrial sites can be difficult to obtain due to confidentiality or other reasons. Therefore data sources need to be documented.</p> <p>Sludge from wastewater handling is often disposed of to solid waste sites. Emissions from this sludge should be included under this category and not 6.B Wastewater Handling (IPCC GPG; p.5.18).</p>
Recalculations/ Consistent time series	All	<p>Are the recalculations due to a change in method, a change in parameter values, or a change in allocation of a source?</p> <p>If the recalculations are due to a change in method, has the time series been recalculated?</p> <p>If the recalculations are due to a change in allocation, does this change affect the full time series?</p>	<p>If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.</p> <p>If there has been a change to the method (from IPCC default to FOD), estimates should be recalculated for all years in the time series (IPCC GPG, p.5.10).</p>
Uncertainty	All	<p>Has any qualitative and/or quantitative assessment of uncertainty been reported?</p> <p>What gases are included in the uncertainty analysis? Priority needs to be given to the gas that contributes the majority of emissions from the source.</p> <p>Are the uncertainties used in the analysis based on expert judgment, sampling and empirical analysis, or uncertainty ranges for other countries or regions?</p>	<p>Refer to the NIR for explanations of qualitative and/ or quantitative assessments of uncertainty and explanations.</p> <p>Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC GPG. See IPCC GPG, Chap. 6, for explanations of quantitative uncertainty analysis.</p> <p>Default uncertainty ranges are provided in the IPCC GPG (p.5.12).</p>

Reporting and documentation	All	<p>Does the documentation explain the allocation of waste between managed sites, unmanaged sites and incineration?</p> <p>Does the documentation indicate whether model parameters are subjected to periodic reviews?</p> <p>If the FOD method is used, are historical data on waste quantities and composition documented?</p>	All country specific references relevant to the inventory should be available. It should be possible to reproduce the inventory from the documentation provided.
QA/QC	All	<p>Have different methods to estimate emissions been used to enable comparison of results and identification of discrepancies?</p> <p>Are activity data changes over time consistent with national waste management policies?</p> <p>Are data obtained from primary sources (surveys) consistent with what is expected based on secondary sources?</p> <p>Are activity data similar to countries or regions with similar national circumstances?</p>	<p>The IPCC Default method assumes that all potential CH<sub>4</sub> is released in the year the waste is disposed of (IPCC GPG, p.5.5). All other things equal, estimates from the IPCC default method will be higher than those from the FOD method.</p> <p>National waste management policies can lead to significant changes in the quantity and composition of waste disposed of at managed sites.</p>

**Table 6.B.1: Industrial Wastewater**

Source category		6.B.1 Industrial Wastewater - Overview	
<b>Definition</b>		Includes wastewater streams generated by industry in the production process (food and beverages, paper and pulp, textiles, petrochemicals, etc.) and treated on-site by the relevant industry. It does not include emissions from industrial wastewater released into municipal sewerage systems and treated at municipal wastewater treatment plants.	
<b>Potential Key Issues:</b>		<p>Explanation of emission estimates for N<sub>2</sub>O.</p> <p>Reporting of estimates of methane recovery.</p> <p>Source of activity data and awareness of the possibility of double counting emissions from industrial wastewater due to some industrial wastewater being released into municipal sewerage systems and accounted for under 6.B.2 Domestic and Commercial Wastewater.</p> <p>Derivation of CH<sub>4</sub> conversion factors that account for different sludge disposal methods.</p> <p>Overestimation of CH<sub>4</sub> emissions as a result of the incineration of sludge.</p> <p>Sludge incinerated as part of energy recovery should be included in the energy sector.</p>	
<b>General References</b>		<p>IPCC Guidelines: Workbook (Vol. 2; pp.6.11-6.22) and Reference Manual (Vol. 3; pp.6.13-6.27).</p> <p>IPCC good practice guidance (GPG), pp.5.19-5.23.</p>	
Source category		6.B.1 Industrial Wastewater - Details	
<b>Detailed Review Element</b>	<b>GHG</b>	<b>Questions</b>	<b>Elaboration/Clarification</b>
Methodology	CH <sub>4</sub>	<p>Are the method parameters specified?</p> <p>Are the sources of the method parameters clearly specified?</p>	<p>The method in simplified form comprises an emission factor multiplied by the total organic waste from which is subtracted methane recovered.</p> <p>Development of emission factors and activity data introduces greater complexity to the estimation.</p> <p>The IPCC methodology requires the development of an emission factor and activity data for each industrial wastewater stream based on the industry of origin. The IPCC Guidelines (Table 6-6, p.6.24) and IPCC GPG (Table 5.4, p.5.22) provide industry-specific default values for organic loads and the quantity of wastewater per unit of output.</p>
	N <sub>2</sub> O	<p>Are the method parameters specified?</p> <p>Are the sources of the method parameters clearly specified?</p>	<p>There is no method for estimating emissions from industrial wastewater provided in the IPCC Guidelines or IPCC GPG.</p> <p>In respect of human sewage disposal, the IPCC good practice guidance notes the requirement for further work in this area (p.5.14).</p> <p>Note that the default method for estimating N<sub>2</sub>O emissions from human sewage is based on per capita protein consumption. This method cannot be applied to industrial wastewater.</p> <p>If N<sub>2</sub>O emissions are estimated, a detailed</p>



