
Carbon Leakage List - Methodology for the Quantitative Assessment

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1. Introduction Carbon Leakage Indicator

Breakdown CLI:

$$\text{Carbon Leakage Indicator (CLI)} = \text{Trade Intensity (TI)} \times \text{Emission Intensity (EI)}$$

$$\text{TI} = \frac{\text{Imports} + \text{Exports}}{\text{Turnover} + \text{Imports}}$$

$$\text{EI} = \text{Direct Emission Intensity (DEI)} + \text{Indirect Emission Intensity (IEI)}$$

$$\text{DEI} = \frac{\text{Direct Emissions}}{\text{GVA entire sector}}$$

$$\text{IEI} = \frac{\text{Indirect Emissions (IE)}}{\text{GVA entire sector}}$$

$$\text{IE} = \text{Net electricity consumption} \times \text{Emission factor}$$





Trade Intensity



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2a. Trade Intensity - definition

$$TI = \frac{Imports + Exports}{Turnover + Imports}$$

- Definition: Value of imports and exports to non-EU ETS countries in relation to the domestic market (domestic turnover + imports) in the European Economic Area
- Base period 2013-2015
- Scope: Mining & quarrying sector and manufacturing sector
 - 245 subsectors (NACE 4-digit)
- Data published by Eurostat (Comext/PRODCOM and Structural Business Statistics)
- EFTA countries are treated as any other EU country (trade between EU and NO/IS is considered internal trade)



2a. Trade Intensity - data sources

- Data provided by Eurostat in value (Euro) as of December 2017
- Trade data:
 - EU Trade since 1988 by CPA_2008 (EU Member States)
 - EFTA Trade Since 2003 By HS2,4,6 (Norway & Iceland)
- Turnover data:
 - Prodcom Annual Sold production data (Comext database)
 - If no data available, Structural Business Statistics turnover data is used for gapfilling
 - For Norway/Iceland additional gapfilling based on data published by national statistic offices and Eurostat exchange rates as of January 2018

$$TI = \frac{Imports + Exports}{Turnover + Imports}$$





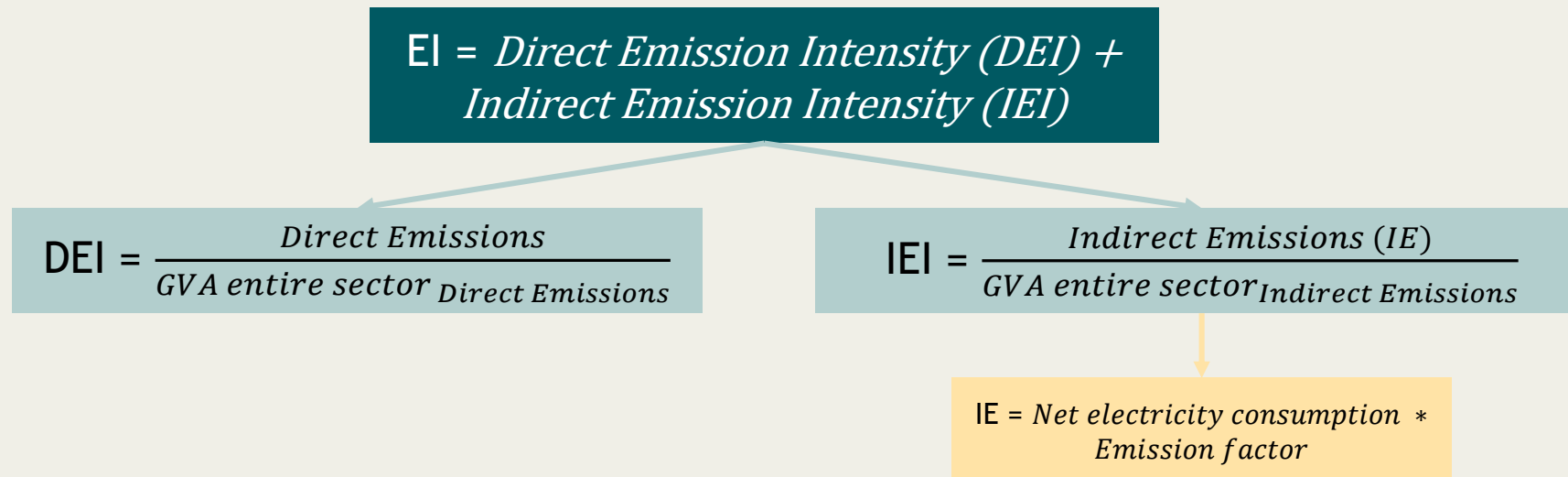
Emission Intensity



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3. Emission Intensity

- **The Emission Intensity:**
Direct and indirect emissions of a sector per Gross Value Added at factor cost (GVA) [kg CO2/€]
- Equals the sum of the Direct Emission Intensity and the Indirect Emission Intensity (caused indirectly by electricity consumption)



3a. Direct Emission Intensity - definition

- Direct emissions are those emitted by each industry as a result of its own production process following the coverage and definitions by the EU ETS directive and guidelines
- Direct emission intensities are calculated by dividing the direct emissions by the sector GVA (in Euro)
- Base period: 2013-2015

$$EI = \text{Direct Emission Intensity (DEI)} + \text{Indirect Emission Intensity (IEI)}$$

$$DEI = \frac{\text{Direct Emissions}}{GVA_{\text{Direct Emissions}}}$$



3a. Direct Emission Intensity - data

- **Direct emissions:**

- Based on emissions recorded in the EUTL (t CO2 equivalent) as of September 2017
- Emissions are attributed to NACE sectors at EUTL installation level, largely based on operator information provided for free allocation (National Implementation Measures - NIMs)
- New entrants were added
- Double check of attribution taking into account EUTL sector, company profiles and industry information

