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Review_Generic methods for CO₂ and non-CO₂ emissions from fires

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“Technical Assistance for Developed Analytical Basis for Land Use, Land Use Change and Forestry (LULUCF) Sector”

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Emissions from fires (CO₂ and non-CO₂ gases)

Description of sources

Two main land management related sources:

Wildfires on managed land

Controlled burning of biomass

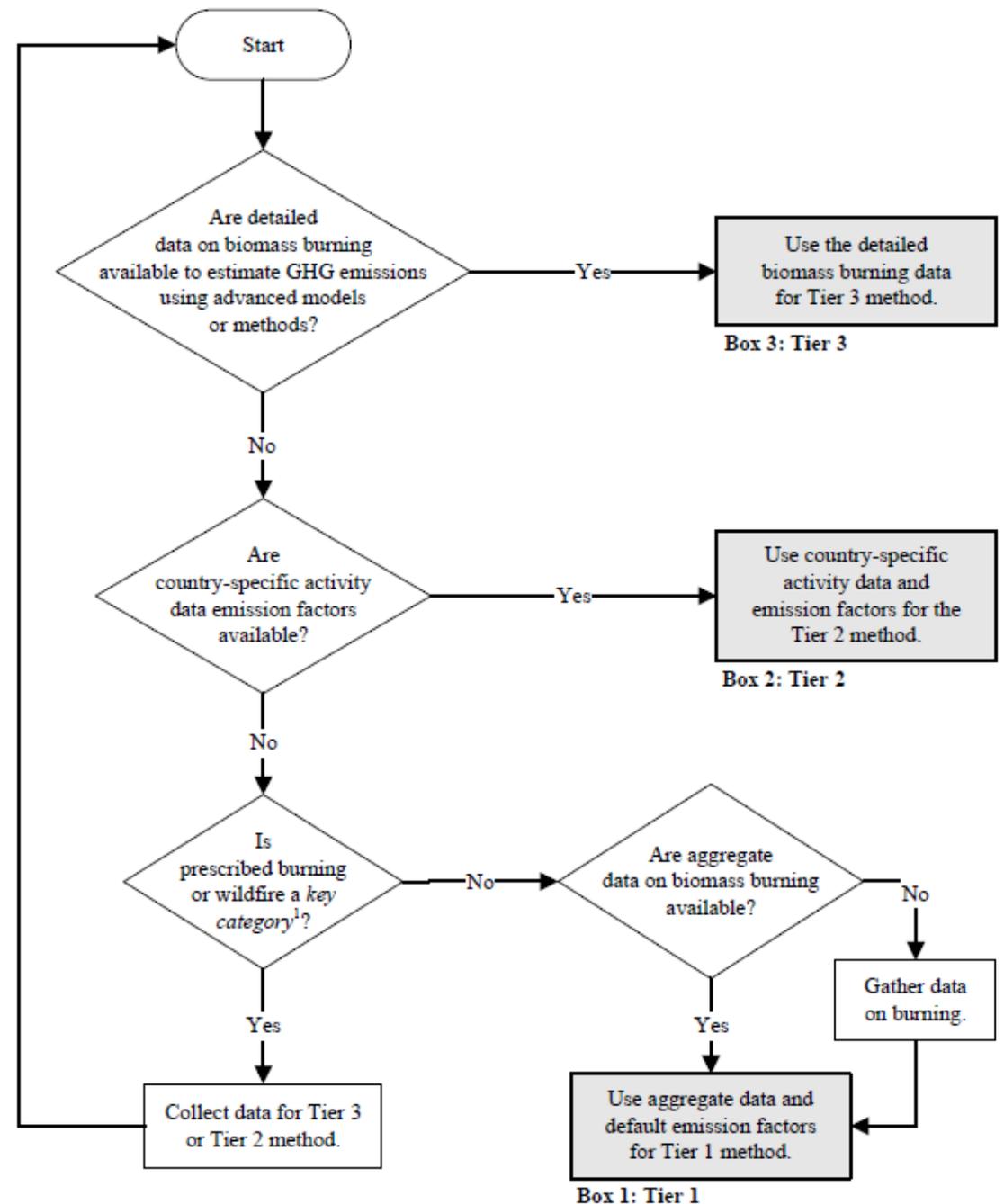
- (1) grassland burning (which includes perennial woody shrubland and savanna burning)
- (2) agricultural residues burning
- (3) burning of litter, understory and harvest residues in Forest Land
- (4) burning following forest clearing and conversion to agriculture
- (5) burning of organic soils
- (6) other types of burning (including those resulting from wildfires)

Activity Data: “area” burned or biomass “amount” burned

Estimating/reporting principles for emissions from fires: CO₂ and non-CO₂ gases

- CO₂ and non-CO₂ need to be reported for **all fires on managed lands**, with **the exception of CO₂** from Grassland and annual crops on Cropland;
- **Wildfire of unmanaged land not to be reported**, unless a land-use change occur;
- **Synchrony of CO₂ emissions and removals**: CO₂ emissions should be reported where the CO₂ emissions and removals for the biomass pool are not equivalent in the inventory year;
- Fuels available for combustion – account for **true burned amount of biomass**;
- Reporting of **annual fire** events

Decision tree for identification of **appropriate tier** to estimate greenhouse gas **emissions from fire** in a land-use category



Emissions from fires: CO₂ and non-CO₂ gases

Assumptions under Tier 1

Emissions of CO₂ from **dead organic matter**

- a) = **0** if **forest stands do not die** because of fire, or,
- b) C contained in the killed biomass is assumed to be **immediately released to the atmosphere**, if fire kills at least portion of stand

Emissions from fires: CO₂ and non-CO₂ gases

EQUATION 2.27

ESTIMATION OF GREENHOUSE GAS EMISSIONS FROM FIRE

$$L_{fire} = A \cdot M_B \cdot C_f \cdot G_{ef} \cdot 10^{-3}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH₄, N₂O, etc.

A = area burnt, ha

M_B = mass of fuel available for combustion, t ha⁻¹. This includes biomass, ground litter and dead wood (default values provided)

C_f = combustion factor, dimensionless (default values provided)

G_{ef} = emission factors, g kg⁻¹ dry matter burnt (default values provided)

Emissions from fires: higher tiers

Tier 2 methods employ the same general approach as Tier 1 but make use of more **refined country-derived emission factors** and/or more refined estimates of **fuel densities and combustion factors**

Tier 3 methods are more comprehensive and include considerations of the dynamics of fuels (biomass and dead organic matter)