Summary of Comments and Responses from State Technical Review of

Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2019

March 2022

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1. Introduction

The U.S. Environmental Protection Agency EPA thanks all commenters for their interest and feedback on this first annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks by State*. The U.S. Environmental Protection Agency (EPA), Climate Change Division (CCD) sought comments from states to review the draft final report *Methods Support Document: Inventory of U.S. Greenhouse Gas Emissions and Sinks by State,* developed by the EPA. This methods support document is referred to throughout this review as the "*State Methods* document" or "*State Methods.*" The review was by sector, lasted 40 days (i.e., implemented from September 17 thru November 1, 2022)[1] and included charge questions to focus review on areas identified by EPA as needing a more in-depth review of approaches to disaggregate the national *Inventory*, including feedback on available state-level data. Feedback received after those dates is also reflected in this report. EPA received comments from 9 States and one organization.

The goal of the technical review by state experts is to provide an objective review of the approaches to developing state-level data consistent with the national Inventory to ensure that the final state-level estimates, and document reflect sound technical information and analysis. Conducting a basic expert peer review of all categories before completing the inventory in order to identify potential problems and make corrections where possible is also consistent with IPCC good practice as outlined in Volume 1, Chapter 6 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Concurrent with the review by state experts, EPA also implemented a letter peer review consistent with EPA's Peer Review Handbook. The peer review involved 17 independent experts identified for their sectoral expertise. Findings from the peer review, including responses to findings are also available online here at https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

The report organizes and summarizes comments received by sector and subsector consistent with the guiding questions EPA distributed during the review. EPA responses to comments are included under each summary. Section 2 summarizes the comments received from all states by Charge Question. It also includes a summary of the comments received from independent organizations. Section 3 provides the individual comments received from states. Section 4 provides comments received from independent organizations.

[1] Note, EPA did distribute a subset of state-level estimates in the Agriculture and LULUCF sectors for review later, sharing data and documentation with state experts on January 18 and 19 for a 30-day review. EPA noted that comments received after the 30 days would still be considered for the next annual publication of this data. EPA has not received any comments from state experts on this data at the time of publication of this report.

2. Summary of Comments and EPA responses

2.1 General Questions

1. What are your overall impressions of the clarity of the methods described in this report?

State reviewers from Maine's Department of Environmental Protection (DEP) listed the following primary concerns regarding the results from the *State Methods*:

1) Data are inconsistent between various EPA GHG datasets;
2) Methods are inconsistent between the national *Inventory*, the disaggregated state GHG inventories, and the State Inventory Tool (SIT); and
3) Stakeholder confusion and associated decreased confidence are likely to result from comparison of EPA-developed state GHG inventories and SIT-based state-developed GHG inventories.

They emphasized the importance of data consistency because it is critical for confidence in a dataset and any strategies or policies that are based on that foundational data. Otherwise, stakeholders will question which dataset is accurate. Specifically, the differences in results from the *State Methods* and the SIT differ significantly. They noted that while the reasons for variability in the *State Methods* and the national *Inventory* results are explained in the *State Methods* report, but the differences between state GHGI data and SIT default data are not defined. They commented that this is concerning since these are the two datasets likely to be compared as many states currently rely on the SIT for development of state GHG inventories.

Maine's DEP continued, commenting that state stakeholders compare SIT default data with the Maine-produced GHGI inventory, and the SIT is augmented when more accurate, state-specific data are available. These changes are tracked and transparent in the revised SIT models, and in contrast input differences and methodology of the *State Methods* and the SIT are unclear. Reviewers from Maine's DEP noted that unlike in the *State Methods*, the SIT makes explicit input data and data sources and is more transparent. Furthermore, the *State Methods* doesn't explain where and how data are used when they are included. They recommended that the EPA hold the release of the disaggregated state data until the SIT default data for each state better matches the state data disaggregated from the national *Inventory*.

Reviewers from Rhode Island's Department of Environmental Management (DEM) found the report had clear and thorough descriptions of methods. They suggested including references at the end of each chapter. Reviewers from Alaska's Department of Environmental Conservation (DEC) found that the methods were clearly laid out and established.

EPA Response: The EPA recognizes that a number of states rely on the SIT as a starting point for preparing their state GHG inventory estimates. The SIT includes default activity data and estimates that states can use as a starting point for compiling a state-level GHG inventory. The default data included in SIT are largely consistent with the EPA's state-level inventory because the data are based on methodologies, emissions factors, and other data from the national* Inventory. *However, some differences exist between default data in SIT and the GHGI by state estimates due to differences in methods, data, and level of completeness. As

additional state-level data and/or methodological approaches become available through the national* Inventory *disaggregation, they will be used to supplement or improve the embedded calculations and defaults in SIT as appropriate. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults.

The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. The fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

Finally, EPA has included data appendices to accompany the State Methods report. The data appendices do include input data to enhance transparency of methods and data.

2. What recommendations do you have to add to or improve the overall transparency, completeness, consistency and accuracy of this report?

Reviewers from Alaska's DEC noted differences in Alaska specific values from national averages in land use and land use change (LULUCF), decomposition rates in landfills, population using waste treatment systems and electrical grid, agriculture, and many other sectors. Responses to their detailed questions are listed below in the chapter specific questions.

Reviewers from Texas Commission on Environmental Quality (CEQ) suggested providing an executive summary. Reviewers from Minnesota's Pollution Control Agency (PCA) commented that there are significant differences between the boundaries of the U.S. state *Inventory* and the inventory produced by the Minnesota Pollution Control Agency. This creates challenges for explaining the different results, but they also recognized that the complexity of estimating emissions for different purposes creates distinct but complementary results.

EPA Response: EPA thanks Texas CEQ for their suggestion and will consider including an executive summary in future annual publications of the Inventory by State. EPA thanks MPCA for their thoughts on explaining differences and acknowledging the different but complementary purpose of this information. EPA will consider including comparative results and an executive summary in future annual publications of the GHG Inventory by U.S. State.

Reviewers from Rhode Island's DEM suggested including a comparison of the methodology used with the EPA's SIT since many states use the SIT to calculate state GHG emissions. They also suggested including sources and estimates of any state level data used in emissions estimates and including specific data sources and estimates, including the data used to estimate GHGs.

EPA Response: The EPA recognizes that a number of states rely on the SIT as a starting point for to preparing their state GHG inventory estimates. The SIT includes default activity data and estimates that states can use as a starting point for compiling a state-level GHG inventory. The default data included in SIT are largely consistent with the EPA's state-level inventory because the data are based on methodologies, emissions factors, and other data from the national* Inventory*. However, some differences exist between default data in SIT and the GHGI by state estimates due to differences in methods, data, and level of completeness. As additional state-level data and/or methodological approaches become available through the national* Inventory *disaggregation, they will be used to supplement or improve the embedded

calculations and defaults in SIT as appropriate. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults.

The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. This fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

Reviewers from Arizona's Department of Environmental Quality (DEQ) Air Quality Division, Technical Analysis Unit noted that it would be helpful to include more details on the calculation of the emissions for each sector. They continued that control measures or existing best practices aimed at reducing GHG emissions should be considered in the emission estimates where possible. Any activity data that incorporates these measures should be specified in the report. For example, for Electric Power sector, is it possible to consider the heat rate improvement actions? Many power plants have applied that to reduce emissions but it seems that these improvements are not considered in this report, according to reviewers from Arizona's DEQ.

EPA Response: The EPA has provided additional level of detail on how state-level emissions were calculated and also further clarified Appendices with additional data on calculations. In terms of the questions on if the report accounts for mitigation efforts, it depends on the source and method. In particular with the electric power sector emissions by state are based on fuel used so it would account for heat rate improvements. It is outside the scope of this report to provide information on control measures more generally but there are other existing GHG mitigation resources from EPA available (see for example: https://www.epa.gov/statelocalenergy).

Reviewers from Iowa's Department of Natural Resources (DNR) compared Iowa DNR emissions for 2015 through 2019 as published in the 2019 GHG Inventory Report & Technical Support Document (TSD) to the EPA's state GHG Trends and Emissions and Sinks by Gas. They mapped the sectors as closely as possible since the two sources have different disaggregation. They cautioned that Iowa DNR's Inventory data refer to activity during the previous calendar year, making it out of sync with the EPA's national *Inventory* and SIT because they calculate emissions for two years before the current year. Furthermore, reviewers from Iowa DNR recommended the EPA carefully consider the wording of its announcement of publicly releasing the data and to include information on the webpage housing the data that helps to clarify the data that the EPA is posting. Regarding the completeness, they identified possible gaps in the Inventory (Table 1) for Iowa.

Table 1: Potential Gaps in Sectors in Iowa

Sector	Pollutant(s)
Non-Energy Use of Fuels	CO_2
Natural Gas Systems	CO_2, N_2O
Glass Production	CO_2
Carbon Dioxide Consumption	CO_2
Urea Consumption for Non-Agricultural Purposes	CO_2
Petrochemical Production	CO_2
Carbide Production and Consumption	CO_2

International Bunker Fuels	CO_2, CH_4, N_2O
Composting	CH_4, N_2O
Anaerobic Digestion at Biogas Facilities	CH_4
N_2O from Product Uses	N_2O

Iowa's DNR also identified areas where there were significant discrepancies between DNR and EPA values for the same category. These sectors can be found in Table 2.

Table 2: Sectors Identified with Significant Differences between Iowa DNR and EPA

Sector	Pollutant(s)
Industrial Fossil Fuel Combustion	CO_2
Cement Production	CO_2
Lime Production	CO_2
Other Process Uses of Carbonates	CO_2
Incineration of Waste	CO_2, CH_4, N_2O
Ammonia Production	CO_2
Liming	CO_2
Urea Fertilization	CO_2
Mobile Combustion	CO_2, N_2O
Natural Gas Systems	CO_2
Enteric Fermentation	CO_2
Manure Management	CO_2, N_2O
Wastewater Treatment	CO_2, N_2O
Stationary Combustion	N_2O
Electronics Industry	HFCs
Electrical Transmission and Distribution	SF_6
LULUCF	CO_2

EPA Response: The EPA appreciates the comments on the comparison of Iowa DNR's inventory with that provided in the GHG Inventory by U.S. State. For many of the differences, it is clear where there are differences in scope/methodology that account for differences. For other categories, the EPA will work with Iowa to help identify the reason for discrepancies. The EPA will add a caveat to the release of the data to indicate they are not considered official state-level GHG data and provide references to state-level official reports.

3. <u>Data availability.</u> Please address the following questions for each inventory source:

- **a. For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?**
- **b. For national level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code levels?**

Reviewers from Minnesota's PCA commented that they hope that ongoing collaboration with EPA will help MPCA improve the estimates for their GHG inventory. There were some areas

where MPCA does not have disaggregated data available. They noted that full transparency and access to input data are important for their ability to compare methods and estimates and to incorporate information into their inventory.

Reviewers from Arizona DEQ noted that providing facility-level data such as CO_2 emissions reported to state and Local Emissions Inventory System (SLEIS) from each facility would be useful. They noted also that weights and measures might be able to help provide local data on transportation fuel consumption. They referenced EPA's Facility level Information on Greenhouse Gases Tool (FLIGHT) database which includes statewide CO_2 emissions for the year 2019 and was recently updated in September, 2020.[2] They also referenced the EIA's energy related emissions.[3]

EPA Response: The EPA appreciates the responses from Minnesota PCA and Arizona DEQ. The EPA has provided some additional information and clarity on the use of other data sources such as the EIA SEDS and GHGRP data. The EPA also notes that GHGRP data by state are available through their State and Tribal Fact Sheets found here: https://www.epa.gov/ghgreporting/ghgrp-state-and-tribal-fact-sheet.

4. **<u>Uncertainty.</u> Currently uncertainty ranges are not included for the state level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Timeseries Coverage. Currently state data covers 1990-2019 consistent with the 2021 National GHG Inventory, and inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the *National Inventory*. As state-specific input datasets are not always available over the entire timeseries, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. EPA appreciates feedback on which, if any years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).**

Reviewers from Virginia's Department of Environmental Quality (DEQ) compared disaggregated values from the state draft methodology report with state emissions obtained from SIT and/or GHGRP oriented methods and found them consistent within ±10% accuracy. They noted that summary emissions trends are very similar, while emissions disaggregated on the basis of the national *Inventory* are the least in recent years compared to values reckoned by the state. They emphasized, "Differences in the accounting decisions do not necessarily indicate that one of the estimates is accurate, or 'correct', but it will make comparability more difficult."

[2] U.S. Environmental Protection Agency. (08/07/2021). Facility Level Information on Greenhouse gases Tool," Available at: https://ghgdata.epa.gov/ghgp/main.do
[3] U.S. Energy Information Administration. (2020). "Energy-Related CO_2 Emission Data Tables," Available at: https://www.eia.gov/environment/emissions/state/

Figure 1 shows the comparison of the gross emissions in Virginia between the *State Methods* and scenarios related to the SIT.

EPA Response: The EPA appreciates the comments from Virginia's DEQ. The EPA notes that several emission sources were missing from the first release of the state-level data, including for example, some key Ag sources (e.g, Ag soils) and some key LULUCF categories, which could be leading to differences. The EPA also recognizes that there are differences with the SIT but that as additional state-level data and/or methodological approaches become available through the national* Inventory *disaggregation, they will be used to supplement or improve the embedded calculations and defaults in SIT as appropriate. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults.

Reviewers from Rhode Island's DEM found the timeseries of 1990 through 2019 to be consistent with the Rhode Island GHG Emissions Inventory and had no additional feedback on any years which should be prioritized.

EPA Response: The EPA thanks Rhode Island's DEM for their feedback.

5. <u>Key Category Analysis</u>. EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. EPA appreciates feedback on which categories are more relevant for further refining for your state.

a. Given that the emissions profile of some states will be different from the national average, which categories that are more significant in terms of absolute emissions, or have changing emission trends (e.g., increasing, variable)?

Reviewers from Rhode Island's DEM noted that in Rhode Island, transportation, electricity consumption and residential heating are the largest sources of GHG emissions. They wondered why EPA had electricity emissions estimated at 0.660 MMT CO_2e in 1990 since Rhode Island's estimated electricity consumption in 1990 was 2.82 MMT CO_2e in 1990, which is a 327% difference in estimates. They wondered if there is an idea of why these estimates vary so significantly. Finally, they noted in every year, electricity emissions are higher in Rhode Island's GHG Inventory when compared to EPA's state level inventory and emissions vary by 10-20%.

EPA Response: The EPA used the EIA SEDS data on fuel used to produce electricity in a given state to determine emissions from electric power generation within a state, including for RI. The SEDS data are based on power plant data reported by state and represent fuel use and emissions associated with electric power produced in the state. For 1990, the SEDS data show much lower fuel use for electricity production than in 1991 and later years, causing lower emissions in that year. The electricity consumption data for RI (also from SEDS) show fairly consistent electricity consumption for 1990 and later years, so if emissions are based on consumption, the 1990 emissions would be higher than those based on production in RI. Electric power sector emissions in other years are likely different for the same reason. The EPA will follow up with RI to better understand differences in electric power sector emissions.

b. The national Inventory includes a key category analysis (KCA) consistent with 2006 IPCC Guidelines. Would it be useful for states if a key category analysis (KCA) was completed for each state?

Reviewers from Rhode Island's DEM found the KCA consistent with 2006 IPCC Guidelines.

EPA Response: The EPA thanks Rhode Island's DEM for their feedback.

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/inventoryexplorer/)?**
      i. **Related to the level of category/gas aggregation or disaggregation?**
      ii. **Are there specific categories where further data disaggregation could be helpful?**
   b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**
   c. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download, etc.)?**
   d. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**
   e. **EPA plans to provide users additional information on where they can find official state data, where it exists. Do you have suggestions on how we should direct users to official state data (i.e., section in methods report including links to state data)?**

Reviewers from Rhode Island's DEM recommended having data available in .xlsx, or .zip files. Reviewers from Arizona's DEQ suggested .xlsx format and suggested that available text and .csv downloads and an FTP site would be useful too. They suggested that, if possible, monthly data disaggregation could be useful, especially for sectors with seasonable variability. Furthermore, they suggested that browsing by state, year, fuel, sector, or facility level could be useful. Finally, they suggested including a separate section containing all necessary links for each section and disseminating information via workgroups EPA is involved with would also be helpful.

Reviewers from Rhode Island's DEM also suggested any data used to estimate GHG emissions in Rhode Island (e.g., energy sales, population, er capita emissions factors used) be included as additional datasets to increase the usability of state-level emissions data. Finally, they referenced the Rhode Island Department of Environmental Management (RIDEM) GHG Emissions Inventory.[4] Reviewers from Alaska's DEC suggested including links to state websites and links to updated NEI data to direct users to official state data.

EPA Response: The EPA appreciates the specific suggestions on additional datasets, data disaggregation, and data formats to enhance usability of the state-level emission data. The EPA will consider these suggestions with future publications of the state data. The EPA has published the data in the GHG Data Explorer and it can be downloaded in .xlsx and .csv

[4] Rhode Island Department of Environmental Management. (2021). "Greenhouse Gas Emissions Inventory," Available at: http://www.dem.ri.gov/programs/air/ghg-emissions-inventory.php

formats. The GHG Data Explorer also allow users to export charts and graphs in .png and jpeg formats. The EPA recognizes that there will be differences between the EPA's state-level estimates and some inventory estimates developed independently by individual state governments. The EPA will provide caveats that inventory data presented here should not be viewed as official data of any state government. Additional information will also be provided on official state data, where those data exist, including information on potential areas of difference between the EPA's data and official state data. Learn more about GHG emissions and the NEI here: https://www.epa.gov/air-emissions-inventories/are-ghgs-national-emissions-inventory-complete.

2.2 Energy

1. What are your overall impressions of the clarity of this section?

Reviewers from Arizona's DEQ thought that the methodology and emissions estimate for Fossil Fuel Combustion sectors were clear, especially the description of why some fuel use reported in SEDS may be different from reporting in the national *Inventory*. They found the tables provided in the appendices helped to explain adjustments made to different sectors. However, they noted more bottom up data collection would be helpful. For the Non-Energy Uses of Fossil Fuels, they thought the emissions calculation method was clearly laid out.

EPA Response: The EPA thanks the reviewers for their comments. The EPA has added some more detail and clarification to the report and appendices to help clarify the data and methods used.

2. What recommendations do you have to add to or improve the overall transparency, completeness, consistency, and accuracy of this chapter?

Reviewers from Rhode Island's DEM suggested discussing the transportation CO_2 emissions from mobile combustion in one section. Additionally, they noted that RIDEM uses MOVES to calculate transportation emissions and they calculate electricity consumption and not generation. They agreed with the methodology for determining the carbon content of fuels.

Reviewers from Arizona's DEQ noted that Section 2.6 of the *State Methods* "describes that the total amount of distillate fuel and motor gasoline used in Transportation sector was taken from the national *Inventory* (based on FHWA data). The totals are said to be based on multiple factors to determine transportation sector fuel use. A more specific description of the mentioned factors would be useful. It would also be useful to know how EPA plans to investigate why the total fuel use on the FHWA forms used to allocate transportation sector gasoline and diesel fuel use across states doesn't match with the EIA statistics. More details regarding how FHWA determines fuel consumption would be helpful as well. The transportation section provided information on the carbon content of the fuel, among other details. Some discussion of carbon content in MSW fossil components/emission factors would be helpful."

EPA Response: The EPA appreciates the comments. The EPA has added more detail to the methodology report on calculation of both national- and state-level transportation sector emissions and specifically the differences with the state-level and national-level data used. The EPA continues to allocate transportation sector emissions to states based on fuel sales data, consistent with the IPCC Guidelines, but will continue to look at other methods including the MOVES model as part of ongoing QA/QC. The EPA is updating the national-level waste incineration calculations as part of ongoing planned improvements, and those updates will be incorporated into the state-level estimates when finalized.

3. **Data Availability. Please address the following questions for each inventory source:**
   a. **For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?**
   b. **For national-level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code level?**

Reviewers from Arizona's DEQ suggested that for the Transportation sector, prioritizing years after 2012 because this is when E15 fuel was first approved. They suggested that for the Electric Power sector, emissions for 2010 and later should be prioritized for Arizona because there was a significant increase followed by a decrease in emissions, which is not the same trend observed for other states. They suggested for NEU of Fossil Fuels, emissions from 2008 and later should be prioritized because NEI data began in 2008 and the two databases can complement each other. Finally, for Stationary Combustion, they suggested prioritizing emissions from 2005 and later because peak use of coal and natural gas for Station Combustion occurred in 2006 and began to decrease after 2010.

EPA Response: The EPA appreciates the comments on time frames to consider for prioritizing analysis.

Reviewers from Alaska's DEC suggested that the NEI for the state of Alaska could be included for Fugitive Emissions and for Point and Non-point sources. They also suggested the data from Alaska Oil and Gas Conservation Council (AOGCC) on flaring (over one hour) and fills in the gaps on routine practices and flaring less than one hour. Finally, they noted for the Oil and Gas Sector, the state contractor used the NEI to generate GHG emissions and they found this representative.

EPA Response: The EPA thanks Alaska's DEC for their comment. We note that there is much coordination between the EPA's NEI and GHG Inventory teams, and we often use the same input data (e.g., activity data) to calculate emissions. While the NEI does quantify CH_4 emissions for some sources in the NEI O&G Tool as an intermediate step to quantifying VOCs, those estimates are not available for all sources. The national GHG Inventory uses data reported to GHGRP to quantify emissions from flaring. Data from flaring in Alaska are included in that dataset. For future annual publications of this report, the EPA will consider

conducting a comparison of the GHG Inventory state flaring values with other state data sources (e.g., AOGCC) to identify potential improvements.

4. **<u>Uncertainty</u>. Currently uncertainty ranges are not included for the state-level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Time Series Coverage. Currently state data cover 1990 through 2019 consistent with the 2021 *National Inventory* and are inclusive of most known baseline periods for climate policy. Subsequent publications of these data will also strive to maintain this consistency with the national *Inventory*. Because state-specific input datasets are not always available over the entire time series, understanding which years may be more important can help us better prioritize our backcasting and methodological efforts across the time series. The EPA appreciates feedback on which, if any, years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).**

Reviewers from Virginia's DEQ compared *State Methods* emissions with SIT and GHGRP results and found similarity in trends irrespective of method for computing emissions and the spread converges especially in recent years supporting near consistency. They noted, "however, GHGRP report oriented data, the highest of all the assessments is slightly higher than disaggregated values. It may be pointed out that total emissions reported by GHGRP between 2010 & 2019 account for above 90% of all emissions from power industry in the state."

EPA Response: The EPA appreciates the comment. The EPA is preparing a fact sheet comparing SIT data with those presented as part of this analysis to help clarify where there may be differences. The EPA uses the GHGRP data in multiple sectors to help allocate national-level total emissions to states.

5. **<u>Key Categories</u>. The EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. The EPA appreciates feedback on which categories are more relevant for further refining for the sector you are reviewing.**

Reviewers from Arizona's DEQ suggested a KCA for Electric Power sector because it has changed significantly over time and decreased in past years. They recommended a KCA for each state because the energy structures for power plants are different. Furthermore, they recommended a KCA for Stationary Combustion for Arizona because there is a significant difference between the national level and the state level emissions Inventory. A KCA of the Mobile Source sector may be useful, they suggested. Finally, they suggested refining Natural Gas systems in Arizona because it is the fourth largest GHG sector. Reviewers from Alaska's DEC suggested refining assumptions and results regarding pipeline compressor stations, pipeline, and tank emissions. Oil and gas rigs are different on the North Slope, they noted. The infrastructure for the lower 48 states does not match what is in Alaska.

EPA Response: EPA thanks the Arizona DEQ for their perspectives on categories more relevant for refining methods to estimate emissions. As commenters suggested, for future iterations of the GHG Inventory by U.S. State, the EPA is considering alternate state-level activity data for allocating state emissions such as processing plant information for the natural gas processing segment, and station data rather than pipelines for the natural gas transmission segment. The EPA will also consider approaches that use additional GHGRP data to further refine state-specific estimates, such as for tanks and other production equipment.

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/inventoryexplorer/)?**
      i. **Related to the level of category/gas aggregation or disaggregation?**
      ii. **Are there specific categories where further data disaggregation could be helpful?**
      iii. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download)?**
   b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**

For the Transportation Sector, reviewers from Arizona's DEQ suggested further disaggregation by vehicle age when looking at light-duty vehicle emissions and breaking vehicles up by Tier type (Tier II or Tier III) to illustrate lower emission rates for newer vehicles. For the Electric Power sector, they recommended finer disaggregation and providing facility-level data. Finally, they suggested disaggregating data for the Stationary Combustion sector at the facility, county, or non-attainment level.

EPA Response: The EPA provided data as part of the state review process in the level of disaggregation that was available. With final release of the data, other disaggregation and ways to look at the data will be available in Data Explorer to the extent the state-level data are available. Data on state-level fuel use by vehicle type were not readily available; more detail was added to the report on differences in national- and state-level transportation sector data used.

2.2.1 Combustion

2.2.1.1 Fossil Fuel Combustion

1. **Some fuels have differences in consumption data between the aggregated state-level totals and national totals. The current approach is to use data from the national *Inventory* in those cases. Are there other approaches that could be taken? Do you know of cases where others have dealt with the differences in the totals, and if so how?**

Reviewers from Alaska's DEC suggested calculating a percentage of emissions from NEI data of large facilities of state emissions and updating the scaling factor every three years. They also noted that SEDS data has been beneficial and accounts for small facilities that don't report emissions through the permit program to complement NEI data. Additionally, they noted that more engagement with state-level planners is needed to generate aggregate totals. This is because Alaska has a unique relationship with both aviation and maritime transportation due to the state's infrastructure arrangements. They noted that fuel consumption habits vary in the state compared to utilization in the continental US. There is continued use of large amounts of light aircraft to bring passengers and cargo to and from remote communities, some of which still burn leaded AvGas and non-standard fuels. They also commented that Alaska receives a large amount of international marine traffic via the Great Circle Route which needs to be considered for long-term fuel consumption data. Many international vessels arrive in state waters using International Maritime Organization (IMO)-designated low sulfur content fuel which generates other criteria area pollutant (CAP) and GHG emissions due to fuel chemistry from prior bunker fuel. The state's adjacent location to major developing trans-Arctic shipping routes could also change how the state's fuel consumption habits appear on national-level inventories.

Reviewers from Alaska's DEC also strongly recommended that rather than relying on generic nationwide data, EPA coordinate with the NEI team on aviation and maritime inventories. Both have developed specific activity data which incorporates satellite location-drive emissions data and actual engine activity data. They recommended this approach because it would be more accurate and CAP emissions have already been generated by this data. The only missing component at that stage would be the application of emissions factors for GHG emissions, they noted. The same applies for state's aviation inventory which is already generated by landing and takeoff data from NEI. This NEI dataset also contains activity and landing and takeoff data from all categories of aircraft.

EPA Response: The EPA appreciates the comments on potential data sources for transportation sector emissions. The EPA continues to use SEDS as the primary data source for allocating combustion emissions to states. The EPA has compared the SEDS data with NEI data for transportation and will continue to look at NEI data as an alternative data source and to be used as a QA/QC comparison. Updates will be incorporated into future reports as applicable.

For Point Source emissions, reviewers from Texas CEQ recommended developing electric utility fuel consumption at the state or site level using EIA data. Regarding Area Source categories, reviewers from Texas CEQ suggested adjusting state-level totals to match the national totals for consistency is reasonable since the adjustments are mostly small (less than 5%). Reviewers from Rhode Island's DEM identified no other approaches and used SIT default fuel consumption data when developing Rhode Island's annual GHG Inventory.

EPA Response: The EPA appreciates the comments on data sources. The EPA relies on EIA SEDS data, which are based on the same data sources used by EIA in their electric power sector results. The EPA is planning on providing more detail on the comparison of this state-level data with results of the SIT.

Reviewers from Arizona's DEQ commented that for most sectors, this approach seemed appropriate and accurate. However, they noted that for some sectors such as Electric Power, a bottom-up method to collect activity data or CEMS data from the facility would be more accurate. They acknowledged that applying this method may not be easy for the Stationary Combustion sector, but it can be considered an alternative way to collect data.

EPA Response: The EPA appreciates the comment. The EPA's approach to allocating emissions to the state level is to rely on a similar approach to the national* Inventory *in terms of calculating fuel use emissions based on fuel use multiplied by an emissions factor. The EPA does not rely on CEMS data for the national* Inventory*, but it is a good QA/QC check of national-level emissions. The EPA will investigate comparisons of power sector CEMS data with the current approach of using SEDS data at the state level and incorporate into future reports as applicable.

Regarding Industrial Fossil Fuel Combustion, reviewers from Iowa DNR estimated their Fossil Fuel Combustion from the industrial sector to be significantly higher than EPA's state GHGI results, varying from 29% to 56% from between 2015 and 2019. They suggested that Iowa DNR's inventory includes emissions from this sector that may be double-counted in some IPPU sectors of Cement Production, Lime Production, Iron & Steel Production, Ammonia Production, etc. They noted that in the national *Inventory*, portions of fuel consumption data for several fuel categories (coking coal, other coal, natural gas, residual fuel, and distillate fuel) were reallocated to IPPU, as these portions were consumed as raw materials during the non-energy related industrial processes. This is an area for the Iowa DNR to improve its inventory to be better aligned with EPA, they commented.

EPA Response: The EPA appreciates the comment and agrees that some of the differences between the Iowa DNR industrial sector fuel combustion emissions estimates and those developed by the EPA could be due to adjustments the EPA makes. The EPA adjusts the industrial sector fuel use combustion emissions to account for some fuel use and emissions that are accounted for specifically under the IPPU sector. The EPA will follow up with Iowa DNR to better understand differences in emissions estimates.

Regarding transportation, reviewers from Iowa DNR calculated highway transportation emissions using the SIT mobile combustion module. For CH_4 and N_2O, they used the actual total annual VMT from Iowa Department of Transportation (DOT).[5] Since Iowa DOT does not have VMT data by model years, DNR allocated Iowa VMT using default national on-road distribution by vehicle/fuel type. Furthermore, Iowa uses the annual vehicle mile accumulation, age distribution, and control technology values from the most recent national *Inventory*. They calculated CO_2 emissions from highway vehicles and all emissions from non-highway vehicles using fuel sales data from either SEDS, FHWA, or the SIT default value. This hybrid calculation method results in Iowa emissions that are lower than the disaggregated Iowa values provided by

[5] Iowa Department of Transportation. (2019). "VMT by County/System," Available at: https://iowadot.gov/maps/msp/vmt/countyvmt19.pdf

EPA (for CO_2 5%, for CH_4 2%, and for N_2O 14% for 2019). Iowa DNR's calculations may have a higher level of uncertainty because DNR did not use the true vehicle/fuel distribution for Iowa. Reviewers from Iowa DNR had no specific concerns regarding the CO_2 emissions estimation by allocated VMT as it seems to be the best method available. They noted that it would be interesting to see the difference between CO_2 emissions based on VMT versus fuel sales, however.

EPA Response: The EPA appreciates the comment and notes the approaches used by the EPA and Iowa are very similar for calculating transportation sector emissions. The differences could be due to a number of reasons, including Iowa DNR using their own specific VMT data and the fact that the EPA uses national average default factors. The EPA will continue to evaluate other approaches for allocating transportation sector emissions across state's VMT and include comparisons in future reports as applicable.

2. **Consistent with the IPCC Guidelines, we have adjusted fuel consumption totals in the energy sector to account for consumption in the IPPU sector. In some cases, this step could lead to a negative emission total for a state if the subtracted amount (as determined from the assumed distribution) was greater than consumption data from the State Energy Data System (SEDS). This outcome was corrected to zero if that was the case, but are there other approaches for correcting for that difference?**

Regarding Point Source emissions, reviewers from Texas CEQ noted in-house energy generation occurs within some industrial sites (e.g., petrochemical production sites) and adjusting fuel consumption in the energy sector may not be needed for those industrial sites. They noted EIA collects consumption and generation data on all generators at sites greater than one megawatt on the Annual Power Plant Operations Report.

EPA Response: The EPA appreciates the comment. The EPA relies on SEDS data for allocating electric power sector emissions across states and notes that the SEDS data are consistent with other EIA-reported power plant data. In terms of adjustments in the industrial sector fuel use, the adjustments are only made to areas where fuel is used as part of the process and not to generate power. Further information about the adjustments made were added to the report.

Regarding Area Source emissions, reviewers from Texas CEQ noted that for some Industrial, Commercial, and Institutional Combustion sources, they have seen an approach where remaining negative emissions are re-allocated among the other non-zero states to fully account for the adjustment. However, making the adjustment to zero without re-allocating the remaining negative emissions is simpler and easier to understand.

EPA Response: The EPA appreciates the comment and will continue to evaluate methods of making adjustments to account for the potential of negative emissions. Updates will be included in future reports as applicable.

Reviewers from Rhode Island's DEM identified no other approaches. Reviewers from Arizona's DEQ found the approach to be generally reasonable but noted whenever a negative value is

increased to 0, there should be a deduction somewhere else. They suggested that the total of the negative values should be tabulated, converted to zero, and then all state totals should be scaled down uniformly by the appropriate amount.

EPA Response: The EPA appreciates the comment and will continue to evaluate methods of making adjustments to account for the potential of negative emissions. Updates will be included in future reports as applicable.

3. **Consistent with the national *Inventory*, the default approach taken here was to allocate transportation sector CO_2 emissions based on Federal Highway Administration (FHWA) fuel use/sales by state. For some states, this may not be accurate because fuel sold in a state may be combusted in other states. Another option is to use vehicle-miles-traveled (VMT) data by state but that approach does not factor in vehicle fuel economy. Are there other alternative or complementary approaches to allocate transportation fuel across states, including VMT data and other sources (e.g., NEI—based on county-level fleet and activity data to generate a bottom-up inventory) that the EPA should consider? If so, what data sources exist to help with that alternative approach? Would it be helpful to present transportation sector emissions using multiple approaches in future inventories?**

Reviewers from Alaska's DEC noted that the existing methodology is appropriate since Alaska doesn't have adjacent states. They also noted that the SEDS dataset is reliable and should be used, as it is with the SIT. They also recommended looking at NEI data on mobile sources combustion, especially on- and off-road maritime, and aviation emissions. They provided a final caveat that FHWA data on registered vehicles are not complete because native populations do not have to register vehicles that don't travel on highway systems. In the triennial NEI, Alaska uses a 10% adjustment to compensate for these unregistered vehicles.

EPA Response: The EPA appreciates the comment on the potential for unregistered vehicles and will evaluate the possibility of making adjustments similar to the NEI in future reports as applicable.

Reviewers from Texas CEQ noted that, consistent with EPA requirements, on-road emissions inventories are developed using emissions factors and corresponding activity levels. The same method can be used to generate both CO_2 and non-CO_2 emissions rates for on-road mobile sources. Using the CO_2 emissions rates from the national emission factor model combined with the corresponding activity levels is the preferred method for producing emissions estimates consistent with other pollutants.

EPA Response: The EPA appreciates the comments on data sources for developing state-level transportation sector emissions. The EPA continues to use SEDS as the primary data source for allocating combustion emissions to states. The EPA will continue to evaluate alternative data sources, and updates will be incorporated into future reports as applicable.

Reviewers from Rhode Island's DEM noted that Rhode Island has rough transportation data provided by the Rhode Island DOT. Additionally, they noted, "current transportation data have significant limitations such as county level VMT data and speed distributions, but updates to transportation data collection are being considered. Rhode Island is in the process of creating Motor Vehicle Emissions Simulator (MOVES) inputs using in state data. For MOVES inputs prior to 2017, Northeast States for Coordinated Air Use Management (NESCAUM) and other contractors provided Rhode Island with the inputs required. No MOVES inputs have been created for 2018-2020. The transportation data necessary for MOVES is in the process of being created for 2020 ahead of the National Emissions Inventory (NEI) submission."

EPA Response: The EPA appreciates the comments on data sources for developing state-level transportation sector emissions. Although the EPA is not adopting the NEI/MOVES approach as the primary method for this annual effort, the EPA will continue comparisons with the NEI and other approaches of allocating vehicle emissions.

Reviewers from Arizona's DEQ commented that a bottom-up inventory using NEI activity data would help mitigate the possibility of allocating CO_2 emissions based on fuel sales that may not directly translate to fuel usage by state. They noted that it would be helpful to present transportation sector emissions using multiple approaches.

EPA Response: The EPA appreciates this comment regarding bottom-up accounting of vehicle emissions. The EPA continues to base vehicle estimates on point-of-fuel sales as the primary approach for allocating vehicle emissions to states, as it is consistent with the IPCC guidelines and ensures no double-counting or gaps. The EPA will continue making comparisons with the other approaches of allocating vehicle emissions.

4. Mobile source non-CO_2 emissions are allocated across states based on vehicle-miles-traveled data while mobile source CO_2 emissions were allocated based on fuel sales, as mentioned above. Is there an issue with using two different methodologies for mobile source CO_2 vs. non-CO_2 state splits?

Regarding on-road mobile missions, reviewers from Texas CEQ recommended consistent methods for estimating CO_2 and non-CO_2 emissions. The activity factors that have already been developed for non- CO_2 pollutants can be used for CO_2. Reviewers from Rhode Island's DEM had no concerns about the difference in methodology but wondered why the EPA decided to take two different approaches to estimate mobile emissions. Reviewers from Arizona's DEQ did not think there is a concern with using two different methodologies as long as the fuel type and quantity of fuel burned is noted. Reviewers from Alaska's DEC had no concerns with using two different methodologies.

EPA Response: The EPA appreciates the comments. The national- and state-level inventories use different methodologies for calculating CO_2 and non-CO_2 emissions for vehicles. CO_2 emissions are derived from fuel consumption data, while non-CO_2 emissions account for fleet

information (i.e., age distribution/vehicle technology breakout, VMT) in the calculation of non-CO_2 emissions. More detail on this is provided in the report, and further clarity can be provided in future releases as needed.

