Data Appendices

Response to the Carbon Border Adjustment Mechanism Request for Information
Submitted by: Climate Leadership Council
September 1, 2026

The Council offers data pulled from the U.S. carbon advantage research. Subsets of this data have previously been published in *America's Carbon Advantage 2025* (see Appendix 4 for source information and Appendix 5 for the full text of Council reports). The appendices include a modestly more comprehensive assembly demonstrating key statistics on sectoral and energy-related emissions intensity, energy efficiency, and energy consumption. We offer data for the U.S., China, and the EU[1] (the three largest trading economies globally), as well as Canada and Mexico (two of the largest U.S. trading partners). The Council's dataset includes 41 additional countries. A final appendix lists the major resources that NETL should be aware of in the emissions intensity literature.

Contents

[1] The EU figures include data for 22 of the 27 EU Member States. The current update does not include Bulgaria, Croatia, Cyprus, Malta, and Romania.

Appendix 1. America's Carbon Efficiency Advantage by Industrial Sector

The Climate Leadership Council has determined the relative emissions intensity of production for the U.S. and other countries using data inputs from the OECD's Inter-Country Input-Output Tables, World Bank economic data, and International Energy Agency energy system data. Using a Leontief inverse matrix, the Council determined sectoral-level emissions intensities for the U.S. and major trading partners. The emissions intensity of each U.S. sector is indexed to 1.0 for ease of comparison. Figures above 1.0 (red) indicate sectors that are more emissions intensive than those in the United States; figures below 1.0 (blue) indicate sectors that are less emissions intensive than those in the United States.

Figure A1 – America's carbon efficiency advantage by industrial sector v. major trading partners (U.S. = 1.0, 2019 data)

	U.S.	China	EU	Canada	Mexico	World
Mining and quarrying, energy producing products	1.0	1.9	1.5	2.2	1.0	1.2
Mining and quarrying, non-energy producing products	1.0	3.8	1.3	1.2	1.2	2.2
Mining support service activities	1.0	5.7	3.1	2.9	1.8	3.4
Wood and products of wood and cork	1.0	1.6	0.9	2.1	1.8	1.4
Paper products and printing	1.0	2.2	1.0	4.2	1.0	1.7
Coke and refined petroleum products	1.0	1.5	1.1	1.6	0.9	1.2
Chemical and chemical products	1.0	2.4	0.9	1.5	1.0	1.8
Pharmaceuticals, medicinal chemical and botanical products	1.0	6.6	2.0	3.1	8.5	3.7
Rubber and plastics products	1.0	2.7	1.0	1.2	1.5	1.9
Other non-metallic mineral products	1.0	2.1	1.3	1.2	0.9	2.0
Basic metals	1.0	2.7	1.2	1.3	1.3	2.3
Fabricated metal products	1.0	4.0	1.0	1.2	1.9	2.4
Computer, electronic and optical equipment	1.0	7.1	2.7	2.6	4.4	5.3
Electrical equipment	1.0	3.8	1.2	1.4	1.9	2.8
Machinery and equipment, nec	1.0	3.7	1.0	1.2	1.5	2.4
Motor vehicles, trailers, and semi-trailers	1.0	2.6	1.0	1.1	1.4	1.7
Other transport equipment	1.0	5.3	1.3	1.3	2.0	2.7
Other manufacturing	1.0	2.6	0.7	1.3	1.4	1.6
Economy-Wide	**1.0**	**3.6**	**1.0**	**1.5**	**1.7**	**2.2**

