

July 2014

Emission Factor for Tropical Peatlands Drained for Oil Palm Cultivation

Peer-Review Report

Prepared for

U.S. Environmental Protection Agency
Office of Transportation and Air Quality
Transportation and Climate Division
1200 Pennsylvania Ave. NW (6401A)
Washington, DC 20460

Prepared by

RTI International
3040 E. Cornwallis Road
Research Triangle Park, NC 27709

RTI Project Number 0213244.002.013



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Charge Questions for Peer Review:
Emission Factor for Tropical Peatlands Drained for Oil Palm Cultivation
May 15, 2014

Instructions:

Please review the attached Technical Work Product (TWP) and respond to the charge questions provided below. We ask that you organize your responses based on the structure of the charge questions provided. Please provide detailed explanations for all responses and provide citations as appropriate.

Charge Questions:

1. **Overarching charge question:** Given the three criteria outlined in the TWP and the estimates available in the literature, did the U.S. Environmental Protection Agency (EPA) choose the most appropriate value for the peat soil emission factor? If not, please provide a recommendation on the most appropriate peat soil emission factor to use in EPA's analysis, with a detailed explanation.
2. **Potential adjustment of emission factor from Hooijer et al. (2012):** Some commenters have raised questions about particular values used in the Hooijer et al. (2012) study (e.g., organic carbon content and peat bulk density). Would you recommend that EPA use the overall approach and data published in Hooijer et al. (2012) but use a different value for: (a) organic carbon content, (b) peat bulk density, (c) the percent of subsidence due to oxidation, or (d) another parameter (please specify)? Please explain your recommendation and provide supporting documentation.
3. **Directionality of estimate:** EPA recognizes that the Hooijer et al. (2012) study that forms the foundation of our estimate of peat soil emissions was conducted under specific circumstances. For example, it was conducted in a limited number of plantations on the island of Sumatra. For the reasons listed in the TWP, we believe this is the best available estimate of peat soil emissions, but we recognize that numerous factors could cause this estimate to be higher or lower than the average emission factor for peat soils drained for oil palm across Southeast Asia. Please discuss whether the emission factor value used by EPA (95 tCO₂e/ha/yr) is likely to overestimate, underestimate (and if so by how much) or provide a plausible estimate of average greenhouse gas (GHG) emissions from peat soil drainage for oil palm across Southeast Asia. In particular, please discuss whether the following factors are likely to make EPA's emission factor an overestimate or an underestimate:
 - a. Variation in the type of peat soil (mineral content, carbon content, depth, extent of degradation, etc).
 - b. Precipitation regime (annual rainfall, timing of rainfall, etc).
 - c. Differing water management practices at plantations.
 - d. Different types of plantations (e.g., oil palm versus acacia).

- e. The approach used by Hooijer et al. (2012) to estimate emissions during the first five years after drainage.
 - f. Omission of methane and nitrous oxide emissions.
 - g. Omission of emissions due to fire. (As discussed in the TWP, omission of this factor will cause EPA's emission factor to underestimate emissions, but we welcome comments about how large this underestimation may be.)
 - h. Omission of incidentally drained peat swamps adjoining the plantations.
4. **Intergovernmental Panel on Climate Change (IPCC) report:** IPCC (2014) lists a Tier 1 emission factor of 40 tCO₂/ha/year for tropical drained oil palm plantations. This value does not include emissions for the first 6 years after drainage. However, studies have shown that a pulse of higher emissions occurs right after drainage. The IPCC report also gives a default DOC emission factor of 3 tCO₂/ha/yr. In addition, the IPCC gives guidance on quantifying emissions from fires. The report gives a default emission factor of 1701 gCO₂/(kg dry matter burned) for tropical organic soil and a default dry matter consumption value of 155 t/ha for prescribed fires in the tropics.¹
- a. Would it be appropriate for EPA to use the IPCC Tier 1 default emission factor of 40 tCO₂/ha/year, or is it scientifically justified to use a different number based on more detailed information?
 - b. Should the emission factor that EPA uses include the emissions pulse that occurs in the first several years immediately following drainage?
 - c. Should EPA include DOC and fire emission factors in the overall emission factor? If so, are the IPCC emission factors appropriate to use, or are there better estimates for EPA's purpose?
 - d. There are also erosion losses of particulate organic carbon (POC) and waterborne transport of dissolved inorganic carbon (primarily dissolved CO₂) derived from autotrophic and heterotrophic respiration within the organic soil. The IPCC concluded that at present the science and available data are not sufficient to provide guidance on CO₂ emissions or removals associated with these waterborne carbon fluxes. Do you agree that the science on these factors is not sufficient for EPA to consider losses of POC and dissolved inorganic carbon in its peat soil emission factor?
5. **Additional input:** Please provide any additional scientific information that you believe the EPA should consider regarding the Agency's assessment of the average annual GHG emissions from draining tropical peatlands for palm oil cultivation for use in EPA's lifecycle GHG analysis of palm oil-based biofuels.

¹ Putting these factors together yields 264 tCO₂ per ha of prescribed burning.