

3.1 INTRODUCTION

Chapter 3 provides guidance on the estimation of emissions and removals of CO₂ and non-CO₂ for the Land Use, Land-Use Change and Forestry (LULUCF) sector, covering Chapter 5 of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (*IPCC Guidelines*).

This chapter provides two significant advances:

- (i) It introduces three hierarchical tiers of methods that range from default data and simple equations to the use of country-specific data and models to accommodate national circumstances. These tiers, if properly implemented, successively reduce uncertainty and increase accuracy.
- (ii) It uses the land-use categories (of Chapter 2) to organise the methodologies and to facilitate: a) transparent reporting, b) association of above and below ground carbon pools (at the higher tiers), whilst allowing comparison with reporting of the *IPCC Guidelines*.

The methodologies in this report are organised by land-use categories (six sections), by broad carbon pools and non-CO₂ gases, and by tier, and are consistent with the other chapters of the report.

3.1.1 Inventory and Reporting Steps

The overall sequence of steps for inventorying and reporting emissions and removals is outlined below. It is *good practice* for countries to follow these steps and those provided in each section of this chapter to estimate emissions and removals:

- (i) Drawing on the three approaches for representing areas in Chapter 2, estimate the land areas in each land use category for time period required.
- (ii) Conduct key category assessment for the relevant LULUCF categories using the guidance provided in Chapters 3 and 5. Within the categories designated as key, assess which non-CO₂ gases and carbon pools are significant, and prioritise such pools in terms of methodological choice.
- (iii) Ensure that the requirements in terms of emission and removal factors and activity data appropriate to the tier level are being met.
- (iv) Quantify emissions and removals and estimate the uncertainty in each estimate, as set out in Chapter 5 and the sector specific data provided in this Chapter.
- (v) Use the reporting tables to report emissions and removals estimates. Utilize the worksheets where appropriate (see Annex 3A.2).
- (vi) Document and archive all information used to produce the national emissions and removals estimates following specific instructions under each land use category, carbon pool, non-CO₂ source, and land use change.
- (vii) Implement quality control checks, verification, and expert peer review of the emission estimates following specific guidance under each land use category, pool or non-CO₂ gas (see also Chapter 5, for broad guidance).

3.1.2 Linkage between this Chapter and the *IPCC Guidelines'* Reporting Categories

Chapter 3 is divided into six sections based on land-use categories; each section is further divided into two subsections based on the status and recent history of the land use.

- The first subsection is for lands that begin and end an inventory period in the same use.
- The second subsection is for land conversions to the land use covered by the section.

Table 3.1.1 shows the sections and subsections of this chapter in relationship to the *IPCC Guidelines*. This provides a basis for comparison, which is described in more detail below.

TABLE 3.1.1
MAPPING BETWEEN THE SECTIONS OF CHAPTER 5 OF THE 1996 IPCC GUIDELINES
AND THE SECTIONS OF CHAPTER 3 OF THIS REPORT

Land Use in the Initial Time period	Land Use in the Reporting (current) Year	Chapter 3 Subsection ¹	<i>IPCC Guidelines</i> ²
Forest land	Forest land	3.2.1	5 A
Cropland	Forest land	3.2.2	5 A, 5 C, 5 D
Grassland	Forest land	3.2.2	5 A, 5 C, 5 D
Wetlands	Forest land	3.2.2	5 A, 5 C, 5 D
Settlements	Forest land	3.2.2	5 A, 5 C, 5 D
Other land	Forest land	3.2.2	5 A, 5 C, 5 D
Cropland	Cropland	3.3.1	5 A, 5 D
Forest land	Cropland	3.3.2	5 B, 5 D
Grassland	Cropland	3.3.2	5 B, 5 D
Wetlands	Cropland	3.3.2	5 D
Settlements	Cropland	3.3.2.	5 D
Other land	Cropland	3.3.2.	5 D
Grassland	Grassland	3.4.1	5 A, 5 D
Forest land	Grassland	3.4.2	5 B, 5 D
Cropland	Grassland	3.4.2	5 C, 5 D
Wetlands	Grassland	3.4.2	5 C, 5 D
Settlements	Grassland	3.4.2	5 C, 5 D
Other land	Grassland	3.4.2	5 C, 5 D
Wetlands	Wetlands	3.5.1	5 A, 5 E
Forest land	Wetlands	3.5.2	5 B
Cropland	Wetlands	3.5.2	5 E
Grassland	Wetlands	3.5.2	5 B
Settlements	Wetlands	3.5.2	5 E
Other land	Wetlands	3.5.2	5 E
Settlements	Settlements	3.6.1	5 A
Forest land	Settlements	3.6.2	5 B
Cropland	Settlements	3.6.2	5 E
Grassland	Settlements	3.6.2	5 B
Wetlands	Settlements	3.6.2	5 E
Other land	Settlements	3.6.2	5 E
Other land	Other land	3.7.1	5 A
Forest land	Other land	3.7.2	5 B
Cropland	Other land	3.7.2	5 E
Grassland	Other land	3.7.2	5 B
Wetlands	Other land	3.7.2	5 E
Settlements	Other land	3.7.2	5 E

¹ Combines both soils and biomass, those in bold represent the 'Forest and grassland conversion' of the *IPCC Guidelines*.