Source: Climate Leadership Council

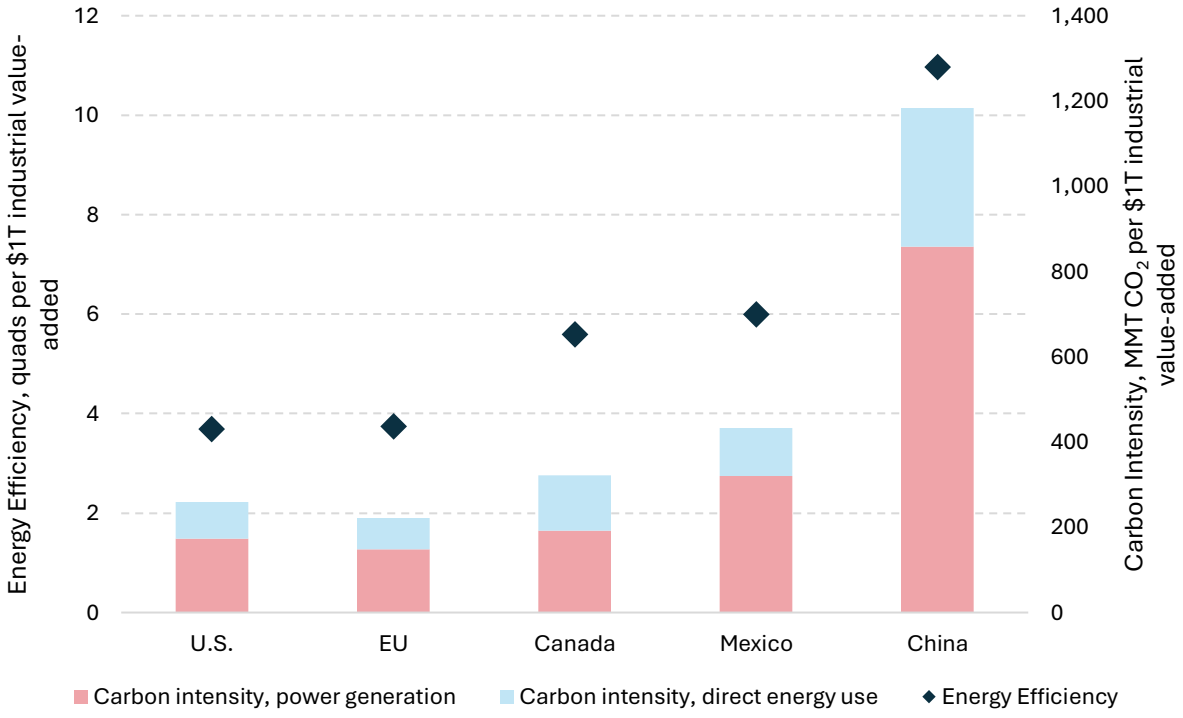
Appendix 2. Relative Energy Consumption and Emissions Intensity

Three factors tend to shape the relative carbon intensity of industrial sectors: energy efficiency (energy inputs to production relative to value of industrial output), the carbon intensity of direct industrial energy use (e.g., natural gas process heat), and the carbon intensity of purchased electricity from the electric grid. Figure A2 contains data for the U.S., China, the EU,[2] Canada, and Mexico. It relies on data from the World Bank and the International Energy Agency (see Appendix 4 for sources).

Key Data:

- **Energy efficiency:** units of energy input relative to output expressed in quadrillions Btu (quads) per trillion dollars of industrial value-added
- **Carbon intensity, power generation:** CO_2 emissions (in million metric tons, MMT) from purchased power per trillion dollars of industrial value-added
- **Carbon intensity, direct energy use:** CO_2 emissions (in million metric tons, MMT) from direct energy use per trillion dollars of industrial value-added

Figure A2 – Energy efficiency, carbon intensity of onsite energy use, and carbon intensity of purchased power



Source: IEA, World Bank, BLS, and author calculations

[2] The EU figures include data for 22 of the 27 EU Member States. The current update does not include Bulgaria, Croatia, Cyprus, Malta, and Romania.

Appendix 3. Primary Energy Inputs to Industry for Major Economies

One factor underpinning the U.S. carbon advantage is the relatively low-emissions suite of energy resources fueling American industry both in onsite direct energy use and electricity supply. These charts lay out the chronology of energy consumption for the U.S. and its four largest trading partners by value. Several trends relevant to evaluating the emissions intensity of a country's industrial sector and manufacturing capacity are evident.

First, the U.S. (Figure A3) has decreased the primary energy inputs into its industrial sector while increasing the level of industrial value-added, a measure of economic output, between 2000 and 2022. This reflects the growing efficiency of industrial operations, as reflected in Figure A2. The shift away from coal and petroleum over the same period and toward an energy mix heavier in natural gas, nuclear, and renewables ensured that the emissions profile of consumed energy declined considerably.

The EU (Figure A5) and Canada (Figure A6) demonstrate similar trends. Both markets reduced primary energy inputs and reduced the emissions intensity of their primary fuel mix while experiencing growth in the industrial sector.

The U.S., EU, and Canada have successfully decoupled industrial sector growth from emissions growth, and all three economies are experiencing declines in the emissions intensity of production. The U.S. is declining in emissions intensity the most quickly of these trading partners.