5. **Several fuels have variable C factors over time including coal, natural gas, gasoline, and diesel fuel. Those fuels might also have variable C factors across areas/states. Are data available to build out state-specific C factors for the fuels with variable C contents? If so, could it be done in a way that the state-level total emissions still matched up to the national total emissions for those fuels?**

For Texas CEQ, the Texas CEQ Commission on Environmental Quality (TCEQ) utilizes multiple data sources to develop state-specific fuel property profiles for the six fuel regions in Texas. The two data sources are: a TCEQ-sponsored statewide triennial fuel study and fuel compliance data submitted to the EPA for federal reformulated gasoline. The two data sources are used in conjunction with regulatory information and default data to develop Texas-specific fuel property profiles for the six Texas fuel regions for both historical and future year assessments, according to reviewers from Texas. Reviewers from Rhode Island's DEM commented that Rhode Island uses SIT defaults for carbon factors and does not have additional information on state specific factors. Reviewers from Arizona's DEQ were not aware of any data available to build out state-specific C factors for the fuels with the variable C content.

EPA Response: The EPA appreciates the comment on state-level C factors. The EPA continues to use national average C factors to develop the state-level inventory values but will continue to investigate the possibility of using state-specific C factors in future reports, specifically for liquid transportation fuels. The EPA will also consider the possibility of applying state-specific factors as part of the national* Inventory *development as part of potential future improvements.

6. **Geothermal emissions could be allocated by the type of geothermal production per state (because different types have different emissions factors) if that data are available. Is there more information on state-level geothermal emission factors and production?**

No reviewers were familiar with up-to-date geothermal datasets or commented that it was not relevant for their state. Reviewers from Alaska's DEC noted that there is significant volcanic geothermal activity throughout Alaska. USGS and University of Alaska-Fairbanks have large databases of information on geothermal power options that should be reviewed and used if possible, they commented. They noted although these are natural sources, these data would be valuable to include in the report.

EPA Response: The EPA appreciates the comment on possible sources of geothermal emissions. The EPA also notes that although volcanic activity may result in emissions, the focus of the report as per IPCC guidelines is on anthropogenic sources. The term "anthropogenic," in this context, refers to greenhouse gas emissions and removals that are a

direct result of human activities or are the result of natural processes that have been affected by human activities.

2.2.1.2 NEU

1. **For petrochemical feedstocks, non-energy use (NEU) of natural gas is allocated across states based on petrochemicals emissions data per state from the IPPU adjustments, while other fuels are allocated based on the underlying SEDS data. Allocating across states based on the underlying SEDS data ensures there are no states where NEU use is larger than original SEDS data and there are no zeros associated with subtracting NEU (it is not an issue for natural gas because use is so high overall compared with NEU use). Could different approaches be used or can the petrochemical data be used without resulting in negative use?**

Reviewers were unaware of alternate approaches. Reviewers from North Dakota's Department of Environmental Quality (DEQ) noted that based on the methodology described in the *State Methods* report which included coal used to produce SNG at the Eastman gas plant for chemical feedstock and therefor accounted for under NEU, the Dakota Gasification Company's Great Plains Synfuels Plant in North Dakota should be included in NEU as it also uses coal to produce SNG.

Reviewers from Arizona's DEQ noted that different approaches to allocating NEU across states should be considered and compared to the current method of using a combination of data from IPPU adjustments and SEDS. They also thought that the current methodology could be sufficient considering the lack of use for most fuels.

Reviewers from Iowa DNR noted that there is a potential gap in their inventory as NEU has not been included. They wondered if this sector will be included in the SIT. Reviewers from Alaska's DEC trusted the SEDS data and noted it is probably the best source of data for Alaska. They also noted that there is not a great use for NEU of fuels.

EPA Response: The EPA appreciates the comments and has provided more information in the report on the data sources used and the step of adjusting energy values to account for NEU of fuels. In terms of the SNG produced at the Eastman plant, they are included as NEU because they are used directly as petrochemical feedstocks. The SNG produced at the Great Plains plant is assumed to be used as supplemental natural gas and, therefore, is accounted as fuel combustion emissions. The EPA accounts for the CO_2 that is exported to Canada for CCS and it is excluded from the Inventory. More information on these adjustments has been added to the report.

2.2.1.3 Incineration of Waste

1. **Waste incineration emissions are calculated based on the combustion of fossil components of both municipal solid waste (MSW) and tires. However, emissions are disaggregated to states based only on MSW tonnage. Are there approaches or data**

available to disaggregate emissions based on waste category (e.g., MSW combustion vs. tire combustion)?

Reviewers from Alaska's DEC noted that burning tires is prohibited Alaska except at approved incarnation facilities. Large incineration facilities are permitted, and their emissions are reported in the NEI, but smaller rural incinerator facilities are permitted so NEI data are limited. They suggested developing a scaling technique for village incinerators and assuming they burn tires.

Reviewers from Texas CEQ expressed doubt for values in Table A-117 in Appendix A which shows MSW incineration by state and indicates zeroes for 2001 through 2019 for Texas. For Area Sources, they use tonnage derived from EPA and were unaware of other data sources to disaggregate emissions.

EPA Response: EPA data from the GHGRP shows intermittent MSW combustion for the years 2011-2015 but none after that. As noted below the methodology for this source is being updated at the national level to include GHGRP data and the results will be reflected in the next release of state-level data.

Reviewers from Iowa DNR calculated the amount of CH_4 mitted from power plants burning MSW to produce electricity using data reported annually by individual facilities to the Iowa DNR's Air Quality Bureau on their annual Title V air emissions inventories. The only facility in Iowa generating electricity from burning MSW reported burning a total of 12,763 tons of refuse derived waste in 2019. Site-specific proportions of discards that are plastics, synthetic rubber, and synthetic fibers were used instead of SIT default values to calculate CO_2 emissions from MSW combustion using SIT. These values came from the 2017 Iowa Statewide Waste Characterization Study. They noted that there may be a gap in Iowa DNR's inventory as they had not previously considered emissions from other incinerators in the state, nor had they included site-specific emissions from tire combustion as a separate value, and they expressed uncertainty that this activity data is easily available. These differences in methodology account for significant differences in Iowa's state-level estimates compared to *State Methods* results; the Iowa DNR's estimates for CO_2 are +14%, for CH_4 are +9625%, and for N_2O are -3%.

EPA Response: The EPA appreciates the comments on updating the sources for waste incineration. For the current state-level report, the EPA has maintained the current approach but is planning updates to the national* Inventory *approach for waste incineration, including the use of GHGRP data as part of the 1990-2020 report. These updates at the national level, when finalized, will be implemented in the next state-level inventory report, likely for the 1990–2020 state-level estimates.

2.2.1.4 International Bunker Fuels

1. **The approach used to allocate jet fuel bunker fuels by state is currently based on the total amount of jet fuel used by state, which could potentially lead to an over- or under-estimation for some states' bunker fuel emissions. Are there other more accurate approaches to allocate jet fuel bunker data across states as opposed to the percentage of jet fuel total use? For example, using Federal Aviation Administration flight-level data**

on departures and destinations or assuming based on states with international airports and flights?

Reviewers from Alaska's DEC used EIA data for their International Bunker fuels and noted that Alaska has lots of international travel. They suggested using NEI landing and takeoff data.

Reviewers from Texas CEQ noted that the TCEQ develops non-road emissions from airport sources on a per-facility approach, using the Federal Aviation Administration's Aviation Environmental Design Tool (AEDT), and entering aircraft and engine types based on collected facility activity data. AEDT then applies appropriate emission factors, fuel types used, etc. based on the aircraft and engine types selected. The TCEQ does not collect or track specific fuel usage data from any airport facilities as part of the emissions inventory development process.

Reviewers from Rhode Island's DEM noted that Rhode Island has one airport (PVD) that reports GHG emissions estimates on an annual basis. They know of no breakout of international fuel in the report provided to RIDEM and no known information about marine bunker fuels.

Reviewers from Iowa DNR noted that they used the total amount of jet fuel used by the state per SEDS and the SIT module and report emissions in the transportation sector. No international flights depart from Iowa municipal airports.

EPA Response: The EPA appreciates the comments on state-level bunker fuel data. The EPA will continue to investigate approaches and data for allocating international bunker fuel data at the state level, including, for example, flight-level data. The EPA has also provided more detail on how transportation emissions are developed at the national and state levels in the report to clarify where emissions from different sources are accounted for.

2.2.1.5 Wood Biomass and Biofuels Consumption

1. **What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)**

Reviewers provided no comments.

2.2.2 Fugitive

2.2.2.1 Coal Mining

1. **Do you have any comments specific to the methodology and emission estimates for active coal mines and abandoned coal mines?**

Reviewers from Arizona's DEQ found this method description appropriate. Reviewers from Alaska's DEC noted that Alaska's coal mining activity is limited compared to its historical activity thanks in large part to the end of coal exports to East Asia in the last decade. Alaska has only one active coal mine presently. Other coal mines have been closed for several years under

state and federal reclamation rules. They commented that for the 2020 Alaska Greenhouse Gas Report, the Alaska Department of Environmental Conservation (ADEC) conducted an inventory of abandoned coal mines and found the average year these mines were abandoned was 1941. They also commented that from initial research at the state level, it does not appear that there is any ongoing methane capture or recovery from abandoned mines in Alaska. Due to the age of most of these abandoned mines, it is highly unlikely that they would be a viable target for methane capture or recovery, they argued. Thus, they suggested that any generic methane recovery emissions should not be applied to Alaska.

EPA Response: The EPA thanks the state reviewers from Alaska's DEC for their feedback and additional information related to coal mining and abandoned mines in Alaska.

2. Are you aware of any state datasets that may be useful in helping to refine emission estimates for abandoned coal mines, including state-level datasets addressing recovery of methane from abandoned mines?

Reviewers from Alaska's DEC recommended data from the Alaska Department of Mining, Land, and Water and Alaska DNR which outline all identified remaining abandoned mines in the state. They noted additional research was needed from ADEC to verify the age of these mines and the dates of mine closure. In instances where the date of the mine closure could not be verified or was within a five-year period, the earliest estimated date of mine closure was used. These data can be forwarded to EPA to be used for future NEI and GHG estimates, but reviewers from Alaska's DEC noted that the database does not have emissions information which needs to be added in by EPA.

Reviewers from Texas CEQ suggested the Railroad Commission of Texas (RRC) for data on permitted surface mining, acreage, and abandoned mine programs.[6] Reviewers from Arizona's DEQ acknowledged that a comprehensive inventory of abandoned coal mines in Arizona does not currently exist.

EPA Response: The EPA thanks the state reviewers from Alaska's DEC, Arizona's DEQ, and Texas CEQ for their feedback and the state data sources identified in their comments.

2.2.2.2 Abandoned Underground Coal Mines

1. Are you aware of any state datasets that may be useful in helping to refine emission estimates for abandoned coal mines, including state-level datasets addressing recovery of methane from abandoned mines?

Reviewers provided no comments.

[6] RRC. n.d. "Mining Regions/Fields and Sites." Available at: https://www.rrc.texas.gov/surface-mining/historical-coal-mining/mining-regions-fields-and-sites/

2.2.2.3 Petroleum Systems and Natural Gas Systems

1. Are there relevant dataset(s) that could be used to replace or supplement the data currently used to allocate petroleum and natural gas system emissions to the state level? Particularly, state or detailed location information on gathering and boosting stations, processing plants, and transmission and storage stations?

Reviewers from Alaska's DEC commented that they have emission fee data from these sources as well as NEI information. In 2000, they asked all small nonpoint sources to submit NEI emission information. Once submitted to EPA, it will be the most complete NEI on these sources. They noted, however, that NEI does not include fugitive emissions unless it is a permitted emission unit. Permit emission fee information has more fugitive information. These data are only available for CAPS but could be used to calculate GHG emissions in some cases, reviewers from Alaska's DEC suggested.

Reviewers from Texas CEQ recommended information from EIA's triennial EIA-757 Schedule A, *Natural Gas Processing Plant Survey*, which tracks the country's population of natural gas plants and has basic location data. They found the current methodology to allocate petroleum and natural gas system emissions to the state level reasonable. Reviewers from North Dakota's DEQ noted that it is unclear how the condensate emissions are estimated, especially for North Dakota which has substantial GHG emissions associated with condensate. Additionally, they noted that is unclear if fugitive emissions associated with compressor stations (natural gas-drive and electric-drive) were accounted for. This would account for many GHG emissions in North Dakota. Furthermore, they noted that the reported volume of gas production in Appendix B appears low for 2019. The NG 3 – Annual Gas Production tab (851,750 MMScf) and the NG 2 – Gas Well Gas Production tab (1,155,856 MScf) totals 852,905,856 MScf of gas produced in North Dakota in 2019. The North Dakota Industrial Commission numbers estimate 927,804,888 MScf of natural gas produced. Finally, they noted it was unclear how emissions from storage vessels were estimated. They suggested North Dakota may have more storage vessels relative to pipeline miles in comparison to other states, which would underestimate storage tank GHG emissions in North Dakota.

Reviewers from Arizona's DEQ found that the current data set appeared to accurately reflect permitted natural gas compressor stations in Arizona. Reviewers from Iowa DNR noted that Iowa has four liquid natural gas (LNG) storage compressor stations, eighteen gas transmission compressor stations, and four gas compressor stations. They also noted that the SIT Natural Gas and Oil system module only calculates CH_4 emissions for Iowa from transportation and distribution. However, EPA's disaggregated Iowa values show CO_2 and N_2O emissions from this sector, likely from flaring, even though natural gas production or petroleum systems are not present in Iowa. In addition, the SIT does not include any activity data for flaring in Iowa, so they were uncertain as to why EPA shows CO_2 and N_2O emissions for this sector in its disaggregated Iowa emissions. Finally, they remarked that is also interesting that DNR calculates CH_4 emissions using the SIT values that are 18% higher than the *State Methods* values for Iowa for 2019.

EPA Response: Emissions from compressor stations are included in the state-level inventory estimates.

As suggested by the commenters, we are considering alternate activity data sources (such as processing plant data) to develop state-level estimates for future state inventories. We are also assessing the potential use of additional GHGRP data to develop state-level estimates that incorporate additional state-specific information on emission sources such as tanks.

We note that there is much coordination between the EPA's NEI and GHG Inventory teams, and we often use the same input data (e.g., activity data) to calculate emissions. Although the NEI does quantify CH_4 emissions for some sources in the NEI O&G Tool as an intermediate step to quantifying VOCs, those estimates are not available for all sources. For future state inventories, the EPA will consider comparing the GHG Inventory state values with other state data sources to identify potential improvements.

Regarding production data for North Dakota, the value used for production did not include all gas production from wells classified as oil wells. This will be corrected for future state-level GHG Inventories.

Emissions from storage vessels are allocated to states based on production volumes, not pipelines. We will continue to consider update approaches to improve the state-level tank estimates.

Regarding production segment emissions from Iowa, those emissions resulted from a spreadsheet error, which has since been corrected.

The EPA notes that there are a number of differences between the current SIT tool that can result in different emissions between the SIT tool and the state GHG Inventory. As both products continue to be updated, it is expected that the values will align better. The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. The fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

2. Are there additional Greenhouse Gas Reporting Program (GHGRP) data that could be used to allocate natural gas and petroleum emissions to each state?

Reviewers from Texas CEQ noted it is difficult to allocate emissions to individual states for sources that report basin-level data to the EPA's GHGRP since many basins cross state boundaries. They suggested using county-level data reported to the GHGRP where possible to use to allocate emissions to individual states. Reviewers from Rhode Island's DEM noted that data from the Narragansett Electric Company on the GHGRP are used to estimate natural gas distribution leakage in Rhode Island. Reviewers from Arizona's DEQ noted that there are no additional GHGRP data that could be used.

Reviewers from Alaska's DEC again recommended NEI data on point source emissions for allocation.

EPA Response: We are assessing the potential use of additional GHGRP data to develop state-level estimates for future versions of the state GHG inventory.

We note that there is much coordination between the EPA's NEI and GHG Inventory teams, and we often use the same input data (e.g., activity data) to calculate emissions. Although the NEI does quantify CH_4 emissions for some sources in the NEI O&G Tool as an intermediate step to quantifying VOCs, those estimates are not available for all sources.

3. Are there particular sources for which state-level regulatory or voluntary programs result in large differences in emission rates between states? Are state-specific datasets available for those sources?

Reviewers from Alaska's DEC mentioned the Alaska Bureau of Land Management (BLM) abandoned well program (also known as legacy wells or orphaned wells) which carries multiple datasets. Furthermore, they mentioned the existence of an AOGCC dataset for all wells ever drilled in Alaska. This dataset also lists the well status. They noted that the AOGCC is strict on plug and abandonment and there are fewer abandoned wells in Alaska than other states. DNR Division of Oil and Gas estimated there are 20 wells.

Reviewers from Texas CEQ noted that RRC has detailed data on newer wells (generally, those drilled after 1950). This includes a well status data element that could be used to identify abandoned and plugged wells. For older historical wells drilled prior to 1950, they were unaware of a detailed dataset of Texas abandoned wells. The RRC does have some limited statewide well counts for older wells as noted in the *State Methods*, but it does not include data at the county level.

EPA Response: Datasets used to develop abandoned well estimates in the national* Inventory *are documented in the national* Inventory *and in a 2018 memo, Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016: Abandoned Oil and Gas Wells found online here: https://www.epa.gov/sites/default/files/2018-04/documents/ghgemissions_abandoned_wells.pdf. The Enverus/DrillingInfo reference used in the national* Inventory *does incorporate data from AOGCC and RRC. We will consider assessing other datasets (e.g., from Alaska BLM) for potential updates to the estimates.

4. Are there particular sources for which state-level regulatory or voluntary programs result in large differences in emission rates between states? Are state-specific datasets available for those sources?

Reviewers from Texas CEQ noted sites located in ozone non-attainment areas are subject to additional emissions and control requirements, and those sites' emission rates can differ from sites located in attainment areas. Reviewers from Arizona's DEQ were unaware of sources for which state-level regulatory or voluntary programs result in large differences in emission rates between states.

EPA Response: The EPA will continue to review information on state-level programs for potential updates to future annual state-level estimates of inventories.

2.2.2.4 Abandoned Oil and Gas Wells

1. What other relevant data sources could be included? If data are used at the national level, are you aware of other comparable data sources at the state level?

Reviewers provided no comments.

2.3 Industrial Processes and Product Use (IPPU)

1. What are your overall impressions of the clarity and transparency of this section?

Reviewers from Arizona's DEQ thought that the selection of emissions factors for Cement Production was clear. However, they noted that the improvement of modernized production methods ought to be considered. Furthermore, there are several new technologies that can reduce CO_2 emissions or even absorb them (such as CarbonCure) which should be considered for the cement production sector, they noted.

EPA Response: The EPA thanks the reviewer for their feedback. The EPA will assess this as a potential update for future annual publications of this report.

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

Reviewers from Arizona's DEQ commented that Cement production includes several chemical processes. It will be more helpful to include different chemical reactions and list the CO_2 emissions from each chemical reaction process. Also, improvement technologies and control measures that are recently used by the cement industry should be considered. Since some cement facilities have installed continuous emission monitoring systems (CEMS), the CO_2 emission data calculated by the activity method can be correlated and adjusted by CEMS results. Therefore, some CEMS adjustment methods can be considered.

EPA Response: The EPA thanks the reviewer for their feedback. The* State Methodologies *document has details on how the GHGRP data was used to allocate cement emissions to the different states, including how adjustments were made to facilities that report using CEMS data. The report is available online at* https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals*. More detail on the chemical process and process equations associated with cement production can be found in the national* Inventory *report.

3. Data Availability. Please address the following questions for each inventory source:

a. For each of the categories, are there additional relevant data sources that are not currently included but could be incorporated into this analysis?

b. For national-level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code level?

Reviewers from Arizona's DEQ expressed interest in CO_2 emissions from Cement Production for after 2005 or 2010 would be helpful because production has increased since 2015 but is still lower than in 2005.

EPA Response: The EPA thanks the reviewer for their feedback.

4. Uncertainty. Currently uncertainty ranges are not included for the state-level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Timeseries Coverage. Currently state data cover 1990-2019 consistent with the 2021 *National Inventory* and are inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the national *Inventory*. As state-specific input datasets are not always available over the entire time series, understanding which years may be more important and can help us better prioritize our backcasting and methodological efforts across the time series. The EPA appreciates feedback on which, if any, years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).

Reviewers provided no comments.

5. Key Categories. The EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. The EPA appreciates feedback on which categories are more relevant for further refining for the sector you are reviewing.

Reviewers from Arizona's DEQ suggested a KCA for Cement Production because the CO_2 emissions from this sector represents 20% of the total emissions from IPPU sectors in Arizona and it shows a higher increase trend in the state. They also suggested a KCA would be beneficial for industrial combustion sector because it is one of the major sources of CO_2 emissions in Arizona.

EPA Response: The EPA thanks the reviewers for their feedback. Consistent with the national* Inventory*, in future annual publications of the GHG Inventory by U.S. State, the EPA plans to provide state-level analysis of key categories in accordance with Volume 1, Chapter 4 of the 2006 IPCC guidelines. This analysis will provide information on significant emission and sinks source categories in the latest year of the GHG Inventory by U.S. State and also categories influencing trends for each state.

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/inventoryexplorer/)?**
   i. **Related to the level of category/gas aggregation or disaggregation?**
   ii. **Are there specific categories where further data disaggregation could be helpful?**
   iii. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download)?**

b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**

Reviewers from Arizona's DEQ suggested disaggregation to the facility level for the Cement Production sector would be helpful because there are large cement production facilities in Arizona.

EPA Response: The EPA thanks the reviewers for their feedback. The GHGRP FLIGHT provides information about GHG emissions from large facilities in the United States. These facilities are required to report annual data about GHG emissions to the EPA as part of the GHGRP. FLIGHT is available online at https://ghgdata.epa.gov.

2.3.1 Minerals

2.3.1.1 Cement Production

1. **Are you aware of data on state-level clinker production for the full 1990-2019 time series? If not, is there any surrogate data that could be used (e.g., facility production capacity, utilization rates by facility or state) for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ suggested the USGS National Mineral Information Center.[7] Reviewers from Arizona's DEQ mentioned the Arizona clinker production data from SLEIS since 2010 which could be useful for creating a state inventory.

Reviewers from Iowa noted that Iowa has two Portland cement manufacturing facilities currently operating. Both facilities are required to report their CO_2 emissions to GHGRP, so they used this GHGRP data for their inventory instead of using clinker production data to calculate emissions. They noted that the combined CO_2 emissions reported by the two facilities for 2019 were 72% higher than EPA's estimated value for Iowa.

EPA Response: The EPA appreciates Iowa noting this difference. Consistent with IPCC methodological guidance and international transparency reporting standards, only process

[7] United States Geological Survey. n.d. "Cement Statistics and Information" Available at: https://www.rrc.texas.gov/surface-mining/historical-coal-mining/mining-regions-fields-and-sites/

emissions are reported for cement production in this IPPU category, while combustion emissions are accounted for under the Energy sector. Some cement facilities report emissions to GHGRP using CEMS data that includes process and fuel combustion related activities. For this state level estimate, emissions data from facilities using CEMS to report to GHGRP were adjusted to differentiate between combustion and process emissions. That could account for the lower emissions indicated in the GHG Inventory by U.S. State report.

2.3.1.2 Lime Production

1. **Are you aware of state-level data on lime production (activity data) by type (e.g., high-calcium quicklime; dolomitic quicklime, high-calcium, hydrated; dolomitic, hydrated; dead-burned dolomite; CO_2 captured for use in onsite processes) for some or all of the 1990–2019 time series? If not, is there any surrogate data (e.g., facility production capacity, utilization rates by facility or state) for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ suggested the USGS National Mineral Information Center.[8] They also requested a contact name and email address to share production data from the TCEQ point source emission inventory on Texas lime production sites.

Reviewers from Iowa noted that Iowa has one lime production facility currently operating, and it is required to report its CO_2 emissions to GHGRP. They used this GHGRP data for their inventory instead of using Lime Production data. Their estimate of CO_2 emissions was 19% higher than EPA's value for Iowa's Lime Production.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA will follow up with the reviewers from Texas CEQ to explore the data mentioned in their comments.

2. **Based on analysis of Greenhouse Gas Reporting Program data, it appears that most facilities that manufacture beet sugar and lime, as well as a few lime manufacturing facilities, capture CO_2 for use in on-site processes. Are you aware of any information why lime-producing facilities capture CO_2 for use in on-site processes, any trends in this practice during the 1990–2019 time series (e.g., have facilities increased or decreased adoption of this practice during the time series), or whether the amount of CO_2 captured is proportional to the amount of lime produced or some other metric? Are you aware of any data on the amount of CO_2 captured on site per facility or state for 1990–2009?**

[8] United States Geological Survey. n.d. "Lime Statistics and Information" Available at: https://www.usgs.gov/centers/nmic/lime-statistics-and-information

Reviewers from Texas CEQ noted that based on information provided in the TCEQ point source emissions inventory, Texas lime plants do not appear to employ CO_2 capture. They were unaware of surrogate data that can be used.

EPA Response: The EPA thanks the reviewers for their feedback.

3. **For some states and years (Colorado for 2010–2015, Idaho for 2011 and 2019, and Nebraska for 2010–2014), calculations using GHGRP data on emissions and CO_2 captured for on-site processes yielded small but erroneous negative emissions. The EPA zeroed emissions for those states and years and plans to adjust calculations so that state emissions totals match national emissions. Do you have any general feedback on this approach?**

Reviewers provided no comments.

2.3.1.3 Glass Production

1. **Are you aware of state-level data on glass production or the amount of carbonate (i.e., limestone, dolomite, soda ash) consumed for glass production by state (activity data) for some or all of the 1990–2019 time series? If not, can you share any state-level surrogate data (e.g., more complete data on glass facilities by state, amount of glass products by type [i.e., containers, flat (window) glass, fiber glass, and specialty glass]) for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ requested a contact name and email address to share production data from the TCEQ point source emission inventory. Reviewers from Iowa noted that they did not identify emissions from glass production separately in their inventory. Rather, they calculated total emissions from limestone and dolomite use for industrial consumption per the SIT Industrial Processes Module. They were unaware of any state-level activity data that may enhance the state inventory calculation.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA will follow up with the reviewers from Texas CEQ to explore the data mentioned in their comments.

2.3.1.4 Other Process Uses of Carbonates

1. **Are you aware of state-level data on the consumption of limestone and dolomite for the iron and steel sector for the 1990–2019 time series? If not, can you share any state-level surrogate data for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends from carbonate consumption by the iron and steel sector?**

Reviewers were unaware of state-level data on consumption of limestone and dolomite for the Iron and Steel sector for the specified period.

EPA Response: The EPA thanks the reviewers for their feedback.

2. Are you aware of state-level data on the consumption of soda ash (not associated with glass manufacturing) for the 1990–2019 time series?

Reviewers were unaware of other data sources on consumption of soda ash for the specified period. Reviewers from Iowa calculated the total emissions from limestone and dolomite use for industrial consumption per the SIT Industrial Processes Module. They suggested including the use of soda ash by the corn wet milling industry because it commonly uses soda ash for pH control, ion exchange regeneration, and other operations. They noted that Iowa's DNR may be able to survey corn wet milling facilities to obtain this annual data.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA will assess the use of soda ash by the corn wet milling industry to understand if it is an emissive activity and then include as a potential update for future annual publications of this report.

3. Are you aware of any state-level data on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone, mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the 1990–2019 time series?

Reviewers were unaware of other state-level data sources on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone, mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the specified period.

EPA Response: The EPA thanks the reviewers for their feedback.

2.3.1.5 CO_2 Consumption

1. Are you aware of other data on the consumption of CO_2 by state for the 1990–2019 time series?

Reviewers were unaware of other data sources of CO_2 consumption data. Reviewers from Iowa noted that this sector is currently not included in the Iowa DNR inventory. They noted that CO_2 is used in the food and beverage industry, and Iowa meat-packers use CO_2 to stun livestock. Typically, meat-packers purchase biogenic CO_2 from ethanol plants. They noted that Iowa DNR may be able to survey the industry to determine the amount of CO_2 from ethanol production that is used in these industries.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA will assess the use of CO_2 captured by ethanol facilities and used by the meat-packing industry as a potential update for future iterations of the state GHGI.

2.3.2 Chemicals

2.3.2.1 Ammonia Production

1. **Currently, production capacity is used as a surrogate for state-level ammonia production for 1990–2009. In the absence of ammonia production by state in more recent years, are you aware of other surrogate data (e.g., facility utilization rates by state) that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ referenced national Ammonia Production data for the U.S. from USGS and Energy Star to estimate state-level ammonia production.[9,10]

Reviewers from Iowa reported that three facilities in Iowa currently produce ammonia and report their CO_2 emissions to the GHGRP, so the Iowa DNR uses this GHGRP data in its inventory. The total emissions reported by the two facilities for 2019 were 69% higher than the *State Methods* data. They wondered whether they should remove land-applied ammonia from the ammonia production emissions.

EPA Response: Consistent with IPCC methodological guidance and international transparency reporting standards, under the IPPU sector, the EPA is aggregating only process-related emissions from ammonia feedstock use rather than total emissions from these facilities. Combustion-related emissions are accounted for under the Energy sector and emissions associated with application of ammonia-based fertilizers, along with all other nitrogen inputs to agricultural soils, are reported under Agricultural Soil Management in the Agriculture sector. A difference in sector allocation of the combustion and process related emissions could be leading to the differences in emissions. The EPA will reach out to Iowa NDR to better understand available state data and any further potential differences between emissions reported to GHGRP resulting from allocation differences EPA's national and state Inventories and DNR's inventory. The EPA will continue to assess this issue for future annual publications of the GHG Inventory by U.S. State data.

Urea Consumption for Nonagricultural Purposes

1. **Are you aware of state-level data on urea consumption for nonagricultural purposes (activity data) for some or all of the 1990–2019 time series?**

Reviewers from Texas CEQ suggested that HIS Markit may have data regarding urea consumption.[11] Reviewers from Iowa identified this sector as a potential gap as it had not been

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[9] USGS. n.d. "Nitrogen Statistics and Information," Available at: https://www.usgs.gov/centers/national-minerals-information-center/nitrogen-statistics-and-information

[10] Worrell, E., Phylipsen, D., Einstein, D., & Martin, N. (2000). "Energy Use and Energy Intensity in the U.S. Chemical Industry," Lawrence Berkeley National Laboratory. https://www.energystar.gov/sites/default/files/buildings/tools/industrial_LBNL-44314.pdf

[11] HIS Markit. (2020). "Urea Chemical Economics Handbook," Available at: https://ihsmarkit.com/products/urea-chemical-economics-handbook.html

included in their state-level inventory calculations and wondered if this sector will be added to the SIT.

EPA Response: The EPA thanks the reviewers for their feedback.

2.3.2.2 Nitric Acid Production

1. **Are you aware of state-level data on nitric acid production (activity data) for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for nitric acid production by state for 1990–2009. We know that the production capacity data used for this state inventory calculation are incomplete for 1990–2009. Are you aware of more complete data on facility production capacity by state?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*.

EPA Response: The EPA notes the reviewers have no additional feedback.

2. **Are you aware of state-level data other than facility production capacity (e.g., utilization rates by facility or state, information about abatement technology installations and use per facility) for 1990–2009 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*. Reviewers from Iowa reported that there are two nitric acid production facilities in Iowa. They are required to report their N_2O emissions to the GHGRP and the Iowa DNR use this data in its inventory. The values for Iowa DNR's inventory and *State Methods* values for 2019 were within 0.13%. Reviewers from Alaska's DEC noted that there are no surrogate state-level data to replace national level data but cautioned not to apply generic national emissions to Alaska.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA found no data showing that nitric acid production occurred in Alaska during any part of the time series.

2.3.2.3 Adipic Acid Production

1. **Are you aware of any other state-level data on adipic acid production (activity or emissions data) for some or all of the 1990–2019 time series?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*.

EPA Response: The EPA notes the reviewers have no additional feedback..

2.3.2.4 Caprolactam, Glyoxal, and Glyoxylic Acid Production

1. **Are you aware of state-level data on caprolactam production or emissions for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate**

for caprolactam production by state. Are you aware of more complete data on facility production capacity or actual production by state? Are you aware of better surrogate data other than facility production capacity (e.g., utilization rates by facility or state, information about abatement technology installations and use per facility) that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*. Reviewers from Alaska's DEC noted that there are no surrogate state-level data to replace national level data but cautioned not to apply generic national emissions to Alaska.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA found no data showing that caprolactam production occurred in Alaska during any part of the time series.

2.3.2.5 Carbide Production and Consumption

1. **Are you aware of state-level data on SiC production (activity data) for the 1990–2019 time series? Are you aware of other data to refine accuracy of the estimation of SiC consumption by state for the 1990–2019 time series?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*. Reviewers from Iowa noted that they do not account for Carbide Production and Consumption because it is not included in the SIT Industrial Processes model. They will assess if this is a gap in their inventory if Iowa data are available.

EPA Response: The EPA thanks the reviewers for their feedback. The only emissions attributed to Iowa are related to silicon carbide consumption.

2. **Are you aware of information that can help us improve the accuracy of production in the two states where SiC facilities are located?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*.

EPA Response: The EPA notes the reviewers have no additional feedback..

2.3.2.6 Titanium Dioxide (TiO_2) Production

1. **Are you aware of data on TiO_2 production (activity data) by state for the 1990–2009 time series? Please share any other surrogate data than facility production capacity or more data by state (e.g., facility utilization rates by facility or state) for 1990–2009 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends.**

Reviewers from Texas CEQ referenced national annual production in the U.S. from USGS.[12] Reviewers from Alaska's DEC noted that there are no surrogate state-level data to replace national level data but cautioned not to apply generic national emissions to Alaska.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA found no data showing that titanium dioxide production occurred in Alaska during any part of the time series.

2.3.2.7 Petrochemical Production

1. **Are you aware of data on petrochemical production by type by state for the 1990–2019 time series? Is there any other surrogate data by state or facility (e.g., facility production capacity; utilization rates by facility or state; timing of facility expansions, openings, and temporary or permanent closures) for the full 1990–2019 time series that could address data gaps and refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ suggested state- or region-level petrochemical data from EIA. Reviewers from Iowa noted that they do not account for Petrochemical Production because it is not included in the SIT Industrial Processes model. They will assess if this is a gap in their inventory if Iowa data are available.

EPA Response: The EPA thanks the reviewers for their feedback.

2.3.2.8 Phosphoric Acid Production

1. **Are you aware of state-level data on phosphoric acid production (activity data) for the 1990–2009 time series? Is there any other surrogate data or information (e.g., timing of facility expansions and temporary or permanent closures, origin of phosphate rock used in facilities) by state or facility for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers were unaware of other data sources beyond those referenced in the national *Inventory*.

EPA Response: The EPA notes the reviewers have no additional feedback..

2.3.2.9 HCFC-22 Production

1. **For the years 1990–2009, there are significant uncertainties in the allocation of national-level U.S. emissions to individual facilities and states, particularly for the five HCFC-22 production facilities that closed before 2003 and for which production**

[12] USGS. n.d. "Titanium Statistics and Information," Available at: https://www.usgs.gov/centers/national-minerals-information-center/titanium-statistics-and-information

capacity data are therefore not available. Are you aware of any more complete sources of production capacity or other relevant historical data?

Reviewers were unaware of state-level data.

EPA Response: The EPA notes the reviewers have no additional feedback..

2. Do you have recommendations for how to refine the methodology to more accurately estimate emissions from HCFC-22 production over the time series?

Reviewers provided no comments.

2.3.3 Metals

2.3.3.1 Iron and Steel and Metallurgical Coke Production

1. Are you aware of state-level data on iron and steel production (activity data) by category (i.e., sinter production, iron production, pellet production, steel production, other activities) for some or all of the 1990–2019 time series? In the absence of steel production by state, are you aware of better surrogate data that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?

Reviewers were unaware of state-level data, but reviewers from Texas CEQ referenced production for the U.S. from USGS.[13]

Reviewers from Minnesota's PCA noted that the emissions from Iron and Steel Production stood out as an anomaly. They commented that an obvious jump in emissions seemed to be due to the change in data sources with the GHGRP data became available, not a change in production that created an actual increase in emissions. Additionally, they noted that their estimates use taconite production collected by the Department of Revenue and energy consumption data that are reported to the state and federal data sources for electricity sold to the grid in order to allocate some emissions to the electricity sector.[14]

Reviewers from Iowa reported that there are currently no metallurgical coke production facilities or pig iron mills operating in Iowa. Furthermore, they reported that all three steel production facilities currently operating in Iowa use electric arc furnaces to produce steel from scrap. They noted that the Iowa DNR inventory used the CO_2 emissions that were reported to the GHGRP. The CO_2 emissions in the Iowa DNR inventory were 7% higher than the *State Methods* value for 2019.

[13] Tuck, C. C. (2021). "Iron and Steel," U.S. Geological Survey, Mineral Commodity Summaries, Available at: https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-iron-steel.pdf
[14] Minnesota Taconite Production Summary (1950-2020) data available at: https://www.revenue.state.mn.us/sites/default/files/2021-10/Minnesota%20Taconite%20Production%20Summary%20%281950-2020%29.xlsx

EPA Response: The EPA thanks the reviewers for their feedback.

The EPA thanks reviewers from Minnesota's PCA for the publicly available data on taconite production and is aware of the time series consistency issues. The EPA notes that the commenter is correct that this is an issue with use of different data sources over time. The EPA will assess this for future annual publications of this report and will also need to consider data across other states as well.

The EPA thanks Iowa for their feedback. Their description of the iron & steel facilities operating in Iowa in 2019 match what is included in this report.

2. **Are you aware of information to better allocate basic oxygen furnace and electric arc furnace (EAF) production by state for 1990–2009?**

Reviewers were unaware of state level or facility information data. However, reviewers from Texas CEQ noted that 100% of iron and steel production in Texas occurs using EAFs and almost none or none through basic oxygen furnaces, based on a conversation with a representative of the Steel Manufacturing Association and confirmed by a contact for Nucor Steel.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA thanks Texas CEQ for confirming that all iron & steel facilities currently in operation in Texas use EAF.

2.3.3.2 Ferroalloy Production

1. **Are you aware of state- or facility-level data on ferroalloy production (activity data) for the 1990–2019 time series? Is there any other surrogate data (e.g., facility production capacity, utilization rates by facility or state) for 1990–2019 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers were unaware of relevant datasets beyond those referenced in the national *Inventory*.

EPA Response: The EPA notes the reviewers have no additional feedback..

