

Methodology



Sustainability

Global Electricity Emission Factors

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Introduction

Ecometrica has been sourcing and calculating global electricity emissions since 2012. The goal of releasing these global electricity factors is to enable businesses to accurately calculate their own emissions using spreadsheets, for every country in the world.

The Factors

The spreadsheet contains electricity grid factors by country in kWh (kilowatt hours) for CO₂, CH₄ and N₂O derived from official data from the UN. The UN data set also provides information for electricity losses from transmission and distribution. This figure was divided by the total amount of electricity generated (adjusted for imports and exports) in order to calculate a 'losses as a percentage of production' figure for each country. This percentage was then applied to the calculated 'emissions per kWh of generated electricity' factors in order to provide a factor set for emissions from electricity transmission and distribution losses.

Purchased electricity consumption in owned or operated sites typically falls under Scope 2 for corporate GHG accounting, and the electricity grid emission factors provided in this data set can be used to calculate these emissions. The transmission and distribution loss (or T&D loss) factors can be separately used to account for the emissions associated with losses during the provision of electricity and typically fall under the Scope 3 category 'Fuel-and energy-related activities (not included in Scope 1 or Scope 2)' as per the GHG Protocol.

These coefficients are the emissions per raw gas. Non-CO₂ gasses have not been converted into CO₂ equivalent values. To convert CH₄ and N₂O into their CO₂ equivalent value an appropriate global warming potential should be applied, provided in the IPCC assessment reports. If the coefficient is 0 for the electricity grid, it means that the country uses 100% renewable energy for electricity generation. If the coefficient for the transmission and distribution loss is 0 it means there is no available data for that figure.

Methodology

The data set that the electricity emission factors are calculated from is the 'Energy Balances 2018' data set from the United Nations Statistics Division (UNSD).

The data used in the emission factor calculations quantify the amount of primary fossil fuel product used in the production of electricity in electricity plants, and combined heat and power (CHP) plants, in each country.

The fuel types are broken down into the

following categories:

- Primary Coal and Peat
- Coal and Peat Products
- Primary Oil
- Oil Products
- Natural Gas
- Biofuels and Waste **

Using information on the exact fuel types included within these categories, average emission factors were created using the IPCC 2006 emission factors from the National Greenhouse Gas Inventory guidelines. It should be noted that these derived emission factors are unweighted averages, rather than weighted averages, as the quantities of each individual fuel type consumed within the broader categories is not provided in the UN data set. For each country, the quantities of each fuel category used in the production of electricity were multiplied by the appropriate average emissions factor in order to calculate the total emissions associated with the generation of electricity in that country.

In order to allocate the emissions from the CHP plant generation between electricity and heat products the 'fixed heat approach' was used. This assumes that the efficiency of heat generation in the CHP plant is 90%, so the heat output of the plant (in TJ) is divided by 0.9 to calculate the TJ of fuel input that was used to generate that heat output. This quantity is then deducted from the total TJ of fuel input into the CHP plant with the remaining amount being the TJ of fuel input assigned to the electricity output.

Once the total emissions associated with the generation of electricity in each country were calculated they were divided by the total amount of electricity generated in that country. This electricity volume includes electricity produced in both electricity plants and CHP plants, along with primary production of electricity (which relates to electricity from hydro, wind, tide, wave and solar capture sources). The resulting output, once energy unit conversions between TJ and kWh take place, provide the CO₂, CH₄ and N₂O emissions per kWh of generated electricity in each country.

*The Biofuels and waste category was adjusted to include only non-biogenic waste combustion, with biofuel and biogenic waste use excluded as out of scope.

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