² The *IPCC Guidelines* cover the following categories: 5 A Changes in Forest and Other Woody Biomass Stocks; 5 B Forest and Grassland Conversion; 5 C Abandonment of Managed Lands; 5 D Emissions and Removals from Soils, and 5 E Other (Reporting Instructions p. 1.14 - 1.16)

3.1.2.1 CHANGES IN FOREST AND OTHER WOODY BIOMASS STOCKS

As with the *IPCC Guidelines*, the *Good Practice Guidance* covers managed forests which can be defined in the following terms:

Forest management is the process of planning and implementing practices for stewardship and use of the forest aimed at fulfilling relevant ecological, economic and social functions of the forest...A managed forest is a forest subject to forest management¹.

This definition implies that managed forests are subject to periodic or ongoing human interventions and that they include the full range of management practices from commercial timber production to stewardship in non-commercial purposes. Section 3.2.1 covers forest land remaining forest land. Management and conversion to forests is covered in Section 3.2.2 Land Converted to Forest land.

The section Forest land provides guidance for all carbon pools and non-CO₂ gases with exception of the harvested wood products (HWP). The *IPCC Guidelines* contain references to the treatment of HWP, and countries choosing to estimate carbon stock changes within the harvested wood products pool can find methodological advice in Appendix 3a.1. The *IPCC Guidelines* briefly address ‘Other Woody Biomass Stocks’, e.g., perennial biomass in croplands and grazing lands, as well as trees in urban areas. Guidance on this topic is elaborated in the *Good Practice Guidance* within the sections entitled “Changes in Biomass Carbon Pools.” Changes in carbon stocks of perennial woody biomass are addressed in relevant biomass sections of each land use category. Urban trees are addressed in the Section 3.6 and in Appendix 3a.4.

3.1.2.2 FOREST AND GRASSLAND CONVERSION

The Forest and Grassland Conversion Section of the *IPCC Guidelines* includes conversion of existing forests and natural grasslands to other land uses such as cropland. Forests can be cleared to convert land to a wide variety of other uses, but a predominant cause is conversion to pasture and croplands, which was the focus of the *IPCC Guidelines*, with an emphasis on changes in carbon in biomass pools. Land use conversions are treated systematically in this report, organised by final land use. Guidance is provided under each section titled “Lands Converted to any other land-use category”, and is given separately for changes in all carbon pools.

A summary estimate of conversion from forests or grassland to other uses can be constructed by totaling each individual conversion from these categories to another land-use category. For CO₂ emissions and removals from forest conversion, the total can be arrived at by summing Equations: 3.3.7, 3.4.12, 3.5.1, 3.6.1, and 3.7.1 for conversions from forest land to each category. Similarly, for grassland conversion, the total can be arrived at by summing the same equations for conversions from grassland. It is *good practice* to estimate and report separately the sum of all forest land conversions (deforestation) and grassland conversions to other final land uses. A reporting table is provided for this in Annex 3A.2 (Table 3A.2.1B).

3.1.2.3 ABANDONMENT OF CROPLANDS, PASTURES, OR OTHER MANAGED LANDS

The *IPCC Guidelines* focus mainly on lands that re-accumulate carbon in biomass as they return to a quasi-natural state following abandonment or active reforestation. However, land can also remain constant or degrade further with respect to carbon re-accumulation.

Croplands and grasslands can be abandoned or actively converted to several different land uses, affecting the net change in carbon in biomass. Therefore, guidance on estimating changes in biomass is located in a number of places depending on the type of land use it changed to. The range of specific land use transitions can be summed for an aggregate assessment of carbon changes from abandonment of cropland, pastures, or other managed lands, as indicated in Table 3.1.1.

¹ Proceedings of the Expert Meeting on Harmonising Forest Related Definitions, Rome, Sept 2002 (FAO 2003).

3.1.2.4 CO₂ EMISSIONS AND REMOVALS FROM SOILS

The *IPCC Guidelines* further divide this topic into: a) Cultivation of Mineral Soils; b) Cultivation of Organic Soils; and c) Liming of Agricultural Soils. In general, in this chapter, each land use section addresses changes in soil carbon for that land use either remaining in the same use, or recently converted to that land use.

Guidance on estimating soil carbon stock changes due to management practices is covered under Cropland Remaining Cropland, and Grassland Remaining Grassland, each at the sub section entitled ‘Changes in Carbon Stocks in Soils’, within which guidance is provided separately for mineral and organic soils. Changes in soil carbon stocks as a result of lands being converted into cropland or grassland are also covered, under the conversion subsections. A total assessment of soil carbon stock changes due to cultivation of mineral soils is the sum of changes in carbon stocks over a finite period following changes in management that impact soil carbon.