2.3.3.3 Aluminum Production

1. **Are you aware of data available to incorporate differences in emissions between smelters based on technology type? Is there any other surrogate data or emission sources that could be used to allocate national total aluminum production emissions across states?**

Reviewers from Texas CEQ referenced USGS annual national data but were unaware of existing state or facility level data.

EPA Response: The EPA thanks the reviewers for their feedback. The EPA already incorporates USGS data as needed for the aluminum sector.

2.3.3.4 Magnesium Production and Processing

1. **Are you aware of state- or facility-level magnesium production or capacity data (or surrogate data) for the 1990–2019 time series?**

Reviewers from Texas CEQ referenced USGS annual national data but were unaware of existing state or facility level data.

EPA Response: The EPA thanks reviewers for their feedback. The EPA already incorporates USGS data as needed for the Magnesium sector.

2. **Are you aware of information on the location (by state) of magnesium production and processing facilities or information on the location (by state) of magnesium production and processing facilities by process type?**

Reviewers from Texas CEQ referenced USGS annual national data but were unaware of existing state or facility level data.

EPA Response: The EPA thanks reviewers for their feedback. The EPA already incorporates USGS data as needed for the Magnesium sector.

2.3.3.5 Lead Production

1. **Are you aware of state- or facility-level data on primary or secondary lead production (activity data) for the 1990–2019 time series? Is there any other surrogate data (e.g., primary or secondary production capacity by facility or state) for 1990–2009 that could refine this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?**

Reviewers from Texas CEQ referenced USGS annual national data but were unaware of existing state or facility level data.

EPA Response: The EPA thanks reviewers for their feedback.

2.3.3.6 Zinc Production

1. **Are you aware of state- or facility-level data on zinc production (activity data) by unit type (i.e., electrothermic furnace, Waelz kiln, other furnaces, and flame reactor units) for the 1990–2019 time series? Is there any other surrogate data (e.g., total number of zinc facilities by state, production capacity by unit type and by facility or state) or other data by state (e.g., utilization rates by facility or state) for 1990–2009 that could refine**

this state inventory calculation to enhance accuracy and consistency of state GHG emissions and trends?

Reviewers from Texas CEQ referenced USGS annual national data but were unaware of existing state or facility level data.

EPA Response: The EPA thanks reviewers for their feedback.

2.3.4 Product Use

2.3.4.1 Electronics Industry

1. **Are you aware of state- or facility-level capacity data or other state-level surrogate data (e.g., sales data) for photovoltaic (PV) manufacturing for 1990–2006 that could be used to refine the allocations of emissions by state? Is there any surrogate data (e.g., sales data by state) by state for semiconductor or micro-electro-mechanical systems (MEMS) manufacturing for 1990–2007 that could be used to refine the allocations of emissions by state?**

Reviewers were unaware of sales, capacity, or other surrogate data for PV manufacturing. Reviewers from Iowa reported that the 2017 Economic Census identifies eleven businesses in Iowa under the North American Industry Classification System (NAICS) for code 33441 – Semiconductor and Other Electronic Manufacturing (U.S. Census 2019), but EPA's disaggregated Iowa values do not include data for Iowa. They also reported that emissions in 2019 from semiconductor manufacturing were calculated by DNR by assuming that Iowa emissions were 0.96% of national emissions as Iowa's population is 0.96% of the total U.S. population.

EPA Response: The EPA thanks the reviewers for their feedback and identification of potential sources of data. Emissions estimated from the electronics manufacturing sector are estimated for the manufacture of semiconductors, MEMS, photovoltaics, and LCDs using fluorinated GHGs in etching, wafer cleaning and chamber cleaning processes and from the use of N_2O and heat transfer fluids. Not all companies that have a NAICS code of 33441 manufacture electronic devices and use fluorinated GHGs. However, the EPA does not currently estimate emissions from MEMS manufacturers that do not report to the GHGRP and is continuing to review data sources for estimates of electronics manufacturing production capacity by state.

2.3.4.2 Substitution of Ozone-Depleting Substances

1. **Are you aware of bottom-up modeling data that are available by state? Is there any surrogate data other than population data that could be used to disaggregate the emissions of substitutes for ozone-depleting substances?**

Reviewers were unaware of modeling data for ozone-depleting substances or surrogate data other than population. Reviewers from Iowa found their 2019 estimate of emissions to be within 1% of EPA's State *Inventory* data. They noted they used the SIT which reports emissions in CO_2e and does not report disaggregated emissions from various GHGs.

EPA Response: The EPA notes most reviewers provided no additional feedback. The EPA appreciates Iowa's notes from comparing the data and notes the new fact sheet cross-walking GHG Inventory by U.S. State methods and data with the SIT available online at https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

2.3.4.3 Electrical Transmissions and Distribution

2. **Are you aware of state-level electrical transmission and distribution equipment data (e.g., nameplate capacity by state) or other data for 1990–2019 (or part of the time series) that could refine this state inventory calculation to reflect state trends in emissions more closely? Is there any other surrogate data (e.g., state population data) to enhance accuracy and consistency of state GHG emissions and trends than the current data being used (transmission mile data by state)?**

Reviewers from Texas CEQ noted that data may be available from either the Electric Reliability Council of Texas (ERCOT) which oversees the state of Texas electrical grid or the Public Utility Commission of Texas which oversees ERCOT. Reviewers from Rhode Island's DEM commented that they request SF_6 emissions from National Grid on an annual basis and use this estimate in their annual GHG inventory.

Reviewers from Iowa noted they calculated emissions from electric power transmission and distribution by using the most current national emissions data adjusted for Iowa retail electricity sales compared to US retail electricity sales. Reviewers from Iowa reported their estimate for 2019 emissions is 24% lower than the disaggregated national *Inventory* value. They attributed this to 2019 data not being available at the time that the Iowa DNR completed its inventory and they used 2018 as a proxy.

Reviewers from Alaska's DEC noted the state has information in its permit system for nameplate capacity which can be provided to EPA.

EPA Response: The EPA thanks the state reviewers for their feedback and identification of potential sources of data. The EPA's state-level estimates use transmission miles and GHGRP data to allocate emissions by state. Differences can be expected if retail electricity sales are used as a proxy instead of transmission miles.

2.3.4.4 N_2O from Product Use

1. **Are you aware of state-level data on N_2O usage for medical and dental anesthesia, food processing propellant and aerosols, sodium azide production, or other applications (e.g., fuel oxidant in auto racing, oxidizing agent in blowtorches) for some or all of the 1990–2019 time series? Is there any other surrogate data (e.g., state population data) that**

could be used to enhance accuracy and consistency of state GHG emissions and trends other than the current data (transmission mile data by state)?

Reviewers from Texas CEQ were unaware of state level N_2O usage data for the medical and dental industries. Only through industry specific surveying efforts could this data be acquired. Reviewers from Iowa noted this sector is not in their inventory as it is not included in the SIT Industrial Processes module and wondered whether it will be added to the SIT. They reported they will research if this a gap in their inventory and if Iowa activity data are available.

EPA Response: The EPA thanks reviewers for their feedback. As additional state-level data and/or methodological approaches become available through the national* Inventory *disaggregation, they will be used to supplement or improve the embedded calculations and defaults in SIT as appropriate. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults.

The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. The fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

2.4 Agriculture

1. What are your overall impressions of the clarity and transparency of this section?

Reviewers provided no comments.

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

Reviewers from Alaska's DEC suggested data from the Alaska Department of Agriculture for state agriculture to supplement USDA information and 2020 NEI as well.

EPA Response: The EPA thanks the reviewers from Alaska's DEC for their feedback and suggested data sources. The EPA will review and assess how best to reflect the data in the agriculture chapter.

3. <u>Data Availability</u>. Please address the following questions for each inventory source:

a. For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?

b. For national-level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code level?

Reviewers provided no comments.

4. **Uncertainty. Currently, uncertainty ranges are not included for the state-level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Time Series Coverage. Currently, state data cover 1990-2019 consistent with the 2021 *National Inventory* and are inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the national *Inventory*. As state-specific input datasets are not always available over the entire timeseries, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. The EPA appreciates feedback on which, if any years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).**

Reviewers from Virginia's DEQ compared *Inventory* data to SIT results. They found that emissions derived from SIT appears to be far apart from what is given in the draft, as the results for agriculture soil management were not yet completed at the time Virginia DEQ received results. States and organizations received *State Methods* results in Fall of 2021, though some sectors in the Agriculture and LULUCF chapters were not available until January 2022. For more detail, see comments from Virginia's DEQ in Section 3.9.

EPA Response: The EPA thanks the reviewers for their feedback and notes state-level data on agricultural soil management was shared with States on January 18 and 19, 2022.

5. **Key Categories. The EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. The EPA appreciates feedback on which categories are more relevant for further refining for the sector you are reviewing.**

Reviewers provided no comments.

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/inventoryexplorer/)?**
      i. **Related to the level of category/gas aggregation or disaggregation?**
      ii. **Are there specific categories where further data disaggregation could be helpful?**
      iii. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download)?**
   b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**

Reviewers provided no comments.

2.4.1 Livestock

2.4.1.1 Enteric Fermentation

1. **Are there other/newer data sources or methods, particularly at the state level, that the EPA should be aware of and consider in calculating these emissions? Especially for:**
   - **Dry matter/gross energy intake;**
   - **Annual data for the digestible energy (DE) values (expressed as the percentage of gross energy intake digested by the animal), CH_4 conversion rates (Ym) (expressed as the fraction of gross energy converted to CH_4), and crude protein values of specific diet and feed components for foraging and feedlot animals;**
   - **Monthly beef births and beef cow lactation rates;**
   - **Weights and weight gains for beef and dairy cattle.**

Reviewers from Iowa commented that their enteric emissions are calculated using the SIT. Both the *State Methods* and the SIT use emission factors from the Cattle Enteric Fermentation Model (CEFM), and the most recent animal population data from either USDA's NASS Quick Stats or USDA's Iowa Agricultural Summary. They noted that since the Iowa DNR's inventory is for the previous calendar year and the national *Inventory* is for two years prior, DNR and EPA are not using the same animal populations. This may be the reason for DNR's emissions being 18% higher than the *State Methods* for 2019, they commented.

EPA Response: The EPA thanks the reviewers from Iowa DNR for their feedback and additional information on why the state-level estimates compiled by the EPA and Iowa DNR's state-level GHG Inventory differ.

2. **Are state-specific diet data available to the EPA to enhance characterization of diet differences across livestock types and U.S. states?**

Reviewers from Alaska's DEC suggested that the Department of Natural Resources, Division of Agriculture or the University of Alaska Agriculture Research Station might have useful data.

EPA Response: The EPA thanks the reviewers from Alaska's DEC for their feedback and suggested data sources. The EPA will review available data and assess how best to reflect the data in methods to estimate state-level emissions from livestock.

3. **For the enteric fermentation source category and the Cattle Enteric Fermentation Model (CEFM), are the various regional designations of U.S. states (as presented in Annex 3.10 of the GHG *Inventory*) used for characterizing the diets of foraging cattle appropriate? The CEFM is used to estimate cattle CH_4 emissions from enteric fermentation and incorporates information on livestock population, feeding practices, and production characteristics.**

Reviewers were unaware of newer sources of state-specific livestock emission factors and production. Reviewers from Alaska's DEC noted that Alaska has little cattle production and USDA information is sufficient.

EPA Response: The EPA thanks the state reviewers for their feedback.

2.4.1.2 Manure Management

1. **Are there other/newer data sources, particularly at the state level, that the EPA should be aware of and consider in calculating these emissions? Especially for the following:**
   - **waste management system data, particularly seasonal changes in emissions from different waste management systems;**
   - **maximum methane-producing capacity;**
   - **volatile solids and nitrogen excretion rates; and**
   - **measured emission estimates (by waste management system) to help refine estimates of methane conversion factors.**

Reviewers from Texas CEQ were unaware of newer sources of Texas-specific livestock emission factors and production. Reviewers from Iowa noted their manure management emissions are calculated using the SIT and the same animal population sources as used for enteric fermentation. To that end, Iowa specific data are more recent than in the *State Methods* which is likely responsible for their emissions being 4% higher than the *State Methods* for 2019. The Iowa DNR calculated emissions for 2017 through 2019 are 60% to 73% higher than the *State Methods* and reviewers from Iowa will further research this discrepancy.

EPA Response: The EPA thanks the reviewers from Texas CEQ and Iowa DNR for their feedback. In particular, if Iowa DNR has state-specific information on manure management they are able to provide EPA, such as distribution and usage or different waste management systems, it could be useful for the EPA to assess where the EPA and Iowa emissions estimate differ.

2.4.2 Agricultural Soil Management

1. **What are your overall impressions of the clarity and transparency of this section?**

Reviewers from Iowa commented that emissions from agricultural soil management in 2019 were 20.97 MMT CO_2e, accounting for 16% of Iowa's total GHG emissions in their estimates, and they look forward to seeing the *State Methods* values when they become available.

EPA Response: The EPA thanks the Iowa DNR reviewers for their feedback. State-level data on N_2O emissions from agricultural soil management estimates were shared on January 18, 2022.

2. **What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*?**

Reviewers from Alaska's DEC noted that Alaska has a very long winter season and thus it makes sense to have an adjustment for the season where agricultural soils are frozen.

EPA Response: The EPA thanks the Alaska DEC reviewers for this feedback. As noted in the State Methods document, for Agricultural Soil Management, only N_2O emissions from mineral fertilizer and PRP N additions are estimated for Alaska. The EPA will assess how best to reflect state-specific circumstances in future state estimation efforts.

2.4.3 Other Charge Questions

2.4.3.1 Rice Cultivation

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.4.3.2 Liming

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers from Iowa DNR noted that their CO_2 emissions from liming are calculated using the total amount of limestone CO_2 that is emitted when acidic agricultural soils are neutralized by adding limestone or dolomite. They also reported that the Iowa DNR used the total annual amount of limestone produced for agricultural use as reported by their members to the Iowa Limestone Producers Association. However, producers do not report the percentage of limestone that is dolomitic. The Iowa DOT tracks general information for active aggregate sources used for construction, including whether the material is limestone or dolomite. They do not track that information for limestone produced for agricultural purposes. The Iowa DOT indicated that some areas of the state have 100% dolomite, some have 100% limestone, and some areas are mixed. Therefore, the Iowa DNR assumed that 50% of the material produced in Iowa for agricultural use is dolomite and 50% is limestone. Reviewers from Iowa commented that the Iowa DNR's emissions are quite different than the disaggregated national *Inventory* values for Iowa. Finally, they noted that the disaggregated national *Inventory* values are not provided for 2017 or 2019.

EPA Response: The EPA thanks Iowa DNR for their feedback. The EPA shared updated data with state experts on January 18, 2022, which included values for 2017–2019. In the national Inventory, the EPA applied a Tier 2 approach to estimate emissions from liming. The EPA obtains state-level data from the U.S. Geological Survey (USGS) on limestone and dolomite applied for agricultural purposes and uses a country-specific emission factor to estimate emissions. The USGS data could be used as a quality assurance/verification measure to assess the ratio of limestone to dolomite applied each year, and how that compares to Iowa's 50% assumption.

2.4.3.3 Urea Fertilization

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers from Minnesota PCA referenced and shared a report from the Minnesota Department of Agriculture.[15] Reviewers from Iowa DNR reported their estimated emissions from Urea Fertilization are significantly lower than the *State Methods* values for Iowa for 2018 (-24%) and 2019 (-30%) but are higher than the *State Methods* values for Iowa for 2015 (+7%), 2016 (+20%), and 2017 (+6%). They believed this corresponds to a change in the availability of state-specific fertilizer data. Prior to 2018, the Iowa Department of Land and Agriculture Stewardship published a report of fertilizer sales that the Iowa DNR used for its inventory. The report was not available for 2018 or 2019, so the Iowa DNR used the amount of 2018 urea applied from the USDA's Iowa Agricultural Statistics Bulletin for both 2018 and 2019.

EPA Response: The EPA thanks Iowa DNR for their feedback and additional information on why the state-level estimates compiled by the EPA and Iowa DNR's state-level GHG Inventory differ. Fertilizer sales data is used by the EPA to calculate emissions from urea fertilization. These reports are generally reported in fertilizer years; therefore, the EPA converts these estimates to calendar year to align with national* Inventory *reporting needs. However, fertilizer sales data for the 2016 through 2019 fertilizer years were not available so application was estimated using a linear, least squares trend of consumption over the data from the previous five years (2011 through 2015) at the state scale. This could be another reason for differences in emissions.

2.4.3.4 Field Burning of Agricultural Residues

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.5 Land Use, Land-Use Change, and Forestry

1. What are your overall impressions of the clarity and transparency of this section?

Reviewers provided no comments.

[15] Minnesota Department of Agriculture. n.d. "Fertilizer Use, Nutrient Management Survey," Available at: https://www.mda.state.mn.us/pesticide-fertilizer/fertilizer-use-sales-data

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

The USCA comments suggested that states have appropriate time to review disaggregated Agricultural Soil Management and Croplands and Grasslands Data. They also suggested giving the opportunity to states to contribute state-level data with the opportunity to review disaggregated data and amended methodologies once state input and data have been incorporated.

Reviewers from Iowa DNR reported their estimates of carbon sequestration in the LULUCF sector are significantly higher than the disaggregated national *Inventory* state values (between +76% to +135%). They were unsure what is driving this difference as they used the SIT to calculate the amount of carbon sequestered and used the SIT default values for forest carbon flux, urban forests, and agricultural soils. In addition, the SIT seems to use the same method as the national *Inventory*.

EPA Response: The EPA appreciates the feedback from Iowa DNR on the differences, and these will be reviewed for the next annual publication of this report.

The EPA notes that there are a number of differences in methods, in particular, cropland and grassland, between the current SIT tool and the GHG Inventory by U.S. State that can result in different emissions. As both products continue to be updated, it is expected that the values will align better. The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. The fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

3. <u>Data Availability</u>. Please address the following questions for each inventory source:

a. For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?

b. For national-level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code level?

Reviewers from Alaska's DEC suggested USGS data on Land Use and Land Use Change on Carbon sequestration Capacity that should be integrated. These data are more complete than EPA datasets which are limited to Southcentral and Southeast Alaska.

EPA Response: The EPA thanks the reviewers for their feedback. EPA has previously reviewed the referenced USGS dataset and conducted a preliminary assessment using these data. Please see Box 6-5 (page 6-34) of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2016, found here: https://www.epa.gov/sites/default/files/2018-01/documents/2018_complete_report.pdf. Based on this review, EPA found that the USGS data was not directly applicable to the Managed Land Proxy approach used for the Land Representation analysis in the national Inventory, consistent with IPCC methodological guidance. The data EPA currently uses covers areas outside of Southcentral and Southeast Alaska. USFS began an operational inventory in interior Alaska in 2016 with a reduced plot density that is being used in combination with remote sensing which allows us to include

estimates of carbon stock changes in interior Alaskan forests. Other datasets used for the lower 48 states (e.g., NRI) are limited in Alaska, so some land use, land use change categories (Croplands, Grasslands, Settlements) are not estimated at this time. EPA notes these as planned improvements.

4. **Uncertainty. Currently, uncertainty ranges are not included for the state-level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Time Series Coverage. Currently, state data cover 1990-2019 consistent with the 2021 *National Inventory* and are inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the national *Inventory*. As state-specific input datasets are not always available over the entire time series, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. The EPA appreciates feedback on which, if any years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).**

Reviewers from Alaska's DEC suggested USGS data on Land Use and Land Use Change on Carbon sequestration Capacity that should be integrated. These data are more complete than EPA datasets which are limited to Southcentral and Southeast Alaska.

EPA Response: The EPA thanks the reviewers for their feedback. Please see response to comment 2.5.3, above.

5. **Key Categories. The EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. The EPA appreciates feedback on which categories are more relevant for further refining for the sector you are reviewing.**

Reviewers from Alaska's DEC commented that LULUCF should be viewed as separate from the national average and analyzed separately from nationwide land use.

EPA Response: The EPA presents emissions consistent with international reporting guidelines and internationally accepted methodological guidance from the IPCC. Consistent with these guidelines, the EPA presents both national totals and state-level totals, including and excluding the LULUCF sector.

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/inventoryexplorer/)?**

i. **Related to the level of category/gas aggregation or disaggregation?**
ii. **Are there specific categories where further data disaggregation could be helpful?**
iii. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download)?**

b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**

Reviewers provided no comments.

2.5.1 Forest Lands and Lands Converted to Forest Land

2.5.1.1 Forest Land Remaining Forest Land

1. **What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)**

Reviewers from Minnesota's PCA noticed that their method for sequestration is highly variable on an annual basis and noticeably different from the *State Methods* estimate. They recommended discussion with inventory staff and experts at the Minnesota Department of Natural Resources to help them understand the method used by the EPA, to share approaches, and further develop accounting methods.

EPA Response: The EPA works closely with USFS to develop the FLRFL estimates. The EPA will follow up with Minnesota DNR and facilitate a discussion on this topic.

2.5.1.2 Land Converted to Forest Land

1. **What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)**

Reviewers provided no comments.

2.5.2 Agricultural Lands (Croplands and Grasslands)

1. **What are your overall impressions of the clarity and transparency of this section?**

Reviewers found the methodology for this category sound. Reviewers from Alaska's DEC noted that the methods were clear but inadequate as the data covers only a small part of Alaska.

EPA Response: Currently, for the national* Inventory *and the State Methods report, EPA does not estimate GHG fluxes from Croplands and Grasslands in Alaska due to insufficient data (e.g., NRI has no coverage in Alaska). Consistent with IPCC methodological guidance and

***international reporting guidelines we have identified the managed lands in Alaska, consistent with the Managed Land Proxy approach, and are working on assembling the necessary data to quantify N_2O emissions and carbon stock changes for Croplands. Grasslands are more challenging due to limited available data but EPA is working to include these GHG fluxes in a future national* Inventory.**

See response to comment 2.5.3 regarding use of USGS data.

2. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*?

Reviewers from Alaska's DEC recommended using the data for croplands and grasslands in the USGS dataset and to coordinate with them to integrate findings into future modeling. They also suggested the University of Alaska.[16]

EPA Response: The EPA thanks the reviewers for their feedback. See response to comment 2.5.3 regarding use of USGS data. EPA will review data from the University of Alaska to assess how it can potentially be incorporated into the Inventory.

2.5.3 Wetlands and Lands Converted to Wetlands

2.5.3.1 Wetlands Remaining Wetlands

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.5.3.2 Land Converted to Wetlands

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.5.3.3 Peatlands Remaining Peatlands

1. Are there state-level data available on the application ("consumption") of peat, including the state of use and the horticultural/landscaping use?

[16] University of Alaska Division of Agriculture. n.d. "Alaska," https://economic-impact-of-ag.uada.edu/alaska/

Reviewers from Alaska's DEC noted all data for peatlands and wetlands is in USGS dataset developed for GHG emissions for the state. They suggested coordinating with USGS to integrate findings into future modeling.[17]

EPA Response: The EPA thanks the reviewers for their feedback and will review the data from USGS to assess how it can potentially be incorporated into the Inventory for Peatlands. See response to comment 2.5.3 regarding use of USGS data.

2. Are there data sources that could support the EPA in determining the quantity of peat harvested per hectare and the total area undergoing peat extraction?

Reviewers were unaware of sources of quantity of peat harvested or total area undergoing peat extraction.

2.5.4 Settlements and Lands Converted to Settlements

2.5.4.1 Settlements Remaining Settlements

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5). *NB*: Emissions estimates not yet available.

Reviewers were unaware of sources of emission factors and production.

2.5.4.2 Changes in Carbon Stocks in Settlements Trees

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.5.4.3 N_2O Remissions from Settlement Soils

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5). *NB*: Emissions estimates not yet available.

Reviewers provided no comments.

[17] Jewell, S., & Kimball, S. M. (2016). "Baseline and Projected Future Carbon Storage and Greenhouse-gas Fluxes in Ecosystems of Alaska," U.S. Geological Survey. Professional Paper 1826. Reston, Virginia.

2.5.4.4 Changes in Yard Trimmings and Food Scrab Carbon Stocks in Landfills

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers provided no comments.

2.5.4.5 Land Converted to Settlements

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5). *NB*: Emissions estimates not yet available.

Reviewers provided no comments.

2.5.5 Other Lands and Lands Converted to Other Lands

1. What recommendations do you have to add to ensure high-quality state-level estimates are consistent with the national *Inventory*? (*Cf.* General Chapter Charge Questions 1-5)

Reviewers were unaware of sources of LULUCF emission factors and production.

2.6 Waste

1. What are your overall impressions of the clarity and transparency of this section?

Reviewers provided no specific comments.

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

Reviewers from Iowa commented that for Industrial sectors, industrial wastewater emissions were calculated using the emission reported by facilities to GHGRP. In 2019, eleven ethanol plants and five food processors reported emissions to the GHGRP. They believed this to be more accurate than calculating emissions based on red meat or ethanol production values. They also noted that they have been unable to find state-specific data to calculate emissions from pulp & paper, fruits & vegetables, or breweries, and the SIT wastewater module does not include default activity data for Iowa.

EPA Response: The EPA appreciates the insight on the industries within Iowa, and as noted in the Planned Improvements section, will determine if additional data sources can be used for all states, including GHGRP data. The EPA is planning to update SIT to better align default

data with the GHG Inventory by U.S. State data. In the interim, SIT does allow states to enter categories not currently included so this new data could be entered directly into SIT by state users as a starting point for including wastewater emissions from these industries.

3. **Data Availability. Please address the following questions for each inventory source:**
   a. **For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?**
   b. **For national-level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the state, county, or zip-code level?**

Reviewers from Alaska's DEC suggested NEI data to include PW Treatment permitted facilities.

EPA Response: EPA appreciates the commenters offer to either provide or point EPA to a potential data source to further refine emissions estimates.

4. **Uncertainty. Currently, uncertainty ranges are not included for the state-level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Time Series Coverage. Currently, state data cover 1990-2019 consistent with the 2021 *National Inventory* and are inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the national *Inventory*. As state-specific input datasets are not always available over the entire time series, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. The EPA appreciates feedback on which, if any years should be prioritized for future state-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).**

Reviewers from Arizona's DEQ expressed interest in prioritizing results from the last decade to investigate how climate policy has changed and if that has caused trends in landfill emissions.

EPA Response: The EPA appreciates the comments. National trends in landfill emissions are covered in the national* Inventory *chapter on waste available online here: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019.

5. **Key Categories. The EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. The EPA appreciates feedback on which categories are more relevant for further refining for the sector you are reviewing.**

Reviewers from Alaska's DEC commented that state landfills are not calculated using continental US decomposition rates, and they need to work with DEC on solid waste decomposition for future emissions modeling. They suggested this as decomposition is different in cold regions, especially areas with permafrost.

EPA Response: The EPA appreciates the comments and data provided. The EPA has added examining Alaska-specific landfill modeling to planned improvements for MSW landfills.

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/inventoryexplorer/)?**
      i. **Related to the level of category/gas aggregation or disaggregation?**
      ii. **Are there specific categories where further data disaggregation could be helpful?**
      iii. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download)?**
   b. **What additional datasets or information could be provided to help increase the usability of the state-level emissions data?**

Reviewers provided no comments.

2.6.1 Solid Waste

2.6.1.1 MSW Landfills

1. **Data Questions**
   - **Are there datasets for individual states' landfill gas (LFG) recovery activity?**
   - **Are there data available for open dumpsites in the U.S. territories?**

Reviewers from Alaska's DEC noted that Alaska has landfill gas processing for Anchorage landfill and Merril field. All other landfills are open air. They also noted the Alaska DEC Environmental Health Division may have data available for open landfills and dumpsites that are not permitted by Air Quality.

From reviewers from Texas CEQ, "Datasets for Texas LFG recovery activity can be found in the TCEQ MSW annual report at the following link: annual report. Pages 99 - 102 of the 2020 report show a List of Facilities Recovering Landfill Gas for Beneficial Use (2020), including information on Gas Processed (ft^3). The annual report is available for several years.

Additional information can be found by filtering the 'physical type' column for 9GR, which are the landfill gas recovery facilities of the spreadsheet at the following link: **msw-facilities-texas.xls**— A spreadsheet listing issued or acknowledged permits and other authorizations as

Explanation of Municipal Solid Waste Data Fields for more information.

Data on open dumpsites may be found at: **msw-unum-texas.xls**. A spreadsheet of historical information listing old, closed unnumbered MSW landfills that were operated before permits were required, as well as unauthorized landfills and miscellaneous illegal dumps and disposal sites. See the TCEQ Inventory of Closed Municipal Solid Waste Landfills page for information about why this information was collected and how it is used. See Explanation of Municipal Solid Waste Data Fields for more information."

Reviewers from Minnesota's PCA commented that NPCA is responsible for closed landfills, and they collect data. They can provide additional data on closed landfill activities to the EPA if requested.

Reviewers from Rhode Island's DEM noted that in Rhode Island, there is only one MSW landfill which is the RI Resource Recover Corporation (RIRRC).[18] They noted that "the landfill gas collection system consists of an intricate network of trenched horizontal piping and several strategically placed negative-pressure gas collection wells. All of the gas collection systems come together at a single common gas extraction point. The gas is then treated by a gas conditioning and compression site (GCC). After treatment, the landfill gas is sent as fuel to the combined cycle combustion turbine generator (CTG) power plant operated by RI LFG Genco, LLC." Regarding data, RIRRC's "permits require that they monitor and calculate quantities of landfill gas generated. They are also required to measure gauge pressure in the gas collection system monthly for each individual well and trench to demonstrate that the gas collection system flow rate is sufficient. Testing is performed on the actual gas itself, as well, including methane content and VOC content. These records are kept on-site at Central Landfill. RIDEM review the records during inspections. RI LFG Genco must also continuously monitor the amount of landfill gas that flows to the engines. In summary, no landfill gas data is submitted to RIDEM."

Reviewers from Arizona's DEQ noted that there are no data on open dumpsites in Appendix F Table F-3 for MSW landfills methane recovery. However, Section 6.1.1.4 of the *State Methods* mentions the inclusion of emissions from all waste management practice, including open dumpsites, as a potential refinement to landfill estimation methods.

Reviewers from Iowa commented that they used emissions reported by MSW landfills to the GHGRP, which are calculated based on the characteristics of each individual report. They also noted that EPA requires MSW landfills that emit 25,000 metric tons CO_2e or more to report their emissions. This included twenty-four Iowa landfills in 2019. An additional twenty-two Iowa MSW landfills were not required to report to the GHGRP. To calculate emissions for those that did not report to the GHGRP, they calculated the potential methane emissions using EPA's Landfill Gas Emissions Model (LandGEM) version 3.02.

[18] They noted that there are two others, but they are very small and for inventory purposes they are not included.

EPA Response: See above response for Alaska's DEC comments.

Regarding comments from Iowa: The EPA will confirm that the 24 nonreporting landfills in Iowa are captured in our nonreporter database of landfills used to develop the scale-up factor. More information on how the scale-up factor is used to account for non-GHGRP reporters and to develop the national MSW landfill emissions is in the waste chapter of the national* Inventory a*vailable online here: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019.

Regarding comments from other states: The EPA appreciates the data suggestions and will continue to evaluate the feasibility of including site-specific data from each state.

2. **The current method makes some simplifying assumptions and includes uncertainties in the allocation of national-level U.S. emissions to states (e.g., recovery rates are the same for all states and match the national recovery rate). Are there alternative assumptions or different datasets that would improve the accuracy of MSW landfill estimates? Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?**

Reviewers from Alaska's DEC commented that Alaska has many landfills, but they are permitted with the waste division. They noted using the national methods may not be applicable to Alaska due to the lengthy time of frozen conditions.

EPA Response: See above response for Alaska's DEC comments.

2.6.1.2 Industrial Landfills

1. **Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?**

Reviewers from Iowa commented that this sector is not included in their inventory and will research if this is a gap and if Iowa activity data are available.

2.6.1.3 Composting

1. **Data Questions**

   - **Is the assumption that Alaska has no commercial composting operations correct?**
   - **Are there any data about composting in U.S. territories?**
   - **Are there any state-level data sources that describe composting activity over time?**

Regarding the first bullet point, reviewers from Alaska's DEC agreed that this assumption is correct. Alaska has no commercial composting operations presently. Limited Anchorage Muni

experimental composting is set-up at present. They also noted some villages have very small local composting operations, but these are not commercial arrangements.

Reviewers from Rhode Island's DEM noted that RIDEM collects annual solid waste data from permitted composting facilities from 2016 through 2020. This includes tonnages of the waste incoming and outgoing from the facilities. In addition, other than solid waste tonnage data, the facility name & contacts, address and permit capacities are maintained. They cautioned that since this data collection effort is relatively new, RIDEM does not have 100% of the data for years before 2019.

Reviewers from Arizona DEQ noted that due to the large area and quantities of fish waste, it may not be correct to assume that there is no commercial composting in Alaska, though they were unaware of any state-level data sources that describe composting activity over time. Reviewers from Iowa commented that this sector is not included in their inventory and will research if this is a gap and if Iowa activity data are available.

EPA Response: The EPA appreciates the data suggestions and will continue to evaluate the feasibility of including site-specific data from each state while ensuring consistency with national methodologies and datasets.

2.6.1.4 Stand-Alone Anaerobic Digestion

1. **Do you have or know of any state-level data for counts of operational anaerobic digesters (processing food waste) by year?**

Reviewers were unaware of sources of operational anaerobic digester emission factors, counts, or production. Reviewers from Iowa commented that this sector is not included in their inventory and will research if this is a gap and if Iowa activity data are available.

EPA Response: The EPA appreciates the feedback acknowledging limited sources of state-level data on operational anaerobic digesters.

2. **Are there any facility-specific data sources we could use to fill data gaps on the quantity of waste processed by stand-alone digesters for any and all years of the 1990–2019 time series?**

Reviewers from Rhode Island's DEM noted that in Rhode Island there is one stand-alone facility, but they are not fully operational at this time. The owners are still going through their shakedown period and stack testing has not yet been completed. After testing, RIDEM will revise the permit to include updated emissions limits and conditions. After that, they will be considered fully operational. In the future, RIDEM will receive data on quantity of waste processed via Air Inventory Forms. Reviewers from Arizona's DEQ noted that there are sources that break down digester type for specific estimate such as biogas data, but they could not find any facility-specific data sources for quantity of waste processed by stand-alone digesters.

Reviewers from Alaska's DEC were unaware of such information, but think it could be found after some research.

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates.

2.6.2 Wastewater

1. **The following national average parameters were used to estimate emissions by state, with state populations used to proxy the distribution of domestic emissions and state-level production data (if available) used to proxy the distribution of industrial emissions. Please comment if you believe states would differ significantly from the national averages for the following parameters and, if so, whether there are state-specific data sources for the EPA to consider:**
    - **wastewater outflow**
    - **biological oxygen demand (BOD), total N, and chemical oxygen demand (COD) concentration in untreated wastewater**
    - **BOD:COD ratios for industrial wastewater**
    - **wastewater treatment unit operations in use at centralized domestic treatment plants or at industrial plants**

Reviewers from Alaska's DEC suggested DEC Water Division likely contains information through the wastewater permits and water well program. The DEC also may have some air quality permit information for permitted facilities, they noted.

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates.

2. **Are there domestic or industrial wastewater treatment operations present on other Pacific islands for industrial sectors included in the national *Inventory?***

Reviewers provided no comments.

3. **For each of the wastewater treatment and discharge subcategories listed for this category, is there any information that was not considered on available state-level data sources with regional or other disaggregated information on emissions?**

Reviewers were unaware of additional data sources. Reviewers from Iowa reported that their estimates were 64% lower than EPA's estimate for 2019. They attributed this to being unable to find state-specific activity data to calculate emissions from several sources.

EPA Response: The EPA recognizes that complete state-level data have not been included and therefore relied on a national value which is based on more recently available data. The EPA is continuing to determine state-level sources for type of wastewater treatment (in the Planned Improvements section) that may inform the point of centralized versus onsite treatment.

2.6.2.1 Domestic

1. **The following national average parameters were used to estimate domestic wastewater treatment emissions by state. Please comment on whether you think that states would differ significantly from the national averages for the following parameters and, if so, are there state-specific data sources for the EPA to consider:**
    - **discharge of POTWs to impaired waterbodies and nonimpaired waterbodies**
    - **discharge of POTWs to reservoirs, lakes, and estuaries**
    - **consumed protein**
    - **percentage of the population on septic (versus centralized treatment)**

Reviewers were unaware of significant changes or additional data sources and suggested the national averages for these parameters are acceptable. Reviewers from Iowa calculated municipal wastewater emissions using the SIT wastewater module along with the fraction of Iowa's population without septic systems, 76%.[19] They noted that this value has not been updated since 2002 and the fraction value has not included in the US Census of Housing since 1990. They also noted they used the most recent protein value from the national *Inventory*.

Reviewers from Alaska's DEC noted Alaska DEC Water Division has this information and possibly permitted facilities in the air program for the discharge of POTWs to reservoirs, lakes, and estuaries. To address consumed protein, they also suggested calculating a percentage of the population on septic (versus centralized treatment) as septic systems are common in rural Alaska except in Western and Northern Alaska.

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates. The EPA also thanks the commenter for their thoughts on how the national value for the percentage of population served by centralized treatment may not be appropriate for the state of Alaska. The EPA plans to update the Planned Improvements to reflect this potential improvement.

2.6.2.2 Industrial—Pulp and Paper

1. **Pulp and paper wastewater flows were estimated using the EPA's ECHO datasets. Do you have any reason to believe that states' pulp and paper wastewater information is**

[19] US Environmental Protection Agency. (2002). "Onsite Wastewater Treatment Systems Manual," Available at: https://www.epa.gov/sites/default/files/2015-06/documents/2004_07_07_septics_septic_2002_osdm_all.pdf

underrepresented in ECHO? If so, do you have an alternative, publicly available pulp and paper wastewater dataset by state?

Reviewers from Texas CEQ suggested the Technical Association for the Pulp and Paper Industry[20] and the National council for Air and Stream Improvement.[21]

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates.

2. **Currently, a single year, 2019, is used to estimate the distribution of national estimates to each state and territory for every year of the time series. Is there reason to believe states' pulp and paper manufacturing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?**

Reviewers from Texas CEQ suggested 1990 data should not be used to determine 2020 emissions and referenced sources listed in the question above.

EPA Response: The EPA appreciates Texas CEQ feedback which suggests operations may have changes since 1990. See the EPA response to previous question.