			explanation of the method should be provided.
Emission Factor	CH <sub>4</sub>	<p>Have different emission factors been used for each wastewater stream?</p> <p>Are the emission factors default values or country specific?</p> <p>If the emission factors are country specific, is an explanation of the derivation of the maximum methane producing capacity and methane conversion factor provided?</p> <p>If a country specific average value for all industrial wastewater is used, is the derivation of the value explained?</p> <p>Do the MCFs take account of different sludge disposal practices?</p> <p>Are the emission factors expressed as per unit of BOD or per unit of COD?</p>	<p>The organic loads for industrial wastewater are usually expressed as COD.</p> <p>Default values are provided in the IPCC Guidelines (Vol.3, pp.6.24-6.26) and additional explanation is provided in the IPCC GPG (pp.5.21-5.22).</p>
Activity Data	All	<p>Is the activity data obtained from national statistics, or a survey of relevant industries?</p> <p>Is the activity data based on measured or estimated wastewater flows for each industry, or is it based on production multiplied by the average quantity of wastewater generated per unit of output?</p> <p>Are the industries with the largest potential wastewater CH<sub>4</sub> emissions included?</p>	<p>It is sensible to focus on those industries that are likely to contribute the majority of emissions (IPCC GPG, p.5.21).</p> <p>The main reference for information on activity data is the NIR</p>
Completeness	All	<p>Are all major industrial sources included?</p> <p>Is methane recovered that is reported based on data for each industrial source, or based on an average value applied to total CH<sub>4</sub> generated by industry?</p>	<p>Data availability for industrial wastewater might be difficult to obtain. Industrial sources should be assessed to ensure that the most significant sources are included (IPCC GPG, p.5.21).</p>
Recalculations/ Consistent time	All	Have there been any changes to industry definitions used	From time to time, national statistical agencies change the definition and coverage of industry

series		<p>by the national statistical agency?</p> <p>Has this reduced or increased the coverage of the inventory?</p> <p>If there have been definitional changes, has the time series been recalculated to reflect the changes?</p> <p>Have there been any changes to the maximum CH<sub>4</sub> potential or CH<sub>4</sub> conversion factor?</p>	<p>classifications. Where estimates are based on output data obtained from national statistics, recalculations could be required to account for changes.</p> <p>If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.</p>
Uncertainty	All	<p>Has any qualitative and/or quantitative assessment of uncertainty been reported?</p> <p>What gases are included in the uncertainty analysis? Priority needs to be given to the gas that contributes the majority of emissions from the source.</p> <p>Are the uncertainties used in the analysis based on expert judgment, sampling and empirical analysis, or uncertainty ranges for other countries or regions?</p>	<p>Refer to the NIR for quantitative assessments of uncertainty and explanations on the implementation of the IPCC good practice guidance.</p> <p>Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC GPG. See IPCC GPG, Chap. 6, for explanations of quantitative uncertainty analysis.</p> <p>Default uncertainty ranges are provided in the IPCC GPG (p.5.19).</p>
Reporting and documentation		<p>Has default data used in developing parameter values been provided?</p> <p>Are all country specific references relevant to the inventory available?</p>	<p>References noted in the NIR should be available to the reviewer.</p> <p>Data used in the development of parameter values such as the emission factor which depends on the maximum CH<sub>4</sub> potential and MCF for each industry should be documented.</p>
QA/QC		<p>Have primary datasets on industrial wastewater been compared with secondary datasets?</p> <p>Have MCFs been compared with other countries with similar wastewater handling practices?</p> <p>Have country-specific values been compared with IPCC defaults?</p>	<p>There are no IPCC defaults for the MCF. Comparisons with other countries assist in validating the factor used.</p> <p>Large discrepancies between country-specific values and IPCC defaults require explanation.</p>

