CHAPTER 9

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9.1 INTRODUCTION

No Refinement

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No Refinement

9.3 LAND CONVERTED TO OTHER LAND

9.3.1 Biomass

No Refinement

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No Refinement

9.3.3 Soil carbon

No Refinement

For Land Converted to Other Land, inventory compilers should estimate the change in carbon stocks in mineral soils under the initial land use relative to Other Land. Conversion of land to Other Land will result in a release of organic carbon previously held in soil if the conversion is to impervious surfaces such as bare rock.

General information and guidance on estimating changes in soil C stocks are provided in Chapter 2, Section 2.3.3 (including equations), and needs to be reviewed before proceeding with a consideration of specific guidelines below. The total change in soil C stocks for land converted to Grassland is estimated using Equation 2.24 for the change in soil organic C stocks for mineral soils and organic soils; and stock changes associated with soil inorganic C pools (Tier 3 only). This section provides specific guidance for estimating mineral soil organic C stock changes. It is assumed that the stock changes in organic soils are minimal because drainage is unlikely in "Other Lands" However, methods are provided in Section 2.3.3 (Chapter 2) to estimate stock changes for organic soils in addition to soil inorganic C.

9.3.3.1 CHOICE OF METHOD

This section provides new guidance.

Inventories can be developed using a Tier 1, 2 or 3 approach, with each successive tier requiring more detail and resources than the previous one. Decision trees are provided for mineral soils (Figure 2.4, in Chapter 2) to assist inventory compilers with selection of the appropriate tier. The approach at Tier 1 is that soil carbon stocks will decline to zero after conversion. If this is not the case, then the land should probably be classified under one of the Other Land uses. For Tier 2, country-specific estimates for C stocks on land that has been converted to Other Land should be used or the dynamics of carbon stocks in soils can be tracked at Tier 3 using country-specific data.

Mineral soils

Tier 1

Using Equation 2.25 in Chapter 2, the change in soil organic C stocks are estimated for mineral soils accounting for the impact of land-use conversion to Other Land. Annual rates of emissions (source) or removals (sink) are estimated based on the difference in stocks (over time) for the initial and last year divided by the time dependence of the stock change factors (D, default is 20 years).

Tier 2

Refining Application of Default Equations

The Tier 2 approach for mineral soils also uses Equation 2.25 in Chapter 2, but involves country- or region-specific reference C stocks and/or stock change factors and possibly more disaggregated land-use activity and environmental data.

Three-Pool Steady-State C Model

The three-pool steady-state soil C model is based on estimating C inputs to soils and applying soil carbon pool specific decomposition rates that are modified given environmental conditions and management practices. This model embraces more of the heterogeneity in soils, by subdividing soil C pool into different rates of turnover, i.e., fast (Active Pool), intermediate (Slow Pool), and long turnover times (Passive Pool). After conversion to Other Land, it is reasonable to assume that C inputs decline to zero, which will eventually lead to the loss of all C from the soil pool. If this is not the case, then the land should probably be classified as another land use.

Tier 3

Tier 3 methods will involve more detailed and country-specific models and/or measurement-based approaches along with highly disaggregated land-use and management data. It is good practice that Tier 3 approaches estimating soil C change from land-use conversions to Other Land, employ models, data sets and/or monitoring networks that are capable of representing transitions over time from other land uses, including Forest Land, Grassland, Cropland, and possibly Settlements. Tier 3 methods should, where possible, be integrated with estimates of biomass removal and the post-clearance treatment of plant residues (including woody debris and litter), as variation in the removal and treatment of residues (e.g., burning, site preparation) will affect C inputs to soil organic matter formation and C losses through decomposition and combustion.

9.3.3.2 CHOICE OF STOCK CHANGE AND EMISSION FACTORS

This section provides new guidance.