3. **Data for pulp and paper manufacturing for U.S. territories are limited in the ECHO dataset. Are there resources to help estimate a time series of production data for pulp and paper wastewater flows? Or are there territory-level data on the number of pulp and paper plants in each U.S. territories?**

Reviewers provided no comments.

2.6.2.3 Industrial—Meat and Poultry

1. **Currently, a single year, 2019, is used to estimate the distribution of national estimates to each state and territory for every year of the time series. Is there reason to believe states' meat and poultry processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?**

Reviewers were unaware of significant changes to this category or additional data sources.

2. **Data for meat and poultry processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of production data for**

[20] Available at: https://www.tappi.org/
[21] Available at: https://www.ncasi.org/

poultry (broilers, turkeys, chicken), beef and calves, hogs, and sheep (lamb and mutton), for example, live weight killed, number of head slaughtered?

Reviewers were unaware of significant changes to this category or additional data sources.

2.6.2.4 Industrial—Fruits and Vegetables

1. **Currently, a single year, 2017, is used to estimate the distribution of national estimates to each state and territory for every year of the time series. Is there reason to believe states' fruit and vegetable processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?**

Reviewers were unaware of significant changes to this category or additional data sources.

2. **Data for fruit and vegetable processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of territory-level production data for fruits and vegetables, for example, canned and frozen processed vegetables, potato production, noncitrus fruits, and citrus production?**

Reviewers were unaware of additional data sources.

2.6.2.5 Industrial—Ethanol

1. **Ethanol production for each state was estimated using the Energy Information Administration (EIA) SEDS dataset. Do you have any reason to believe that states' information is underrepresented in the SEDS dataset? If so, do you have an alternative, publicly available ethanol production dataset by state?**

Reviewers from Texas CEQ referenced the Nebraska Department of Environment and Energy which lists Ethanol Facilities Capacity by state and Plant which can be used for cross reference.[22]

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates.

2. **Data for ethanol production for U.S. territories are limited in the SEDS dataset. Are there resources to help estimate a time series of production data for ethanol production?**

[22] Nebraska Department of Environment and Energy. (2020). "Ethanol Facilities Capacity by State and Plant," https://neo.ne.gov/programs/stats/inf/122.htm

Reviewers provided no comments.

3. **What other relevant data sources could be included? If data are used at the national level, are you aware of other comparable data sources at the state level?**

Reviewers provided no comments.

2.6.2.6 Industrial—Petroleum

1. **Petroleum production for each state was estimated using EIA's Petroleum Administration for Defense Districts production and state-level operating capacity datasets. Do you have any reason to believe that states' information is underrepresented in the EIA datasets? If so, do you know of an alternative, publicly available petroleum refining production dataset by state?**

Reviewers from Alaska's DEC suggested the Department of Revenue likely has this information.

EPA Response: The EPA appreciates the commenters offer to either provide or point the EPA to a potential data source to further refine emissions estimates.

2. **Do you have any concerns about using operating capacity to estimate petroleum production by state is not a good method? If so, would you suggest an alternative method?**

Reviewers provided no comments.

3. **Data for petroleum refining for U.S. territories are limited in the EIA dataset. Are there resources to help estimate a time series of territory-level production data for petroleum production?**

Reviewers provided no comments.

2.6.2.7 Industrial—Breweries

1. **Brewery production, and by extension brewery production emissions, for each state was estimated using the Alcohol and Tobacco Tax and Trade Bureau (TTB) taxable production dataset.**
   - **The TTB dataset is based on taxable production/volume. Is there any reason why taxable production from breweries may be underrepresented by state and therefore**

potentially underrepresent total emissions? If so, do you know of an alternative dataset or assumption?

- **The TTB dataset provides production data from 2008 to the present. The 2008 values were used as a proxy for 1990–2007 values. Is there reason to believe states' brewery production has significantly changed over that time period? If so, do you have an alternative, publicly available state-level brewery production dataset (i.e., barrels produced) or suggestions for alternative data to use as a proxy?**

Reviewers from Texas CEQ found the methodology sound and were unaware of other proxy, datasets, or assumptions. Reviewers from Rhode Island's DEM had no reason to believe that the taxable production/volume is not accurate. Reviewers from Alaska's DEC also thought TBB production data are reliable. Reviewers from Rhode Island's DEM commented that there is no reason to believe that Rhode Island's brewing production has significantly increased during 1990 through 2007.

EPA Response: The EPA thanks the state reviewers for their feedback on TBB data.

2. **Data for brewery production for U.S. territories are limited in the TTB dataset. Are there resources to help estimate a time series of territory-level production data for brewery production (i.e., barrels produced)?**

Reviewers provided no comments.

EPA Response: The EPA notes that no feedback was provided on this question.

2.7 Comments from Independent Organizations

The United States Climate Alliance (USCA) submitted comments of behalf of alliance Sates that emphasized the importance of consistency between the state level results and other state level sources such as the SIT and from the national *Inventory* and other data available at the federal level, e.g., the Energy Information Administration's (EIA) State Energy Data System (SEDS) and Greenhouse Gas Reporting Program (GHGRP). Data consistency across federal and state tools is important because states rely on SIT as the starting point for their own official GHG inventories and conflicting datasets requires justification of one source over another. When this is the case, the USCA comments recommended making the methodology explicit to identify and explain methodological or data differences for each state. The USCA comments suggested releasing downscaled inventory data after EPA's SIT is released for the same year as several Alliance states rely on SIT for their state-specific greenhouse gas inventory (GHGI).

EPA Response: The EPA has provided further information and clarity on the data sources used in the state-level estimates, in particular for the use of SEDS and GHGRP data. This effort will also provide updated information for EPA's existing State Inventory Tool.

The EPA also recognizes that a number of states rely on the SIT as a starting point for preparing their state GHG inventory estimates. The SIT includes default activity data and estimates that states can use as a starting point for compiling a state-level GHG inventory. The default data included in SIT are largely consistent with the EPA's state-level inventory because the data are based on methodologies, emissions factors, and other data from the national* Inventory. *However, some differences exist between default data in SIT and the GHGI by state estimates due to differences in methods, data, and level of completeness. As additional state-level data and/or methodological approaches become available through the national* Inventory *disaggregation, they will be used to supplement or improve the embedded calculations and defaults in SIT as appropriate. SIT users will retain the ability to customize the tool with their own data in lieu of using any defaults. Consistent with IPCC methodological guidance, for more significant emission sources, it is good practice to apply higher-tiered methods which generally reflect more detailed characterization of activities and involve use of data and emission factors that are country, region, state or technology specific.

The EPA has also provided a fact sheet with information cross walking the state-level GHG estimates with the SIT methods. The fact sheet is available online here: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.

Regarding uncertainty, the USCA provided comments on behalf of alliance states and suggested highlighting individual state inventories as the preferred source of state-specific GHG emissions when relevant. When state inventories are not available, they thought downscaled data could be a useful source but in cases where bottom-up inventory data are not available, they suggested including appropriate caveats and disclaimers to make it clear that state inventories take priority for policy making and tracking. They suggested explaining any remaining differences in methodologies between state GHGI results and SIT. Furthermore, the USCA comments suggested uncertainty for at least the current year and common baseline years, e.g., 1990, 2005.

EPA Response: The EPA recognizes that there will be differences between the EPA's state-level estimates and some inventory estimates developed independently by individual state governments. The EPA will add a caveat to the data to indicate that inventory data presented here should not be viewed as official data of any state government. The EPA will also point to additional information on official state data, where that data exist, including information on potential areas of difference between EPA's data and official state data.

At this time, the uncertainty provided in the GHG Inventory by U.S. State report reflects that of the national Inventory and includes a qualitative discussion of state level uncertainties. The EPA continues to assess how best to analyze and present qualitative uncertainty estimates associated with state-level estimates but will do so in the context of prioritizing improvements in other areas.

The USCA comments suggested adding additional caveats explaining the lack of standardized allocation methodology for bunker fuel. As a source category, many Alliance states are actively working to improve, and Alliance states would welcome continued discussion on the topic.

EPA Response: The EPA appreciates the comments on state-level bunker fuel data. The EPA will continue to investigate approaches and data for allocating international bunker fuel data at the state level, including, for example, flight-level data. The EPA has also provided more

detail on how transportation emissions are developed at the national and state levels in the report to clarify where emissions from different sources are accounted for.

The USCA comments on landfill emissions reported, "It appears that the oxidation was removed after recovery for years 1990-2004 (flat 10%). For years 2005-2019, the oxidation was removed before the recovery (flat 19.5%) which implies that oxidation may be overestimated for years 2005-2019 (Section 6.1.1 in draft methodology report, with the data in Appendix F). EPA should clarify if oxidation is removed after recovery or why the oxidation appears to be removed after recovery for one period and before recover for another period."

EPA Response: The EPA has removed the MSW activity estimates from the GHG Inventory by U.S. State for the 1990–2019 report because presenting them was not consistent with the national* Inventory*. The forthcoming national* Inventory *report for 1990–2020 will include these, and the full methodology for developing the estimates will be presented.

3. Individual State Comments

This section provides comments from States presented in alphabetical order.

3.1 Alaska Department of Environmental Conservation (DEC)

Charge to State GHG Inventory Experts for the *Draft Methodology Report: Inventory of U.S. Greenhouse Emissions and Sinks by State*

General Questions

a) What are your overall impressions of the clarity of the methods described in this report?
- The methods are clearly laid out and established.

b) What recommendations do you have to add to or improve the overall transparency,completeness, consistency and accuracy of this report?

The accuracy of the methodology needs to be adjusted for the State of Alaska when using national averages. Some of Alaska's differences from national averages include Land Use/Change, decomposition rates in landfills, population using waste treatment systems and electrical grid, agriculture, and many other sectors. Our responses in this questionnaire will identify data availability as well as comments on methodology.

c) Data availability. Please address the following questions for each inventory source:

a. For each of the categories, are there additional relevant data sources that are notcurrently included, but could be incorporated into this analysis?
- Agriculture - Alaska Department of Agriculture has available data for state Ag to supplement USDA information; reference 2020 NEI as well.
- Oil and Gas flaring – Alaska Oil and Gas Conservation Council (AOGCC) puts out yearly reports that have flaring data (over 1 hour) and fills in the gaps on routine practices and flaring less than one hour.
- Energy Fugitive Emissions: State of Alaska NEI
- Waste water- NEI to include PW Treatment permitted facilities
- Land Use/Change: U.S. Geological Survey (USGS) has Land Use/Change data and Carbon Sequestration Capacity data that should be integrated. It is far more complete than the EPA data sets that are limited to Southcentral and Southeast Alaska.

b. For national level datasets that are currently used, are you aware of other comparabledatasets of activity, emission factor, or emissions data that are available at the State, county, or zip-code levels?
- NEI should be used for point and non-point sources

d) For the oil and gas sector, the state contractor used the NEI to generate GHG emissions that we believe is a good representative of how that can be achieved

(attached)

e) Key Category Analysis. EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. EPA appreciatesfeedback on which categories are more relevant for further refining for your State.
   a. Given that the emissions profile of some states will be different from the national average, which categories that are more significant in terms of absolute emissions, orhave changing emission trends (e.g., increasing, variable)?
      - Land use/change should be viewed as separate from national average and analyzed separately from nationwide land use.
      - State landfills are not calculated using continental US decomposition rates; need to work with DEC on solid waste decomposition for future emissions modeling. Decomposition is different in cold regions, especially with permafrost.
      - Pipeline compressor stations, pipeline, and tank emissions. Oil and gas rigs are different on the North Slope. The infrastructure for the lower 48 does not match what we have in AK.
   b. The national *Inventory* includes a key category analysis (KCA) consistent with 2006 IPCC Guidelines. Would it be useful for States if a key category analysis (KCA) was completedfor each state? Yes
      -

f) Data Presentation and Usability.
   a. Are there other ways the state-level emissions data could be presented to facilitate theiruse (e.g., in the EPA GHG Inventory Data Explorer available online at: https://cfpub.epa.gov/ghgdata/inventoryexplorer/)?
      i. Related to the level of category/gas aggregation or disaggregation?
      ii. Are there specific categories where further data disaggregation could behelpful? No comment
   b. What data format would best facilitate the use of the state-level emissions data (e.g.,
      .xlsx download, etc.)? any spreadsheet format works.
   c. What additional datasets or information could be provided to help increase the usabilityof the state-level emissions data? Alaska Oil and Gas Conservation Commission maintains data on all wells drilled that is complete.
   d. EPA plans to provide users additional information on where they can find official State data, where it exists. Do you have suggestions on how we should direct users to officialstate data (i.e., section in methods report including links to State data)?
      - Include links to state websites. Include link to updated EPA NEI data

Energy – Combustion Emissions Questions

a) Some fuels have differences in consumption data between the aggregated State-level totals andnational totals. The current approach is to use data from the national Inventory in those cases. Are there other approaches that could be taken? Has this come up in developing estimates at the State level?

- NEI data is very helpful but the annual data sets are for the largest facilities only. It may be worth while to calculate a percentage that the annual data represents the rest of the state emissions and update that scaling factor every three years.
- The SEDS data has been beneficial and does account for small facilities that don't report emissions through the permit program

- *Other comments for consideration:* For the development of state-level inventories for Alaska, what is needed is significantly more engagement with state-level planners for generating aggregate totals. AK has a unique relationship with both aviation and maritime transportation due to the state's infrastructure arrangements. Fuel consumption habits vary in the state compared to utilization in the continental United States. There is continued use of large amounts of light aircraft to bring passengers and cargo to and from remote communities, some of which still burn leaded AvGas and non-standard fuels. Alaska also receives a large amount of international marine traffic via the Great Circle Route which needs to be considered for long-term fuel consumption data. Many international vessels are arriving in state waters using IMO-designated low sulfur content fuel which generates other CAP and GHG emissions due to fuel chemistry from prior bunker fuel. The state's adjacent location to major developing trans-Arctic shipping routes could also change how the state's fuel consumption habits appear on national-level inventories.

  Rather than relying on generic nationwide data, ADEC strongly recommends coordination with the NEI team, specifically the teams working on the aviation and marine inventories. Both have developed specific activity data which incorporates satellite location-driven emissions data and actual engine activity data. This would be far more accurate, as CAP emissions have already been generated by this data. All that would be needed at that stage would be the application of emissions factors for GHG emissions. The same applies for the state's aviation inventory, which is already generated by LTO data from the NEI team. This dataset already includes activity and landing and take-off data from all categories of aircraft.

  As both the aviation and marine inventories have already been generated by the NEI team, ADEC encourages the EPA GHG team to coordinate with the NEI team for the purposes of GHG inventory generation.

b) Consistent with the IPCC Guidelines, we have adjusted fuel consumption totals in the energy sector to account for consumption in the IPPU sector. In some cases, this

step could lead to a negative emission total for a State if the subtracted amount (as determined from the assumed distribution) was greater than consumption data from the State Energy Data System (SEDS). Thisoutcome was corrected to zero if that was the case, but are there other approaches for correcting for that difference? No comment

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c) Consistent with the national Inventory, the default approach taken here was to allocate transportation sector CO_2 emissions based on FHWA fuel use/sales by State. For some States, this may not be accurate because fuel sold in a State may be combusted in other States. Anotheroption is to use vehicle miles traveled (VMT) data by State but that approach does not factor in vehicle fuel economy. Are there other alternative or complementary approaches to allocate transportation fuel across States, including VMT data and other sources (e.g., NEI – based on county-level fleet and activity data to generate a bottom-up inventory) that EPA should consider? If so, what data sources exist to help with that alternative approach? Would it be helpful to present transportation sector emissions using multiple approaches in future inventories?

- The existing methodology works for AK since we don't have adjacent states.
- The SEDS data set is reliable and should be used – as it is with the SIT tool.
- ADEC recommends looking at the NEI dataset for mobile sources combustion, especially on- and off-road, maritime, and aviation emissions.

Note: FHWA does not have complete data on registered vehicles because native populations don't have to register vehicles that don't travel on the highway system. In the triennial NEI, the state uses an adjustment of 10% to compensate for all the unregistered vehicles.

d) Mobile source non-CO_2 emissions are allocated across States based on vehicle-miles-traveled data while mobile source CO_2 emissions were allocated based on fuel sales, as mentioned above. Do you have any concerns with using two different methodologies for mobile source CO_2vs. non-CO_2 State splits? No

e) Several fuels have variable C factors over time including coal, natural gas, gasoline, and diesel fuel. Those fuels might also have variable C factors across areas/States. Are data available to build out State-specific C factors for the fuels with variable C contents? If so, could it be done ina way that the State-level total emissions still matched up to the national total emissions for those fuels?

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f) Geothermal emissions could be allocated by the type of geothermal production per State (because different types have different emissions factors) if that data is available. Is there moreinformation on State-level geothermal emission factors and production?

- *No geothermal data is available.*

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- *Note:* As Alaska has significant amounts of volcanic geothermal activity throughout the state. Rather than verifying with ADEC, this is a question which needs to be taken to the USGS and University of Alaska-Fairbanks. Both USGS and UA-F have large databases of information on geothermal power options that should be reviewed and used if possible. Although these are natural sources, it would be valuable to include in the report.

Non-Energy Uses (NEU) of Fossil Fuels:

a) For petrochemical feedstocks, non-energy use (NEU) of natural gas is allocated across States based on petrochemicals emissions data per State from the IPPU adjustments, while other fuelsare allocated based on the underlying SEDS data. Allocating across States based on the underlying SEDS data ensures there are no States where NEU use is larger than original SEDS data and there are no zeros associated with subtracting NEU (it is not an issue for natural gas because use is so high overall compared with NEU use). Could different approaches be used or can the petrochemical data be used without resulting in negative use?

AK trusts the SEDS data and it is probably the best source of data for AK. In Alaska, there is not a lot of use for NEU of fuels.

Incineration of Waste:

a) Waste incineration emissions are calculated based on the combustion of fossil components of both municipal solid waste (MSW) and tires. However, emissions are disaggregated to Sates based only on MSW tonnage. Are there approaches or data available to disaggregate emissionsbased on waste category (e.g., MSW combustion vs. tire combustion)?

- In AK, burning tires is prohibited except at approved incineration facilities. Normally, large incineration facilities are permitted, and their emissions are reported in the NEI, however few small rural incinerator facilities are permitted so NEI data is limited. It may be worthwhile to develop a scaling technique for village incinerators and assume they burn tires.

International Bunker Fuels:

a) The approach used to allocate jet fuel bunker fuels by State is currently based on the total amount of jet fuel used by State which could potentially lead to an over- or under-estimation for some States of bunker fuel emissions. Are there other more accurate approaches to allocate jet fuel bunker data across States as opposed to the percentage of jet fuel total use? For example, using Federal Aviation Administration flight level data on departures and destinations or assuming based on States with international airports and flights?

- DEC relies on the EIA data. AK does have a lot of international travel. Perhaps, the NEI landing/takeoff data could be used.

Energy – Fugitive Emissions Questions

Coal mining:

a) Do you have any comments specific to the methodology and emission estimates for active coalmines and abandoned coal mines?

- Alaska's coal mining activity is limited compared to its historical activity thanks in large part to the end of coal exports to East Asia in the last decade. The state only has one active coal mine at present. All other coal mines have been closed for several years under state and federal reclamation rules. . For the 2020 Alaska Greenhouse Gas Report, the DEC conducted its first inventory of abandoned coal mines and included them in the state report. The average year these coal mines were abandoned was 1941.

  Why is the focus on methane recovery from abandoned coal mines. From initial research at the state level, it does not appear that there is any ongoing methane capture or recovery from any abandoned mines in the state. Due to the age of most of these abandoned mines, it is highly unlikely that they would be a viable target for methane capture or recovery. Any application of generic methane recovery emissions Should not be applied to Alaska.

b) Are you aware of any State datasets that may be useful in helping to refine emission estimatesfor abandoned coal mines, including State-level datasets addressing recovery of methane fromabandoned mines?

- The only state datasets that would be of use are those from the AK Department of Mining, Land, and Water and Alaska Department of Natural Resources which outlines all identified remaining abandoned mines in the state. Additional research was needed from ADEC to verify age of these mines and date of mine closure. In some instances, the date of mine closure could not be verified or was within a five-year period. In those instances, earliest estimated date of mine closure was used. Should EPA require access, ADEC can forward the verified dataset on for use with future NEI and GHG estimates. However, database does not have emissions information which needs to be added in by EPA.

Petroleum Systems and Natural Gas Systems:

a) Are there relevant dataset(s) that could be used to replace or supplement the data currently used to allocate petroleum and natural gas system emissions to the state level? Particularly, state or detailed location information on gathering and boosting stations, processing plants, andtransmission and storage stations?

- DEC has emission fee data from these sources as well as NEI information. In 2000 we asked all small nonpoint sources to submit NEI emission information. Once

submitted to EPA, It will be the most complete NEI on these sources; however, NEI does not include fugitive emissions unless it is a permitted emission unit. Permit emission fee information has more fugitive information. This data is only for CAPS data but could be used to calculate GHGs in some cases.

b) Are there additional Greenhouse Gas Reporting Program (GHGRP) data that could be used toallocate natural gas and petroleum emissions to each State?
   - see above

c) Are you aware of any State datasets that may be useful in helping to refine emission estimatesfor abandoned wells, including State-level datasets addressing plugging status of abandoned wells?
   - The Alaska BLM abandoned well program (aka legacy wells or orphaned wells) carries numerous datasets.
   - Also, the Alaska oil and Gas Conservation Commission has a data set for all wells ever drilled that lists well status. Please note that the Commission is very strict on plug and abandonment practices. There are not as many abandoned wells in AK as in other states. DNR Division of Oil and Gas estimates there are 20 well.

d) Are there particular sources for which State-level regulatory or voluntary programs result inlarge differences in emission rates between states? Are state-specific data sets available forthose sources? Not applicable

IPPU – Minerals Emissions Questions

Cement Production:

) Are you aware of data on clinker production by all States for the full 1990-2019 time series? Please share a surrogate data that could be used (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends. No cement production in AK.

Lime Production:

a) Are you aware of data on State-level lime production (activity data) by type (e.g., high-calcium quicklime; dolomitic quicklime, high-calcium, hydrated; dolomitic, hydrated; dead-burned dolomite; CO_2 captured for use in onsite processes) for some or all of the 1990–2019 time series? If not, is there any surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?
   -

b) Based on analysis of Greenhouse Gas Reporting Program data, it appears that most but not all beet sugar manufacturing facilities that also produce lime and a few lime

manufacturing facilities capture CO_2 for use in onsite processes. Are you aware of any information on why and how facilities producing lime capture CO_2 for use in onsite processes (e.g., purification), and any trends in this practice during the 1990–2019 time series (e.g., have facilities increased or decreased adoption of this practice during the time series), or whether the amount of CO_2 captured is proportional to the amount of lime produced or some other metric?

- This does not apply to Alaska.

Glass Production:

a) Are you aware of state-level data on glass production or the amount of carbonate (i.e., limestone, dolomite, soda ash) consumed for glass production by State (activity data) for some or all of the 1990–2019 time series? If not, can you share any state-level surrogate data (e.g., more complete data on glass facilities by State, amount of glass products by type [i.e., containers, flat (window) glass, fiber glass, and specialty glass]) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- This does not apply to Alaska.

Other Process Uses of Carbonates:

a) Are you aware of state-level data on the consumption of limestone and dolomite for the iron and steel sector for the 1990–2019 time series? If not, can you share any state-level surrogate data for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends from carbonate consumption by the iron and steel sector? This does not apply to Alaska.
b) Are you aware of state-level data on the consumption of soda ash (not associated with glass manufacturing) for the 1990–2019 time series? This does not apply to Alaska.
c) Are you aware of any state-level data on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone, mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the 1990–2019 time series? This does not apply to Alaska.

CO_2 Consumption:

a) Are you aware of other sources of data on the consumption of CO_2 by State or region for the 1990–2019 time series? This does not apply to Alaska.

IPPU – Chemicals Emissions Questions

Ammonia Production:

a) Currently, production capacity is used as a surrogate for state-level ammonia production for 1990–2009. In the absence of ammonia production by State in more recent years, are you awareof other surrogate data (e.g., facility utilization rates by

State) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- This does not apply to Alaska to this time.

Urea Consumption for Nonagricultural Purposes:

a) Are you aware of state-level data on urea consumption for nonagricultural purposes (activity data) for some or all of the 1990–2019 time series? No

Nitric Acid Production:

a) Are you aware of state-level data on nitric acid production (activity data) for some or all of the1990–2009 time series? We currently use production capacity as a surrogate for nitric acid production by State for 1990–2009. We know that the production capacity data used for this State inventory calculation are incomplete for 1990–2009. Are you aware of more complete data on facility production capacity by State?

- Alaska does not have Nitric Acid production at this time.
-

b) Are you aware of surrogate state-level data other than facility production capacity (e.g., utilization rates by facility or State, information about abatement technology installations anduse per facility) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- Currently, there is no surrogate state-level data to replace national level data. However, do not apply generic national emissions to Alaska.

Adipic Acid Production:

a) Are you aware of any other state-level data on adipic acid production (activity or emissions data) for some or all of the 1990–2019 time series?

- No other state level data for adipic acid production in Alaska at present. Alaska does not have this production. Do not apply generic national emissions to Alaska.

Caprolactam, Glyoxal, and Glyoxylic Acid Production:

a) Are you aware of state-level data on caprolactam production or emissions for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for caprolactam production by State. Are you aware of more complete data on facility production capacity or actual production by State? Are you aware of better surrogate data other than facility production capacity (e.g., utilization rates by facility or State, information about abatement technology installations and use per facility) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- Currently, there is no surrogate state-level data to replace national level data. However, do not apply generic national emissions to Alaska.

Carbide Production and Consumption:

a) Are you aware of state-level data on SiC production (activity data) for the 1990–2019 time series? Are you aware of other data to refine accuracy of the estimation of SiC consumption by State for the 1990–2019 time series?

- Alaska does not have carbide manufacturing or production

b) Are you aware of information that can help us improve the accuracy of production in the two States where SiC facilities are located?

Titanium Dioxide (TiO_2) Production:

a) Are you aware of state-level data on TiO_2 production (activity data) for the 1990–2009 time series? Is there any surrogate data other than facility production capacity (e.g., facility utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- Currently, there is no surrogate state-level data to replace national level data. However, do not apply generic national emissions to Alaska.

Petrochemical Production:

This section is not applicable to AK

a) Are you aware of state-level data on petrochemical production by type for the 1990–2019 timeseries? Is there any other surrogate data by State or facility (e.g., facility production capacity; utilization rates by facility or State; timing of facility expansions, openings, and temporary or permanent closures) for the full 1990–2019 time series that could address data gaps and refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

Phosphoric Acid Production:

a) Are you aware of state-level data on phosphoric acid production (activity data) for the 1990– 2009 time series? Is there any other surrogate data or information (e.g., timing of facility expansions and temporary or permanent closures, origin of phosphate rock used in facilities) by State or facility for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

HCFC-22 Production:

a) For the years 1990–2009, there are significant uncertainties in the allocation of national-level U.S. emissions to individual facilities and States, particularly for the five HCFC-22 production facilities that closed before 2003 and for which production capacity data are therefore not available. Are you aware of any more complete sources of production capacity or other relevant historical data?
b) Do you have recommendations for how to refine the methodology to more accurately estimate emissions from HCFC-22 production over the time series?

IPPU – Metals Emissions Questions

This section is not applicable to AK

Iron and Steel and Metallurgical Coke Production:

a) Are you aware of State-level data on iron and steel production (activity data) by category (i.e., sinter production, iron production, pellet production, steel production, other activities) for some or all of the 1990–2019 time series? In the absence of steel production by State, are you aware of better surrogate data that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?
b) Are you aware of state or facility-specific information to better allocate basic oxygen furnace and electric arc furnace production by State for 1990–2009?

Ferroalloy Production:

a) Are you aware of state or facility-level data on ferroalloy production (activity data) or facility for the 1990–2019 time series? Please share any other surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.

Aluminum Production:

a) Are you aware of state or facility-level data available to incorporate differences in emissions between smelters based on technology type? Is there any other surrogate data or emission sources that could be used to allocate national total aluminum production emissions across States?

Magnesium Production and Processing:

a) Are you aware of state or facility-level magnesium production or capacity data (or surrogate data) or facility for the 1990–2019 time series?
b) Are you aware of information on the location (by State) of magnesium production and processing facilities or information on the location (by State) of magnesium production and processing facilities by process type?

Lead Production:

a) Are you aware of state or facility-level data on primary or secondary lead production (activity data) or facility for the 1990–2019 time series? Is there any other surrogate data (e.g., primary or secondary production capacity by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

Zinc Production:

a) Are you aware of data on zinc production (activity data) by unit type (i.e., electrothermic furnace, Waelz kiln, other furnaces, and flame reactor units) by State or facility for the 1990– 2019 time series? Is there any other surrogate data (e.g., total number of zinc facilities by State, production capacity by unit type and by facility or State) or other data by State (e.g., utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

IPPU – Product Use Emissions Questions

This section is not applicable to AK

Electronics Industry:

a) Are you aware of State- or facility-level capacity data or other surrogate data (e.g., sales data) by State for PV manufacturing for 1990–2006 that could be used to refine the allocations of emissions by State? Please share any surrogate data (e.g., sales data by State) by State for semiconductor or MEMS manufacturing for 1990–2007 that could be used to refine the allocations of emissions by State.

Substitution of Ozone-Depleting Substances:

a) Are you aware of bottom-up modeling data that are available by State? Is there any surrogate data other than population data that could be used to disaggregate the emissions of substitutes for ozone-depleting substances? No

Electrical Transmissions and Distribution:

a) Are you aware of State-level electrical transmission and distribution equipment data (e.g., nameplate capacity by State) or other data by State for 1990–2019 (or part of the time series) that could refine this State inventory calculation to reflect State trends in emissions more closely? Is there any other surrogate data (e.g., State population data) to enhance accuracy andconsistency of State GHG emissions and trends than the current data being used (transmission mile data by State)?

- The state has information in its permit system for nameplate capacity which could be provided to EPA

N_2O from Product Use:

a) Are you aware of any State-level data on N_2O usage for medical and dental anesthesia, food processing propellant and aerosols, sodium azide production, or other applications (e.g., fuel oxidant in auto racing, oxidizing agent in blowtorches) by State for some or all of the 1990–2019 time series? Is there share any other surrogate data (e.g., State population data) to enhance accuracy and consistency of State GHG emissions and trends than the current data being used (transmission mile data by State)? Not available.

Agriculture – Livestock Emissions Questions

Enteric Fermentation:

a) Are there other/newer data sources or methods, particularly at the State level, that EPA shouldbe aware of and consider in calculating these emissions? Especially for:
   - Dry matter/gross energy intake;
   - Annual data for the digestible energy (DE) values (expressed as the percent of gross energy intake digested by the animal), CH_4 conversion rates (Ym) (expressed as the fraction of gross energy converted to CH_4), and crude protein values of specific diet and feed components for foraging and feedlot animals;
   - Monthly beef births and beef cow lactation rates;
   - Weights and weight gains for beef and dairy cattle.
   - The State does not have this information.

b) Are State-specific diet data available to EPA to enhance characterization of diet differences across livestock types and U.S. States?
- Data may exist with the Department of Natural resources, Division of Agriculture or the University of Alaska Agriculture Research Station

c) For the enteric fermentation source category and the Cattle Enteric Fermentation Model (CEFM), are the various regional designations of U.S. States (as presented in Annex 3.10 of the GHG Inventory) used for characterizing the diets of foraging cattle appropriate? The CEFM is used to estimate cattle CH_4 emissions from enteric fermentation and incorporates information on livestock population, feeding practices, and production characteristics.
- Alaska has little cattle production therefore, USDA information is sufficient.

Manure Management:

a) Are there other/newer data sources, particularly at the State-level, that EPA should be aware of and consider in calculating these emissions? AK does not have this information at this time. Especially for the following:
   - waste management system data, particularly seasonal changes in emissions from different waste management systems;
   - maximum methane-producing capacity;

- volatile solids and nitrogen excretion rates; and
- measured emission estimates (by waste management system) to help refine estimates of methane conversion factors.

Agriculture – Rice Cultivation, Urea Fertilization, Liming and Field Burning of Agricultural Residues Questions

No category-specific questions, see general questions.

Agriculture - Agricultural Soil Management Emissions Questions

As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Agricultural Soil Management. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapter 5.4 and Annex 3.12.

a) What are your overall thoughts of the clarity and transparency of these methods? The methods are clear.
b) What recommendations do you have to add to ensure high-quality state-level estimates consistent with the national Inventory? Alaska has a very long winter season. It makes sense to have an adjustment for the season where ag soils are frozen.

LULUCF – Forest Lands and Lands Converted to Forest Land.

No category-specific questions, see general questions.

LULUCF – Croplands and Grasslands Questions

As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Croplands and Grasslands. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapters 6.4 through 6.7 and Annex 3.12. To view an example state-table currently available, please seetable A-201 in Annex 3.12.

a) What are your overall thoughts of the clarity and transparency of these methods? The methods are clear but inadequate for Alaska as the data covers only a small part of Alaska.
b) What recommendations do you have to add to ensure high-quality state-level estimatesconsistent with the national Inventory? Alaska recommends using the

- All data for croplands and grasslands is in USGS dataset; please coordinate with them to integrate findings into future modeling.
- See also the University of Alaska. https://economic-impact-of-ag.uada.edu/alaska/

LULUCF – Wetlands and Lands Converted to Wetlands Questions

Peatlands Remaining Peatlands

a) Are there state-level data available on the application ("consumption") of peat, including thestate of use and the horticultural/landscaping use?
b) Are there data sources that could support EPA determining the quantity of peat harvested perhectare and the total area undergoing peat extraction?

- All data for peatlands and wetlands is in USGS dataset developed for greenhouse gas emissions for the state. Please coordinate with them to integrate findings into future modeling. An attached copy of this report is provided with our responses.

LULUCF – Settlements and Lands Converted to Settlements Questions

No category-specific questions, see general questions.

LULUCF – Other Lands and Lands Converted to Other Lands Questions

No category-specific questions, see general questions.

Waste – Solid Waste Disposal and Management Emissions Questions

MSW Landfills:

a) Data Questions
   - Are there datasets for individual States' landfill gas (LFG) recovery activity?
     - Yes, Alaska has land fill gas processing for Anchorage landfill, and Merril field. All other landfills are open air.
   - Are there data available for open dumpsites in the U.S. territories?
     - No. Alaska has numerous dumpsites. The Alaska DEC Environmental Health Division may have data available for open landfills and dumpsites that are not permitted by Air Quality.

b) The current method makes some simplifying assumptions and includes uncertainties in the allocation of national-level U.S. emissions to States (e.g., recovery rates are the same for all States and match the national recovery rate). Are there alternative assumptions or different datasets that would improve the accuracy of MSW landfill estimates? Do you have recommendations to refine the methodology to estimate emissions over the time series moreaccurately?
   - As noted, AK has many landfills, but they are permitted with the waste division. Using the national methods may not be applicable to AK due to the lengthy time of frozen conditions.

Industrial Landfills:

a) Do you have recommendations to refine the methodology to estimate emissions over the timeseries more accurately?

Composting:

a) Data Questions
   - Is it correct to assume that Alaska has no commercial composting operations correct?
   - This is correct, AK has no commercial composting operations at present. Limited Anchorage Muni experimental composting set-up at present. Some villages have very small local composting operations, but these are not commercial arrangements.
   - Are there any datasets about composting in U.S. territories?
   - Are there any State-level data sources that describe composting activity over time? No

Stand-Alone Anaerobic Digestion:

a) Do you have or know of any State-level data for counts of operational anaerobic digesters(processing food waste) by year? No.
b) Are there any facility-specific data sources we could use to fill data gaps on the quantity of waste processed by stand-alone digesters for any and all years of the 1990–2019 time series? No. There may be some information, but it would take research.

Waste – Wastewater Treatment and Discharge Emissions Questions

Overall:

a) The following national average parameters were used to estimate emissions by State, with Statepopulations used to proxy the distribution of domestic emissions and State-level production data (if available) used to proxy the distribution of industrial emissions. Please comment if you believe States would differ significantly from the national averages for the following parametersand, if so, whether there are State-specific data sources for EPA to consider:
   - wastewater outflow
   - biological oxygen demand (BOD), total N, and chemical oxygen demand (COD)concentration in untreated wastewater
   - BOD:COD ratios for industrial wastewater
   - wastewater treatment unit operations in use at centralized domestic treatment plantsor at industrial plants

-
  - There is likely some information available through DEC Water division in waste water permits and through the water well program. DEC may have some air quality permit information for permitted facilities.

b) Are there domestic or industrial wastewater treatment operations present on other Pacificislands for industrial sectors included in the national Inventory? N/A
c) For each of the wastewater treatment and discharge subcategories listed for this category, isthere any information that was not considered on available State-level data sources with regional or other disaggregated information on emissions?
d) For each of the subcategories, what relevant data sources could be included? If data are used atthe national level, are you aware of other comparable data sources at the State level?

Domestic:

a) The following national average parameters were used to estimate domestic wastewater treatment emissions by State. Please comment on whether you think that States would differ significantly from the national averages for the following parameters and, if so, are there State-specific data sources for EPA to consider:
    - discharge of publicly owned treatment works (POTWs) to impaired waterbodies andnonimpaired waterbodies Alaska has no impaired water bodies. There is likely information on permitted facilities.
    - discharge of POTWs to reservoirs, lakes, and estuaries. Alaska DEC Water division will have this information and perhaps permitted facilities in the air program.

    - consumed protein
    - percentage of the population on septic (versus centralized treatment): Septic systems are common in rural Alaska except in Western and Northern Alaska.

Industrial – Pulp and Paper:

- No Pulp and Paper in AK

a) Pulp and paper wastewater flows were estimated using EPA's Enforcement and Compliance History Online (ECHO) datasets. Do you have any reason to believe that States' pulp and paper wastewater information is underrepresented in ECHO? If so, do you have an alternative, publicly available pulp and paper wastewater dataset by State?
b) Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' pulp and paper manufacturing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?
c) Data for pulp and paper manufacturing for U.S. territories are limited in the ECHO dataset. Are there resources to help estimate a time series of production data for pulp and paper wastewater flows? Or are there territory-level data on the number of pulp and paper plants in each U.S. territories?