**Table 6.B.2: Domestic and Commercial Wastewater**

Source category		6.B.2 Domestic and Commercial Wastewater - Overview	
<b>Definition</b>		Includes wastewater generated by households (domestic wastewater) and cafes, restaurants, hotels, offices, etc, and industrial wastewater that is released into the municipal sewerage system.	
<b>Potential Key Issues:</b>		<p>Explanation of emission estimates for N<sub>2</sub>O.</p> <p>Reporting of estimates of methane recovery.</p> <p>Derivation of CH<sub>4</sub> conversion factors that account for different sludge disposal methods.</p> <p>Overestimation of CH<sub>4</sub> emissions as a result of the incineration of sludge.</p> <p>Sludge incinerated as part of energy recovery should be included in the energy sector.</p> <p>Possible double counting of some emissions from industrial wastewater treated at municipal wastewater treatment plants.</p>	
<b>General References</b>		<p>IPCC Guidelines: Workbook (Vol. 2; pp.6.11-6.15) and Reference Manual (Vol. 3; pp.6.13-6.23).</p> <p>IPCC good practice guidance (GPG), pp.5.14-5.19.</p>	
Source category		6.B.2 Domestic and Commercial Wastewater – Details	
<b>Detailed Review Element</b>	<b>GHG</b>	<b>Questions</b>	<b>Elaboration/Clarification</b>
Methodology	CH <sub>4</sub>	<p>Are the method parameters specified?</p> <p>Are the sources of the method parameters clearly specified?</p>	<p>The method in simplified form comprises an emission factor multiplied by the total organic waste from which is subtracted methane recovered.</p> <p>Country specific methods or models can be used.</p> <p>Refer to Table Summary 3 for summary information on the methodology used.</p> <p>Refer to the documentation box for summary explanation and the Party's NIR for more detailed explanation.</p>
Emission Factor	CH <sub>4</sub>	<p>Is the emission factor expressed as per unit of BOD or per unit of COD?</p> <p>Is the MCF derived from an assessment of all treatment processes to obtain a weighted average MCF?</p> <p>Does the MCF take account of different sludge disposal practices?</p>	<p>The emission factor is derived from the maximum CH<sub>4</sub> potential multiplied by a weighted average CH<sub>4</sub> conversion factor (MCF).</p> <p>The organic loads for domestic and commercial wastewater are usually expressed as BOD. The same units should be used either BOD or COD.</p> <p>Default BOD and COD values are provided in the IPCC Guidelines (vol.3, sect. 6.3) and additional explanation is provided in the IPCC GPG (sect. 5.2, p.5.17).</p> <p>The derivation of the MCF should be explained (IPCC GPG, p.5.17).</p> <p>Refer to the NIR for information on country specific values.</p>