Drainage of peatland soils for forest establishment is found in the Forest land soil section. All greenhouse gas emissions from Wetlands Remaining Wetlands are presented in Appendix 3a.3. Cultivation of organic soils in the sense of peat extraction is handled under lands converted to peat extraction in Section 3.5 of this report.

Methodological guidance on liming of agricultural soils is addressed as in the *IPCC Guidelines*.

3.1.2.5 OTHER CATEGORIES OF REPORTING AND SPECIFIC CASES

The *IPCC Guidelines* briefly describe general issues and methodological approaches for other categories. The issues are often complex and agreed methodologies were not available at the time the *IPCC Guidelines* were being prepared. This chapter addresses some of these categories in more depth. “Other possible categories” as discussed in the *IPCC Guidelines* explicitly includes belowground biomass, natural disturbances (including fire), shifting cultivation, and flooding and drainage of wetlands. Information on estimating CO₂ emission and removals and non-CO₂ emissions from managed wetland (including peatlands and flooded lands), and for Settlements Remaining Settlements, are addressed in Appendix 3a.3 and 3a.4, respectively, because the methods and available data for these land use types are preliminary. Estimation methods for belowground biomass are included explicitly in the section covering carbon stock changes in forest biomass (Sections 3.2.1.1 and 3.2.2.1) and options for including belowground biomass in non-forest land uses are provided in other sections as well. Non-CO₂ emissions from drainage and rewetting of forest soils are addressed in Appendix 3a.2.

The *Good Practice Guidance* does not alter the basic default assumptions that land use changes have a linear impact on soil organic matter for 20 years before a new equilibrium is reached (Tier 1), with possible successions of 20 year periods to deal with longer time constants in temperate and boreal zones. This means that, when a piece of land changes use, then it is followed in that ‘changed status’ for 20 years, with each year 1/20 of the CO₂ and non-CO₂ effects reported. Tier 3 modeling approaches may utilize different assumptions. Land should be reported in a conversion category for 20 years, and then moved to a “remaining category”, unless a further change occurs.

Natural disturbances (e.g., storms, fires, insects but only on managed lands) are included for their CO₂ and non-CO₂ effects. Where natural disturbances on unmanaged lands are followed by a land use change, then the CO₂ and non-CO₂ effects of the natural disturbance are to be reported.

3.1.3 Definitions of Carbon Pools

The methodologies in this report are organised first by land-use categories, as described above, and second by broad pools. Table 3.1.2 provides a generic representation of these pools occurring in a terrestrial ecosystem. Each of these pools is discussed in the *IPCC Guidelines*, although in some cases with only minimal guidance.

TABLE 3.1.2
DEFINITIONS FOR TERRESTRIAL POOLS USED IN CHAPTER 3

Pool ²		Description (see also notes below in italics)
Living Biomass	Above-ground biomass	All living biomass ³ above the soil including stem, stump, branches, bark, seeds, and foliage. Note: In cases where forest understorey is a relatively small component of the above-ground biomass carbon pool, it is acceptable for the methodologies and associated data used in some tiers to exclude it, provided the tiers are used in a consistent manner throughout the inventory time series as specified in Chapter 5.
	Below-ground biomass	All living biomass of live roots. Fine roots of less than (suggested) 2mm diameter are often excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead Organic Matter	Dead wood	Includes all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.
	Litter	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for example 10 cm), lying dead, in various states of decomposition above the mineral or organic soil. This includes the litter, fomic, and humic layers. Live fine roots (of less than the suggested diameter limit for below-ground biomass) are included in litter where they cannot be distinguished from it empirically.
Soils	Soil organic matter	Includes organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series. Live fine roots (of less than the suggested diameter limit for below-ground biomass) are included with soil organic matter where they cannot be distinguished from it empirically.
<p><i>Note: National circumstances may necessitate slight modifications to the pool definitions used here. Where modified definitions are used, it is good practice to report upon them clearly, to ensure that modified definitions are used consistently over time, and to demonstrate that pools are neither omitted nor double counted.</i></p>		

3.1.4 General Methods

Chapter 3 uses the same basic methodological approaches as in the *IPCC Guidelines*. As stated in the *IPCC Guidelines*:

The fundamental basis for the methodology rests upon two linked themes: i) the flux of CO₂ to or from the atmosphere is assumed to be equal to changes in carbon stocks in existing biomass and soils, and ii) changes in carbon stocks can be estimated by first establishing rates of change in land use and the practice used to bring about the change (e.g., burning, clear-cutting, selective cut, etc.). Second, simple assumptions or data are applied about their impact on carbon stocks and the biological response to a given land use.