Mineral soils

Tier 1

The initial (pre-conversion) soil organic C stock (SOC(0-T)) is computed from the default reference soil organic C stock (SOCREF) and stock change factor for land-use systems (FLU). The reference C stock at the end of the 20 year default transition period is assumed to be zero. See the appropriate section for specific information regarding the derivation of pre-conversion stock change factors for other land-use sectors (Forest Land in Section 4.2.3.2, Cropland in 5.2.3.2, Grassland in 6.2.3.2, and Settlements in 8.2.3.2).

Tier 2

Refining Application of Default Equations

A Tier 2 approach can be implemented in which country-specific data are used to derive reference C stock and stock change factors (SOC(0-T), FLU, FMG, FI) that better represent conditions in different types of Other Land. Country-specific reference stocks at the end of the 20 year period can also be applied. Subsequently, emissions and removals are set to zero. See the appropriate section for specific information regarding the derivation of pre-conversion stock change factors for other land-use sectors (Forest Land in Section 4.2.3.2, Cropland in 5.2.3.2, Grassland in 6.2.3.2, and Settlements in 8.2.3.2).

Reference values should be consistent across land-use sectors (i.e., Forest Land, Cropland, Grassland, Settlements, and Other Land), which requires coordination among the various teams conducting soil C inventories for AFOLU.

Three-Pool Steady-State C Model

Default parameters are provided for the three-pool steady-state C pool equations (Chapter 2, Section 2.3.3.1, Table 2), but parameters may be revised if experimental data are available to test the model.

Tier 3

Model parameters will be determined using country-specific data or soil stocks measures; using soil inventories with representative sampling as set out in Chapter 3.

9.3.3.3 CHOICE OF ACTIVITY DATA

This section provides new guidance.

Mineral soils

Tier 1

For purposes of estimating soil carbon stock change, area estimates of land-use conversions to Other Land should be stratified according to major climate regions and soil types. If such information has not already been compiled, an initial approach would be to overlay available land cover/land-use maps (of national origin or from global datasets such as IGBP_DIS) with soil and climate maps of national origin or global sources, such as the FAO Soils Map of the World and climate data from the United Nations Environmental Program. Detailed descriptions of the default climate and soil classification schemes are provided in Chapter 3. Soil types are classified based on taxonomic description and textural data, and climate regions are based on mean annual temperatures and precipitation, elevation and potential evapotranspiration. See corresponding sections dealing with each land-use category for sector-specific information on activity data (Forest Land in Section 4.2.3.3, Cropland in 5.2.3.3, Grassland in 6.2.3.3, and Settlements in 8.2.3.3).

Activity data gathered using Approach 2 or 3 (see Chapter 3) provide the underlying basis for determining the previous land use for Land Converted to Other Land, but in its basic form at least, aggregate data (Approach 1) do not reveal specific transitions. In this case, conversions to Other Land will be reported with the Other Land Remaining Other Land and in effect transitions become step changes across the landscape. This makes it particularly important to achieve coordination among categories of land use to ensure consistency over time.

Tier 2

Refining Application of Default Equations

See guidance for Tier 1 Method.

Three-Pool Steady-State C Model

It is reasonable to assume that C input declines to zero after conversion to Other Lands, which will lead to a loss of all organic carbon from the soil over time. Estimating C input for other types of land uses are discussed in other sections of this guidance (Forest Land in Chapter 4, Cropland in Chapter 5, Grassland in Chapter 6, Wetlands in Chapter 7, and Settlements in Chapter 8). Additional ancillary data for this method include monthly weather data and soil texture (i.e., sand content), which are available from global weather and soils datasets if country-specific data are not available, such as the CRU climate dataset (https://crudata.uea.ac.uk/cru/data/hrg/), and the Harmonized World Soil Database (http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/), respectively.

Tier 3

For application of dynamic models and/or a direct measurement-based inventory in Tier 3, similar or more detailed data on the combinations of climate, soil, topographic and management data are needed, relative to Tier 1 or 2 methods, but the exact requirements will be dependent on the model or measurement design.

9.3.3.4 UNCERTAINTY ASSESSMENT

No Refinement

9.4 COMPLETENESS, TIME SERIES, QA/QC AND REPORTING

No Refinement