Activity Data	All	<p>Does the activity data include the total population or the urban population only?</p> <p>If the urban population only is included is this because of a lack of data or because in rural areas waste degrades aerobically?</p> <p>Is data collected each year from all treatment plants, estimated from data collected from a sample of plants, or estimated using population multiplied by an estimate of waste generated per person?</p>	<p>In rural areas in some countries significant amounts of waste degrade aerobically in which case the urban population only should be used to estimate total organic waste (IPCC GPG, p.5.19).</p> <p>The main reference for information on activity data is the NIR.</p>
Completeness	All	<p>Is methane recovered reported?</p> <p>Are any sources omitted from the estimates?</p> <p>Are estimates for sludge reported separately or included in total wastewater?</p>	<p>The IPCC method does not allow for the inclusion of latrines, river discharge, sewer lines and septic tanks (IPCC GPG, p.5.17).</p> <p>In most countries sludge is rarely collected separately (IPCC GPG, p.5.18).</p>
Recalculations/ Consistent time series	All	<p>Have parameter changes or data improvements resulted in recalculations?</p>	<p>If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.</p>
Uncertainty	All	<p>Has any qualitative and/or quantitative assessment of uncertainty been reported?</p> <p>What gases are included in the uncertainty analysis? Priority needs to be given to the gas that contributes the majority of emissions from the source.</p> <p>Are the uncertainties used in the analysis based on default values, expert judgment, sampling and empirical analysis, or uncertainty ranges for other countries or regions?</p>	<p>Refer to the NIR for quantitative assessments of uncertainty and explanations on the implementation of the IPCC good practice guidance.</p> <p>Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC GPG. See IPCC GPG, Chap. 6, for explanations of quantitative uncertainty analysis.</p> <p>Default uncertainty ranges are provided in the IPCC GPG (p.5.23).</p>

Reporting and documentation		<p>Has default data used in developing parameter values been provided?</p> <p>Are all country specific references relevant to the inventory available?</p>	<p>References noted in the NIR should be available to the reviewer.</p> <p>Data used in the development of parameter values such as the emission factor which depends on the maximum CH<sub>4</sub> potential and weighted MCF should be documented.</p>
QA/QC		<p>Has the “check method” been used to evaluate emission estimates obtained from the method used?</p> <p>Have MCFs been compared with other countries with similar wastewater handling practices?</p> <p>Have country-specific values been compared with IPCC defaults?</p>	<p>A method is provided in the IPCC GPG (p.5.16) to check emission estimates.</p> <p>There are no IPCC defaults for the MCF. Comparisons with other countries assist in validating the factor used.</p> <p>Large discrepancies between country-specific values and IPCC defaults require explanation.</p>
Methodology	N <sub>2</sub> O	<p>Are the method parameters specified?</p> <p>Are the sources of the method parameters clearly specified?</p>	<p>There is no method provided in the IPCC Guidelines or IPCC GPG for estimating emissions from total domestic and commercial wastewater flows.</p> <p>In respect of human sewage disposal, the IPCC good practice guidance notes the requirement for further work in this area (p.5.14).</p> <p>The default method for estimating N<sub>2</sub>O emissions from human sewage is based on per capita protein consumption (IPCC Guidelines, vol.3, p.6.28).</p> <p>If N<sub>2</sub>O emissions are estimated using an alternative method, a detailed explanation of the method should be provided.</p>