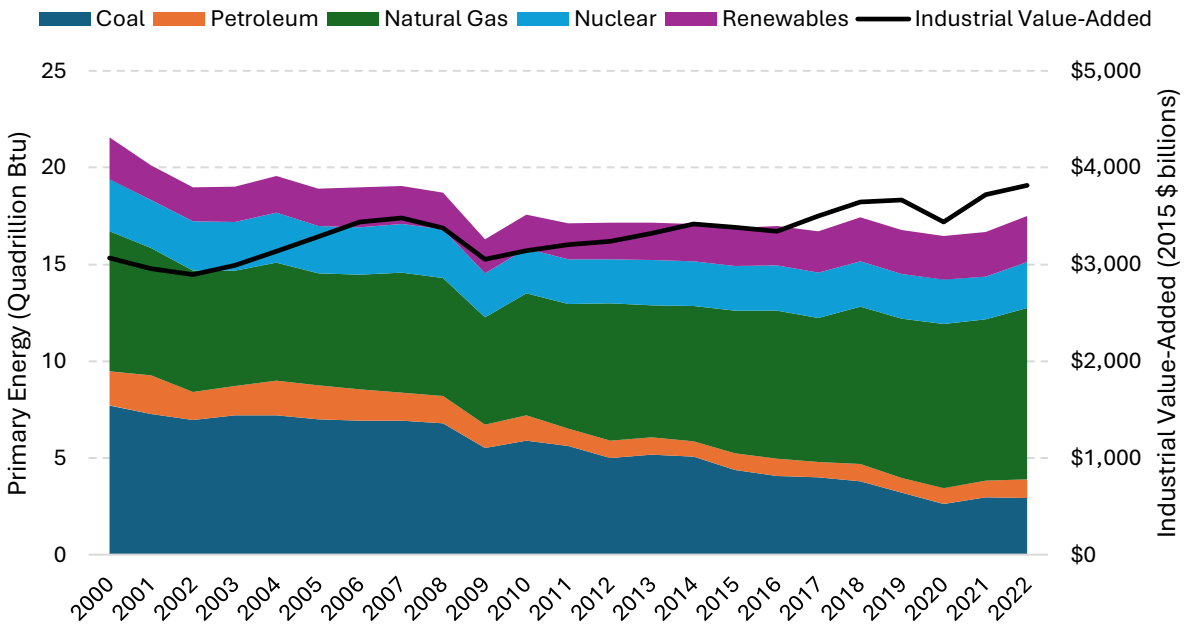
China's (Figure A4) behavior is distinct among the largest U.S. trading partners. As its industrial sector grew dramatically through 2022, so did primary energy consumption. In recent years, large amounts of renewable, nuclear, and natural gas energy have come online, but coal, at 72% of the energy mix, remains the dominant source. These factors contribute to high emissions intensity across the Chinese industrial sector.

Mexico (Figure A7) shares characteristics with China and with the U.S., EU, and Canada. Energy consumption "tracks" industrial value-added, suggesting that, like China, the energy efficiency of the industrial sector has remained relatively stable. The energy mix is increasingly characterized by natural gas, nuclear, and renewables. Emissions-intensive coal consumption has remained low since 2000.

These industrial sector-wide trends provide context for the more granular analysis envisioned in the NETL study.

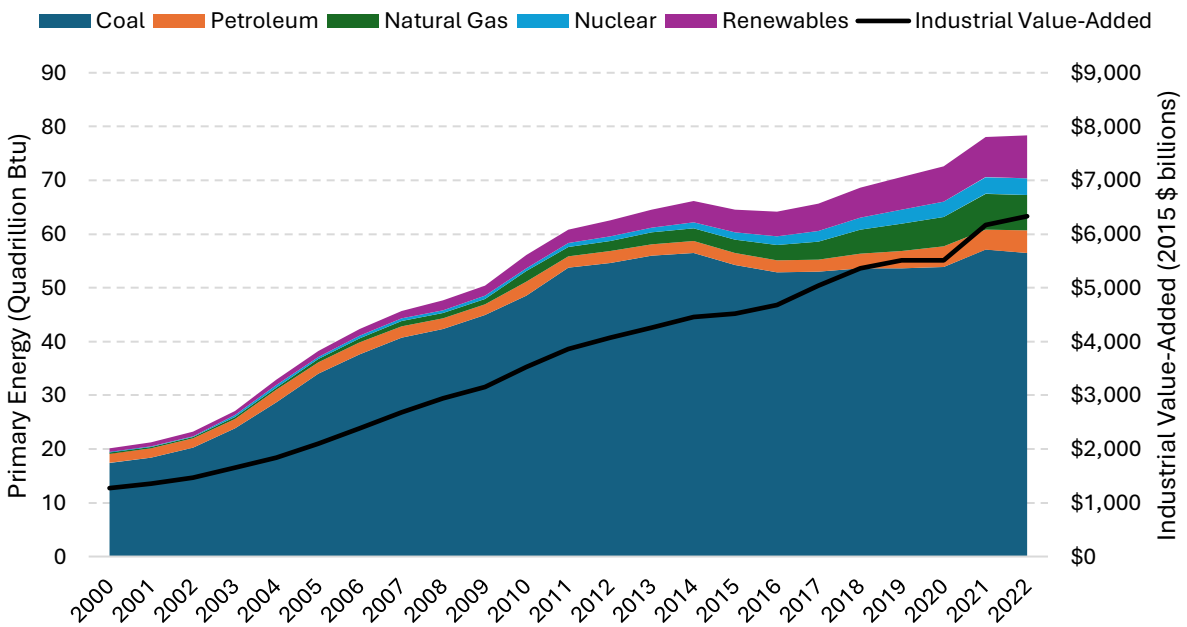
Figures A3-A7 – Primary energy inputs to global industrial sectors and industrial value-added, 2000-2022 (quadrillion Btu)