The first order approach described above is the foundation for the basic methodologies presented in this chapter for calculating changes in carbon pools. This approach can be generalised and applied to all carbon pools (i.e., aboveground biomass, belowground biomass, dead wood, litter, and soils), subdivided as necessary to capture differences between ecosystems, climatic zones and management practice. Equation 3.1.1 illustrates the general approach for estimating carbon stock change based on rates of carbon losses and gains by area of land use.

In most first order approximations, the “activity data” are in terms of area of land use or land use change. The generic guidance is to multiply the activity data by a carbon stock coefficient or “emission factor” to provide the source/or sink estimates. Guidance is provided for all relevant carbon pools and changes of land use from one type to another. The full range of possible changes in land use from one type to another is covered systematically and default transition periods are provided.

² The default assumption in *IPCC Guidelines* is that carbon removed in wood and other biomass from forests is oxidised in the year of removal. Countries may report on HWP pools if they can document that existing stocks of forest products are in fact increasing. Appendix 3a.1 provides guidance to countries and information that could be used in future methodological development subject to decisions by UNFCCC.

³ Expressed in tonnes dry weight.

EQUATION 3.1.1
ANNUAL CARBON STOCK CHANGE IN A GIVEN POOL AS A FUNCTION OF GAINS AND LOSSES

$$\Delta C = \sum_{ijk} [A_{ijk} \bullet (C_1 - C_L)_{ijk}]$$

Where:

ΔC = carbon stock change in the pool, tonnes C yr⁻¹

A = area of land, ha

ijk = corresponds to climate type i , forest type j , management practice k , etc...

C_1 = rate of gain of carbon, tonnes C ha⁻¹ yr⁻¹

C_L = rate of loss of carbon, tonnes C ha⁻¹ yr⁻¹

An alternative approach is proposed in the *IPCC Guidelines* where carbon stocks are measured at two points in time to assess carbon stock changes. Equation 3.1.2 illustrates the generic approach for estimating carbon stock change in this way. This latter approach is presented in this chapter as an option in some instances.

EQUATION 3.1.2
ANNUAL CARBON STOCK CHANGE IN A GIVEN POOL

$$\Delta C = \sum_{ijk} (C_{t_2} - C_{t_1}) / (t_2 - t_1)_{ijk}$$

Where:

C_{t_1} = carbon stock in the pool at time t_1 , tonnes C

C_{t_2} = carbon stock in the pool at time t_2 , tonnes C

Even though national reporting of sources and sinks is required annually, it does not mean that national inventories have to be carried out annually for all pools, since data from national inventories done on 5 to 10 year cycles, can be interpolated. Chapter 5 provides guidance on how to use interpolation and extrapolation to merge sources of data.

Several sources of non-CO₂ greenhouse gas emissions from land use were discussed in the Agriculture Chapter (Chapter 4) of the *IPCC Guidelines* and the related parts of the *GPG2000*. Chapter 4 of *IPCC Guidelines* and *GPG2000* cover CH₄ and N₂O emissions from savanna burning and agricultural residue burning, direct and indirect N₂O emissions from agricultural soils, and CH₄ emissions from rice production. Guidance on greenhouse gas emissions from the biomass fraction in waste disposed at solid waste disposal sites or incinerated is provided in the Waste Chapter of *IPCC Guidelines* and *GPG2000*.

This *good practice guidance* provides additional information on how to apply and expand the Agriculture Chapter of the *IPCC Guidelines* and *GPG2000* to these additional categories of land uses and land use change:

- Non-CO₂ (N₂O and CH₄) from forest fire (Section 3.2.1.4);
- N₂O from managed (fertilized) forests (Section 3.2.1.4);
- N₂O from drainage of forest soils (Appendix 3a.2);
- N₂O and CH₄ from managed wetland (Appendix 3a.3); and
- Soil emissions of N₂O following land use conversion (Sections 3.3.2.3 and 3.4.2.3).

3.1.5 Tier Levels

This chapter provides users with three methodological tiers for estimating greenhouse gas emissions and removals for each source. Tiers correspond to a progression from the use of simple equations with default data to country-specific data⁴ in more complex national systems. Three general tiers are summarised in Box 3.1.1. Tiers implicitly progress from least to greatest levels of certainty in estimates as a function of methodological complexity, regional specificity of model parameters, and spatial resolution and extent of activity data. Complete

⁴ Country-specific data may require subdivision to capture different ecosystems and site qualities, climatic zones and management practice within a single land category.

guidance is provided for the implementation of Tier 1. Regardless of tier level, countries should document what tiers were used for various categories and pools as well as the emission factors, and activity data used to prepare the estimate. For higher tiers, inventory agencies may need to provide additional documentation to support decisions to use more sophisticated methodologies or country-defined parameters. Moving from lower to higher tiers will usually require increased resources, and institutional and technical capacity.