**Table 6.B (3): N<sub>2</sub>O from Human Sewage**

Source category		6.B. (3) N <sub>2</sub> O from Human Sewage - Overview	
<b>Definition</b>		Includes direct nitrous oxide emissions from human sewage.	
<b>Potential Key Issues:</b>		Possible double counting of emission estimates for N <sub>2</sub> O where estimates are reported for domestic and commercial wastewater and N <sub>2</sub> O emissions from human sewage. Provision of additional information where country specific or other methods are used.	
<b>General References</b>		IPCC Guidelines: Workbook (Vol. 2; p.6.23) and Reference Manual (Vol. 3; p.6.28). IPCC good practice guidance (GPG), p.5.14, Note 5.	
Source category		6.B. (3) N <sub>2</sub> O from Human Sewage - Details	
Detailed Review Element	GHG	Questions	Elaboration/Clarification
Methodology	N <sub>2</sub> O	If a country specific method is used, are the method and assumptions clearly explained?	The IPCC GPG notes the requirement for further work in this area (p.5.14). Refer to Table Summary 3 for summary information on the methodology used. The IPCC Guidelines provide a default methodology for indirect emissions (Vol.3, p.6.28). Ensure that reported emissions are N <sub>2</sub> O and not N. Equation 15 (IPCC Guidelines, Vol.3, p.6.28) provides an estimate of N <sub>2</sub> O-N; this needs to be multiplied by 44/28 to obtain emissions of N <sub>2</sub> O (see Vol. 2, p.6.37; for an example, also see IPCC GPG, p.4.42, equation 4.18).  Refer to IPCC Guidelines (Vol.3, sect. 6.4) and IPCC GPG(sect. 5.2, footnote 5) for further explanation.
Emission Factor	N <sub>2</sub> O	Is the emission factor default or country specific?	Refer to the NIR for information on the derivation of country specific emission factors.
Activity Data	N <sub>2</sub> O	What is the source of data on protein consumption per capita?	The NIR should state the source of data on protein consumption per capita and population.
Completeness	N <sub>2</sub> O	If emissions are reported for domestic and commercial wastewater (6.B.2), is it clear that emissions have not been double counted?  Are the estimates for the total population or the urban population only?	Where emissions are reported for both domestic and commercial wastewater, and N <sub>2</sub> O emissions from human sewage, there is potential for double counting.
Recalculations/ Consistent time series	N <sub>2</sub> O	What reasons are given for recalculations?  Do the recalculations affect the full time series or selected years only?	Refer to Tables 8a and 8b for summary information on recalculations.  If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.
Uncertainty	N <sub>2</sub> O	Is any qualitative or quantitative assessment of uncertainty reported?	Refer to the NIR for quantitative assessments of uncertainty and explanations on the implementation of the IPCC GPG.

			Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC good practice guidance.
Reporting and documentation	N <sub>2</sub> O	Are data on protein consumption documented?  Are all country specific references relevant to protein consumption and emission factors provided?	References noted in the NIR should be available to the reviewer.  It should be possible to reproduce the inventory from the documentation provided.
QA/QC	N <sub>2</sub> O	Have data on protein consumption been compared with data available from other sources?  Are the data on protein consumption consistent with what might be expected as dietary habits change over time?	The FAO periodically collates data on protein consumption, which can be accessed via the FAO's website. ( <a href="http://www.fao.org">www.fao.org</a> )  As incomes increase and diets improve over time, it is reasonable to expect an increase in protein consumption per capita.  Refer to the NIR for explanations.

**Table 6.C: Waste Incineration**

Source category		6.C Waste Incineration - Overview	
<b>Definition</b>		Includes incineration of solid waste (paper, food waste, plastics, etc.). Emissions of CO <sub>2</sub> from biomass raw materials (biogenic wastes) are not included in the totals, CO <sub>2</sub> emissions from fossil fuel based fractions (non-biogenic wastes) are included in the totals.	
<b>Potential Key Issues:</b>		Double counting of emissions between the energy sector and the waste sector. Reporting of separate estimates for biogenic and non-biogenic wastes. Inclusion of non-CO <sub>2</sub> emissions from biogenic sources in the totals. Double counting of emissions between the waste sector and energy sector from incinerators with energy recovery.	
<b>General References</b>		IPCC Guidelines: Reference Manual (Vol. 3; pp.6.28-6.29). IPCC good practice guidance (GPG), pp.5.25-5.31.	
Source category		6.C Waste Incineration - Details	
Detailed Review Element	GHG	Questions	Elaboration/Clarification
Methodology	All	Are the method parameters default values or country specific?  Are the sources of the method parameters specified?	The IPCC Guidelines describe a general approach for waste incineration. The IPCC GPG outlines a method for estimating emissions from waste incineration (sect.5.3).  Note the method in the IPCC GPG (p.5.25) provides estimates of emissions from waste of fossil origin. CO <sub>2</sub> from biogenic sources should be estimated and reported but is not counted in the totals. Non-CO <sub>2</sub> emissions from all sources are included in the totals.  Default parameters to estimate CO <sub>2</sub>