Figure A3 – United States



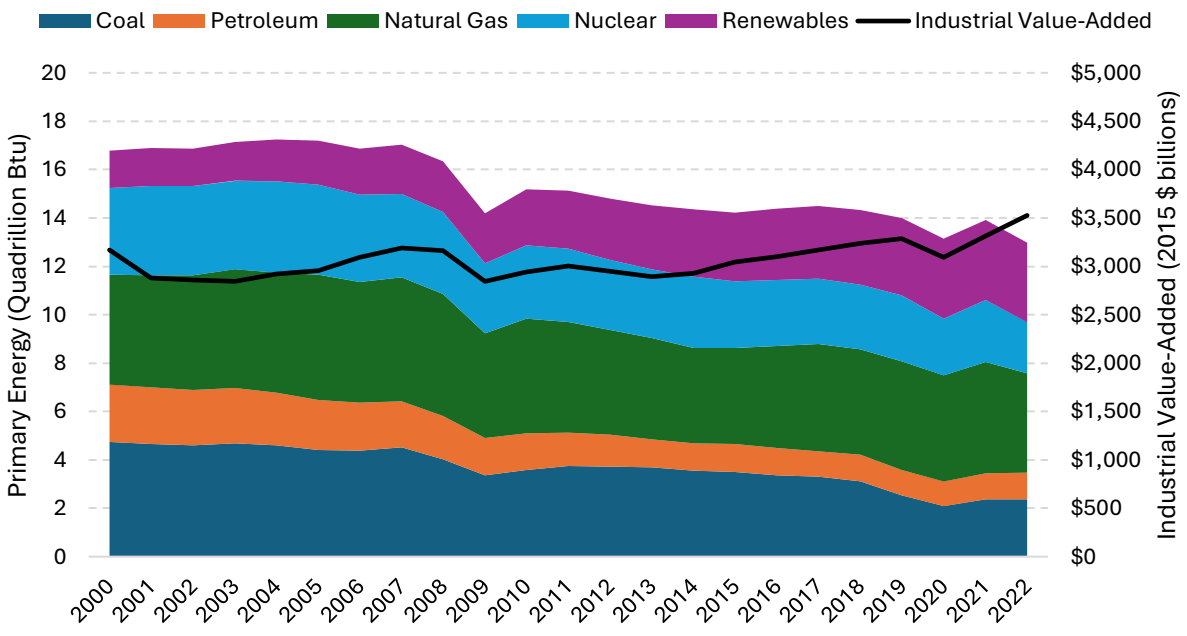
Source: IEA, World Bank, and author calculations