Industrial – Meat and Poultry:

a) Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason

to believe States' meat and poultry processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes? No.

b) Data for meat and poultry processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of territory-level production data for poultry (broilers, turkeys, chicken), beef and calves, hogs, and sheep (lamb and mutton), for example, live weight killed, number of head slaughtered?
    - AK accepts USDA information.

Industrial – Fruits and Vegetables:

a) Currently, a single year, 2017, is used to estimate the distribution of national estimates to eachState and territory for every year of the time series. Is there reason to believe States' fruit and vegetable processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes? No.
b) Data for fruit and vegetable processing for U.S. territories are not captured in the USDA dataset.Are there resources to help estimate a time series of territory-level production data for fruits and vegetables, for example, canned and frozen processed vegetables, potato production, noncitrus fruits, and citrus production? N/A

Industrial – Ethanol:

a) Ethanol production for each State was estimated using the Energy Information Administration (EIA) SEDS dataset. Do you have any reason to believe that States' information is underrepresented in the SEDS dataset? If so, do you have an alternative, publicly available ethanol production dataset by State? AK accepts EIA data.
b) Data for ethanol production for U.S. territories are limited in the SEDS dataset. Are there resources to help estimate a time series of production data for ethanol production? N/A

Industrial – Petroleum:

a) Petroleum production for each State was estimated using EIA's Petroleum Administration for Defense Districts production and State-level operating capacity datasets. Do you have any reason to believe that States' information is underrepresented in the EIA datasets? If so, do you know of an alternative, publicly available petroleum refining production dataset by State?
    - The Department of Revenue likely has this information.
b) Do you have any concerns about using operating capacity to estimate petroleum production by State is not a good method? If so, would you suggest an alternative method? AK is ok with this.
c) Data for petroleum refining for U.S. territories are limited in the EIA dataset. Are there resources to help estimate a time series of territory-level production data for petroleum production?

Industrial – Breweries:

a) Brewery production, and by extension brewery production emissions, for each State wasestimated using the Alcohol and Tobacco Tax and Trade Bureau (TTB) taxable productiondataset.
    - The TTB dataset is based on taxable production/volume. Is there any reason why taxableproduction from breweries may be underrepresented by State and therefore potentiallyunderrepresent total emissions? NO If so, do you know of an alternative dataset or assumption?
    - The TTB dataset provides production data from 2008 to the present. The 2008 values were used as a proxy for 1990–2007 values. Is there reason to believe States' breweryproduction has significantly changed over that time period? If so, do you have an alternative, publicly available State-level brewery production dataset (i.e., barrels produced), or suggestions for alternative data to use as a proxy?

    No state-level data; TTB production data is reliable for AK.

b) Data for brewery production for U.S. territories are limited in the TTB dataset. Are thereresources to help estimate a time series of territory-level production data for brewery production (i.e., barrels produced)?

3.2 Arizona Department of Environmental Quality Air Quality Division Technical Analysis Unit

ARIZONA'S RESPONSE TO GENERAL AND CHARGE QUESTIONS ON THE DRAFT METHODOLOGYREPORT: INVENTORY OF U.S GREENHOUSE EMISSIONS AND SINKS BY STATE

Prepared by Arizona Department of Environmental
QualityAir Quality Division
Technical Analysis Unit

General Questions

a. What are your overall impressions of the clarity of the methods described in this report?

The methodology and emissions estimate for Fossil Fuel Combustion sectors are described clear, especially the description of why some fuel use reported in SEDS may be different from reportingin the national inventory. The tables provided in appendices are also helpful to understand the adjustments made to different sectors. However, more bottom up data collection would be helpful.

R: For the Non-Energy Uses of Fossil Fuels, the emissions calculation method is clearly laid out.The steps taken to reconciliate the disaggregated inventory on a state level with emission on anational level was impressing.

For the cement production sector, the selection of emission factors is clear. However, the improvement of modernized production methods needs to be considered. Also, there are severalnew technologies that can reduce CO2 emissions or even absorb CO2 emissions (such as CarbonCure). These credits should be considered for cement production sector.

b. What recommendations do you have to add to or improve the overall transparency, completeness, consistency and accuracy of this report?

R: In general, that would be helpful to include more details on the calculation of the emissions foreach sector.

Control measures or any existing best practice aimed at reducing GHG emissions should be considered in the emission estimates where possible. If the activity data incorporates these measures, it should be specified in the report. For example, for Electric Power sector, is it possibleto consider the heat rate improvement actions? Many power plants have applied that to reduce emissions but it seems that these improvements are not considered in this report.

Cement production includes several chemical processes. It will be more helpful to include differentchemical reactions and list the CO2 emissions from each chemical

reaction process. Also, improvement technologies and control measures that are recently used by the cement industry should be considered. Since some cement facilities have installed CEMS, the CO2 emission data calculated by the activity method can be correlated and adjusted by CEMS results. Therefore, someCEMS adjustment methods can be considered.

Section 2.6 of the methodology report describes that the total amount of distillate fuel and motorgasoline used in Transportation sector was taken from the national inventory (based on FHWA data). The totals are said to be based on multiple factors to determine transportation sector fuel use. A more specific description of the mentioned factors would be useful. It would also be useful to know how EPA plans to investigate why the total fuel use on the FHWA forms used to allocatetransportation sector gasoline and diesel fuel use across states doesn't match with the EIA statistics. More details regarding how FHWA determines fuel consumption would be helpful as well.

The transportation section provided information on the carbon content of the fuel, among other details. Some discussion of carbon content in MSW fossil components/emission factors would behelpful.

c. Data availability. Please address the following questions for each inventory source:

a. **For each of the categories, are there additional relevant data sources that arenot currently included, but could be incorporated into this analysis? Providing facility-level data (such as CO2 emissions reported to SLEIS from each facility) would be useful.**

R: Weights and Measures might be able to help provide local data on transportation fuel consumption.

EPA's Facility Level Information on Green House gases Tool (FLIGHT) database includes statewide CO2 emissions for the year 2019. The EPA FLIGHT databasewas newly updated on SEP. 26th, 2020. https://www.eia.gov/environment/emissions/state

b. **For national level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the State, county, or zip-code levels?**

R: Statewide CO2 data from the Energy Information Agency's (EIA) energy related CO2emissions database was updated to 2018 on Mar. 2nd, 2021. https://ghgdata.epa.gov/ghgp/main.do

d. Uncertainty. Currently uncertainty ranges are not included for the state level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Timeseries Coverage. Currently State data covers 1990-2019 consistent with the 2021 National GHG Inventory, and inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the National Inventory. As state-specific input datasets are not always available over the entire timeseries, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. EPA appreciates feedback on which, if any years should be prioritized for future State-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).

R: It would be useful to investigate how climate policy has changed in the last decade to see ifany changes have caused major trends in landfill emissions and prioritize those years.

CO2 emissions from Cement production in Arizona have increased after 2015 but is much lower back in 2005 (~800 tons vs ~300 tons). A dataset for after 2005 or after 2010 would behelpful. Since the methods after 2010 are consistent, prioritizing emissions data for 2010 or later is recommended.

For Transportation sector, E15 fuel was first approved in 2012, so it might be useful to prioritize emission data beyond this point. This will be helpful for future projections anddisaggregating data even further.

For Electric Power sector, emissions for 2010 and later should be prioritized for Arizona because there was a significant increase followed by a decrease in emissions, which is not thesame trend observed for other states.

For Non-Energy Use of Fossil Fuels, emissions in 2008 and later should be a priority. With NEIdata starting from 2008, this GHG inventory can complement the NEI database for some analyses.

For Stationary Combustion sector, emissions in 2005 and later should be prioritized for Arizona. Since the peak of using coal and natural gas for stationary combustion occurred in 2006 and started to decrease after 2010.

e. Key Category Analysis. EPA anticipates prioritizing methodological refinements for moresignificant categories to make efficient use of available resources over time. EPA appreciates feedback on which categories are more relevant for further refining for your State.

a. **Given that the emissions profile of some states will be different from the national average, which categories that are more significant in terms of absolute emissions,or have changing emission trends (e.g., increasing, variable)?**

R: Based on the results of the GHG inventory and other available data, the following sectors in Arizona are recommended to be prioritized for more refinement and KCA:

The CO2 emissions from the Cement Production sector represents 20% of the total CO2 emissions from the industrial processes sectors in Arizona. It also shows a higher increase trend in the state. Therefore, a KCA should be considered for this sector.

Based on the state-level GHG emissions estimation results, industrial combustion sector is one of the major sources of CO2 emissions in Arizona. A KCA would be beneficial for this sector.

The emissions from the Electric Power sector has had a significant change over time and has decreased in the past years. So, a KCA is recommended for this sector. Also a KCA for each state would be useful because energy structure for power plants are different (coal/natural gas/nuclear/solar/other new energies).

The Stationary Combustion Sector for Arizona shows a significant difference between national average level and state level emissions inventory. So, a KCA would be needed.

Natural Gas Systems is the fourth largest GHG sector for AZ, so some priority for further refinement may be appropriate.

A KCA within the mobile source sector could be useful as well.

b. **The national Inventory includes a key category analysis (KCA) consistent with 2006 IPCC Guidelines. Would it be useful for States if a key category analysis (KCA) was completed for each state?**

R: Yes, a KCA for states would be useful.

f. 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/inventoryexplorer/)?**

   i. **Related to the level of category/gas aggregation or disaggregation?**
   ii. **Are there specific categories where further data disaggregation could be helpful?**

R: Disaggregation to facility level for the Cement Production sector would be helpful because there are couple large cement production facilities in Arizona.

For the Transportation Sector, further data disaggregation in terms of vehicle ageis helpful when looking at light-duty vehicles emissions. Breaking vehicles out by Tier type (Tier II or Tier III) illustrates how low emission rates are for newer vehicles.

For the Electric Power sector, more data disaggregation and providing facility-level data are useful.

More data disaggregation for the Stationary Combustion sector will be usefultoo. If it is too much work to provide facility-level data, a county or non- attainment level data will be helpful.

b. **What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download, etc.)?**

R: Excel download would be ideal for data format. Text and CVS downloads and FTP sitewill be useful too.

Monthly data disaggregation could be useful (if possible), especially for sectors with seasonal variability. The ability to browse the data by state, year, fuel, sector, facility levelcould be useful.

c. **What additional datasets or information could be provided to help increase theusability of the state-level emissions data?**

R: Facility-level data and location information would be useful.

d. **EPA plans to provide users additional information on where they can find official State data, where it exists. Do you have suggestions on how we should direct usersto official state data (i.e., section in methods report including links to State data)?**

R: Similar to how references are mentioned at the end of each section, a separate section containing all necessary links would be useful (perhaps in a table with shortdescriptions of link content). Disseminating information via work groups EPA is involved with is also helpful. Sending out emails via official EPA electronic mailing lists works as well.

It would be very helpful if EPA can provide the details of emissions calculations methods.

Energy – Combustion Emissions Questions
Fossil Fuel Combustion:

a) **Some fuels have differences in consumption data between the aggregated State-level totals and national totals. The current approach is to use data from the national Inventory in those cases. Are there other approaches that could be taken? Has this come up in developing estimates at the State level?**

R: For most of the sectors, this approach sounds appropriate and accurate enough. However, for some sectors such as Electric Power, a bottom-up method to collect activity data or CEMS data from the facility would be more accurate. Applying this method may not be easy for the Stationary Combustion sector but it can be considered an alternative way to collect data.

Arizona has not developed the estimates at the State level for the sectors mentioned above.

b) **Consistent with the IPCC Guidelines, we have adjusted fuel consumption totals in the energy sector to account for consumption in the IPPU sector. In some cases, this step could lead to a negative emission total for a State if the subtracted amount (as determined from the assumed distribution) was greater than consumption data from the State Energy Data System (SEDS). This outcome was corrected to zero if that was the case, but are there other approaches for correcting for that difference?**

R: The approach is generally reasonable. However, whenever a negative value is increased to 0, probably that difference should be deducted somewhere else. Maybe the total of the negative values should be tabulated, converted to zero, and then all state totals should be scaled down uniformly by the appropriate amount.

c) **Consistent with the national Inventory, the default approach taken here was to allocate transportation sector CO_2 emissions based on FHWA fuel use/sales by State. For some States, this may not be accurate because fuel sold in a State may be combusted in other States. Another option is to use vehicle miles traveled (VMT) data by State but that approach does not factor in vehicle fuel economy. Are there other alternative or complementary approaches to allocate transportation fuel across States, including VMT data and other sources (e.g., NEI – based on county-level fleet and activity data to generate a bottom-up inventory) that EPA should consider? If so, what data sources exist to help with that alternative approach? Would it be helpful to present transportation sector emissions using multiple approaches in future inventories?**

R: A bottom-up inventory using NEI activity data would help mitigate the possibility of allocating CO2 emissions based on fuel sales that may not directly

translate to fuel usage by State. It would be helpful to present transportation sector emissions using multiple approaches.

d) **Mobile source non-CO_2 emissions are allocated across States based on vehicle-miles-traveled data while mobile source CO_2 emissions were allocated based on fuel sales, as mentioned above. Do you have any concerns with using two different methodologies for mobile source CO_2 vs. non-CO_2 State splits?**

R: As long as the fuel type and quantity of fuel burned is noted, we don't think there is a concern with using two different methodologies.

e) **Several fuels have variable C factors over time including coal, natural gas, gasoline, and diesel fuel. Those fuels might also have variable C factors across areas/States. Are data available to build out State-specific C factors for the fuels with variable C contents? If so, could it be done in a way that the State-level total emissions still matched up to the national total emissions for those fuels?**

R: At this time, we are not aware of any data available to build out State-specific C factors for the fuels with variable C content.

f) **Geothermal emissions could be allocated by the type of geothermal production per State (because different types have different emissions factors) if that data is available. Is there more information on State-level geothermal emission factors and production?**

R: We are not aware of any information on state-level geothermal emission factors.

Non-Energy Uses (NEU) of Fossil Fuels:

a) **For petrochemical feedstocks, non-energy use (NEU) of natural gas is allocated across States based on petrochemicals emissions data per State from the IPPU adjustments, while other fuels are allocated based on the underlying SEDS data. Allocating across States based on the underlying SEDS data ensures there are no States where NEU use is larger than original SEDS data and there are no zeros associated with subtracting NEU (it is not an issue for natural gas because use is so high overall compared with NEU use). Could different approaches be used or can the petrochemical data be used without resulting in negative use?**

R: Different approaches to allocating NEU across states should be considered and compared to the current method of using a combination of data from IPPU

adjustments and SEDS. From theperspective of NEU of fossil fuels in Arizona, the current methodology could be sufficient considering the lack of use for most fuels.

Incineration of Waste:

a) **Waste incineration emissions are calculated based on the combustion of fossil componentsof both municipal solid waste (MSW) and tires. However, emissions are disaggregated to Sates based only on MSW tonnage. Are there approaches or data available to disaggregateemissions based on waste category (e.g., MSW combustion vs. tire combustion)?**

R: The Biocycle, EIA, and EPA GHGRP data for Arizona indicates MSW incineration is negligible, and EPA's FLIGHT tool has zero emissions for Arizona. Therefore, this question doesn't apply to Arizona.

International Bunker Fuels:

a) **The approach used to allocate jet fuel bunker fuels by State is currently based on the total amount of jet fuel used by State which could potentially lead to an over- or under-estimationfor some States of bunker fuel emissions. Are there other more accurate approaches to allocate jet fuel bunker data across States as opposed to the percentage of jet fuel total use? For example, using Federal Aviation Administration flight level data on departures and destinations or assuming based on States with international airports and flights?**

R: At this time, we are not aware of other approaches to allocate jet fuel bunker data acrossstates.

Energy – Fugitive Emissions Questions
Coal Mining:

a) **Do you have any comments specific to the methodology and emission estimates for active coalmines and abandoned coal mines?**

R: The methods described seem appropriate.

b) **Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned coal mines, including State-level datasets addressing recovery of methane from abandoned mines?**

R: A comprehensive inventory of abandoned coal mines in Arizona does not currently exist.

Petroleum Systems and Natural Gas Systems:

a) **Are there relevant dataset(s) that could be used to replace or supplement the data currentlyused to allocate petroleum and natural gas system emissions to the state level? Particularly, state or detailed location information on gathering and boosting stations, processing plants, and transmission and storage stations?**

R: The current data set appears to accurately reflect permitted natural gas compressorstations in Arizona.

b) **Are there additional Greenhouse Gas Reporting Program (GHGRP) data that could be used to allocate natural gas and petroleum emissions to each State?**

R: No.

c) **Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned wells, including State-level datasets addressing plugging status ofabandoned wells?**

R: No state dataset of abandoned wells currently exists.

d) **Are there particular sources for which State-level regulatory or voluntary programs resultin large differences in emission rates between states? Are state-specific data sets availablefor those sources?**

R: No.

IPPU – Minerals Emissions Questions
Cement Production:

a) **Are you aware of data on clinker production by all States for the full 1990-2019 time series? Please share a surrogate data that could be used (e.g., facility production capacity,utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.**

R: We are not aware of such dataset but we have the Arizona clinker production data fromSLEIS since 2010, which is probably useful for creating state inventory.

Waste – Solid Waste Disposal and Management Emissions Questions
MSW Landfills:

a) **Data Questions:**
   - **Are there datasets for individual States' landfill gas (LFG) recovery activity?**
   - **Are there data available for open dumpsites in the U.S. territories?**

   R: There are datasets for MSW landfills methane recovery estimates by state in Appendix FTable F-3. There is no data on open dumpsites. However, section 6.1.1.4 mentions the inclusion of emissions from all waste management practice, including open dumpsites, as apotential refinement to landfill estimation methods.

b) **The current method makes some simplifying assumptions and includes uncertainties in theallocation of national-level U.S. emissions to States (e.g., recovery rates are the same for allStates and match the national recovery rate). Are there alternative assumptions or different datasets that would improve the accuracy of MSW landfill estimates? Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?**

   R: No recommendations to refine the methodology at this time.

Industrial Landfills:

a) Do you have recommendations to refine the methodology to estimate emissions over thetimeseries more accurately?

   R: No recommendations to refine the methodology at this time.

Composting:

a) **Data Questions**
   - **Is it correct to assume that Alaska has no commercial composting operations correct?**
   - **Are there any datasets about composting in U.S. territories?**
   - **Are there any State-level data sources that describe composting activity over time?**

   R: Due to the large area and quantities of fish waste, it may not be correct to assume thatthere is no commercial composting in Alaska. We are not aware of any State-level data sources that describe composting activity over time.

Stand-Alone Anaerobic Digestion:

a) **Do you have or know of any State-level data for counts of operational anaerobicdigesters (processing food waste) by year?**

R: Other than publicly available data on EPA's website, we are not aware of any otherstate-level counts for operational anaerobic digesters.

b) **Are there any facility-specific data sources we could use to fill data gaps on the quantity ofwaste processed by stand-alone digesters for any and all years of the 1990–2019 time series?**

R: There are sources that break down digester type for specific estimates such as biogasdata, but we could not find any facility-specific data sources for quantity of waste processed by stand-alone digesters.

3.3 Iowa Department of Natural Resources

IOWA DEPARTMENT OF NATURAL RESOURCES

GOVERNOR KIM REYNOLDS
LT. GOVERNOR ADAM GREGG
DIRECTOR KAYLA LYON

October 27, 2021

Greenhouse Gas (GHG) Inventory Staff
US EPA
GHGInventory@epa.gov

Dear EPA GHG Inventory Staff,

Thank you for this opportunity to review and comment on EPA's draft *Inventory of U.S. Emissions and Sinks by State* (referred to in this comment letter as "EPA's disaggregated Iowa emissions or values"). This review process has helped the Iowa Department of Natural Resources (DNR) identify several possible gaps in its inventory as well as identify several categories where EPA's results and DNR's results differ significantly. The DNR also appreciated the pre-meeting with Andrea Denny and Mausami Desai on July 2, 2021, and DNR looks forward to discussing these comments further. We have also greatly benefitted from the assistance of Andrea, Mausami, and Kong Chiu over the past decade as DNR has developed its GHG inventory program.

I was the GHG inventory lead for the 2010 – 2018 DNR inventories, but I have been transitioning the inventory over to Krysti Mostert starting with the 2019 inventory. Please send any responses, questions, or comments to both Krysti (krysti.mostert@dnr.iowa.gov) and me.

Sincerely,

Marnie Stein

Marnie Stein
Air Quality Bureau
Supervisor – Operating Permits & Emissions Inventory
515-725-9525
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Attachments:
Iowa Inventory Comparison 10.27.2021.xlxs

DNR's Annual Statewide GHG Inventory for Iowa

The Iowa DNR has prepared a full top-down statewide emissions inventory annually starting with emissions year 2010 as required by Iowa Code 455B.104. The inventory reports and technical support documents are posted at https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Greenhouse-Gas-Emissions, and DNR is happy to provide our SIT module files upon request. For these comments, DNR staff compared its calculated emissions for 2015 – 2019 as published in the 2019 GHG Inventory Report & Technical Support Document (TSD) to the disaggregated Iowa emissions provided by EPA in the file *"State-GHG_Trends_Emissions_&_Sinks_By_Gas"*. This comparison is provided in the attached spreadsheet titled *"Iowa Inventory Comparison 10.27.2021"*. Because DNR and EPA do not use the exact same sector names in their inventories, DNR has matched its data to the EPA sectors as closely as possible. Please note that DNR was not able to review the EPA's *Draft Methodology Report* in its entirety or answer all of the charge questions due to limited staff resources. Instead, DNR is providing comments on sectors with the biggest differences in emissions or sectors that are potential gaps in DNR's inventory.

Method

DNR calculates annual GHG emissions using the most recent version of the EPA's State Greenhouse Gas Inventory Tool (SIT) and updating it with any available Iowa-specific activity data. The energy and industrial processes sectors are also supplemented with GHG emissions data submitted by individual Iowa facilities to the federal GHG reporting program (GHGRP). The versions of the SIT modules used and their corresponding chapters in the TSD are listed in Table 1. The coal module was not used, as no coal mines currently operate in Iowa. The DNR uses the global warming potentials from the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (AR4).

Table 1: DNR 2019 TSD Chapters and Corresponding SIT Modules

TSD Chapter	SIT Module	Release Date
Agriculture	Ag	10/06/20
Energy	CO_2FFC	11/05/18
	Stationary Combustion	11/05/18
Industrial Processes	IP	10/06/20
Natural Gas Transmission & Distribution	Natural Gas and Oil	11/05/18
Transportation	Mobile Combustion	10/06/20
Waste	Solid Waste	11/05/18
	Wastewater	11/05/18
Land Use, Land Use Change, and Forestry	LULUCF	10/06/20

It is worth noting that the Iowa Code requires that "by December 31 of each year, the department shall submit a report to the governor and the general assembly regarding the greenhouse gas (GHG) emissions in the state during the previous calendar year…" This makes DNR's inventory out-of-sync with EPA's national inventory and the SIT because they both calculate emissions for two years before the current year. This can lead to differences in emissions because DNR may have been forced to use an earlier year as a proxy for the previous calendar year, forecast emissions for the previous calendar year, or may be use more recent activity data than EPA.

DNR Comments and Response to EPA's Charge Questions

General Questions

DNR is concerned about how to explain the differences between EPA's disaggregated Iowa values and DNR's annual emissions inventories. The inventory method is very complex and not easy for public and other data users to understand. Overall, EPA has far more resources than DNR does and DNR is using EPA's method to create the annual inventory. DNR is doing the best it can with less than 150 hours devoted to the inventory per year and it may be burdensome for DNR to respond to questions.

DNR recommends that EPA carefully consider the wording of its announcement of publically releasing the data. DNR also encourages EPA to include information on the webpage housing the data that helps to clarify the data that EPA is posting. EPA should also include a link to Iowa's GHG Inventory.

Gaps

DNR identified the following possible gaps in its inventory. These categories are identified in Table 2 below and in blue font on the attached *Iowa Inventory Comparison 10.27.2021* spreadsheet.

Table 2: Possible Inventory Gaps

Sector	Pollutant(s)
Non-Energy Use of Fuels	CO_2
Natural Gas Systems	CO_2, N_2O
Glass Production	CO_2
Carbon Dioxide Consumption	CO_2
Urea Consumption for Non-Agricultural Purposes	CO_2
Petrochemical Production	CO_2
Carbide Production and Consumption	CO_2
International Bunker Fuels	CO_2, CH_4, N_2O
Composting	CH_4, N_2O
Anaerobic Digestion at Biogas Facilities	CH_4
N_2O from Product Uses	N_2O

DNR's review also identified significant discrepancies between DNR and EPA values in several categories. These categories are identified in Table 3 below and in red font on the attached *Iowa Inventory Comparison 10.27.2021* spreadsheet.

Table 3: Sectors where DNR & EPA Emissions Differ Significantly

Sector	Pollutant(s)
Industrial Fossil Fuel Combustion	CO_2
Cement Production	CO_2
Lime Production	CO_2
Other Process Uses of Carbonates	CO_2
Incineration of Waste	CO_2, CH_4, N_2O
Ammonia Production	CO_2
Liming	CO_2
Urea Fertilization	CO_2

Mobile Combustion	CH_4, N_2O
Natural Gas Systems	CH_4
Enteric Fermentation	CH_4
Manure Management	CH_4, N_2O
Wastewater Treatment	CH_4, N_2O
Stationary Combustion	N_2O
Electronics Industry	HFCs
Electrical Transmission and Distribution	SF_6
LULUCF	CO_2

Energy – Combustion Emissions Questions

Fossil Fuel Combustion - Industrial:

DNR's estimate for fossil fuel combustion from the industrial sector are significantly higher than EPA's disaggregated Iowa value (varies from 29% - 56% from 2015 – 2019). It is likely that DNR's inventory includes emissions in this sector that may be double-counted in the IPPU sectors for the production of cement, lime, iron & steel, ammonia, etc. It appears that in the national inventory, EPA reallocated portions of fuel consumption data for several fuel categories (coking coal, other coal, natural gas, residual fuel, and distillate fuel) to IPPU, as these portions were consumed as raw materials during non-energy related industrial processes. This is definitely an area of future improvement for DNR's inventory.

Fossil Fuel Combustion – Transportation:

DNR calculates highway transportation emissions using the SIT mobile combustion module. For CH_4 and N_2O, DNR uses the actual total annual VMT provided from the Iowa Department of Transportation (DOT) - VMT BY County/System as of December 31 2019. The Iowa DOT does not have vehicle miles traveled (VMT) data by model years, so DNR allocates Iowa VMT using the default national on-road distribution by vehicle/fuel type. DNR also uses the annual vehicle mile accumulation, age distribution, and control technology values from the most recent national inventory. DNR calculates CO_2 emissions from highway vehicles and all emissions from non-highway vehicles using fuel sales data from either SEDS, FHWA, or the SIT default value. This hybrid calculation method results in Iowa emissions that are lower than the disaggregated Iowa values provided by EPA (CO_2 -5%, CH_4 -2%, N_2O – 14% for 2019), and may have a higher level of uncertainty because DNR is not using the true vehicle/fuel distribution for Iowa.

Regarding EPA's questions about non-CO_2 emissions being calculated by allocated VMT while CO_2 emissions are based on fuel sales, DNR has no specific concerns per se as it seems to be the best method available. However, it would be interesting to see the difference between CO_2 emissions based on VMT versus fuel sales.

Regarding EPA's questions about state-specific carbon factors and geothermal emission factors, DNR is not aware of any data sources currently available to develop these factors.

Non-Energy Uses of Fossil Fuels:

This is a potential gap in DNR's inventory as it has not been previously included. It appears this a calculation method for this sector is not included in any of the SIT modules. Will EPA be adding this sector to the SIT?

Incineration of Waste:

DNR calculates the amount of CH_4 emitted from power plants burning municipal solid waste (MSW) to produce electricity using data reported annually by individual facilities to the DNR's Air Quality Bureau on their annual Title V air emissions inventories. The only facility in Iowa generating electricity from burning MSW reported burning a total of 12,763 tons of refuse derived waste in 2019. The DNR uses state-specific proportions of discards that are plastics, synthetic rubber, and synthetic fibers instead of SIT default values to calculate CO_2 emissions from MSW combustion using SIT. These state-specific proportion values are from the 2017 Iowa Statewide Waste Characterization Study. A previous study was done in 2011. The state-specific proportions of discards used are shown in Table 4.

Table 4: Proportions of Discards used by DNR

Material	SIT Default Value	2011 Iowa Study	2017 Iowa Study
Plastics	17.0 – 18.0%	16.7%	18.3%
Synthetic Rubber	2.3 – 2.6%	1.0%	1.2%
Synthetic Fibers	5.6 – 6.3%	4.1%	4.5%

There may be a gap in DNR's inventory as DNR has not previously considered emissions from other incinerators in the state, nor has DNR included site-specific emissions from tire combustion as a separate value. It is unclear if this activity data is easily accessible. The calculation methods used by DNR as described above result in quite different emissions than EPA's disaggregated Iowa values. As shown in the attached spreadsheet, for 2019, DNR's results are CO_2 +14%, CH_4 +9625%, and N_20 -3%.

International Bunker Fuels:

The DNR uses the total amount of jet fuel used by the state per SEDS and the SIT module and reports emissions in the transportation sector. No international flights depart from Iowa municipal airports.

Energy – Fugitive Emissions Questions

Coal Mining:

Iowa does not have any active coal mines, so this sector is not included in the DNR's inventory.

Petroleum Systems and Natural Gas Systems:

Iowa does not have natural gas production or petroleum systems, so there is not GHGRP data available for this category. Iowa has four LNG storage compressor stations, eighteen gas transmission compressor stations, and four gas compressor stations. The SIT natural gas and oil system module only calculates CH_4 emissions for Iowa from transportation and distribution. However, EPA's disaggregated Iowa values show CO_2 and N_2O emissions from this sector, likely from flaring, even though natural gas production or petroleum systems are not present in Iowa. In addition, the SIT does not include any activity data for flaring in Iowa, so DNR is uncertain as to why EPA shows CO_2 and N_2O emissions for this sector in its disaggregated Iowa emissions. It is also interesting that DNR calculates CH_4 emissions using the SIT that are higher (+18% in 2019) than EPA's disaggregated Iowa values.

IPPU – Minerals Emissions Questions

Cement Production:

Iowa has two Portland cement manufacturing facilities currently operating. Both facilities are required to report their CO_2 emissions to the GHGRP, so DNR uses this GHGRP data in its inventory instead of using clinker

production data to calculate emissions. As shown in the attached spreadsheet, the combined CO_2 emissions reported by the two facilities for 2019 were 72% higher than EPA's disaggregated Iowa value.

Lime Production:

Iowa has one lime production facility currently operating, and it is required to report its CO_2 emissions to the GHGRP. DNR uses this GHGRP data in its inventory instead of using lime production data. As shown in the attached spreadsheet, the CO_2 emissions reported by the facility for 2019 was 19% higher than EPA's disaggregated Iowa value.

Glass Production:

DNR does not identify emissions from glass production separately in its inventory. Instead, DNR calculates the total emissions from limestone and dolomite use for industrial consumption per the SIT Industrial Processes Module. DNR is not aware of any state-level activity data that may enhance the state inventory calculation.

Other Process Uses of Carbonates:

DNR calculates the total emissions from limestone and dolomite use for industrial consumption per the SIT Industrial Processes Module. One area of enhancement may be the use of soda ash by the corn wet milling industry. In Iowa, this industry commonly uses soda ash for pH control, ion exchange regeneration, and other operations. DNR may be able to survey its corn wet milling facilities to obtain the actual annual amount of soda ash used by the industry.

CO_2 Consumption:

This is a potential area for enhancement in DNR's inventory as it is not currently included. CO_2 it is used in the food & beverage industry, and Iowa meat-packers use significant amounts of CO_2 to stun animals (poultry, pigs, cattle, etc.) before they are killed. Typically, meat-packers purchase biogenic CO_2 from ethanol plants. DNR may be able to survey the industry to determine the amount of CO_2 from ethanol production that is used in these industries.

IPPU – Chemicals Emissions Questions

Ammonia Production:

Three facilities in Iowa currently produce ammonia and report their CO_2 emissions to the GHGRP, so DNR uses this GHGRP data in its inventory. As shown in the attached spreadsheet, the total CO_2 emissions reported by the two facilities for 2019 are 69% higher than EPA's disaggregated Iowa data.

Iowa farmers land-apply a large amount of ammonia to agricultural land each year. Should DNR be subtracting the land-applied ammonia from the ammonia production emissions?

Urea Consumption for Nonagricultural Purposes:

This is a potential gap in DNR's inventory as it has not been previously included. It appears this a calculation method for this sector is not included in any of the SIT modules. Will EPA be adding this sector to the SIT?

Nitric Acid Production:

Two nitric acid production facilities currently in Iowa. They are required to report their N_2O emissions to the GHGRP, and DNR uses this data in its inventory. As shown in the attached spreadsheet, the DNR's inventory and

EPA's disaggregated Iowa data agree within 0.13% for 2019.

Adipic Acid Production; Caprolactam, Glyoxal, and Glyoxylic Acid Production; Titanium Dioxide (TiO_2) Production; Phosphoric Acid Production; HCFC-22 Production:

These sectors are not operating in Iowa and are not included in either DNR's inventory or EPA's disaggregated Iowa data.

Carbide Production and Consumption:

This sector is not in DNR's inventory as it is not included in the SIT Industrial Processes module. DNR will further research if this is a gap in its inventory and if Iowa activity data is available.

Petrochemical Production:

This sector is not in DNR's inventory as it is not included in the SIT Industrial Processes module. DNR will further research if this is a gap in its inventory and if Iowa activity data is available.

IPPU – Metals Emissions Questions

Iron and Steel and Metallurgical Coke Production:

There are currently no metallurgical coke production facilities or pig iron mills operating in Iowa. All three steel production facilities currently operating in Iowa use electric arc furnaces to produce steel from scrap. DNR uses the CO_2 emissions they report to the GHGRP in its inventory. As shown in the attached spreadsheet, the CO_2 emissions in DNR's inventory for 2019 are 7% higher than EPA's disaggregated Iowa value.

Ferroalloy Production, Aluminum Production, Magnesium Production & Processing. Lead Production, Zinc Production:

These sectors are not present in Iowa and are not included in either DNR's inventory or EPA's disaggregated Iowa data.

IPPU – Product Use Emissions Questions

Electronics Industry:

The 2017 Economic Census identifies eleven businesses in Iowa under the North American Industry Classification System (NAICS) for code 33441 – Semiconductor and Other Electronic Manufacturing (U.S. Census 2019), but EPA's disaggregated Iowa values do not include data for Iowa. Emissions in 2019 from semiconductor manufacturing were calculated DNR by assuming that Iowa emissions were 0.96% of national emissions as Iowa's population is 0.96% of the total U.S. population.

Substitution of Ozone-Depleting Substances:

The 2019 emissions calculated by DNR are within 1% of EPA's disaggregated Iowa values. However, the DNR uses the SIT, which reports emissions in units of CO_2e and does not identify HFCs and PFCs separately as EPA's disaggregated Iowa values do.

Electrical Transmissions and Distribution:

DNR calculated emissions from electric power transmission and distribution by using the most current national emissions data adjusted for Iowa retail electricity sales compared to U.S. retail electricity sales. DNR's estimate

for 2019 is 24% lower than EPA's disaggregated Iowa value, but this is likely because 2019 data was not available at the time that DNR completed its inventory, and thus used 2018 as a proxy.

N_2O from Product Use:

This sector is not in DNR's inventory as it is not included in the SIT Industrial Processes module. Will EPA be adding it to the SIT? DNR will further research if this is a gap in its inventory and if Iowa activity data is available.

Agriculture – Livestock Emissions Questions

Enteric Fermentation:

DNR calculates enteric emissions using the SIT. It appears that EPA's disaggregated state values and the SIT both use emission factors from the same source, CEFM, and the most recent animal population data from either USDA's NASS Quick Stats or USDA's Iowa Agricultural Summary. Because DNR's inventory is for the previous calendar year and EPA's national inventory is for two years before that, DNR and EPA are not using the same animal populations. This may lead to DNR's emissions being higher than EPA's (+18% for 2019) as shown on the attached spreadsheet.

Manure Management:

DNR calculates manure management emissions using the SIT and the same animal population sources as for enteric fermentation. Again, DNR uses more current animal populations that EPA, likely leading to DNR's emissions being slightly higher than EPA's (+4% for 2019). Oddly, DNR's calculated emissions for 2017 – 2019 are 60% - 73% higher than EPA's disaggregated state values. DNR will further research this discrepancy and will advise EPA of our findings.

Agriculture – Rice Cultivation, Urea Fertilization, Liming and Field Burning of Agricultural Residues Questions

Rice Cultivation:

Rice is not cultivated in Iowa.

Urea Fertilization:

As the attached spreadsheet shows, DNR's estimated emissions from urea fertilization are significantly lower than EPA's disaggregated Iowa values for 2018 (-24%) and 2019 (-30%) but are higher than EPA's disaggregated Iowa values for 2015 (+7%), 2016 (+20%), and 2017 (+6%). DNR believes this corresponds to a change in the availability of state-specific fertilizer data. Prior to 2018, the Iowa Department of Land and Agriculture Stewardship published a report of fertilizer sales that DNR used for its inventory. The report was not available for 2018 or 2019, so DNR used the amount of 2018 urea applied from the USDA's Iowa Agricultural Statistics Bulletin for both 2018 and 2019.

Liming:

DNR calculates CO_2 emissions from liming using the total amount of limestone CO_2 is emitted when acidic agricultural soils are neutralized by adding limestone or dolomite. DNR used the total annual amount of limestone produced for agricultural use as reported by their members to the Iowa Limestone Producers Association. However, producers do not report the percentage of limestone that is dolomitic. The Iowa DOT tracks general information for active aggregate sources used for construction, including whether the material is limestone or dolomite. They do not track that information for limestone produced for agricultural purposes. The Iowa DOT indicated that some areas of the state have 100% dolomite, some have 100% limestone, and

some areas are mixed. Therefore, the DNR assumed that 50% of the material produced in Iowa for agricultural use is dolomite and 50% is limestone. As shown in the attached spreadsheet, DNR's emissions are quite different than EPA's disaggregated Iowa values and EPA does not provide a value for 2017 or 2019.

Field Burning of Agricultural Residues:

Burning of agricultural fields is not a common practice in Iowa.

