



NLA SUPPLEMENTAL REVIEW DOCUMENT

TO: Kirsten Franz, RTI International
FROM: Jonathan De'Ath, NLA
SUBJECT: NLA Review of Draft Methodology Report: Inventory of U.S. Greenhouse Gas Emissions and Sinks by State
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NLA is pleased to offer the following supplemental comments and recommendations on the document “of Draft Methodology Report: Inventory of U.S. Greenhouse Gas Emissions and Sinks by State.”

Areas for improvements include adding text that discusses and explains CO₂ emissions contribution from calcined waste generation (lime kiln dust in particular), and using slightly more accurate IPCC Tier 2 emissions factors. Also, certain erroneous assumptions are used to back-calculate emissions inventories for years 1990 through – 2009. However, the necessary information needed to accurately calculate state level inventories are considered confidential by the lime manufacturing industry.

2.1 GENERAL CROSS-CUTTING QUESTIONS

2. What recommendations do you have to add to the overall completeness and accuracy of this chapter?

2.1.2.1 Background

74 ...,when limestone – mostly calcium carbonate (CaCO₃) -

A more accurate statement should read “when limestone – consisting of calcium and/or magnesium carbonate is roasted at high temperatures.....”

NLA General Comments

In section 2.1.2 Lime Production, where appropriate there should be recognition and explanation that CO₂ emissions are also generated along with the formation of calcined waste created during lime manufacture. These include (primarily) lime kiln dust (LKD) (which is a saleable product),

with additional contributions from off-spec lime, scrubber sludge, or other miscellaneous site-specific waste¹.

2.1.2.2 Methods/Approach

92 “The methodology used for 1990–2009 was based on dividing the number of facilities in each State by the number of facilities nationally to calculate a percentage of total U.S. facilities in each State for each year. This percentage was applied to the gross national CO₂ emissions from lime production per year (EPA 2021) to calculate disaggregated gross CO₂ emissions by State for each year. This method is implicitly the same as multiplying by the national emissions and other factors used in the national *Inventory*.

102 In the absence of State-specific activity data, using the number of facilities per State to determine the State allocation percentage assumes that each facility has the same amount of input and output.”

NLA Comment

For the period 1990-2009, there are erroneous assumptions, and some of the underlying data are inaccurate. Gross national CO₂ emissions from lime production per year do not accurately account for the contribution from LKD generation and other calcined wastes (see footnote 1). LKD and calcined waste can account for up to 5 percent or more total emissions.

The methodology used by EPA to calculate CO₂ emissions for the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* uses the 2006 IPCC Tier 2 approach where the amounts of high-calcium and dolomitic lime produced annually are multiplied by their respective emission factors. The emission factor is the product of the stoichiometric ratio between CO₂ and CaO, and the average CaO and MgO content for lime. The CaO and MgO content for lime is assumed to be 95 percent for both high-calcium and dolomitic lime (IPCC 2006). The emission factors were calculated as follows:

For high-calcium lime:

¹ Please note that EPA calcination emission calculations used in the National U.S. Inventory of Greenhouse Gas Emissions and Sinks rely on output-based emission factors from the relatively outdated IPCC 2006 GHG Guidelines.

Essentially, IPCC multiplies lime product-related emissions by a “correction factor” of 1.02 to account for LKD. The IPCC Guidelines acknowledge that this correction factor for LKD is borrowed from its chapter on cement, which in turn explains that the factor for cement kiln dust (CKD) is relatively low because most CKD is recycled back into the process (unlike LKD, which is not).

NLA has recommended EPA should discontinue using the IPCC emission factors to account for LKD emissions, and also take into account CO₂ emissions from off-spec lime, scrubber sludge, and other wastes. NLA recommends that quicklime calcination emissions should be multiplied a factor of 1.06 (not 1.02) to account for LKD, and by 1.02 to account for wastes generated at lime plants (which are currently not accounted for).

In the “Planned Improvements” section of the Inventory of U.S. GHG Emissions and Sinks, Chapter 4, EPA acknowledges that “Future improvements involve improving and/or confirming the representativeness of current assumptions associated with emission from the production of LKD and other byproducts/wastes as discussed in the Uncertainty and Time Series Consistency section, per comments from the NLA provided during a prior Public Review comment period.”

$$[(44.01 \text{ g/mole CO}_2) \div (56.08 \text{ g/mole CaO})] \times (0.9500 \text{ CaO/lime}) = 0.7455 \text{ g CO}_2/\text{g lime}$$

For dolomitic lime:

$$[(88.02 \text{ g/mole CO}_2) \div (96.39 \text{ g/mole CaO})] \times (0.9500 \text{ CaO/lime}) = 0.8675 \text{ g CO}_2/\text{g lime}$$

However, NLA data suggests that 95 percent is too low, and 96 percent is more representative. This means the emission factor for hi-cal lime is 0.7534, and for dolomitic lime, the emission factor is 0.8766. This represents another source of inaccuracy in the underlying data set.

Although the text acknowledges that to calculate state level emissions from lime plants, in the absence of production or other required data, the assumption is made that each facility has the same amount of input and output. However, this approach potentially generates erroneous data because of the often substantial disparity between lime manufacturing plants. The lime manufacturing industry includes a spectrum of facilities with some smaller facilities manufacturing a few thousand tons per year, to a million tons or more per year for larger facilities. A single facility in Wyoming, for example, is potentially substantially different from a single facility in Oklahoma or Missouri.

However, company and plant level lime production data are considered confidential business information and typically not released by the lime industry. Further, as a caution, any state level aggregation (or disaggregation) must always meet EPA's CBI criteria (see below).

Additionally, it is not uncommon for certain lime plants to become idle for a period of time, possibly up to a year or more, and then come back on line to meet market demands. Idled lime plants, by state, should be taken into consideration when calculating state-level emissions to improve accuracy.

6. Data Presentation and Usability.

- a. Are there other ways the state-level emissions data could be presented to facilitate their use (e.g., in the EPA GHG Inventory Data Explorer available online at: <https://cfpub.epa.gov/ghgdata/inventorvexplorer/>)?**
 - i. Related to the level of category/gas aggregation or disaggregation?**

NLA has concerns when releasing any state level aggregated (or disaggregated) data due to the risk of potentially releasing data considered CBI by the lime industry.

As per EPA, when considering any level of data aggregation (or disaggregation), each aggregated data value to be released by EPA must meet the following four conditions:

- The data used to calculate the value must be reported by at least four separate facilities or suppliers that have no common ownership or operator;
- No single owner or operator of an individual or multiple facilities can contribute more than X percent to a particular aggregated value (EPA will not disclose the value of X).
- No two owners or operators of an individual or multiple facilities can contribute more than Y percent to a particular aggregated value (EPA will not disclose the value of Y).
- No underlying CBI for a facility of supplier can be back-calculated or otherwise determined using the aggregated value in combination with other publicly available data, including any facility-, supplier-, regional-, or national-data published by the GHG

Reporting Program or any other data likely to be available to owners, operators, or the public.