BOX 3.1.1

FRAMEWORK OF TIER STRUCTURE IN THE GOOD PRACTICE GUIDANCE

The **Tier 1** approach employs the basic method provided in the *IPCC Guidelines* (Workbook) and the default emission factors provided in the *IPCC Guidelines* (Workbook and Reference Manual) with updates in this chapter of the report. For some land uses and pools that were only mentioned in the *IPCC Guidelines* (i.e., the default was an assumed zero emissions or removals), updates are included in this report if new scientific information is available. Tier 1 methodologies usually use activity data that are spatially coarse, such as nationally or globally available estimates of deforestation rates, agricultural production statistics, and global land cover maps.

Tier 2 can use the same methodological approach as Tier 1 but applies emission factors and activity data which are defined by the country for the most important land uses/activities. Tier 2 can also apply stock change methodologies based on country-specific data. Country-defined emission factors/activity data are more appropriate for the climatic regions and land use systems in that country. Higher resolution activity data are typically used in Tier 2 to correspond with country-defined coefficients for specific regions and specialised land-use categories.

At **Tier 3**, higher order methods are used including models and inventory measurement systems tailored to address national circumstances, repeated over time, and driven by high-resolution activity data and disaggregated at sub-national to fine grid scales. These higher order methods provide estimates of greater certainty than lower tiers and have a closer link between biomass and soil dynamics. Such systems may be GIS-based combinations of age, class/production data systems with connections to soil modules, integrating several types of monitoring. Pieces of land where a land-use change occurs can be tracked over time. In most cases these systems have a climate dependency, and thus provide source estimates with interannual variability. Models should undergo quality checks, audits, and validations.

3.1.6 Choice of Method

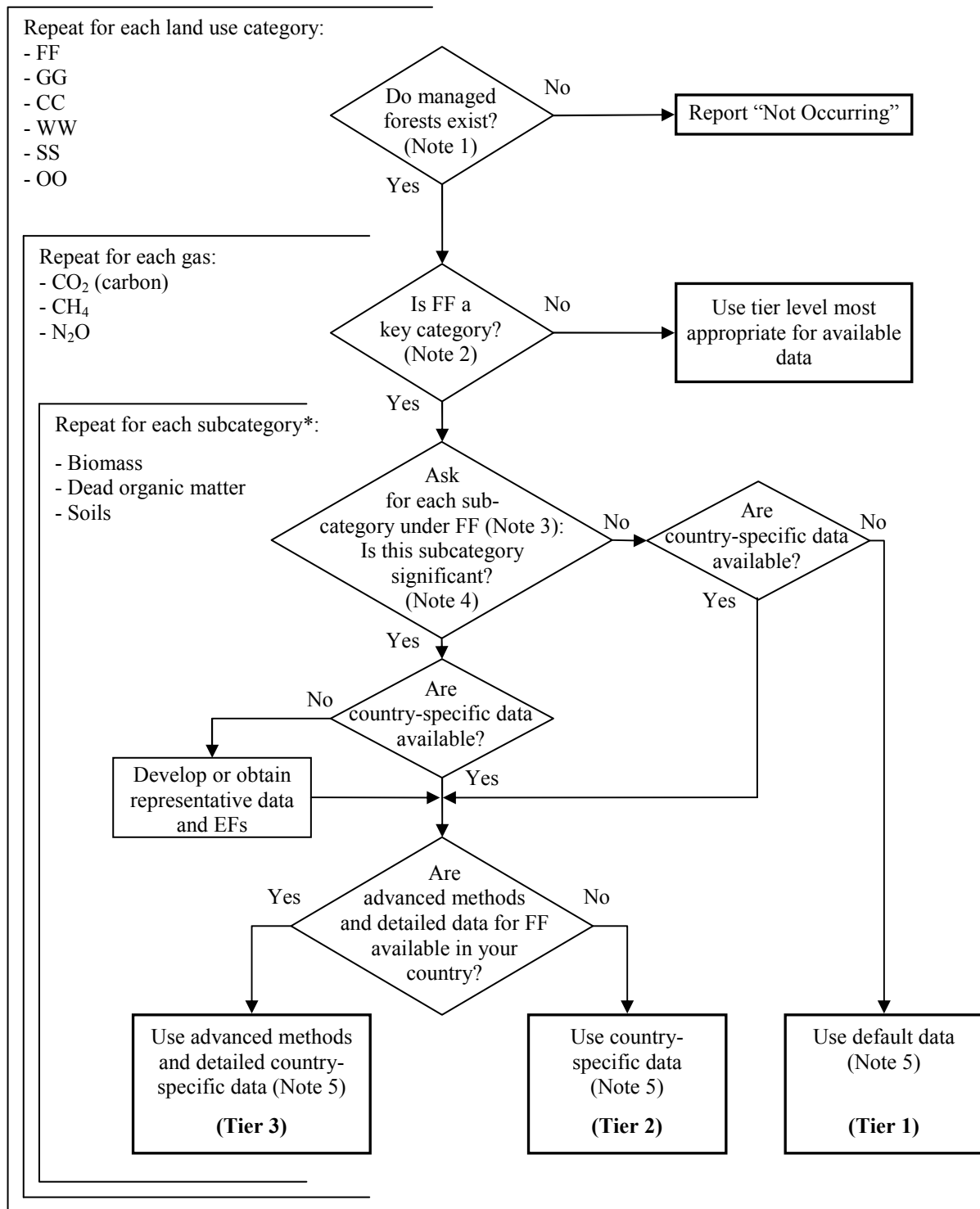
It is *good practice* to use methods that provide the highest levels of certainty, while using available resources as efficiently as possible. The decision about what tier to use and where to expand resources for inventory improvement should take into account whether the land use is a key category, as described in Chapter 5, Section 5.4 in this report. Guidance on methodological choice is provided in a set of decision trees, which are designed to assess whether a source/sink category is a key category and which pools within a key category are considered significant. Decision trees are applied at the sub-category level which corresponds roughly to carbon pools and sources of non-CO₂ gases (see Table 3.1.3 for a list of subcategories). It is important to note that the key category analysis is an iterative process and that initial estimates are needed for each sub-category to perform the analysis. Figure 3.1.1 provides a generic decision tree to determine the appropriate methodological tier for lands that begin and end an inventory period in the same use. This decision tree should be applied to subcategories described in Sections 3.2.1, 3.3.1, 3.4.1, 3.5.1, 3.6.1, and 3.7.1. The figure uses Section 3.2.1, Forest land Remaining Forest land, as an example. Figure 3.1.2 provides a generic decision tree to determine the appropriate methodological tier for lands that changes uses during the inventory period, using Section 3.2.2, Lands Converted to Forest land, as an example. This decision tree should be applied to subcategories described in Sections 3.2.2., 3.3.2, 3.4.2, 3.5.2., 3.6.2., and 3.7.2.