- **GVA:**

- Value added at factor costs stems from the Structural Business Statistics by Eurostat (in Euro) as of December 2017
- Standardized gap filling for missing data points based on information at aggregated level

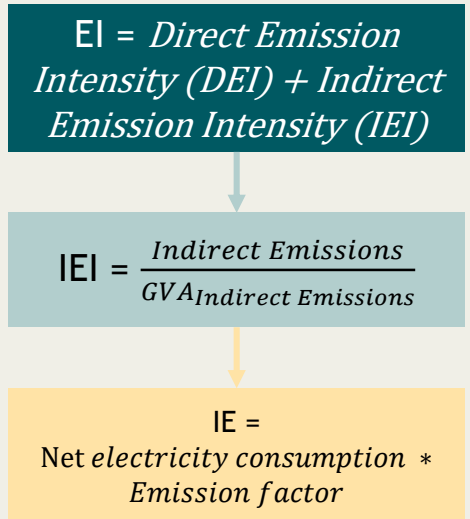
$$EI = \text{Direct Emission Intensity (DEI)} + \text{Indirect Emission Intensity (IEI)}$$

$$DEI = \frac{\text{Direct Emissions}}{GVA_{\text{Direct Emissions}}}$$



3b. Indirect Emission Intensity - data

- Indirect emission intensity measures a sector's average emissions caused by the sector's electricity consumption per € Gross Value Added (GVA)
- Data
 - Net electricity consumption:
 - MS data (MS's statistical agencies)
 - Years: **2013-2015**
 - NACE 4-digit
 - Coverage:
 - **20 Member States** submitted electricity consumption data
 - GVA coverage of these MSs in mining & quarrying and manufacturing sector: **71%** (2015)
 - GVA:
 - Eurostat
 - NACE 4-digit



3b. Indirect Emission Intensity - methodology

- General approach:

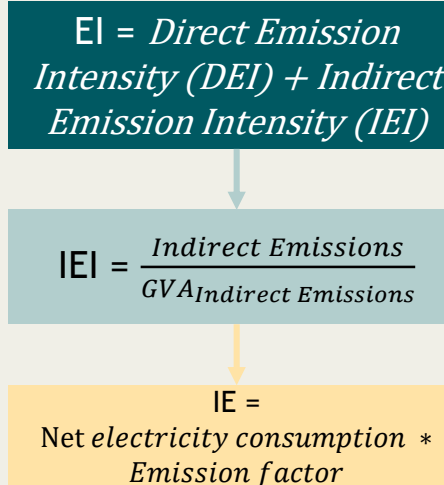
- $IEI = \frac{\text{Net final electricity consumption} \times \text{Emission factor}}{GVA}$
 - Net final electricity consumption and GVA: *Sum of all countries (per sector) which submitted electricity data, average 2013-2015*
 - In words: *The net electricity consumption of MSs that submitted data was summed and divided it by the aggregated GVA of those MSs (per sector)*

- Auto production:

- Net electricity consumption = Electricity Consumption - **Electricity production** → corrected for auto production

- Emission Factor:

- An ETS-region wide Emission Factor is used: 0.376
- Same methodology as in phase 3, base year is 2015



3b. Indirect Emission Intensity - methodology

- Data gaps

- Data can be used if 2 conditions are met:
 1. MS submitted data for specific sector and year;
 2. GVA of corresponding sector, country, year is available in Eurostat.

- GVA gaps filled

- When electricity data available but GVA data not available, gap filling is applied

$$EI = \text{Direct Emission Intensity (DEI)} + \text{Indirect Emission Intensity (IEI)}$$

$$IEI = \frac{\text{Indirect Emissions}}{GVA_{\text{Indirect Emissions}}}$$

$$IE = \text{Net electricity consumption} * \text{Emission factor}$$





Final indicator and quality checks



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4. Final indicator and quality checks

Final indicator:

$$\text{Carbon Leakage Indicator} = \text{Trade Intensity} \times (\text{Direct Emission Intensity} + \text{Indirect Emission Intensity})$$

- Quality checks:

- General check
 - Comparison with previous Carbon Leakage List data (Phase 3)
 - Compared with previous outcome
 - Applied methodology from phase 4 on data from phase 3



4. Final indicator and quality checks

- **Component specific quality checks:**
 - Trade intensity:
 - Calculation of the share of exports in production
 - Sensitivity analysis of sectors with gap filling
 - Direct emission intensity:
 - Double check of sectors with significant fluctuations in emission intensity between years
 - Sensitivity check for sectors with gap filling for specific years
 - Sensitivity check for industrial electricity generators
 - Comparison of data quality changes compared to the phase 3 CL exercise (notably data quality/availability for non-CO2 gases improved).



4. Final indicator and quality checks

- **Component specific quality checks:**
 - Indirect emission intensity:
 - Comparison with electricity consumption data with (more aggregated) Eurostat data
 - Double check on the gap-filling procedure
 - Checked if the indirect emission intensity significantly affects the CLI for each sector given the direct emission intensity and trade intensity





Thank you for your attention



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