Agriculture - Agricultural Soil Management Emissions Questions

Emissions from agricultural soil management in 2019 were 20.97 MMtCO2e, accounting for 16% of Iowa's total GHG emissions in DNR's inventory. DNR looks forward to seeing EPA's disaggregated Iowa values when they become available.

LULUCF

DNR's estimates of carbon sequestration in the LULUCF sector are significantly higher than EPA's disaggregated state values (between +76% to +135%) as shown in the attached spreadsheet. DNR is unsure what is driving this difference as DNR uses the SIT to calculate the amount of carbon sequestered and uses the SIT default values for forest carbon flux, urban forests, and agricultural soils. In addition, the SIT seems to use the same method as EPA's national inventory.

Waste – Solid Waste Disposal and Management Emissions

MSW Landfills:

The DNR used emissions reported by MSW landfills to the GHGRP, which are calculated based on the characteristics of each individual report. EPA requires MSW landfills that emit 25,000 metric tons CO_2e or more to report their emissions. This included twenty-four Iowa landfills in 2019. An additional twenty-two Iowa MSW landfills were not required to report to the GHGRP. To calculate emissions for those that did not report to the GHGRP, the DNR calculated the potential methane emissions using EPA's Landfill Gas Emissions Model (LandGEM) version 3.02. As shown in the attached values.

Industrial Landfills:

This sector is not included in DNR's inventory. DNR will further research if this is a gap in its inventory and if Iowa activity data is available.

Composting:

This sector is not in DNR's inventory as it is not included in the SIT Solid Waste module. DNR will further research if this is a gap in its inventory and if inventory and if Iowa activity data is available.

Stand-Alone Anaerobic Digestion:

This sector is not in DNR's inventory as it is not included in the SIT Solid Waste module. DNR has previously recognized this gap in the inventory and is researching solutions.

Waste – Wastewater Treatment and Discharge Emissions

Overall:

As shown in the attached spreadsheet, N_2O emissions from wastewater calculated by DNR are significantly lower (-64% in 2019) than EPA's disaggregated Iowa value. This is likely because DNR has been unable to find

state-specific activity data to calculate emissions from several sources.

Municipal:

DNR calculates municipal wastewater emissions using the SIT wastewater module along with the Iowa fraction of population without septic systems, 76%, from EPA's Onsite Wastewater Systems Treatment Manual. Unfortunately, the fraction has not been updated by EPA since 2002, and the fraction value has not been included in the *U.S. Census of Housing* since 1990. DNR also uses the most recent protein value (kg/person/year) from the national inventory.

Industrial:

DNR calculates industrial wastewater emissions using the emission reported by facilities to EPA's GHGRP. In 2019, eleven ethanol plants and five food processors reported emissions to the GHGRP. DNR believes this to be more accurate than calculating emissions based on red meat or ethanol production values. DNR has been unable to find state-specific data to calculate emissions from pulp & paper, fruits & vegetables, or breweries, and the SIT wastewater module does not include default activity data for Iowa.

3.4 Maine Department of Environmental Protection

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

MELANIE LOYZIM
COMMISSIONER

November 1, 2021

U.S. Environmental Protection Agency
GHGInventory@epa.gov

Re: Charge to State GHG Inventory Experts for the *Draft Methodology Report: Inventory of U.S. Greenhouse Emissions and Sinks by State*

Dear Greenhouse Gas Inventory Team:

The Maine Department of Environmental Protection (Department) appreciates the opportunity to provide feedback on both the *Draft Methodology Report: Inventory of U.S. Greenhouse Gas Emissions and Sinks by State*, which describes the disaggregation of the national greenhouse gas (GHG) inventory across the 50 states, and the resulting state data.

While the Department was unable to address the 100+ questions listed in the 14-page Charge outline, the Department would like to express qualitative overarching concerns with the proposed release of the disaggregated dataset.

The Department has three primary concerns:

1. Data is inconsistent between various EPA GHG datasets;
2. Methods are inconsistent between the National GHG Inventory, the disaggregated state GHG inventories, and the State Inventory Tool (SIT); and
3. Stakeholder confusion and associated decreased confidence are likely to result from comparison of EPA-developed state GHG inventories and SIT-based state-developed GHG inventories.

Data consistency is critical for confidence in a dataset and any strategies or policies that are based on that foundational data. Without consistency, stakeholders will question which dataset is accurate. Unfortunately, the current SIT default data differ significantly from the draft state disaggregated data under review. While the reasons for variability between the national inventory and the disaggregated state data are described in the Methodology Report, the differences between the disaggregated data and the SIT default data are not defined, which is concerning since these are the two datasets likely to be compared as many states currently rely on the SIT for development of state GHG inventories.

Although EPA has stated they plan to ensure users understand that the EPA disaggregated state datasets should not be viewed as official data of any state government, stakeholders will almost certainly compare the datasets, and state governments will be faced with numerous questions about the differences in both the data and methodologies. In Maine, these stakeholders already compare SIT default data with the Maine-produced GHG inventory. Currently, these data and methodology questions are relatively easily answered. The Department purposefully augments the SIT when more

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website: www.maine.gov/dep

accurate state-specific data is available. These changes are tracked and are transparent in the revised SIT modules, allowing such improvements to be clearly explained to stakeholders. In contrast, the specific methodology and input data differences between the SIT and the disaggregated dataset are not clear.

One of the primary benefits of the SIT is full transparency. Input data and data sources are clear in each module, and the input data is easily augmented when more accurate state-specific data is available. The proposed disaggregated state datasets do not have the necessary level of transparency. While some data are available in the appendices to the Methodology Report, not all input data are accessible, and for data that are, where and exactly how these data are used to calculate the final data is very difficult to determine or understand, even with the explanations in the Methodology Report.

The inconsistencies in methodology and data are numerous, and such inconsistencies will inevitably lead to stakeholder confusion and questions that cannot be readily answered. The Department recommends EPA hold the release of the disaggregated state data until the SIT default data for each state better matches the state data disaggregated from the EPA National GHG Inventory. States rely heavily on the SIT as a foundation to produce state GHG inventories, and regular updates of these GHG inventories are important for tracking emissions trends as well as for strategy and policy development. For these reasons, the Department recommends the annual release of the SIT not be delayed and that the disaggregated data not be released until EPA more closely aligns these two datasets.

Sincerely,

Stacy R. Knapp
Emissions Inventory Section Manager, Bureau of Air Quality
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(207) 287-2235

3.5 Minnesota Pollution Control Agency

MINNESOTA POLLUTION CONTROL AGENCY

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300

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November 1, 2021

U.S. Environmental Protection Agency
Climate Change Division
Office of Atmospheric Programs (MC-6202A)
1200 Pennsylvania Ave NW
Washington, DC 20460

Submitted electronically via GHGInventory@epa.gov

RE: MPCA Comments on the Draft Methodology Report: Inventory of U.S. Greenhouse Emissions and Sinks by State

Dear Colleagues:

Staff at the Minnesota Pollution Control Agency (MPCA) have reviewed the methods used to create the scaled-down inventory for the state and estimates of greenhouse gas emissions in Minnesota. There are significant differences between the boundaries of the U.S. Environmental Protection Agency (EPA) State Inventory and the inventory produced by the MPCA. This does create challenges for us to explain the different results, but we also recognize that the complexity of estimating emissions for different purposes will always produce distinct, but complementary results. While we have general concerns about the compatibility and comparability of this inventory with others, our comments here will focus on technical issues where we can offer information that is unique or of special interest to Minnesota.

Taconite

From an exploration of the EPA data, emissions from Iron and Steel Production stood out as an anomaly. An obvious jump in emissions seems to be due to the change in data sources when the GHGRP data became available. There was not an increase or change in production that created an actual increase in emissions. For the Minnesota GHG inventory, our estimates use taconite production data collected by the Department of Revenue, citation below. We also use energy consumption data that is reported to the state and federal data sources for electricity sold to the grid in order to allocate some emissions to the electricity sector.

> *Minnesota Taconite Production Summary (1950-2020).*
> https://www.revenue.state.mn.us/sites/default/files/2021-10/Minnesota%20Taconite%20Production%20Summary%20%281950-2020%29.xlsx

Agriculture, Forestry and Land Use

Minnesota has a group of technical experts working on emissions from and carbon sequestration on natural and working lands. We are working to improve accounting in our own inventory and may have information that is also useful for the EPA inventory. Collaboration with experts would be mutually beneficial, and likely a more efficient way to discuss available data.

There are a few areas that Minnesota includes within natural and working lands that are of special interest in the state inventory. We include an estimate of methane emissions from inland lakes and rivers because human influences have increased emissions from those areas beyond natural levels. Also, farming in peatlands and cultivation of wild rice occur in Minnesota and emissions are accounted for in our inventory.

The MN Department of Agriculture publishes a report of fertilizer sold within Minnesota, which may be useful: https://www.mda.state.mn.us/pesticide-fertilizer/fertilizer-use-sales-data.

Forestry is a large store of sequestered carbon in Minnesota. Our current method, which uses federal data, creates an estimate that is highly variable on an annual basis and noticeably different from the EPA estimate. Discussion with inventory staff and experts at the Minnesota Department of Natural Resources would be useful to understand the method used by the EPA, share our approach, and further develop accounting methods that reflect the best science.

Landfills

The MPCA is responsible for closed landfills, which provides us with the opportunity to manage landfill gas and collect data. We can provide additional data on closed landfill activities to the EPA if requested.

Data availability

Finally, we want to convey our hope that ongoing collaboration with EPA will help the MPCA improve the estimates in our GHG inventory. There are many similarities between our inventories, but there are areas where we simply do not have disaggregated data available. Full transparency and access to input data is important for our ability to compare our methods and estimates to EPA estimates and to incorporate information into our inventory.

Thank you for the opportunity to comment on this draft. We look forward to our future collaboration.

Please contact Anne Claflin (MPCA Research Scientist) at anne.claflin@state.mn.us with any technical questions.

Sincerely,

Kari Palmer

This document has been electronically signed.

Kari Palmer
Manager
Air Assessment Section
Environmental Analysis and Outcomes Division

KP/AH:je

3.6 North Dakota Department of Environmental Quality

North Dakota's comments for the *Draft Methodology Report: Inventory of U.S. Greenhouse Emissions and Sinks by State*

We were not able to readily find the units in Appendix A, which made it difficult to check how accurate the data were for North Dakota specifically.

In Step 5: Subtract Consumption for NEU (Page 18 of DRAFT-StateGHG_MethodologyReport_09172021.pdf), it is discussed that the coal used to produce SNG at the Eastman gas plant was assumed to be used for chemical feedstock and therefore was accounted for under NEU. It appears that the Dakota Gasification Company's Great Plains Synfuels Plant in North Dakota should be included in this since it also uses coal to produce SNG.

It is not clear how condensate emissions were estimated for each state, specifically in North Dakota, which has substantial GHG emissions associated with condensate.

It is not clear if fugitive emissions associated with compressor stations (natural gas-driven and electric-driven) were accounted for. This would account for many GHG emissions in North Dakota.

The volume of gas production appears low in Appendix B for 2019. The NG 3 – Annual Gas Production tab (851,750 MMScf) and the NG 2 – Gas Well Gas Production tab (1,155,856 MScf) totals 852,905,856 MScf of gas produced in North Dakota in 2019. The North Dakota Industrial Commission numbers estimate 927,804,888 MScf of natural gas produced.

It is unclear how emissions were estimated from storage vessels. Was this only based off pipeline data? We expect that North Dakota may have more storage vessels relative to pipeline miles in comparison to other states, which would underestimate storage tank GHG emissions in North Dakota.

3.7 Rhode Island Department of Environmental Management (DEM)

10/26/21
Comments prepared by Dena Gonsalves (dena.gonsalves@demri.gov)
and Owen Jackson (owen.jackson@dem.ri.gov)
RI Department of Environmental management (RIDEM), Office of Air Resources

General comments - RI like several Northeast states uses the State Inventory Tool (SIT) for calculating RI's GHG Emissions Inventory. In general, we agree with EPA's methodology, however, several sectors do not apply to RI (see below). For example, RI does not have active industrial landfills, however, using EPA's approach, RI has emissions associated with industrial landfills.

General Questions –

a) *What are your overall impressions of the clarity of the methods described in this report?*
   - **Clear and thorough description of methods**
   - **References at end of each Chapter helpful**

b) *What recommendations do you have to add to or improve the overall transparency, completeness, consistency and accuracy of this report?*
   - **Would be extremely helpful to have a section comparing the methodology used with EPA's SIT tool since many states especially in the Northeast use the SIT to calculate state GHG emissions. Perhaps use a table to compare?**
   - **In Energy section, could the transportation CO2 emissions from mobile combustion be discussed in one section.**
   - **Appendix A Table A-1 in the "FCC CO2" tab – provides details on where State level data (based on SEDS) was used to make adjustments and disaggregate National numbers across fuel types and sectors – where is Appendix A?**
   - **RIDEM uses MOVES to calculate transportation emissions and we also calculate electricity consumption and not generation.**
   - **We agree with methodology for determining carbon content of fuels.**
   - **Including sources and estimates of any state level data used in emissions estimates.**
   - **Specific data sources and estimates for states. Including the data used to estimate GHGs in Rhode Island.**

c) *Data availability. Please address the following questions for each inventory source:*
   a. *For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?*
      - **See below**

b. *For national level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the State, county, or zip-code levels?*
   - **See below**

d) *Uncertainty. Currently uncertainty ranges are not included for the state level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Timeseries Coverage. Currently State data covers 1990-2019 consistent with the 2021 National GHG Inventory, and inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the National Inventory. As state-specific input datasets are not always available over the entire timeseries, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. EPA appreciates feedback on which, if any years should be prioritized for future State-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).*
   - **Timeseries of 1990-2019 is consistent with RI GHG Emissions Inventory and have no additional feedback on any years which should be prioritized.**

e) Key Category Analysis. EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. EPA appreciates feedback on which categories are more relevant for further refining for your State.

a. Given that the emissions profile of some states will be different from the national average, which categories that are more significant in terms of absolute emissions, or have changing emission trends (e.g., increasing, variable)?
   - **In RI, transportation, electricity consumption and residential heating are the largest sources of GHG emissions.**
   - **Why does EPA have electricity emissions estimated at 0.660 MMTCO2e in 1990? Rhode Island's estimated electricity consumption in 1990 is 2.82 MMTCO2e. There is a 327% difference in these estimates. Do you have any idea why these estimates vary so significantly?**
   - **In every year, electricity emissions are higher in Rhode Island's greenhouse gas inventory when compared to EPA's state level inventory. Emissions vary by about 10-20% (0.30 – 0.64 MMTCO2e difference, 2015-2018).**

b. The national Inventory includes a key category analysis (KCA) consistent with 2006 IPCC Guidelines. Would it be useful for States if a key category analysis (KCA) was completed for each state?
   - **Yes.**
   -

f) 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/inventoryexplorer/)?

-

i. Related to the level of category/gas aggregation or disaggregation?

-

ii. Are there specific categories where further data disaggregation could be helpful?

-

c. What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download, etc.)?

- **.xlsx or .zip**

d. What additional datasets or information could be provided to help increase the usability of the state-level emissions data?

- **Any data used to estimate GHG emissions in Rhode Island (energy sales, population, per capita emissions factors used)**

d. EPA plans to provide users additional information on where they can find official State data, where it exists. Do you have suggestions on how we should direct users to official state data (i.e., section in methods report including links to State data)?

- **RIDEM GHG Emissions Inventory webpage found at** http://www.dem.ri.gov/programs/air/ghg-emissions-inventory.php
-

- *Energy – Combustion Emissions Questions*
- ***Fossil Fuel Combustion:***

a) Some fuels have differences in consumption data between the aggregated State-level totals and national totals. The current approach is to use data from the national Inventory in those cases. Are there other approaches that could be taken? Has this come up in developing estimates at the State level?

- **No other approaches have been identified in Rhode Island. Rhode Island uses SIT default fuel consumption data when developing Rhode Island's annual greenhouse gas inventory.**

b) Consistent with the IPCC Guidelines, we have adjusted fuel consumption totals in the energy sector to account for consumption in the IPPU sector. In some cases, this step could lead to a negative emission total for a State if the subtracted amount (as determined from the assumed distribution) was greater than consumption data from the State Energy Data System (SEDS). This outcome was

corrected to zero if that was the case, but are there other approaches for correcting for that difference?

- **No other approaches have been identified in Rhode Island.**

c) *Consistent with the national Inventory, the default approach taken here was to allocate transportation sector CO2 emissions based on FHWA fuel use/sales by State. For some States, this may not be accurate because fuel sold in a State may be combusted in other States. Another option is to use vehicle miles traveled (VMT) data by State but that approach does not factor in vehicle fuel economy. Are there other alternative or complementary approaches to allocate transportation fuel across States, including VMT data and other sources (e.g., NEI – based on county-level fleet and activity data to generate a bottom-up inventory) that EPA should consider? If so, what data sources exist to help with that alternative approach? Would it be helpful to present transportation sector emissions using multiple approaches in future inventories?*

- **Rhode Island has very rough transportation data provided by the Rhode Island Department of Transportation. Current transportation data has significant limitations such as county level VMT data and speed distributions, but updates to transportation data collection are being considered. Rhode Island is in the process of creating MOVES inputs using in state data. For MOVES inputs prior to 2017, NESCAUM and other contractors provided Rhode Island with the inputs required. No MOVES inputs have been created for 2018-2020. The transportation data necessary for MOVES is in the process of being created for 2020 ahead of the NEI submission.**

d) *Mobile source non-CO2 emissions are allocated across States based on vehicle-miles-traveled data while mobile source CO2 emissions were allocated based on fuel sales, as mentioned above. Do you have any concerns with using two different methodologies for mobile source CO2 vs. non-CO2 State splits?*

- **No concerns about the difference in methodology. Why did EPA decide to take two different approaches to estimate mobile emissions?**

e) *Several fuels have variable C factors over time including coal, natural gas, gasoline, and diesel fuel. Those fuels might also have variable C factors across areas/States. Are data available to build out State-specific C factors for the*

fuels with variable C contents? If so, could it be done in a way that the State-level total emissions still matched up to the national total emissions for those fuels?

- **No coal used in Rhode Island. Rhode Island uses SIT defaults for carbon factors and does not have additional information on state specific factors.**

f) Geothermal emissions could be allocated by the type of geothermal production per State (because different types have different emissions factors) if that data is available. Is there more information on State-level geothermal emission factors and production?

- **No data has been identified in Rhode Island.**

-
- ***Non-Energy Uses (NEU) of Fossil Fuels:***

a) For petrochemical feedstocks, non-energy use (NEU) of natural gas is allocated across States based on petrochemicals emissions data per State from the IPPU adjustments, while other fuels are allocated based on the underlying SEDS data. Allocating across States based on the underlying SEDS data ensures there are no States where NEU use is larger than original SEDS data and there are no zeros associated with subtracting NEU (it is not an issue for natural gas because use is so high overall compared with NEU use). Could different approaches be used or can the petrochemical data be used without resulting in negative use?

- **No different approaches have been identified in Rhode Island.**

-
- ***Incineration of Waste:*** Not applicable to RI

a) Waste incineration emissions are calculated based on the combustion of fossil components of both municipal solid waste (MSW) and tires. However, emissions are disaggregated to Sates based only on MSW tonnage. Are there approaches or data available to disaggregate emissions based on waste category (e.g., MSW combustion vs. tire combustion)?

-
- ***International Bunker Fuels:***

a) The approach used to allocate jet fuel bunker fuels by State is currently based on the total amount of jet fuel used by State which could potentially lead to an over- or under-estimation for some States of bunker fuel emissions. Are there other more accurate approaches to allocate jet fuel bunker data across States as opposed to the percentage of jet fuel total use? For example, using Federal Aviation Administration flight level

data on departures and destinations or assuming based on States with international airports and flights?

- **Rhode Island has one airport (PVD) that reports greenhouse gas emissions estimates on an annual basis. No breakout of international fuel in the report provided to RIDEM. No known information about marine bunker fuels in Rhode Island.**

Coal Mining: Not applicable RI *a) Do you have any comments specific to the methodology and emission estimates for active coal mines and abandoned coal mines?*

- *b) Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned coal mines, including State-level datasets addressing recovery of methane from abandoned mines?*
-
- ***Petroleum Systems and Natural Gas Systems:***
  a) *Are there relevant dataset(s) that could be used to replace or supplement the data currently used to allocate petroleum and natural gas system emissions to the state level? Particularly, state or detailed location information on gathering and boosting stations, processing plants, and transmission and storage stations?*
     - **The RIDEM does not have any state level data at this time.**
  b) *Are there additional Greenhouse Gas Reporting Program (GHGRP) data that could be used to allocate natural gas and petroleum emissions to each State?*
     - **Data from the "Narragansett Electric Company" on the GHGRP (FLIGHT) are used to estimate natural gas distribution leakage in Rhode Island.**
  c) *Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned wells, including State-level datasets addressing plugging status of abandoned wells?*
     - Not applicable to RI
  d) *Are there particular sources for which State-level regulatory or voluntary programs result in large differences in emission rates between states? Are state-specific data sets available for those sources?*
     - **No.**
-
- *IPPU – Minerals Emissions Questions*
- ***Cement Production:*** Not applicable to RI
  b) *Are you aware of data on clinker production by all States for the full 1990-2019 time series? Please share a surrogate data that could be used (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.*
-
- ***Lime Production:*** Not applicable to RI
- *a) Are you aware of data on State-level lime production (activity data) by type (e.g., high-calcium quicklime; dolomitic quicklime, high-calcium, hydrated; dolomitic, hydrated; dead-burned*

dolomite; CO2 captured for use in onsite processes) for some or all of the 1990–2019 time series? If not, is there any surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

- *b) Based on analysis of Greenhouse Gas Reporting Program data, it appears that most but not all beet sugar manufacturing facilities that also produce lime and a few lime manufacturing facilities capture CO2 for use in onsite processes. Are you aware of any information on why and how facilities producing lime capture CO2 for use in onsite processes (e.g., purification), and any trends in this practice during the 1990–2019 time series (e.g., have facilities increased or decreased adoption of this practice during the time series), or whether the amount of CO2 captured is proportional to the amount of lime produced or some other metric? Is this CO2 ultimately released to the atmosphere? Are you aware of any data on the amount of CO2 captured onsite per facility or State for 1990–2009? C) For some States and years (Colorado for 2010–2015, Idaho for 2011 and 2019, and Nebraska for 2010–2014), calculations using GHGRP data on emissions and CO2 captured for onsite processes yielded small but erroneous negative emissions. EPA zeroed emissions for those States and years and plans to adjust calculations so that State emissions totals match national emissions. Do you have any general feedback on this approach?*
    - **No feedback from RI.**
- ***Glass Production:*** Not applicable to RI
- *a) Are you aware of state-level data on glass production or the amount of carbonate (i.e., limestone, dolomite, soda ash) consumed for glass production by State (activity data) for some or all of the 1990–2019 time series? If not, can you share any state-level surrogate data (e.g., more complete data on glass facilities by State, amount of glass products by type [i.e., containers, flat (window) glass, fiber glass, and specialty glass]) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
-
- ***Other Process Uses of Carbonates:***

    a) *Are you aware of state-level data on the consumption of limestone and dolomite for the iron and steel sector for the 1990–2019 time series? If not, can you share any state-level surrogate data for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends from carbonate consumption by the iron and steel sector?*

- Not applicable to RI

b) *Are you aware of state-level data on the consumption of soda ash (not associated with glass manufacturing) for the 1990–2019 time series?*
   - **RIDEM is not aware of any state-level data on soda ash.**

c) *Are you aware of any state-level data on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone, mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the 1990–2019 time series?*
   - **RIDEM is not aware of any state-level data on the activities listed above.**

-
- ***CO2 Consumption:***

a) *Are you aware of other sources of data on the consumption of CO2 by State or region for the 1990–2019 time series?*
   - **RIDEM is not aware of any other data sources for CO2 consumption.**

-
- *IPPU – Chemicals Emissions Questions*
- ***Ammonia Production:*** Not applicable to RI
- *a) Currently, production capacity is used as a surrogate for state-level ammonia production for 1990–2009. In the absence of ammonia production by State in more recent years, are you aware of other surrogate data (e.g., facility utilization rates by State) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*

- ***Urea Consumption for Nonagricultural Purposes:***

a) *Are you aware of state-level data on urea consumption for nonagricultural purposes (activity data) for some or all of the 1990–2019 time series?*
   - **RIDEM is not aware of any state-level data on urea consumption.**

-
- ***Nitric Acid Production:*** Not applicable to RI
- *a) Are you aware of state-level data on nitric acid production (activity data) for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for nitric acid production by State for 1990–2009. We know that the production capacity data used for this State inventory calculation are incomplete for 1990–2009. Are you aware of more complete data on facility production capacity by State?*
- *b) Are you aware of surrogate state-level data other than facility production capacity (e.g., utilization rates by facility or State,*

information about abatement technology installations and use per facility) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

-
- ***Adipic Acid Production*****:** Not applicable to RI
- *a) Are you aware of any other state-level data on adipic acid production (activity or emissions data) for some or all of the 1990–2019 time series?*
-
- ***Caprolactam, Glyoxal, and Glyoxylic Acid Production*****:** Not applicable to RI
- *a) Are you aware of state-level data on caprolactam production or emissions for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for caprolactam production by State. Are you aware of more complete data on facility production capacity or actual production by State? Are you aware of better surrogate data other than facility production capacity (e.g., utilization rates by facility or State, information about abatement technology installations and use per facility) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
-
-
-
-
- ***Carbide Production and Consumption:***
  a) *Are you aware of state-level data on SiC production (activity data) for the 1990–2019 time series? Are you aware of other data to refine accuracy of the estimation of SiC consumption by State for the 1990–2019 time series?*
     - **RIDEM is not aware of any data that exists.**
  b) *Are you aware of information that can help us improve the accuracy of production in the two States where SiC facilities are located?*
     - **No.**

- ***Titanium Dioxide (TiO2) Production*****:** Not applicable to RI
- *a) Are you aware of state-level data on TiO2 production (activity data) for the 1990–2009 time series? Is there any surrogate data other than facility production capacity (e.g., facility utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
-
- ***Petrochemical Production:*** Not applicable to RI

- *a) Are you aware of state-level data on petrochemical production by type for the 1990–2019 time series? Is there any other surrogate data by State or facility (e.g., facility production capacity; utilization rates by facility or State; timing of facility expansions, openings, and temporary or permanent closures) for the full 1990–2019 time series that could address data gaps and refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
-
- ***Phosphoric Acid Production:*** Not applicable to RI
- *a) Are you aware of state-level data on phosphoric acid production (activity data) for the 1990–2009 time series? Is there any other surrogate data or information (e.g., timing of facility expansions and temporary or permanent closures, origin of phosphate rock used in facilities) by State or facility for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
-
- ***HCFC-22 Production:*** Not applicable to RI
- *a) For the years 1990–2009, there are significant uncertainties in the allocation of national-level U.S. emissions to individual facilities and States, particularly for the five HCFC-22 production facilities that closed before 2003 and for which production capacity data are therefore not available. Are you aware of any more complete sources of production capacity or other relevant historical data?*
- *b) Do you have recommendations for how to refine the methodology to more accurately estimate emissions from HCFC-22 production over the time series?*
-
- IPPU – Metals Emissions Questions
- ***Iron and Steel and Metallurgical Coke Production:*** Not applicable to RI
- *a) Are you aware of State-level data on iron and steel production (activity data) by category (i.e., sinter production, iron production, pellet production, steel production, other activities) for some or all of the 1990–2019 time series? In the absence of steel production by State, are you aware of better surrogate data that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*
- *b) Are you aware of state or facility-specific information to better allocate basic oxygen furnace and electric arc furnace production by State for 1990–2009?*
- ***Ferroalloy Production:*** Not applicable to RI
- *a) Are you aware of state or facility-level data on ferroalloy production (activity data) or facility for the 1990–2019 time*

series? Please share any other surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.

- ***Aluminum Production:*** Not applicable to RI
- *a) Are you aware of state or facility-level data available to incorporate differences in emissions between smelters based on technology type? Is there any other surrogate data or emission sources that could be used to allocate national total aluminum production emissions across States?*

Magnesium Production and Processing: Not applicable to RI

- *a) Are you aware of state or facility-level magnesium production or capacity data (or surrogate data) or facility for the 1990–2019 time series?*
- *b) Are you aware of information on the location (by State) of magnesium production and processing facilities or information on the location (by State) of magnesium production and processing facilities by process type?*

- ***Lead Production:*** Not applicable to RI
- *a) Are you aware of state or facility-level data on primary or secondary lead production (activity data) or facility for the 1990–2019 time series? Is there any other surrogate data (e.g., primary or secondary production capacity by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*

- ***Zinc Production:*** Not applicable to RI
- *a) Are you aware of data on zinc production (activity data) by unit type (i.e., electrothermic furnace, Waelz kiln, other furnaces, and flame reactor units) by State or facility for the 1990–2019 time series? Is there any other surrogate data (e.g., total number of zinc facilities by State, production capacity by unit type and by facility or State) or other data by State (e.g., utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?*

- *IPPU – Product Use Emissions Questions*
- ***Electronics Industry:*** Not applicable to RI

a) *Are you aware of State- or facility-level capacity data or other surrogate data (e.g., sales data) by State for PV manufacturing for 1990–2006 that could be used to refine the allocations of emissions by State? Please share any surrogate data (e.g.,*

sales data by State) by State for semiconductor or MEMS manufacturing for 1990–2007 that could be used to refine the allocations of emissions by State.

- ***Substitution of Ozone-Depleting Substances:***
  a) *Are you aware of bottom-up modeling data that are available by State? Is there any surrogate data other than population data that could be used to disaggregate the emissions of substitutes for ozone-depleting substances?*
     - **RIDEM is not aware of any data that exists. Default data derived from state population is used in Rhode Island's greenhouse gas inventory.**
- ***Electrical Transmissions and Distribution:***
  a) *Are you aware of State-level electrical transmission and distribution equipment data (e.g., nameplate capacity by State) or other data by State for 1990–2019 (or part of the time series) that could refine this State inventory calculation to reflect State trends in emissions more closely? Is there any other surrogate data (e.g., State population data) to enhance accuracy and consistency of State GHG emissions and trends than the current data being used (transmission mile data by State)?*
     - **Rhode Island requests SF6 emissions from National Grid on an annual basis. This estimate is used in the annual greenhouse gas inventory.**
- ***N2O from Product Use:***
  a) *Are you aware of any State-level data on N2O usage for medical and dental anesthesia, food processing propellant and aerosols, sodium azide production, or other applications (e.g., fuel oxidant in auto racing, oxidizing agent in blowtorches) by State for some or all of the 1990–2019 time series? Is there share any other surrogate data (e.g., State population data) to enhance accuracy and consistency of State GHG emissions and trends than the current data being used (transmission mile data by State)?*
     - **RIDEM is unaware of any data at this time.**
- *Agriculture – Livestock Emissions Questions*
- ***Enteric Fermentation:***
- *a) Are there other/newer data sources or methods, particularly at the State level, that EPA should be aware of and consider in*

calculating these emissions? Especially for: • Dry matter/gross energy intake;

- *• Annual data for the digestible energy (DE) values (expressed as the percent of gross energy intake digested by the animal), CH4 conversion rates (Ym) (expressed as the fraction of gross energy converted to CH4), and crude protein values of specific diet and feed components for foraging and feedlot animals;*
- *• Monthly beef births and beef cow lactation rates;*
- *• Weights and weight gains for beef and dairy cattle.*

    - **RIDEM is not aware of any data that currently exists.**

- *b) Are State-specific diet data available to EPA to enhance characterization of diet differences across livestock types and U.S. States?*
    - **RIDEM is not aware of any data that currently exists.**

- *c) For the enteric fermentation source category and the Cattle Enteric Fermentation Model (CEFM), are the various regional designations of U.S. States (as presented in Annex 3.10 of the GHG Inventory) used for characterizing the diets of foraging cattle appropriate? The CEFM is used to estimate cattle CH4 emissions from enteric fermentation and incorporates information on livestock population, feeding practices, and production characteristics.*
    - **Rhode Island has no better way to designate cattle diets, this approach is appropriate and there is not much agriculture in Rhode Island.**

- ***Manure Management:***
- *a) Are there other/newer data sources, particularly at the State-level, that EPA should be aware of and consider in calculating these emissions? Especially for the following:*

- *• waste management system data, particularly seasonal changes in emissions from different waste management systems;*
    - **No data sources.**
- *• maximum methane-producing capacity;*
    - **No data sources.**
- *• volatile solids and nitrogen excretion rates; and*
    - **No data sources.**
- *• measured emission estimates (by waste management system) to help refine estimates of methane conversion factors.*
    - **No data sources.**
-
- *Agriculture – Rice Cultivation, Urea Fertilization, Liming and Field Burning of Agricultural Residues Questions*
-
- *No category-specific questions, see general questions.*
-
- *Agriculture - Agricultural Soil Management Emissions Questions*
- *As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Agricultural Soil Management. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapter 5.4 and Annex 3.12.*
    - *a) What are your overall thoughts of the clarity and transparency of these methods?*
        - **Rhode Island has nothing to add. Agriculture is a very small part of our overall emissions.**
    - *b) What recommendations do you have to add to ensure high-quality state-level estimates consistent with the national Inventory?*
        - **No recommendations.**
-
- *LULUCF – Forest Lands and Lands Converted to Forest Land.*
- *No category-specific questions, see general questions.*
- *LULUCF – Croplands and Grasslands Questions*
- *As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Croplands and Grasslands. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapters 6.4 through 6.7 and Annex 3.12. To view an example state-table currently available, please see table A-201 in Annex 3.12.*
    - *a) What are your overall thoughts of the clarity and transparency of these methods?*

- **TBD**

b) *What recommendations do you have to add to ensure high-quality state-level estimates consistent with the national Inventory?*

- **TBD**

-
- *LULUCF – Wetlands and Lands Converted to Wetlands Questions*
- ***Peatlands Remaining Peatlands***

a) *Are there state-level data available on the application ("consumption") of peat, including the state of use and the horticultural/landscaping use?*

- **No data available.**

b) *Are there data sources that could support EPA determining the quantity of peat harvested per hectare and the total area undergoing peat extraction?*

- **No data available at this time.**

-
- *LULUCF – Settlements and Lands Converted to Settlements Questions*
- *No category-specific questions, see general questions.*
- *LULUCF – Other Lands and Lands Converted to Other Lands Questions*
- *No category-specific questions, see general questions.*
-

Waste – Solid Waste Disposal and Management Emissions Questions

- ***MSW Landfills:***
- *a) Data Questions*
- *• Are there datasets for individual States' landfill gas (LFG) recovery activity?*

- **In RI, there is really only one MSW landfill which is RI Resource Recovery Corporation (Central Landfill). FYI, there are two others but they are very small and for inventory purposes are not included. Background: The landfill gas collection system consists of an intricate network of trenched horizontal piping and several strategically placed negative-pressure gas collection wells. All of the gas collection systems come together at a single common gas extraction point. The gas is then treated by a gas conditioning and compression site (GCC). After treatment, the landfill gas is sent as fuel to the combined cycle combustion turbine generator (CTG) power plant operated by RI LFG Genco, LLC**

- **In regards to data, RIRRC's/Central Landfill permits require that they monitor and calculate monthly quantities of landfill gas generated. They are also required to measure gauge pressure in the gas collection system monthly for each individual well and trench to demonstrate that the gas collection system flow rate is sufficient. Testing is performed on the actual gas itself, as well, including methane content and VOC content. These records are kept on-site at Central Landfill. RIDEM review the records during inspections. RI LFG Genco must also continuously monitor the amount of landfill gas that flows to the engines. In summary, no landfill gas data is submitted to RIDEM.**
- *Are there data available for open dumpsites in the U.S. territories?*
    - **N/A to Rhode Island.**

c) *The current method makes some simplifying assumptions and includes uncertainties in the allocation of national-level U.S. emissions to States (e.g., recovery rates are the same for all States and match the national recovery rate). Are there alternative assumptions or different datasets that would improve the accuracy of MSW landfill estimates? Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?*

- **No recommendations.**

- ***Industrial Landfills:*** Not applicable to RI
- *a) Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?*
- ***Composting:***
- *a) Data Questions • Is it correct to assume that Alaska has no commercial composting operations correct?* **N/A**
- *• Are there any datasets about composting in U.S. territories?*
    - **Unknown**
- *• Are there any State-level data sources that describe composting activity over time?*
    - **RIDEM collects annual solid waste data from permitted composting facilities from 2016-2020. This includes tonnages of the waste incoming and outgoing from the facilities. In addition, other than solid waste tonnage data, the facility name & contacts, address and permit capacities**

are maintained. Please note, that since this data collection effort is relatively new, RIDEM does not have 100% of the data for years before 2019.

-

Stand-Alone Anaerobic Digestion:

a) *Do you have or know of any State-level data for counts of operational anaerobic digesters (processing food waste) by year?*
   - **No known data exists in Rhode Island.**

b) *Are there any facility-specific data sources we could use to fill data gaps on the quantity of waste processed by stand-alone digesters for any and all years of the 1990–2019 time series?*
   - **In RI, there is one stand-alone facility, however, they are not fully operational at this time. They are still going through their shakedown period and stack testing has not yet been completed. After testing, RIDEM will revise the permit to include updated emissions limits and conditions. After that, they will be considered fully operational. In the future, RIDEM will receive data on quantity of waste processed via Air Inventory Forms.**

-
- *Waste – Wastewater Treatment and Discharge Emissions Questions*
- ***Overall:***

a) *The following national average parameters were used to estimate emissions by State, with State populations used to proxy the distribution of domestic emissions and State-level production data (if available) used to proxy the distribution of industrial emissions. Please comment if you believe States would differ significantly from the national averages for the following parameters and, if so, whether there are State-specific data sources for EPA to consider:*

- *• wastewater outflow*
- *• biological oxygen demand (BOD), total N, and chemical oxygen demand (COD) concentration in untreated wastewater*
- *• BOD:COD ratios for industrial wastewater*

• wastewater treatment unit operations in use at centralized domestic treatment plants or at industrial plants

b) *Are there domestic or industrial wastewater treatment operations present on other Pacific islands for industrial sectors included in the national Inventory? c) For each of the wastewater treatment and discharge subcategories listed for this category, is there any information that was not considered*

on available State-level data sources with regional or other disaggregated information on emissions?