Figure A4 – China



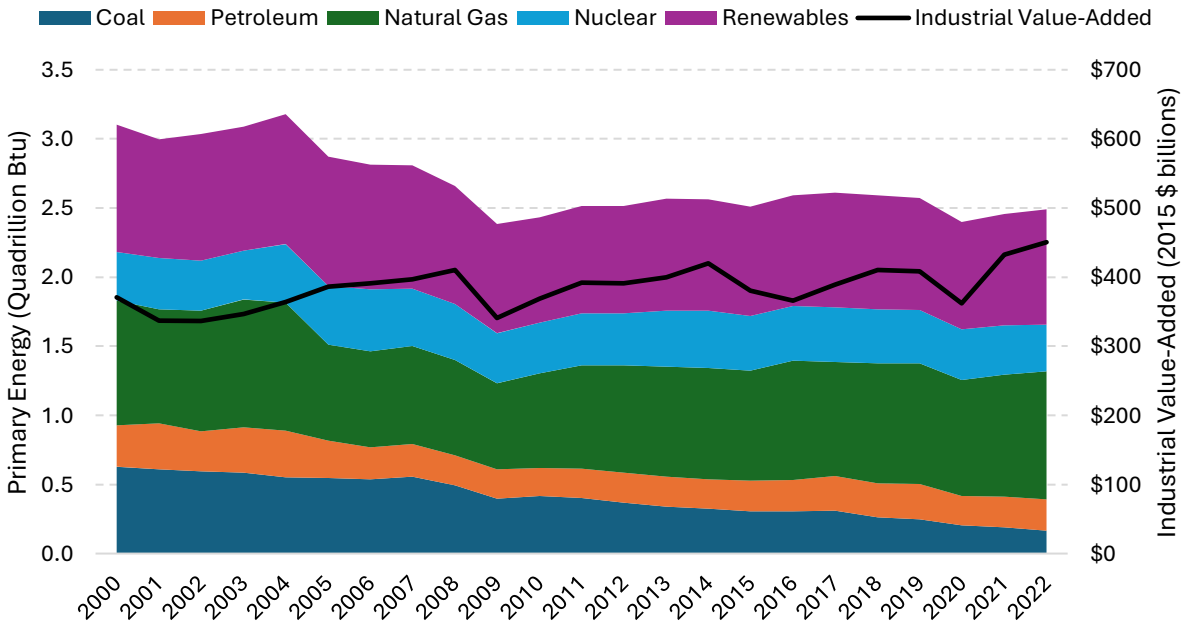
Source: IEA, World Bank, and author calculations

Figure A5 – European Union[3]



Source: IEA, World Bank, and author calculations

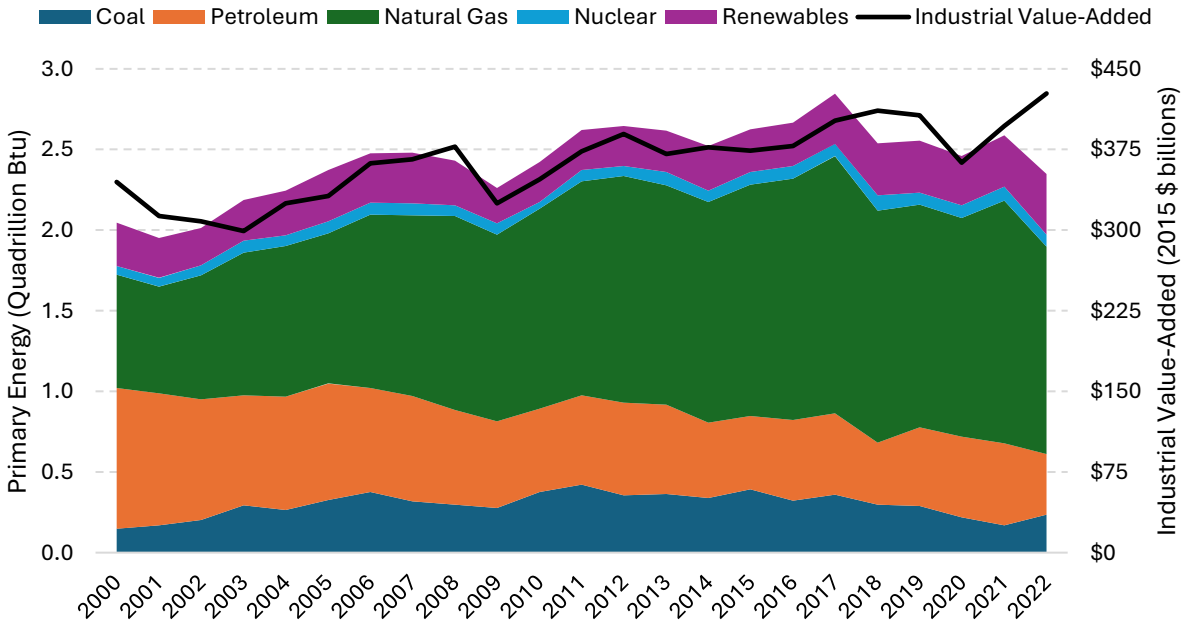
Figure A6 – Canada



Source: IEA, World Bank, and author calculations

[3] Does not include Bulgaria, Croatia, Cyprus, Malta, and Romania

Figure A7 – Mexico



Source: IEA, World Bank, and author calculations

Appendix 4. Key Resources

The following resources reflect important pieces in the emissions intensity literature and source material.