The abbreviations FF, GG, CC, WW, SS, OO used in Figure 3.1.1 denote land-use categories undergoing no conversions; and the abbreviations LF, LG, LC, LW, LS, LO in Figure 3.1.2 denote land conversions to these land-use categories:

FF	=	forest land remaining forest land	LF	=	lands converted to forest land
GG	=	grassland remaining grassland	LG	=	lands converted to grassland
CC	=	cropland remaining cropland	LC	=	lands converted to cropland
WW	=	wetlands remaining wetlands	LW	=	lands converted to wetlands
SS	=	settlements remaining settlements	LS	=	lands converted to settlements
OO	=	other land remaining other land	LO	=	lands converted to other land

These abbreviations have been used throughout Chapter 3 as subscripts for symbols in the equations.

Figure 3.1.1 Decision tree for identification of appropriate tier-level for land remaining in the same land use category (example given for forest land remaining forest land, FF)



Note 1: The use of 20 years, as a threshold, is consistent with the defaults contained in *IPCC Guidelines*. Countries may use different periods where appropriate to national circumstances.

Note 2: The concept of key categories is explained in Chapter 5, Subsection 5.4 (Methodological Choice – Identification of Key Categories).

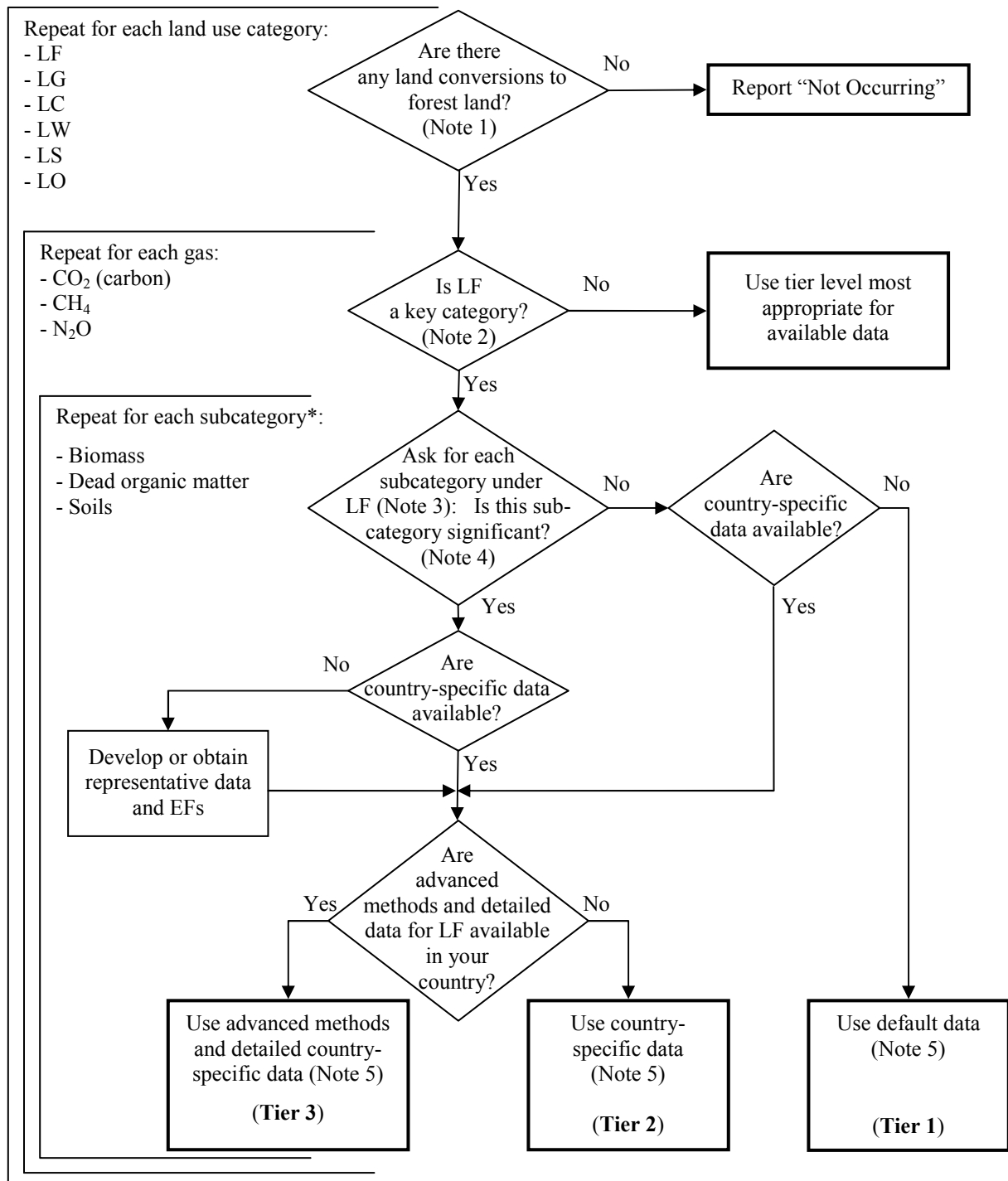
Note 3: See Table 3.1.2 for the characterisation of subcategories.

Note 4: A subcategory is significant if it accounts for 25-30% of emissions/removals for the overall category.

Note 5: See Box 3.1.1 for definition of Tier levels.

* If a country reports harvested wood products (HWP) as a separate pool, it should be treated as a subcategory.

Figure 3.1.2 Decision tree for identification of appropriate tier-level for land converted to another land use category (example given for land converted to forest land, LF)



Note 1: The use of 20 years, as a threshold, is consistent with the defaults contained in the *IPCC Guidelines*. Countries may use different periods where appropriate to national circumstances.

Note 2: The concept of key categories is explained in Chapter 5, Subsection 5.4 (Methodological Choice – Identification of Key Categories).

Note 3: See Table 3.1.2 for the characterisation of subcategories.