- **Rhode Island has nothing to add.**

- d) For each of the subcategories, what relevant data sources could be included? If data are used at the national level, are you aware of other comparable data sources at the State level?
    - **Rhode Island is not aware of comparable data sources.**
- ***Domestic:***
- *a) The following national average parameters were used to estimate domestic wastewater treatment emissions by State. Please comment on whether you think that States would differ significantly from the national averages for the following parameters and, if so, are there State-specific data sources for EPA to consider: • discharge of publicly owned treatment works (POTWs) to impaired waterbodies and nonimpaired waterbodies*
- *• discharge of POTWs to reservoirs, lakes, and estuaries*
- *• consumed protein*
- *• percentage of the population on septic (versus centralized treatment)*
-
-
- ***Industrial – Pulp and Paper:***
- *a) Pulp and paper wastewater flows were estimated using EPA's Enforcement and Compliance History Online (ECHO) datasets. Do you have any reason to believe that States' pulp and paper wastewater information is underrepresented in ECHO? If so, do you have an alternative, publicly available pulp and paper wastewater dataset by State?*
- *b) Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' pulp and paper manufacturing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?*
- *c) Data for pulp and paper manufacturing for U.S. territories are limited in the ECHO dataset. Are there resources to help estimate a time series of production data for pulp and paper wastewater flows? Or are there territory-level data on the number of pulp and paper plants in each U.S. territories?*
-
- ***Industrial – Meat and Poultry:***

a) Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' meat and poultry processing operations have changed

significantly since 1990? If so, are there data sources to quantify those changes?

- **No reason to believe meat and poultry processing operations have changed significantly. No data in Rhode Island supports any significant change.**

- *b) Data for meat and poultry processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of territory-level production data for poultry (broilers, turkeys, chicken), beef and calves, hogs, and sheep (lamb and mutton), for example, live weight killed, number of head slaughtered?*
    - **N/A to Rhode Island - use SIT default values**

Industrial – Fruits and Vegetables:

a) Currently, a single year, 2017, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' fruit and vegetable processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?

b) Data for fruit and vegetable processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of territory-level production data for fruits and vegetables, for example, canned and frozen processed vegetables, potato production, noncitrus fruits, and citrus production?

- **No reason to believe fruits and vegetables processing operations have changed significantly. No data in Rhode Island supports any significant change.**

Industrial – Ethanol:

a) Ethanol production for each State was estimated using the Energy Information Administration (EIA) SEDS dataset. Do you have any reason to believe that States' information is underrepresented in the SEDS dataset? If so, do you have an alternative, publicly available ethanol production dataset by State?

b) Data for ethanol production for U.S. territories are limited in the SEDS dataset. Are there resources to help estimate a time series of production data for ethanol production?

- **Unsure if this data exists in Rhode Island.**

Industrial – Petroleum:

a) Petroleum production for each State was estimated using EIA's Petroleum Administration for Defense Districts production and State-level operating capacity datasets. Do you have any reason to believe that States' information is underrepresented in the EIA datasets? If so, do you know of an alternative, publicly available petroleum refining production dataset by State?

b) Do you have any concerns about using operating capacity to estimate petroleum production by State is not a good method? If so, would you suggest an alternative method?

- **No concerns with the methodology used in Rhode Island.**

c) Data for petroleum refining for U.S. territories are limited in the EIA dataset. Are there resources to help estimate a time series of territory-level production data for petroleum production?

- **N/A in Rhode Island.**

Industrial – Breweries:

a) Brewery production, and by extension brewery production emissions, for each State was estimated using the Alcohol and Tobacco Tax and Trade Bureau (TTB) taxable production dataset.

- *• The TTB dataset is based on taxable production/volume. Is there any reason why taxable production from breweries may be underrepresented by State and therefore potentially underrepresent total emissions? If so, do you know of an alternative dataset or assumption?*
    - **No reason to believe taxable production/volume is not accurate in Rhode Island.**

• The TTB dataset provides production data from 2008 to the present. The 2008 values were used as a proxy for 1990–2007 values. Is there reason to believe States' brewery production has significantly changed over that time period? If so, do you have an alternative, publicly available State-level brewery production dataset (i.e., barrels produced), or suggestions for alternative data to use as a proxy?

- **No reason to believe Rhode Island's brewing production has significantly increased during 1990-2007.**

b) Data for brewery production for U.S. territories are limited in the TTB dataset. Are there resources to help estimate a time series of territory-level production data for brewery production (i.e., barrels produced)?

- **N/A to Rhode Island.**

3.8 Texas CEQ

Responses to Greenhouse Gas Emissions and Sinks Related Questions

General Questions:

a. What are your overall impressions of the clarity of the methods described in this report?

RESPONSE: We do not have overall comments on the methods.

b. What recommendations do you have to add to or improve the overall transparency, completeness, consistency, and accuracy of this report?

RESPONSE: Provide an executive summary.

c) Data availability. Please address the following questions for each inventory source:

a. For each of the categories, are there additional relevant data sources that are not currently included, but could be incorporated into this analysis?
RESPONSE: See responses below.

b. For national level datasets that are currently used, are you aware of other comparable datasets of activity, emission factor, or emissions data that are available at the State, county, or zip-code levels?
RESPONSE: See responses below.

d. Uncertainty. Currently uncertainty ranges are not included for the state level estimates. Please provide feedback on what qualitative and quantitative information would be useful. Timeseries Coverage. Currently State data covers 1990-2019 consistent with the 2021 National Greenhouse Gas (GHG) Inventory, and inclusive of most known baseline periods for climate policy. Subsequent publications of this data will also strive to maintain this consistency with the National Inventory. As state-specific input datasets are not always available over the entire timeseries, understanding which years may be more important can help us to better prioritize our backcasting and methodological efforts across the time series. United States Environmental Protection Agency (EPA) appreciates feedback on which, if any years should be prioritized for future State-level estimates (e.g., 2000 and later, 2005 and later, 2010 and later, or the full time series).

RESPONSE: No comment.

e) Key Category Analysis. EPA anticipates prioritizing methodological refinements for more significant categories to make efficient use of available resources over time. EPA appreciates feedback on which categories are more relevant for further refining for your State.

a. Given that the emissions profile of some states will be different from the national average, which categories that are more significant in terms of absolute emissions, or have changing emission trends (e.g., increasing, variable)?
RESPONSE: No comment.

b. The national *Inventory* includes a key category analysis (KCA) consistent with 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines. Would it be useful for States if a KCA was completed for each state?
RESPONSE: No comment.

f) 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/inventoryexplorer/)?
RESPONSE: No comment.

i. Related to the level of category/gas aggregation or disaggregation?
RESPONSE: No comment.

ii. Are there specific categories where further data disaggregation could be helpful?
RESPONSE: No comment.

b. What data format would best facilitate the use of the state-level emissions data (e.g., .xlsx download, etc.)?
RESPONSE: No comment.

c. What additional datasets or information could be provided to help increase the usability of the state-level emissions data?
RESPONSE: No comment.

d. EPA plans to provide users additional information on where they can find official State data, where it exists. Do you have suggestions on how we should direct users to official state data (i.e., section in methods report including links to State data)?
RESPONSE: No comment.

Energy – Combustion Emissions Questions

Fossil Fuel Combustion:

a. Some fuels have differences in consumption data between the aggregated State-level totals and national totals. The current approach is to use data from the national Inventory in those cases. Are there other approaches that could be taken? Has this come up in developing estimates at the State level?

RESPONSE:

Point Source: We recommend developing electric utility fuel consumption at the state or site level using Energy Information Administration (EIA) data. For electric utilities, please see attached file (EIA annual_consumption_state.xls) from EIA website.

Area Source: For area source categories such as residential fuel combustion, adjusting the state-level totals to match the national totals for consistency is reasonable since the adjustments are mostly small (less than 5%).

b. Consistent with the IPCC Guidelines, we have adjusted fuel consumption totals in the energy sector to account for consumption in the IPPU sector. In some cases, this step could lead to a negative emission total for a State if the subtracted amount (as determined from the assumed distribution) was greater than consumption data from the State Energy Data System (SEDS). This outcome was corrected to zero if that was the case, but are there other approaches for correcting for that difference?

RESPONSE:

Point Source: In-house energy generation occurs within some industrial sites (e.g., petrochemical production sites). Adjusting fuel consumption in the energy sector may not be needed for those industrial sites. EIA collects consumption and generation data on all generators at sites greater than one megawatt on the Annual Power Plant Operations Report.

Area Source: For some industrial, commercial, and institutional combustion sources, we have seen an approach where the remaining negative emissions are re-allocated among the other non-zero states to fully account for the adjustment. However, making the adjustment to zero without re-allocating the remaining negative emissions is simpler and easier to understand.

c. Consistent with the national Inventory, the default approach taken here was to allocate transportation sector carbon dioxide (CO_2) emissions based on Federal Highway Administration fuel use/sales by State. For some States, this may not be accurate because fuel sold in a State may be combusted in other States. Another option is to use vehicle miles traveled (VMT) data by State but that approach does not factor in vehicle fuel economy. Are there other alternative or complementary approaches to allocate transportation fuel across States, including VMT data and other sources (e.g., National Emissions Inventory – based on county-level fleet and activity data to generate a bottom-up inventory) that EPA should consider? If so, what data sources exist to help with that alternative approach? Would it be helpful to present transportation sector emissions using multiple approaches in future inventories?

RESPONSE: Consistent with EPA requirements, on-road emissions inventories are developed using emissions factors and corresponding activity levels. The same method can be used to generate both CO_2 and non-CO_2 emissions rates for on-road mobile sources. Using the CO_2 emissions rates from the national emission factor model combined with the corresponding activity levels is the preferred method for producing emissions estimates consistent with other pollutants.

d. Mobile source non-CO_2 emissions are allocated across States based on VMT data while mobile source CO_2 emissions were allocated based on fuel sales, as mentioned above. Do you have any concerns with using two different methodologies for mobile source CO_2 vs. non-CO_2 State splits?

RESPONSE:

On-road Mobile: Consistent methods for estimating CO_2 and non-CO_2 emissions are recommended. The activity factors that have already been developed for the non-CO_2 pollutants can be used for CO_2.

e. Several fuels have variable C factors over time including coal, natural gas, gasoline, and diesel fuel. Those fuels might also have variable C factors across areas/States. Are data available to build out State-specific C factors for the fuels

with variable C contents? If so, could it be done in a way that the State-level total emissions still matched up to the national total emissions for those fuels?

RESPONSE: The Texas Commission on Environmental Quality (TCEQ) utilizes multiple data sources to develop state-specific fuel property profiles for the six fuel regions in Texas. The two data sources are: a TCEQ-sponsored statewide triennial fuel study and fuel compliance data submitted to the EPA for federal reformulated gasoline. The two data sources are used in conjunction with regulatory information and default data to develop Texas-specific fuel property profiles for the six Texas fuel regions for both historical and future year assessments.

f. Geothermal emissions could be allocated by the type of geothermal production per State (because different types have different emissions factors) if that data is available. Is there more information on State-level geothermal emission factors and production?

RESPONSE: We are not aware of any sources of Texas-specific geothermal emission factors and production.

Non-Energy Uses (NEU) of Fossil Fuels:

For petrochemical feedstocks, NEU of natural gas is allocated across States based on petrochemicals emissions data per State from the IPPU adjustments, while other fuels are allocated based on the underlying SEDS data. Allocating across States based on the underlying SEDS data ensures there are no States where NEU use is larger than original SEDS data and there are no zeros associated with subtracting NEU (it is not an issue for natural gas because use is so high overall compared with NEU use). Could different approaches be used or can the petrochemical data be used without resulting in negative use?

RESPONSE: We are not aware of alternate approaches.

Incineration of Waste:

Waste incineration emissions are calculated based on the combustion of fossil components of both municipal solid waste (MSW) and tires. However, emissions are disaggregated to Sates based only on MSW tonnage. Are there approaches or data available to disaggregate emissions based on waste category (e.g., MSW combustion vs. tire combustion)?

RESPONSE: Table A-117 in Appendix A of this report shows MSW incineration by state and indicates zeros for 2001 through 2019 for Texas. This does not seem correct, is there a way to verify this?

For area sources, we use tonnage also derived from EPA and do not know of other data sources to disaggregate emissions.

International Bunker Fuels:

The approach used to allocate jet fuel bunker fuels by State is currently based on the total amount of jet fuel used by State which could potentially lead to an over- or under-estimation for some States of bunker fuel emissions. Are there other more accurate approaches to allocate jet fuel bunker data across States as opposed to the percentage of jet fuel total use? For example, using Federal Aviation Administration flight level data on departures and destinations or assuming based on States with international airports and flights?

RESPONSE: The TCEQ develops non-road emissions from airport sources on a per-facility approach, using the Federal Aviation Administration's Aviation Environmental Design Tool (AEDT), and entering aircraft and engine types based on collected facility activity data. AEDT then applies appropriate emission factors, fuel types used, etc. based on the aircraft and engine types selected. The TCEQ does not collect or track specific fuel usage data from any airport facilities as part of the emissions inventory development process.

Energy – Fugitive Emissions Questions

Coal Mining:

a. Do you have any comments specific to the methodology and emission estimates for active coal mines and abandoned coal mines?

RESPONSE: No comment.

b. Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned coal mines, including State-level datasets addressing recovery of methane from abandoned mines?

RESPONSE: The Railroad Commission of Texas (RRC) has data on permitted surface mining, acreage, and abandoned mine programs: https://www.rrc.texas.gov/surface-mining/historical-coal-mining/mining-regions-fields-and-sites/

Petroleum Systems and Natural Gas Systems:

a. Are there relevant dataset(s) that could be used to replace or supplement the data currently used to allocate petroleum and natural gas system emissions to the state level? Particularly, state or detailed location information on gathering and boosting stations, processing plants, and transmission and storage stations?

RESPONSE: Detailed location information is available for sites reporting to the Texas point source emissions inventory. EIA's triennial EIA-757 Schedule A, *Natural Gas Processing Plant Survey*, **tracks the country's population of natural gas plants and has basic location data.**

The current methodology to allocate petroleum and natural gas system emissions to the state level are reasonable (e.g., using oil, condensate, and natural gas production and oil and gas well counts to ratio the national emissions to individual states).

b. Are there additional Greenhouse Gas Reporting Program (GHGRP) data that could be used to allocate natural gas and petroleum emissions to each State?

RESPONSE: For sources that report basin-level data to the EPA's GHGRP, it is difficult to allocate the emissions to individual states since many basins cross state boundaries. As a result, some of the GHGRP data is for multiple states. For sources that report county-level data to the GHGRP, it may be possible to use that data to allocate emissions to individual states.

c. Are you aware of any State datasets that may be useful in helping to refine emission estimates for abandoned wells, including State-level datasets addressing plugging status of abandoned wells?

RESPONSE: The RRC has detailed data on newer wells (generally, those drilled after 1950). This includes a well status data element that could be used to identify abandoned and plugged wells. For older historical wells drilled prior to 1950, we are not aware of a detailed dataset of Texas abandoned wells. The RRC does have some limited statewide well counts for older wells as noted in the EPA methodology document, but it does not include data at the county level.

d. Are there particular sources for which State-level regulatory or voluntary programs result in large differences in emission rates between states? Are state-specific data sets available for those sources?

RESPONSE: Sites located in ozone nonattainment areas are subject to additional emissions and control requirements, and those sites' emission rates can differ from sites located in attainment areas. The TCEQ does not inventory GHG emissions.

IPPU – Minerals Emissions Questions

Cement Production:

Are you aware of data on clinker production by all States for the full 1990-2019 time series? Please share a surrogate data that could be used (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.

RESPONSE: See the USGS National Mineral Information Center: https://www.usgs.gov/centers/nmic/cement-statistics-and-information

Lime Production:

a. Are you aware of data on State-level lime production (activity data) by type (e.g., high-calcium quicklime; dolomitic quicklime, high-calcium, hydrated; dolomitic, hydrated; dead-burned dolomite; CO_2 captured for use in onsite processes) for some or all of the 1990–2019 time series? If not, is there any surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: Please see the USGS National Mineral Information Center: https://www.usgs.gov/centers/nmic/lime-statistics-and-information. As part of the annual TCEQ point source emission inventory, some Texas lime production sites may provide non-confidential source level activity data. Please provide a contact name and email address so we can share this production data. We are not aware of surrogate data that can be used.

b. Based on analysis of Greenhouse Gas Reporting Program data, it appears that most but not all beet sugar manufacturing facilities that also produce lime and a few lime manufacturing facilities capture CO_2 for use in onsite processes. Are you aware of any information on why and how facilities producing lime capture CO_2 for use in onsite processes (e.g., purification), and any trends in this

practice during the 1990–2019 time series (e.g., have facilities increased or decreased adoption of this practice during the time series), or whether the amount of CO_2 captured is proportional to the amount of lime produced or some other metric? Is this CO_2 ultimately released to the atmosphere? Are you aware of any data on the amount of CO_2 captured onsite per facility or State for 1990–2009?

RESPONSE: Based on information provided in the TCEQ point source emissions inventory, Texas lime plants do not appear to employ CO_2 capture. We are not aware of surrogate data that can be used.

c. For some States and years (Colorado for 2010–2015, Idaho for 2011 and 2019, and Nebraska for 2010–2014), calculations using GHGRP data on emissions and CO_2 captured for onsite processes yielded small but erroneous negative emissions. EPA zeroed emissions for those States and years and plans to adjust calculations so that State emissions totals match national emissions. Do you have any general feedback on this approach?

RESPONSE: No comment at this time.

Glass Production:

a. Are you aware of state-level data on glass production or the amount of carbonate (i.e., limestone, dolomite, soda ash) consumed for glass production by State (activity data) for some or all of the 1990–2019 time series? If not, can you share any state-level surrogate data {e.g., more complete data on glass facilities by State, amount of glass products by type [i.e., containers, flat (window) glass, fiber glass, and specialty glass]} for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: As part of the annual TCEQ point source emission inventory, some Texas glass production sites may provide non-confidential source level activity data. Please provide a contact name and email address so we can share this production data.

Other Process Uses of Carbonates:

b. Are you aware of state-level data on the consumption of limestone and dolomite for the iron and steel sector for the 1990–2019 time series? If not, can you share any state-level surrogate data for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends from carbonate consumption by the iron and steel sector?

RESPONSE: We are not aware of state-level data on the consumption of limestone and dolomite for the iron and steel sector for the specified period.

c) Are you aware of state-level data on the consumption of soda ash (not associated with glass manufacturing) for the 1990–2019 time series?

RESPONSE: We are not aware of state-level data on the consumption of soda ash for the specified period or any other period.

d. Are you aware of any state-level data on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone,

mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the 1990–2019 time series?

RESPONSE: We are not aware of state-level data on limestone and dolomite consumption for flux stone, flue gas desulfurization systems, chemical stone, mine dusting or acid water treatment, acid neutralization, and sugar refining activities for the specified period or any other period.

CO_2 Consumption:

Are you aware of other sources of data on the consumption of CO_2 by State or region for the 1990–2019 time series?

RESPONSE: We are not aware of other sources of CO_2 consumption data.

IPPU – Chemicals Emissions Questions

Ammonia Production:

Currently, production capacity is used as a surrogate for state-level ammonia production for 1990–2009. In the absence of ammonia production by State in more recent years, are you aware of other surrogate data (e.g., facility utilization rates by State) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of a current source of ammonia production in Texas.

Annual ammonia production for the U.S., not by state, can be found at the following USGS web site: https://www.usgs.gov/centers/nmic/nitrogen-statistics-and-information. It may be possible to combine the information from the USGS website with the information in Appendix B of the *Energy Use and Energy Intensity of the U.S. Chemical Industry* report **(https://www.energystar.gov/sites/default/files/buildings/tools/industrial_LBNL-44314.pdf)** to estimate state-level ammonia production.

Urea Consumption for Non-agricultural Purposes:

Are you aware of state-level data on urea consumption for non-agricultural purposes (activity data) for some or all of the 1990–2019 time series?

RESPONSE: We are not aware of publicly available resources regarding urea consumption. It appears that IHS Markit may have data regarding urea consumption for non-agricultural purposes: https://ihsmarkit.com/products/urea-chemical-economics-handbook.html

Nitric Acid Production:

a. Are you aware of state-level data on nitric acid production (activity data) for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for nitric acid production by State for 1990–2009. We know that the production capacity data used for this State inventory calculation are incomplete for 1990–2009. Are you aware of more complete data on facility production capacity by State?

RESPONSE: We are not aware of state-level data.

b. Are you aware of surrogate state-level data other than facility production capacity (e.g., utilization rates by facility or State, information about abatement

technology installations and use per facility) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of surrogate state-level data.

Adipic Acid Production:

Are you aware of any other state-level data on adipic acid production (activity or emissions data) for some or all of the 1990–2019 time series?

RESPONSE: We are not aware of state-level data.

Caprolactam, Glyoxal, and Glyoxylic Acid Production:

Are you aware of state-level data on caprolactam production or emissions for some or all of the 1990–2009 time series? We currently use production capacity as a surrogate for caprolactam production by State. Are you aware of more complete data on facility production capacity or actual production by State? Are you aware of better surrogate data other than facility production capacity (e.g., utilization rates by facility or State, information about abatement technology installations and use per facility) that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of state-level data.

Carbide Production and Consumption:

a. Are you aware of state-level data on SIC production (activity data) for the 1990–2019 time series? Are you aware of other data to refine accuracy of the estimation of SIC consumption by State for the 1990–2019 time series?

RESPONSE: We are not aware of state-level data.

b. Are you aware of information that can help us improve the accuracy of production in the two States where SIC facilities are located?

RESPONSE: We are not aware of state-level data.

Titanium Dioxide (TiO_2) Production:

Are you aware of state-level data on TiO_2 production (activity data) for the 1990–2009 time series? Is there any surrogate data other than facility production capacity (e.g., facility utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: Annual production for the U.S., not by state, can be found at the following USGS web site: https://www.usgs.gov/centers/nmic/titanium-statistics-and-information

Petrochemical Production:

Are you aware of state-level data on petrochemical production by type for the 1990–2019 time series? Is there any other surrogate data by State or facility (e.g., facility production capacity; utilization rates by facility or State; timing of facility expansions, openings, and temporary or permanent closures) for the full 1990–2019 time series that could address data gaps and refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: State- or region-level petrochemical data is available from the EIA: https://www.eia.gov/

Phosphoric Acid Production:

Are you aware of state-level data on phosphoric acid production (activity data) for the 1990–2009 time series? Is there any other surrogate data or information (e.g., timing of facility expansions and temporary or permanent closures, origin of phosphate rock used in facilities) by State or facility for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of state-level data.

HCFC-22 Production:

a. For the years 1990–2009, there are significant uncertainties in the allocation of national-level U.S. emissions to individual facilities and States, particularly for the five HCFC-22 production facilities that closed before 2003 and for which production capacity data are therefore not available. Are you aware of any more complete sources of production capacity or other relevant historical data?

RESPONSE: We are not aware of state-level data.

b. Do you have recommendations for how to refine the methodology to more accurately estimate emissions from HCFC-22 production over the time series?

RESPONSE: No comment at this time.

IPPU – Metals Emissions Questions

Iron and Steel and Metallurgical Coke Production:

a. Are you aware of State-level data on iron and steel production (activity data) by category (i.e., sinter production, iron production, pellet production, steel production, other activities) for some or all of the 1990–2019 time series? In the absence of steel production by State, are you aware of better surrogate data that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of existing state-level data on iron and steel production for the sinter, iron, pellet, odr steel production categories for the specified period or any other period. Annual production for the U.S., not by state, can be found at the following USGS web site: https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-iron-steel.pdf

b. Are you aware of state or facility-specific information to better allocate basic oxygen furnace and electric arc furnace (EAF) production by State for 1990–2009?

RESPONSE: We are not aware of state-level or facility information data to better allocate production between EAFs and other oxygen furnaces. Based on a direct conversation with a representative of the Steel Manufacturing Association, 100% of iron and steel production in Texas occurs using EAFs, and almost none or none through basic oxygen furnaces. This information was confirmed by a contact for Nucor Steel.

Ferroalloy Production:

Are you aware of state or facility-level data on ferroalloy production (activity data) or facility for the 1990–2019 time series? Please share any other surrogate data (e.g., facility production capacity, utilization rates by facility or State) for 1990–2019 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends.

RESPONSE: We are not aware of existing state-level data on ferroalloy production.

Aluminum Production:

Are you aware of state or facility-level data available to incorporate differences in emissions between smelters based on technology type? Is there any other surrogate data or emission sources that could be used to allocate national total aluminum production emissions across States?

RESPONSE: We are not aware of existing state-level, facility, or surrogate data. The USGS has annual national data available here: https://www.usgs.gov/centers/nmic/commodity-statistics-and-information**.**

Magnesium Production and Processing:

a. Are you aware of state or facility-level magnesium production or capacity data (or surrogate data) or facility for the 1990–2019 time series?

RESPONSE: We are not aware of existing state-level, facility, or surrogate data. The USGS has annual national data available here: https://www.usgs.gov/centers/nmic/commodity-statistics-and-information**.**

b. Are you aware of information on the location (by State) of magnesium production and processing facilities or information on the location (by State) of magnesium production and processing facilities by process type?

RESPONSE: We are not aware of existing state-level, facility, or surrogate data. The USGS has annual national data available here: https://www.usgs.gov/centers/nmic/commodity-statistics-and-information**.**

Lead Production:

Are you aware of state or facility-level data on primary or secondary lead production (activity data) or facility for the 1990–2019 time series? Is there any other surrogate data (e.g., primary or secondary production capacity by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?

RESPONSE: We are not aware of existing state-level, facility, or surrogate data. The USGS has annual national data available here: https://www.usgs.gov/centers/nmic/commodity-statistics-and-information**.**

Zinc Production:

Are you aware of data on zinc production (activity data) by unit type (i.e., electrothermic furnace, Waelz kiln, other furnaces, and flame reactor units) by State or facility for the 1990–2019 time series? Is there any other surrogate data (e.g., total number of zinc facilities by State, production capacity by unit type and by facility or State) or other data by State (e.g., utilization rates by facility or State) for 1990–2009 that could refine this State inventory calculation to enhance accuracy and consistency of State GHG emissions and trends?
RESPONSE: We are not aware of existing state-level, facility, or surrogate data. The USGS has annual national data available here: https://www.usgs.gov/centers/nmic/commodity-statistics-and-information.

IPPU – Product Use Emissions Questions

Electronics Industry:

Are you aware of State- or facility-level capacity data or other surrogate data (e.g., sales data) by State for PV manufacturing for 1990–2006 that could be used to refine the allocations of emissions by State? Please share any surrogate data (e.g., sales data by State) by State for semiconductor or micro-electromechanical system manufacturing for 1990–2007 that could be used to refine the allocations of emissions by State.
RESPONSE: We are unaware of any sales data, capacity data, or other surrogate data for PV manufacturing in Texas.

Substitution of Ozone-Depleting Substances:

Are you aware of bottom-up modeling data that are available by State? Is there any surrogate data other than population data that could be used to disaggregate the emissions of substitutes for ozone-depleting substances?
RESPONSE: We are unaware of any Texas-specific modeling for ozone-depleting substances or surrogate data other than population.

Electrical Transmissions and Distribution:

Are you aware of State-level electrical transmission and distribution equipment data (e.g., nameplate capacity by State) or other data by State for 1990–2019 (or part of the time series) that could refine this State inventory calculation to reflect State trends in emissions more closely? Is there any other surrogate data (e.g., State population data) to enhance accuracy and consistency of State GHG emissions and trends than the current data being used (transmission mile data by State)?
RESPONSE: We do not have access to data on electrical transmission and distribution equipment data. This data may be available from either the Electric Reliability Council of Texas (ERCOT) which oversees the State of Texas electrical grid or the Public Utility Commission of Texas which oversees ERCOT.

N_2O from Product Use:

Are you aware of any State-level data on N_2O usage for medical and dental anesthesia, food processing propellant and aerosols, sodium azide production, or other applications (e.g., fuel oxidant in auto racing, oxidizing agent in blowtorches) by State for some or all of the 1990–2019 time series? Is there any other surrogate data (e.g., State population data) to enhance accuracy and consistency of State GHG emissions and trends than the current data being used (transmission mile data by State)?

RESPONSE: We are unaware of state level N_2O usage data for the medical and dental industries. Only through industry specific surveying efforts could this data be acquired.

Agriculture – Livestock Emissions Questions

Enteric Fermentation:

a. Are there other/newer data sources or methods, particularly at the State level, that EPA should be aware of and consider in calculating these emissions? Especially for: · Dry matter/gross energy intake;

· Annual data for the digestible energy (DE) values (expressed as the percent of gross energy intake digested by the animal), CH_4 conversion rates (Ym) (expressed as the fraction of gross energy converted to CH_4), and crude protein values of specific diet and feed components for foraging and feedlot animals;

· Monthly beef births and beef cow lactation rates;

· Weights and weight gains for beef and dairy cattle.

RESPONSE: We are not aware of any newer sources of Texas-specific livestock emission factors and production.

b. Are State-specific diet data available to EPA to enhance characterization of diet differences across livestock types and U.S. States?

RESPONSE: We are not aware of any sources of Texas-specific livestock emission factors and production.

c. For the enteric fermentation source category and the Cattle Enteric Fermentation Model (CEFM), are the various regional designations of U.S. States (as presented in Annex 3.10 of the GHG Inventory) used for characterizing the diets of foraging cattle appropriate? The CEFM is used to estimate cattle CH_4 emissions from enteric fermentation and incorporates information on livestock population, feeding practices, and production characteristics.

RESPONSE: We are not aware of any sources of Texas-specific livestock emission factors and production.

Manure Management:

Are there other/newer data sources, particularly at the State-level, that EPA should be aware of and consider in calculating these emissions? Especially for the following:

· waste management system data, particularly seasonal changes in emissions from different waste management systems;

· maximum methane-producing capacity;

· volatile solids and nitrogen excretion rates; and

· measured emission estimates (by waste management system) to help refine estimates of methane conversion factors.

RESPONSE: We are not aware of any newer sources of Texas-specific livestock emission factors and production.

Agriculture – Rice Cultivation, Urea Fertilization, Liming and Field Burning of Agricultural Residues Questions

No category-specific questions, see general questions.

Agriculture – Agricultural Soil Management Emissions Questions

As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Agricultural Soil Management. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapter 5.4 and Annex 3.12.

a. What are your overall thoughts of the clarity and transparency of these methods?

RESPONSE: We do not have any comments.

b. What recommendations do you have to add to ensure high-quality state-level estimates consistent with the national Inventory?

RESPONSE: We do not have any recommendations.

Land use, land-use change and forestry (LULUCF) – Forest Lands and Lands Converted to Forest Land.

No category-specific questions, see general questions. (No Response Needed From TCEQ)

LULUCF – Croplands and Grasslands Questions

As described in the methodology section, EPA is currently compiling the state-level emissions estimates from Croplands and Grasslands. EPA plans to provide these estimates in coming weeks. The methods used to compile state-level estimates are the same as those in the national Inventory, described in Chapters 6.4 through 6.7 and Annex 3.12. To view an example state-table currently available, please see table A-201 in Annex 3.12.

a. What are your overall thoughts of the clarity and transparency of these methods?

RESPONSE: The methodology for this category seems sound.

b. What recommendations do you have to add to ensure high-quality state-level estimates consistent with the national Inventory?

RESPONSE: We have no further recommendations.

LULUCF – Wetlands and Lands Converted to Wetlands Questions

Peatlands Remaining Peatlands

a. Are there state-level data available on the application ("consumption") of peat, including the state of use and the horticultural/landscaping use?

RESPONSE: We are not aware of any sources of Texas-specific application of peat/consumption.

b. Are there data sources that could support EPA determining the quantity of peat harvested per hectare and the total area undergoing peat extraction?

RESPONSE: We are not aware of any sources of Texas-specific quantity of peat harvested or total area undergoing peat extraction.

LULUCF – Settlements and Lands Converted to Settlements Questions

No category-specific questions, see general questions.

RESPONSE: We are not aware of any sources of Texas-specific LULUCF emission factors and production.

LULUCF – Other Lands and Lands Converted to Other Lands Questions

No category-specific questions, see general questions.

RESPONSE: We are not aware of any sources of Texas-specific LULUCF emission factors and production.

Waste – Solid Waste Disposal and Management Emissions Questions

MSW Landfills:

a. Data Questions

- Are there datasets for individual States' landfill gas (LFG) recovery activity?
- Are there data available for open dumpsites in the U.S. territories?

RESPONSE:

- **Datasets for Texas LFG recovery activity can be found in the TCEQ MSW annual report at the following link: annual report. Pages 99 - 102 of the 2020 report show a List of Facilities Recovering Landfill Gas for Beneficial Use (2020), including information on Gas Processed (ft^3). The annual report is available for several years.**

Additional information can be found by filtering the 'physical type' column for 9GR, which are the landfill gas recovery facilities of the spreadsheet at the following link: msw-facilities-texas.xls— A spreadsheet listing issued or acknowledged permits and other authorizations as well as pending applications for MSW landfills and processing facilities that are active, inactive, or not yet constructed. Data fields include facility name and type; permit, registration, or notification number; authorization status; facility physical status; and location information. See Explanation of Municipal Solid Waste Data Fields for more information.

- **Data on open dumpsites may be found at: msw-unum-texas.xls. A spreadsheet of historical information listing old, closed unnumbered MSW landfills that were operated before permits were required, as well as unauthorized landfills and miscellaneous illegal dumps and disposal sites. See the TCEQ Inventory of Closed Municipal Solid Waste Landfills page for information about why this information was collected and how it is used. See Explanation of Municipal Solid Waste Data Fields for more information.**

b. The current method makes some simplifying assumptions and includes uncertainties in the allocation of national-level U.S. emissions to States (e.g., recovery rates are the same for all States and match the national recovery rate). Are there alternative assumptions or different datasets that would improve the accuracy of MSW landfill estimates? Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?

RESPONSE: We are not aware of alternative assumptions or other datasets that would improve the accuracy of MSW landfill estimates.

Industrial Landfills:

Do you have recommendations to refine the methodology to estimate emissions over the time series more accurately?
RESPONSE: We do not have any recommendations.

Composting:

Data Questions: Is it correct to assume that Alaska has no commercial composting operations correct?

· Are there any datasets about composting in U.S. territories?

· Are there any State-level data sources that describe composting activity over time?

RESPONSE: We are not aware of any sources of Texas-specific composting datasets or data sources in regards to composting activity over time.

Stand-Alone Anaerobic Digestion:

a. Do you have or know of any State-level data for counts of operational anaerobic digesters (processing food waste) by year?

RESPONSE: We are not aware of any sources of Texas-specific operational anaerobic digester emission factors, counts, or production.

b. Are there any facility-specific data sources we could use to fill data gaps on the quantity of waste processed by stand-alone digesters for any and all years of the 1990–2019 time series?

RESPONSE: We are not aware of any sources of Texas-specific data.

Waste – Wastewater Treatment and Discharge Emissions Questions

Overall:

a. The following national average parameters were used to estimate emissions by State, with State populations used to proxy the distribution of domestic emissions and State-level production data (if available) used to proxy the distribution of industrial emissions. Please comment if you believe States would differ significantly from the national averages for the following parameters and, if so, whether there are State-specific data sources for EPA to consider:

· wastewater outflow

· biological oxygen demand (BOD), total N, and chemical oxygen demand (COD) concentration in untreated wastewater

· BOD:COD ratios for industrial wastewater

· wastewater treatment unit operations in use at centralized domestic treatment plants or at industrial plants

RESPONSE: We do not have any comments.

b. Are there domestic or industrial wastewater treatment operations present on other Pacific islands for industrial sectors included in the national Inventory?

RESPONSE: Not applicable to Texas.

c. For each of the wastewater treatment and discharge subcategories listed for this category, is there any information that was not considered on available

State-level data sources with regional or other disaggregated information on emissions?

RESPONSE: We are not aware of any additional data.

d. For each of the subcategories, what relevant data sources could be included? If data are used at the national level, are you aware of other comparable data sources at the State level?

RESPONSE: We are not aware of any additional data.

Domestic:

The following national average parameters were used to estimate domestic wastewater treatment emissions by State. Please comment on whether you think that States would differ significantly from the national averages for the following parameters and, if so, are there State-specific data sources for EPA to consider:

- discharge of publicly owned treatment works (POTWs) to impaired waterbodies and nonimpaired waterbodies
- discharge of POTWs to reservoirs, lakes, and estuaries
- consumed protein
- percentage of the population on septic (versus centralized treatment)

RESPONSE: The TCEQ knows of no significant changes to this category or additional data sources and believe the national averages for the parameters listed are acceptable.

Industrial – Pulp and Paper:

a. Pulp and paper wastewater flows were estimated using EPA's Enforcement and Compliance History Online (ECHO) datasets. Do you have any reason to believe that States' pulp and paper wastewater information is underrepresented in ECHO? If so, do you have an alternative, publicly available pulp and paper wastewater dataset by State?

RESPONSE: The following web sites may help estimate pulp and paper wastewater activity data: the Technical Association for the Pulp and Paper Industry: https://www.tappi.org/ and the National Council for Air and Stream Improvement: https://www.ncasi.org/ .

b. Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' pulp and paper manufacturing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?

RESPONSE: Yes, 1990 data should not be used to determine 2020 emissions. Please see the data sources listed in a) above.

c. Data for pulp and paper manufacturing for U.S. territories are limited in the ECHO dataset. Are there resources to help estimate a time series of production data for pulp and paper wastewater flows? Or are there territory-level data on the number of pulp and paper plants in each U.S. territories?

RESPONSE: Not applicable to Texas.

Industrial – Meat and Poultry:

a. Currently, a single year, 2019, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' meat and poultry processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?

RESPONSE: We are unaware of significant changes to this category or additional data sources.

b. Data for meat and poultry processing for U.S. territories are not captured in the United States Department of Agriculture (USDA) dataset. Are there resources to help estimate a time series of territory-level production data for poultry (broilers, turkeys, chicken), beef and calves, hogs, and sheep (lamb and mutton), for example, live weight killed, number of head slaughtered?

RESPONSE: We are unaware of significant changes to this category or additional data sources in regard to time series territory level production data.