Emissions Intensity Analysis, Reports

1. Catrina Rorke, Scott Nystrom, and Daniel Hoenig, *America's Carbon Advantage 2025*, Climate Leadership Council (March 2025), https://clcouncil.org/wp-content/uploads/2025/06/2025-Carbon-Advantage_report-1.pdf
2. U.S. International Trade Commission, *Greenhouse Gas Emissions Intensities of the U.S. Steel and Aluminum Industries at the Product Level* (February 2025) https://www.usitc.gov/publications/332/pub5584_0.pdf
3. Danko Vidovic, Alain Marmier, Lovro Zore, Jose A. Moya, *Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners*, Joint Research Centre (2023), https://publications.jrc.ec.europa.eu/repository/handle/JRC134682

Emissions Intensity Analysis, Data Sets

4. Organization for Economic Cooperation and Development (OECD), "Greenhouse Gas Footprints (GHGFP) 2025 edition: Emissions embodied in production by scope" (April 29, 2026), https://tinyurl.com/59nhhy7u
5. OECD, "Greenhouse Gas Footprints (GHGFP) 2025 edition: Emissions embodied in bilateral trade" (April 29, 2026), https://tinyurl.com/yj8spebc

International Economic and Energy Statistics, Data Sets

6. International Energy Agency, "World Energy Balances" (April 2026), https://www.iea.org/data-and-statistics/data-product/world-energy-balances
7. OECD, "Inter-Country Input-Output Tables" (January 2026), https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html
8. World Bank, "Industry (including construction), value added (% of GDP)," https://data.worldbank.org/indicator/NV.IND.TOTL.ZS

Appendix 5. Council Publications

The Council has built a library of work studying the relative carbon intensity of manufacturing and available emissions and emissions-intensity data series. We invite NETL to explore the enclosed studies, which offer a survey of approaches relevant to scoping and validating the ongoing emissions intensity analysis.

Carbon Advantage Analysis

1. Catrina Rorke, Scott Nystrom, and Daniel Hoenig, *America's Carbon Advantage 2025*, Climate Leadership Council (March 2025), https://clcouncil.org/wp-content/uploads/2025/06/2025-Carbon-Advantage_report-1.pdf
2. Catrina Rorke and Greg Bertelsen, *America's Carbon Advantage,* Climate Leadership Council (September 2020), https://clcouncil.org/publications/research/americas-carbon-advantage/

Industry-Specific Carbon Intensity Studies

3. Catrina Rorke, *The U.S. Carbon Advantage in Chemicals Manufacturing*, Climate Leadership Council (September 2022), https://clcouncil.org/publications/research/the-u-s-carbon-advantage-in-chemicals-manufacturing/
4. CRU Consulting for the Climate Leadership Council, *Opportunities for US-EU steel trade agreement* (December 2022), https://clcouncil.org/publications/research/opportunities-for-us-eu-steel-trade-agreement/

Critiques of CBAM Methodologies

5. Climate Leadership Council, "UK CBAM Technical Consultation Response" (May 18, 2026), https://clcouncil.org/publications/research/uk-cbam-comments/
6. Climate Leadership Council, "Call for evidence on CBAM emission methodology for the definitive period starting on 1 January 2026" (September 25, 2025), https://clcouncil.org/publications/research/cbam-comments/
7. Matthew C. Porterfield and Daniel Hoenig, *ITC Values as the Basis for CBAM Emissions Intensity Defaults,* Climate Leadership Council (April 2025), https://clcouncil.org/publications/research/itc-values-as-basis-for-cbam-emissions-intensity-defaults/

Emissions Measurement Approaches

8. Matthew C. Porterfield, Daniel Hoenig, and Holly Rooper, *An Approach to Interoperability of U.S. and EU Systems for Determining GHG Emissions Intensity of Steel*, Climate Leadership Council (April 2024), https://clcouncil.org/publications/research/interoperability-carbon-accounting/
9. Daniel Hoenig, "Interoperability: Promoting International Coordination on Determining Carbon Intensity," Climate Leadership Council (May 21, 2024), https://clcouncil.org/publications/blog/interoperability/
10. Climate Leadership Council and ERM, *Counting Carbon: Voluntary and Mandatory Emissions Reporting Programs* (May 2023), https://clcouncil.org/publications/research/counting-carbon/