			<p>emissions are provided in IPCC GPG (p.5.30).</p> <p>Refer to the documentation box for summary explanation and the Party's NIR for more detailed explanation.</p>
Emission Factor	All	<p>Are different values used for different waste streams incinerated?</p> <p>If average values are used, is the C content the same as the C content of MSW streams treated by other means? If the C content is different, is an explanation provided?</p> <p>Does the N<sub>2</sub>O emission factor take into account the incinerator type?</p>	<p>The CO<sub>2</sub> emission factor for waste of fossil origin is a function of the C fraction of waste, the fossil C fraction of waste, and the burn out efficiency (IPCC GPG, p.5.25).</p> <p>Refer to the NIR for information on the derivation of country specific emission factors.</p> <p>The IPCC Guidelines (p.6.29) and IPCC GPG (p.5.30) provide default values for N<sub>2</sub>O based on incinerator type.</p>
Activity Data	All	<p>Is the activity data consistent with the data on waste quantities disposed of by other means?</p> <p>Is the activity data obtained directly from incineration plants or estimated?</p> <p>Has the activity data been disaggregated into different waste types?</p> <p>Has the activity data been disaggregated so as to exclude data from incinerators with energy recovery?</p> <p>Has the quantity of starter fuel been explicitly excluded from the activity data?</p>	<p>The fraction of MSW incinerated should be consistent with the fraction of MSW shown as disposed of to SWDS.</p> <p>Activity data obtained directly from plants is likely to be more accurate than data from other sources.</p> <p>The most accurate estimates are obtained from disaggregated data.</p> <p>Emissions from incinerators with energy recovery should be included in the energy sector (IPCC GPG, p.5.25). Refer to the energy sector for information on the composition of biomass fuels.</p> <p>If starter fuel is not excluded, emissions will be overestimated because it should be accounted for in the energy sector.</p> <p>The main reference for information on activity data is the NIR.</p>
Completeness	All	<p>Are sources included that should not be included?</p> <p>Are non-CO<sub>2</sub> emissions from biogenic sources reported and included in the totals?</p> <p>Are CO<sub>2</sub> emissions from biogenic sources excluded from the totals?</p>	<p>A source that might be incorrectly included is burning of agricultural waste; this should be included in the agriculture sector.</p> <p>Note that CO<sub>2</sub> emissions from combustion used as a management practice at waste disposal sites are to be included under Solid Waste Disposal.</p>



			Refer to the NIR for further explanation of coverage.
Recalculations/ Consistent time series	All	<p>What reasons are given for recalculations?</p> <p>Do the recalculations affect the full time series or selected years only?</p>	<p>The same method and dataset should be used for all years.</p> <p>If parameters have been revised that affect estimates for all years, to ensure time series consistency estimates for all years need to be recalculated and reported.</p>
Uncertainty	All	<p>Has any qualitative and/or quantitative assessment of uncertainty been reported?</p> <p>What gases are included in the uncertainty analysis? Priority needs to be given to the gas that contributes the majority of emissions from the source.</p> <p>Are the uncertainties used in the analysis based on expert judgment, sampling and empirical analysis, or uncertainty ranges for other countries or regions?</p>	<p>Refer to the NIR for quantitative assessments of uncertainty and explanations on the implementation of the IPCC good practice guidance.</p> <p>Quantitative uncertainty analysis is a requirement of the progressive implementation of the IPCC GPG. See IPCC GPG, Chap. 6, for explanations of quantitative uncertainty analysis.</p> <p>Default uncertainty ranges are provided in the IPCC GPG (p.5.30).</p>
Reporting and documentation	All	<p>Is documentation provided on the derivation of C content of waste, fossil C fraction of waste, and N<sub>2</sub>O emission factors?</p> <p>Are all country specific references relevant to the inventory available?</p>	<p>References noted in the NIR should be available to the reviewer.</p> <p>It should be possible to reproduce the inventory from the documentation provided.</p>
QA/QC	All	<p>Have internationally recognised standard methods been used to obtain direct measurements of emissions?</p> <p>Have country-specific or plant-specific factors been compared with IPCC default values?</p> <p>If waste is disaggregated into different categories, has the disaggregation been subject to review?</p>	<p>Failure to apply internationally recognised standards requires careful evaluation.</p> <p>Large differences could disclose a problem with the values used.</p> <p>Many plants do not maintain data on different waste stream quantities.</p>