Industrial – Fruits and Vegetables:

a. Currently, a single year, 2017, is used to estimate the distribution of national estimates to each State and territory for every year of the time series. Is there reason to believe States' fruit and vegetable processing operations have changed significantly since 1990? If so, are there data sources to quantify those changes?

RESPONSE: We are unaware of significant changes in the fruit and vegetable processing and no additional data sources.

b. Data for fruit and vegetable processing for U.S. territories are not captured in the USDA dataset. Are there resources to help estimate a time series of territory-level production data for fruits and vegetables, for example, canned and frozen processed vegetables, potato production, noncitric fruits, and citrus production?

RESPONSE: We are unaware of additional data sources to estimate time series of territory-level production.

Industrial – Ethanol:

a. Ethanol production for each State was estimated using the EIA SEDS dataset. Do you have any reason to believe that States' information is underrepresented in the SEDS dataset? If so, do you have an alternative, publicly available ethanol production dataset by State?

RESPONSE: The Nebraska Department of Environment and Energy lists Ethanol Facilities Capacity by State and Plant provides a data set that can be used for cross-reference: https://neo.ne.gov/programs/stats/inf/122.htm

b. Data for ethanol production for U.S. territories are limited in the SEDS dataset. Are there resources to help estimate a time series of production data for ethanol production?

RESPONSE: Not applicable to Texas.

Industrial – Petroleum:

a. Petroleum production for each State was estimated using EIA's Petroleum Administration for Defense Districts production and State-level operating capacity datasets. Do you have any reason to believe that States' information is underrepresented in the EIA datasets? If so, do you know of an alternative, publicly available petroleum refining production dataset by State?

RESPONSE: No comments.

b. Do you have any concerns about using operating capacity to estimate petroleum production by State as not a good method? If so, would you suggest an alternative method?

RESPONSE: No comments.

c. Data for petroleum refining for U.S. territories are limited in the EIA dataset. Are there resources to help estimate a time series of territory-level production data for petroleum production?

RESPONSE: Not applicable to Texas.

Industrial – Breweries:

a. Brewery production, and by extension brewery production emissions, for each State was estimated using the Alcohol and Tobacco Tax and Trade Bureau (TTB) taxable production dataset.

· The TTB dataset is based on taxable production/volume. Is there any reason why taxable production from breweries may be underrepresented by State and therefore potentially underrepresent total emissions? If so, do you know of an alternative dataset or assumption?

· The TTB dataset provides production data from 2008 to the present. The 2008 values were used as a proxy for 1990–2007 values. Is there reason to believe States' brewery production has significantly changed over that time period? If so, do you have an alternative, publicly available State-level brewery production dataset (i.e., barrels produced), or suggestions for alternative data to use as a proxy?

RESPONSE: For Area Source, the methodology used above seems sound and we are unaware of other proxy, datasets, or assumptions.

b. Data for brewery production for U.S. territories are limited in the TTB dataset. Are there resources to help estimate a time series of territory-level production data for brewery production (i.e., barrels produced)?

RESPONSE: Not applicable to Texas.

3.9 Virginia Department of Environmental Quality (DEQ)

REVIEW

of

Draft Inventory of U.S. Emissions and Sinks by State: 1990-2019

Prepared by EPA for Virginia

EPA is planning to publish a new annual complementary product to the U.S. Environmental Protection Agency's (EPA) annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (hereafter national *Inventory*), titled the *Inventory of U.S. Emissions and Sinks by State.* In preparation for this, EPA has circulated a draft inventory for 1990-2019, disaggregated to different states seeking a review on the draft applicable to the respective states.

The review provided in this document is applicable to the state of Virginia. The review has been oriented, primarily, to compare the emissions, being estimated annually for the last 30 years (a bottoms up approach) with that derived for the state on the basis of National Inventory (a top down approach). Based on the review results, any inconsistency that is observed in the process is addressed.

In Virginia, it is not mandatory to maintain annual GHG inventory. A onetime GHG inventory was prepared to assist a Committee set up by the Governor in 2001. From then on GHG inventory is being compiled annually with in Virginia DEQ. For this purpose, State Inventory Tool (SIT), sponsored by EPA and encouraged for use by the states has been the basis, by augmenting additional input data as available for the purpose. The latest annual inventory till 2019 is built on the results of EPA's GHGRP program to the extent available and further expanded to cover other sources using SIT. The reasons for using GHGRP reports in the development of the inventory are:

(1) The process of estimation of emissions for submission is more detailed, specific to source, and therefore, considered to be more accurate than using generalized emission factors;

(2) Source reports are scrutinized by EPA and validated before publicized;

(3) GHGRP sources account for more than 90 percent of emissions from power industry, & more than 50 percent of emissions from industry of all Virginia emissions; and

(4) GHGRP program that is 10 years old is likely to encompass more sources in future.

The disaggregated state level draft inventory has three versions, covering all the emissions attributable to the state and one version accounting for sinks. Version 3, in which the emissions are classified on the basis of economic sectors is used in this review, as translating state inventory to the draft for line item comparison is found to be convenient. There are 19 line items in the draft inventory, accounting for a small proportion of the total emissions (less than 5%) that are not identifiable in the state inventory. For comparison to be on same level, these unique 19 line items are also included appropriately to be a part of the state inventory. Only Version 4 deals with Sinks for which no state comparison is made and disaggregated data only is considered for the purpose of this review.

1.0 Summary Emissions: A spreadsheet associated with this report, provides a line-by-line comparison of disaggregated emissions with the corresponding values in the state inventory. For many line items, there are more than one value flowing from state compilations, between the one based on SIT default and the other based on GHGRP reports for 2010 to 2019. Emissions on the basis of GHGRP reported values are backtracked for earlier years on the basis of corresponding annual throughput values generated from the departmental emissions database (CEDS).

Figure 1 and Figure 2 show a comparison of gross and net emissions for the state between the disaggregated national and the state values. Net emissions are based on the sink data from the draft.

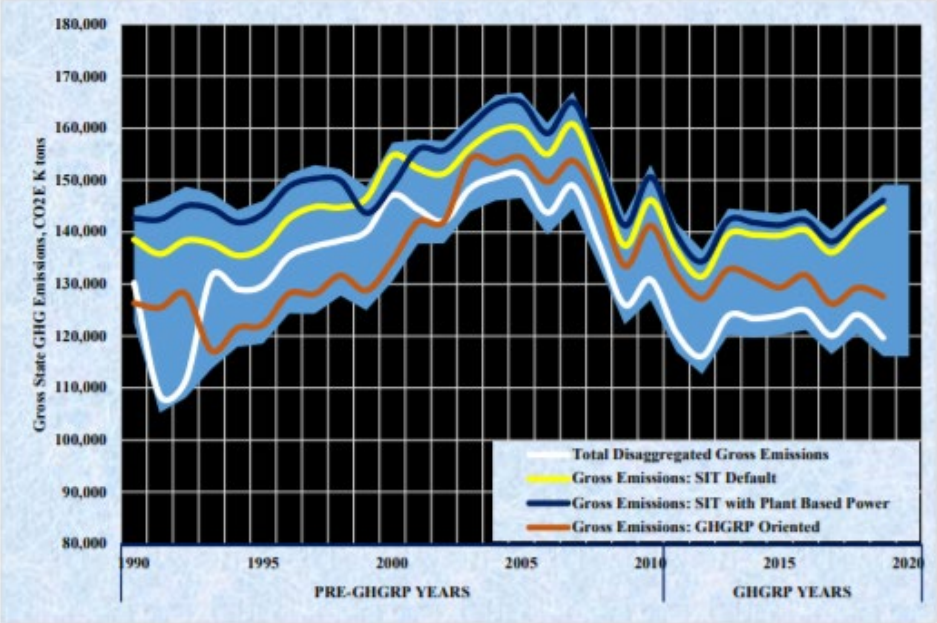

Figure 1: Gross State Emissions Comparison

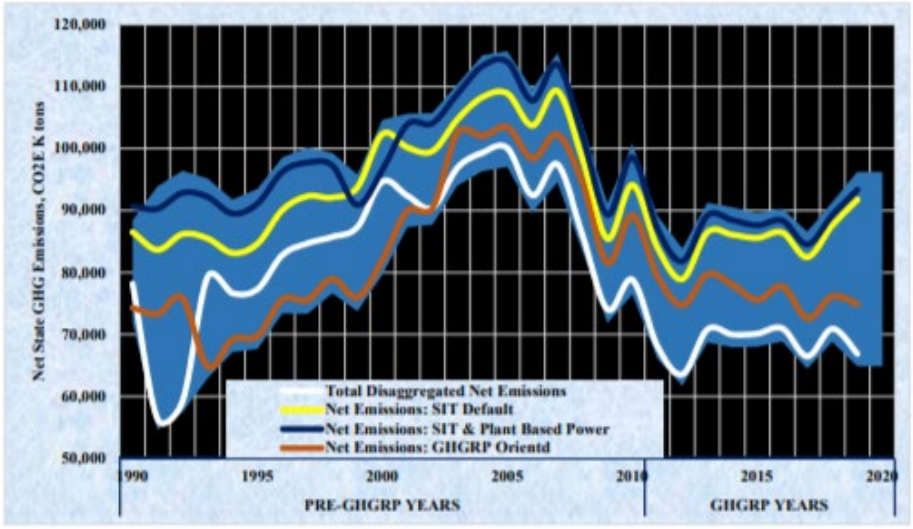

Figure 2: Net State Emissions Comparison

Above charts primarily indicate, that emissions disaggregated on the basis of National Inventory (White Line) are the least in recent times compared to values reckoned by the state, while the trends are very similar. State emissions computed for the purpose, has three scenarios:

(1) SIT Default – As it results from all the modules contained in SIT and energy input values derived from State Energy Data System (SEDS);

(2) All as in item (1), except, energy input data for power generation derived from the operating data of individual plants that feed the national grid, obtained from the Electricity Section, other wing of the Energy Information Administration (EIA), of the Department of the Energy (DOE). If the inventory has to reckon impact of every kwh of power that goes to national grid, this is closer in contrast to SEDS that only take coal, oil, natural gas & biomass into account; and

(3) Oriented to GHGRP reports based on actual values for 2010 to 2011 (mostly from 2011) projected to earlier years on the basis of their performance linked to throughput values of inputs contributing GHG.

In the above assessment, computed state emissions for Agriculture and Residential Sectors are only SIT based. Whereas, Commercial Sector has a GHGRP component, since the draft includes emissions from municipal landfills.

Net emissions are lower to the extent discounted by sinks attributed to the state in the draft.

Disparities observed in emissions between different approaches, sector wise, are further addressed in the following pages.

2.0 Transportation:

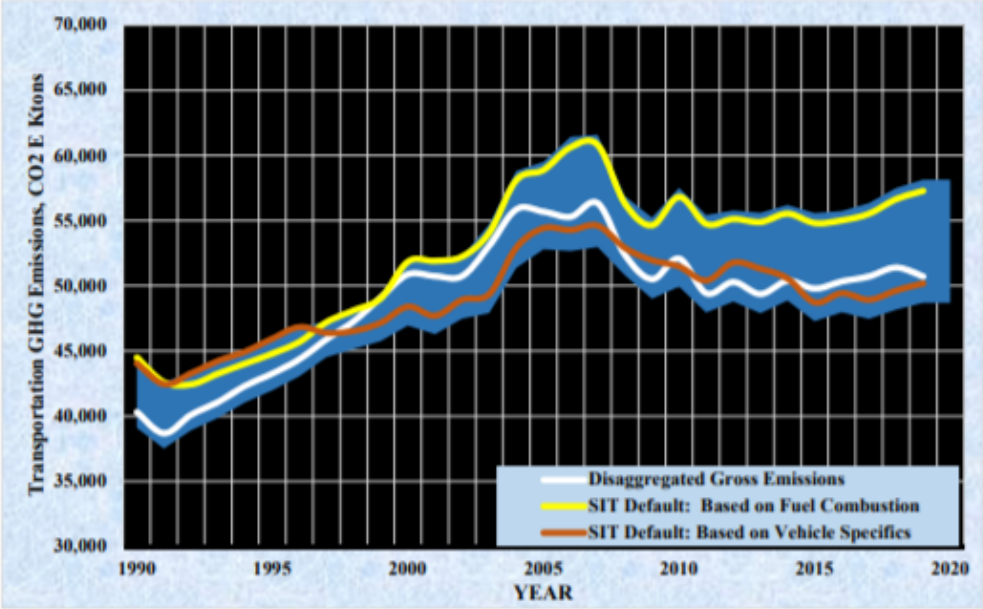

Figure 2.3: Comparison of Gross Emissions from Transportation

Figure 2.3 shows a comparison of gross emissions from Transportation between the disaggregated and the state computed values resulting from SIT. SIT provides two alternatives:

(1) CO2 emissions are computed on the basis of carbon contained in the fuels used with the minor components of CH4 & N2O on the basis of vehicle miles travelled (VMT) and a variety of vehicle specifics; and

(2) CO2 emissions computed on the basis of VMT along with minor components as above.

As can be seen from the Figure 2.1, alternative (2) above provides greater consistency & convergence with the disaggregated values than that relates fuel combustion for CO2.

Steady decline in the emissions in recent years, is attributable to both improved fuel efficiency of miles per gallon as well as relative changes in the proportion of greenhouse gases in the total emissions as supported by Figure 2.4.

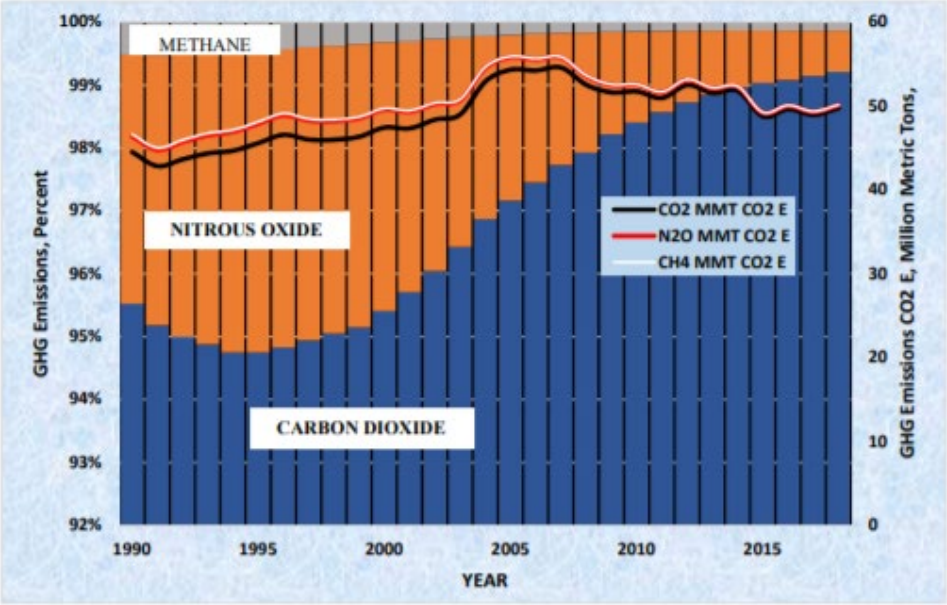

Figure 2.4: Trend in the Distribution of GHG Components in Transportation Emissions

Response to charges to states in this context: SIT based approach to assess CO2 emissions also indirectly on the basis of VMT and other changing vehicle specifics than to depend only on the combustion of fuel consumed by the sector, appears a better approach.

3.0 Power Industry: Figure 3.5 shows a comparison between disaggregated emissions & computed state emissions. Different scenarios considered for computations are:

(1) SIT Default (Fuel data based on SEDS);

(2) SIT Default with fuel data based on individual plant performance (Based on EIA Database)

(3) Oriented to GHGRP Reports (for 2010 to 2019 with extrapolation based on appropriate throughput data based on Departmental database that feeds NEI) and

(4) Based on power consumption based on SIT evaluation (perhaps outside the scope of reference).

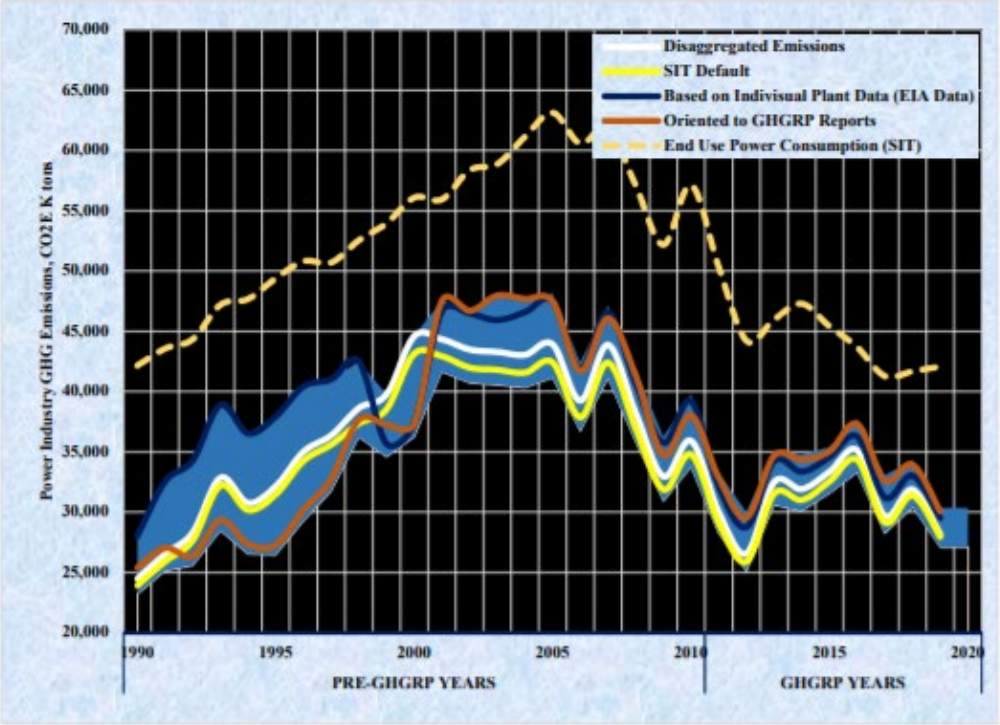

Figure 3.5: Comparison of Gross GHG Emissions from Power Industry

From Figure 3.5 it is observed, besides similarity in trends irrespective of method for computing emissions, the spread converges specially in recent years supporting near consistency. However, GHGRP report oriented data, the highest of all the assessments is slightly higher than disaggregated values. It may be pointed out that total emissions reported by GHGRP between 2010 & 2019 account for above 90 percent of all emissions from power industry in the state.

Emissions based on actual consumption of total power in the state based on sales resulting from provisions available in SIT Module is also compared in the same figure. The estimated emissions are far above that attributed to generation within the state since the Virginia imports significant amount of power from across the state, as is the case for many other states. If at all there is any need for state specific GHG inventory, it is more to serve as an awareness of the load on the state. Regional emissions cannot be related to climate change. It is also interesting to be aware that indirect CO2 emissions based on consumption gives the lowest emissions for all the power consumed in the state because it is difficult to attribute specifically emissions for each kwh of power imported. This is shown in Figure 3.6.

Accurate assessment of GHG emissions will also be useful in some economic programs like Regional Greenhouse Gas Initiative (RGGI), that Virginia along with many other states are participating.

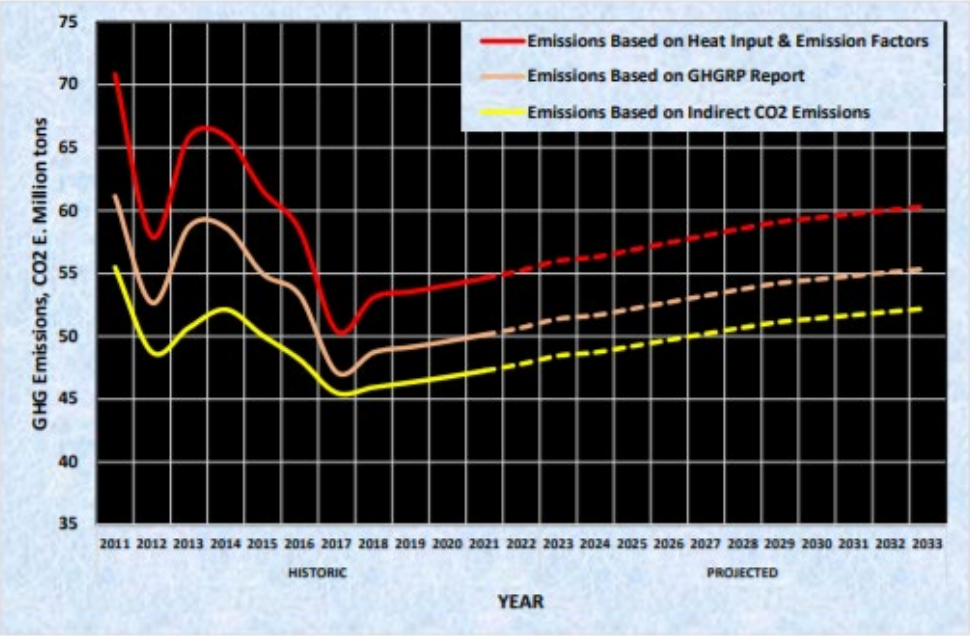

Figure 3.6: Estimated emissions for Total Power Usage in Virginia

4.0 Industry: Figure 4.7 shows a comparison of emissions between disaggregated and state level computed values.

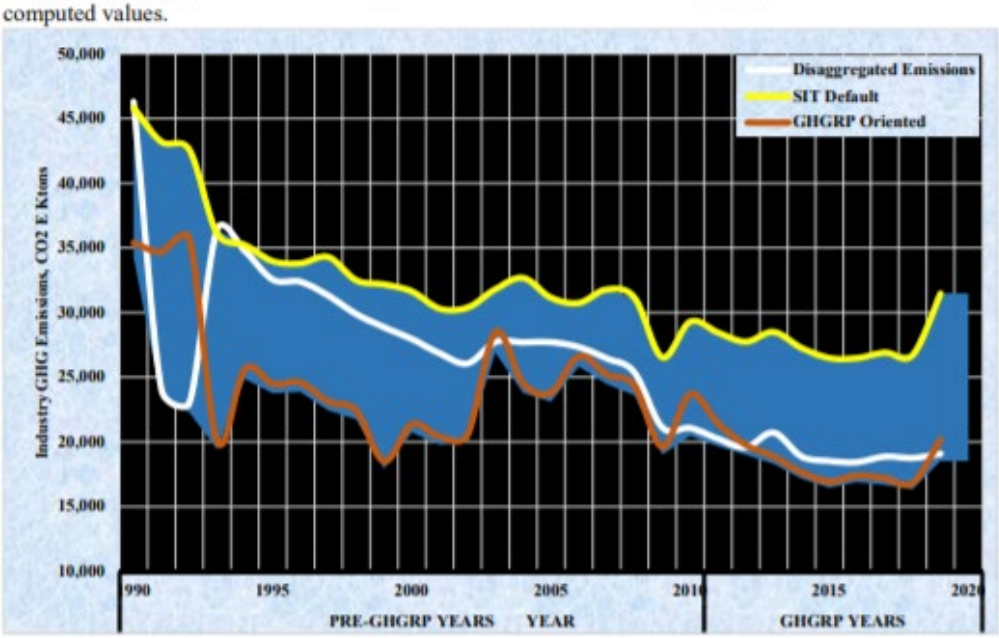

Figure 4.7: Comparison of Gross Industries Emission

Different scenarios considered are:

(1) SIT Default; and

(2) GHGRP Oriented.

GHGRP emissions for fossil fuel combustion are arrived at on the basis of 2010 to 2019 reported emissions for all the 44 sources, with their emissions assessed for other years based on the corresponding annual fuel throughput from the Departmental Point Sources database. Similar estimations are made for all other point sources not covered by GHGRP.

There is a good convergence between disaggregated values & values oriented to GHGRP reports.

5.0 Agriculture: Figure 5.1 shows the comparison of emissions from Agriculture Sector between disaggregated values and that derived from SIT.

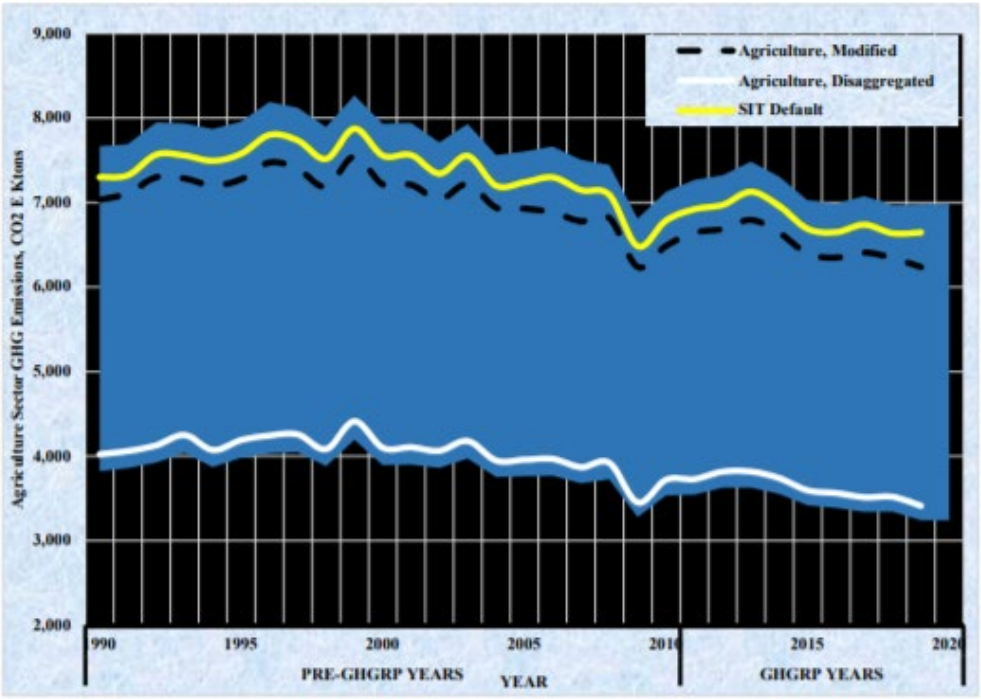

Figure 5.8: Comparison of Emissions for Agriculture Sector

Apparently, emissions derived from SIT appears to be far apart from what is given in the draft, as the values for agriculture soil management are yet to be populated. If values from that source is assumed as that obtained from SIT, there is consistency between two sets as represented by black dotted line.

6.0 Commercial Sector: Figure 6.9 shows comparison for emissions between disaggregated values & state estimation involving

(1) SIT Default; and

(2) GHGRP Oriented.

Only difference between SIT & GHGRP oriented is that due to emissions from municipal solid wastes. A large number of solid waste facilities reporting to GHGRP makes a difference. This is the only sector, showing significant divergence in recent years between disaggregated & state emissions.

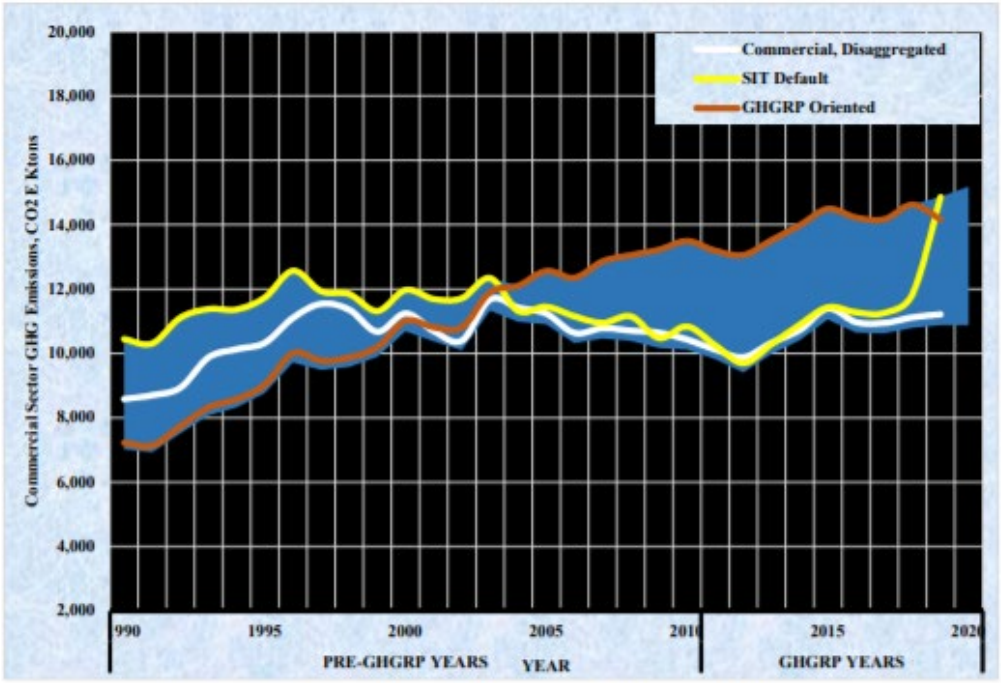

Figure 6.9: Comparison of Emissions for Commercial Sector

7.0 Residential Sector: Figure 7.10 show the comparison of emissions between disaggregated values and that obtained from SIT. Emissions from two sets are consistent and almost identical.

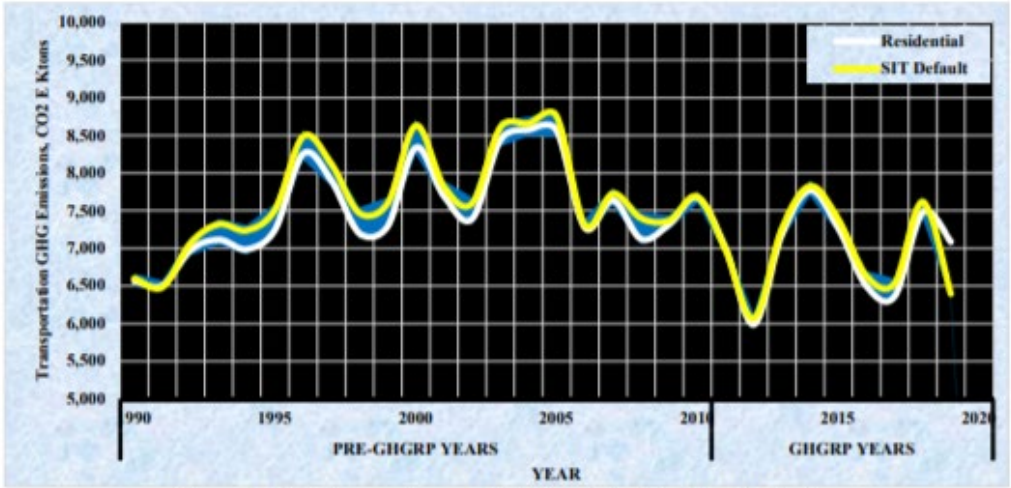

Figure 7.10: Comparison of Emissions for Residential Sector

8.0 Review Conclusions: On the basis of individual sectoral analysis, difference between the disaggregated individual sectoral emissions & gross values from the state is computed.

Gross as well as the sectoral emissions in the draft inventory disaggregated from National Inventory being the least compared to any state values, and mindful of the statement,

"Differences in the accounting decisions do not necessarily indicate that one of the estimates is accurate, or "correct", but it will make comparability more difficult",

The extent of disparity in emissions is evaluated by the difference between the draft report and the least of the corresponding state computed value.

Figure 8.11 shows the results of the evaluation. There are only two points beyond ±10 percent error in recent years, after 2005. White line represents gross emissions.

Disaggregated values indicated in the draft report being reviewed are consistent with state emissions obtained from SIT and/or GHGRP oriented methods with ±10% accuracy. More accurate values for emissions for Transportation are obtained based on VMT travelled & vehicle specifics, obtainable with the use of SIT Module.

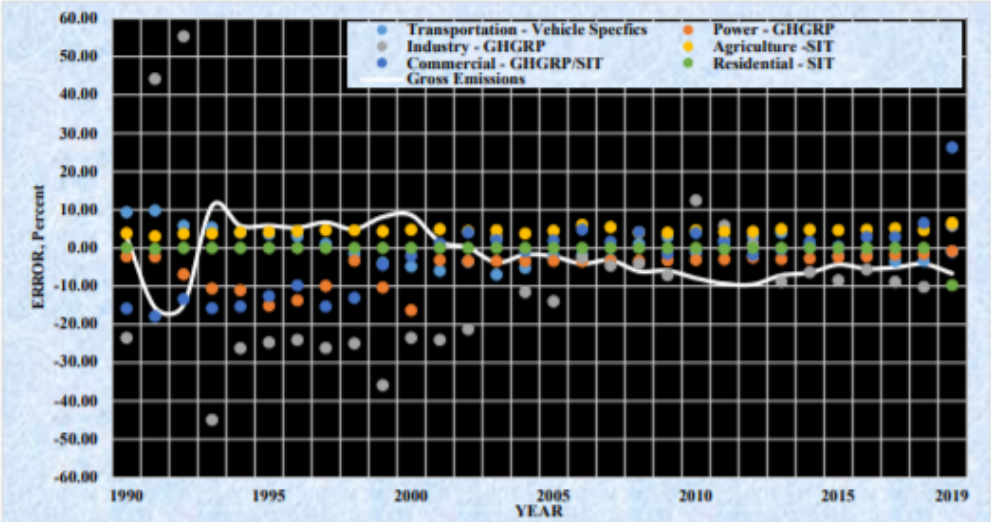

Figure 8.11: Computation of Consistency of Disaggregated Emissions with State Values

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Point Source Inventory Specialist
Air Data Analysis
Virginia Department of Environmental Quality
Richmond VA

4. Independent Organization Responses

4.1 U.S. Climate Alliance on Behalf of Alliance Member States

MEMO

To: U.S. Environmental Protection Agency, GHGInventory@epa.gov
From: U.S. Climate Alliance Secretariat
Date: November 5, 2021
Subject: Charge to State GHG Inventory Experts for the Draft Methodology Report: Inventory of U.S Greenhouse Emissions and Sinks by State

Context

The U.S. Climate Alliance is a bipartisan coalition of two dozen U.S. governors collaborating to address the climate crisis. Through its Emissions Working Group, Alliance states work with one another to identify and overcome challenges towards regularly measuring and publicly reporting progress towards their own climate goals.

On September 17, 2021, the U.S. Environmental Protection Agency requested feedback on its Draft Methodology Report: Inventory of U.S Greenhouse Emissions and Sinks by State. The below set of comments, intended to inform the final methodology report and future data updates, were developed in consultation with Member States and do not represent an official U.S. Climate Alliance position. Some Climate Alliance states raised concerns related to the timing, purpose, and the accuracy of data relied upon in the Draft Methodology Report. Therefore, we request EPA address the following prior to public release:

Ensure data consistency across federal data sources and tools

- State-level data should match with other federal sources, including EPA's State Inventory Tool (SIT), National Emissions Inventory, and Greenhouse Gas Reporting Program, and the Energy Information Administration's State Energy Data System. EPA should also confirm that they have not omitted industrial process emissions erroneously for some of the states as initial review suggests that there is an inconsistency between this assessment and the list of facilities that have been reporting to the GHGRP.
- Because many states rely on SIT as the starting point for their own official GHG inventories, having SIT match EPA's state inventory data would allow states to see the input data and make adjustments based on their own methodologies and data sources as relevant. Having two conflicting data sets from EPA can cause confusion and would require states to then have to justify why they are using one over another.
- Where EPA's final state inventory data are unable to be consistent with other federal data sources, EPA's methodology document needs to clearly identify and discuss the specific differences for each state.
-
- ***Emphasize important caveats***

- For states that develop their own inventory, EPA should highlight these individual state GHG inventories as the preferred source of state-specific GHG emissions.
- For states that do not develop their own inventory, this downscaled data can be a useful source of broad trends and major GHG emissions source identification. However, an important benefit of a bottom-up inventory is being able to track whether policies are working or not. There is concern that, in some cases, EPA state inventory estimates will not be able to reflect targeted state policy and therefore should not be used in that manner. EPA should make sure to include appropriate caveats and disclaimers that speak to this point and make it clear that state inventories take priority for policymaking and tracking. EPA should consider undertaking a more thorough review with outside reviewers as well as ensuring that there is sufficient information provided that states are able to repeat EPA's analysis.
- EPA is preparing to publish 2019 state GHG inventory data; however, due to the timing and availability of different data sources (including updates to EPA's SIT), many official state inventories will lag. To avoid confusion and potential conflicts with official state inventories, EPA should make it very clear why it is able to provide more recent estimates than states.
- EPA should consider adding uncertainty ranges for all source categories for at least the current year and common baseline years like 1990 and 2005, which would allow states to compare uncertainty to their own inventory data.

Align publication of the EPA's final inventory data with EPA's SIT

- Because many Alliance states rely on EPA's SIT as the basis for their own state-specific GHG inventory, EPA should consider releasing its downscaled inventory data only after EPA's SIT is released for the same data year.
- Understanding that it is EPA's intention to reflect the downscaled state data in the next iteration of SIT, EPA should consider providing a detailed description and quantification of all data updates to help states describe potential differences in previous GHG inventories. EPA should also be available for direct consultation with states.
- EPA should consider thoroughly explaining any remaining differences in methodologies between the final state inventory data and the SIT in addition to identifying all source categories that do not align yet

Sector-specific notes:

- **Aviation.** Due to the cross-boundary and allocation issues with aviation, EPA should consider adding additional caveats explaining the lack of a standardized allocation methodology . As a source category many Alliance states are actively working to improve, Alliance states would welcome continued discussion on this topic.
- **MSW landfill calculations**. It appears that the oxidation was removed after recovery for years 1990-2004 (flat 10%). For years 2005-2019, the oxidation was removed before the recovery (flat 19.5%) which implies that oxidation may be overestimated for years 2005-2019 (Section 6.1.1 in draft methodology report, with the data in Appendix F). EPA should clarify if oxidation is removed after recovery or why the oxidation appears to be removed after recovery for one period and before recover for another period.

- **Agriculture & Land Use, Land Use Change, and Forestry (LULUCF).** EPA should ensure that for (1) Agricultural Soil Management and Croplands and Grasslands, states are given an appropriate amount of time to review disaggregated data once it is released and (2) Wetlands and Livestock Emissions, states are given the opportunity to contribute state-level data with the opportunity to review disaggregated data and amended methodologies once state input and data has been incorporated.