Note 4: A subcategory is significant if it accounts for 25-30% of emissions/removals for the overall category.

Note 5: See Box 3.1.1 for definition of Tier levels.

* If a country reports harvested wood products (HWP) as a separate pool, it should be treated as a subcategory.

Gas	Subcategory
CO ₂	Living Biomass
	Dead Organic Matter
	Soils
N ₂ O	Fire
	Soil Organic Matter Mineralization
	Nitrogen Inputs
	Cultivation of organic soils
CH ₄	Fire

3.1.7 Reporting

It is *good practice* to conduct key category assessments for each land use category using the guidance provided in this chapter and in Chapter 5 Section 5.4:

- Within each land use category designated as key, to assess which subcategories are significant; and
- Use the results of this analysis to determine what categories and subcategories should be prioritised in terms of methodological choice.

Reporting categories are divided into greenhouse gases and land uses i.e., lands remaining in a use and lands converted to that use. Category estimates are a compilation of individual subcategories. Table 3.1.3 shows the subcategories within each reporting category. The reporting tables are given in Annex 3A.2. When compiling emissions and sinks estimates from land use, land-use change, and forestry with other elements of national greenhouse gas inventories, consistent signs (+/-) must be followed. In final reporting tables, emissions (decrease in the carbon stock, non-CO₂ emissions) are always positive (+) and removals (increase in the carbon stock) negative (-). For calculating initial estimates, this chapter follows the convention used in Chapter 5 of the *IPCC Guidelines* in which net increases of carbon stocks are positive (+) and net decreases are negative (-). As is the case in the *IPCC Guidelines*, the signs of these values need to be converted in the final reporting tables in order to maintain consistency with other sections of national inventory reports.

Units

Units of CO₂ emissions/removals and emissions of non-CO₂ gases are reported in gigagrams (Gg). To convert tonnes C to Gg CO₂, multiply the value by 44/12 and 10⁻³. To convert unit from kg N₂O-N to Gg N₂O, multiply the value by 44/28 and 10⁻⁶.

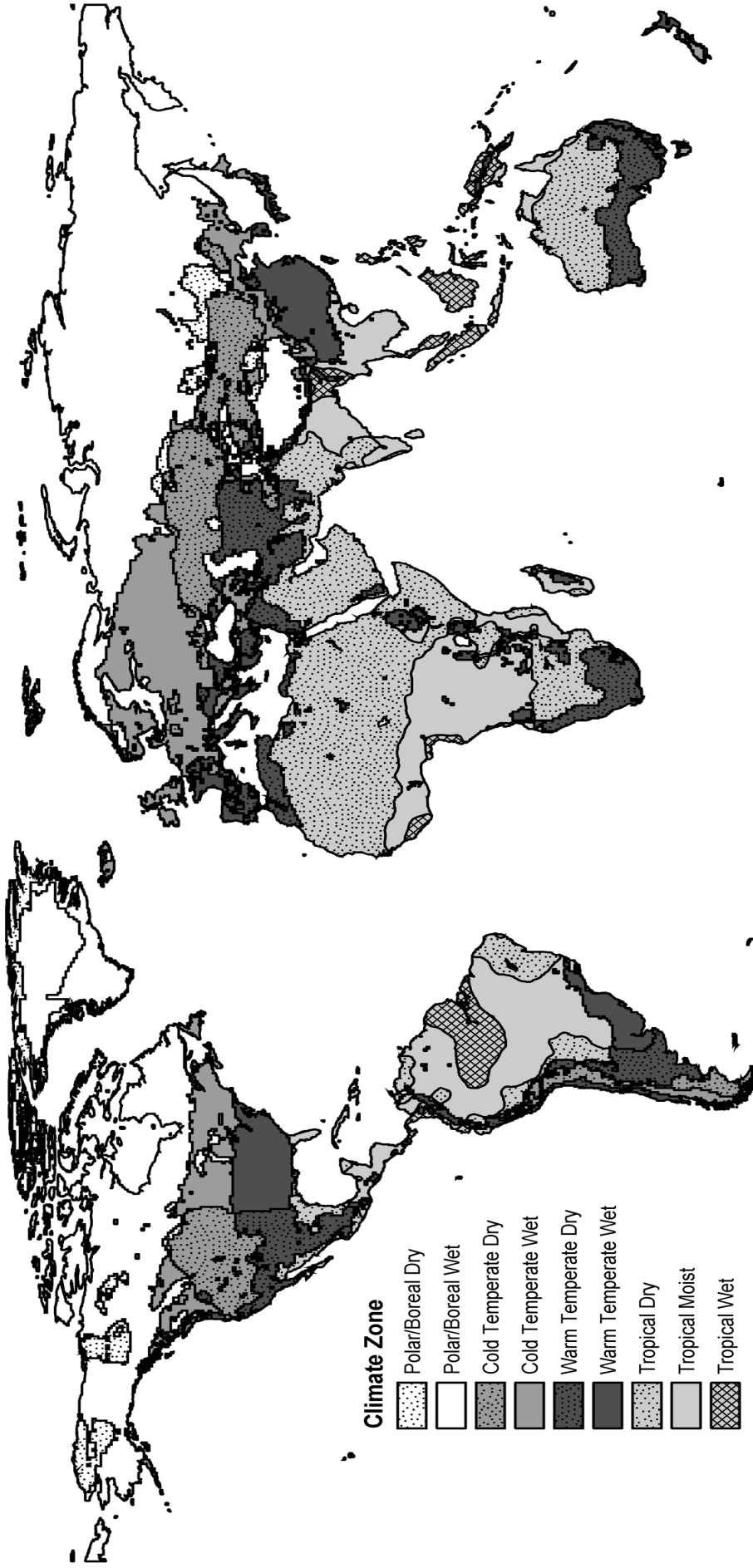
Convention

For the purpose of reporting, which is consistent with the *IPCC Guidelines*, the signs for removal (uptake) are always (-) and for emissions (+).

3.1.8 Generic Climatic Zones

Some default values in this chapter are provided by climatic zones. Figure 3.1.3 provides the global delineation of these zones. In comparison to the *IPCC Guidelines* this figure only holds polar/boreal as additional classes.

Figure 3.1.3 Delineation of major climate zones, updated from the IPCC Guidelines. Temperature zones are defined by mean annual temperature (MAT): Polar/boreal (MAT<0 °C), Cold temperate (MAT 0-10 °C), Warm temperate (MAT 10-20 °C) and Tropical (MAT>20 °C). Moisture regimes for boreal and temperate zones are defined by the ratio of mean annual precipitation (MAP) and potential evapotranspiration (PET): Dry (MAP/PET < 1) and Wet (MAP/PET > 1); and for tropical zones by precipitation alone: Dry (MAP < 1000 mm), Moist (MAP 1000-2000 mm) and Wet (MAP > 2000 mm). Precipitation and temperature data are from UNEP-GRID.



<http://www.grid.unep.ch/data/grid/climate.php>

