



Photo by Maxim Tolchinskiy on Unsplash

When factoring heat generation required for the manufacturing and transportation of products, *Greenhouse gas emissions attributable to products, from food to sneakers to appliances, make up more than 75% of global emissions.*

(Source: The Carbon Catalogue <https://www.nature.com/articles/s41597-022-01178-9>)

Our data, which is publicly available on [nature.com](https://www.nature.com), contains product carbon footprints (PCFs) for various companies. PCFs are the greenhouse gas emissions attributable to a given product, measured in CO₂ (carbon dioxide equivalent).

This data is stored in a PostgreSQL database containing one table, `product_emissions`, which looks at PCFs by product as well as the stage of production that these emissions occurred. Here's a snapshot of what `product_emissions` contains in each column:

`product_emissions`

| field | data type |
|---|-----------|
| <code>id</code> | VARCHAR |
| <code>year</code> | INT |
| <code>product_name</code> | VARCHAR |
| <code>company</code> | VARCHAR |
| <code>country</code> | VARCHAR |
| <code>industry_group</code> | VARCHAR |
| <code>weight_kg</code> | NUMERIC |
| <code>carbon_footprint_pcf</code> | NUMERIC |
| <code>upstream_percent_total_pcf</code> | VARCHAR |
| <code>operations_percent_total_pcf</code> | VARCHAR |
| <code>downstream_percent_total_pcf</code> | VARCHAR |

You'll use this data to examine the carbon footprint of each industry in the dataset!

 Projects Data DataFrame as `df`

```
-- Update your query here
SELECT *
FROM product_emissions
LIMIT 5;
```

| ... | ↑↓ | id | ... | ↑↓ | ... | ↑↓ | product_name | ... | ↑↓ | company | ... | ↑↓ | ... | ↑↓ | industry_group |
|-----|----|--------------|-----|----|------|----|---|-----|----|----------------------|-----|----|-------|----|--------------------------------|
| | 0 | 10056-1-2014 | | | 2014 | | Frosted Flakes(R) Cereal | | | Kellogg Company | | | USA | | Food, Beverage & Tobacco |
| | 1 | 10056-1-2015 | | | 2015 | | Frosted Flakes, 23 oz, produced in Lancaster, ... | | | Kellogg Company | | | USA | | Food & Beverage Processing |
| | 2 | 10222-1-2013 | | | 2013 | | Office Chair | | | KNOLL INC | | | USA | | Capital Goods |
| | 3 | 10261-1-2017 | | | 2017 | | Multifunction Printers | | | Konica Minolta, Inc. | | | Japan | | Technology Hardware & Equipmer |
| | 4 | 10261-2-2017 | | | 2017 | | Multifunction Printers | | | Konica Minolta, Inc. | | | Japan | | Technology Hardware & Equipmer |

Rows: 5

Projects Data

DataFrame as df1

```
SELECT
  MAX(year) AS max_years,
  MIN(year) AS min_years
FROM product_emissions
```

| index | ... | ↑↓ | max_years | ... | ↑↓ | min_years |
|-------|-----|----|-----------|-----|------|-----------|
| | | 0 | | | 2017 | |

Rows: 1

Projects Data

DataFrame as carbon_emi

```
SELECT
  industry_group,
  -- counts the unique companies
  COUNT (DISTINCT company) AS num_companies,
  -- sum of pcf and rounding off to 1 deci
  ROUND(SUM(carbon_footprint_pcf), 1) AS total_industry_footprint
FROM product_emissions
WHERE year >= 2017
GROUP BY industry_group
ORDER BY total_industry_footprint DESC;
```

| ind... | ... | ↑↓ | industry_group | ... | ↑↓ | num_companies | ... | ↑↓ | total_industry_footprint |
|--------|-----|----|------------------------------------|-----|----|---------------|-----|----|--------------------------|
| | | 0 | Materials | | | | | 3 | |
| | | 1 | Capital Goods | | | | | 2 | |
| | | 2 | Technology Hardware & Equipment | | | | | 4 | |
| | | 3 | Food, Beverage & Tobacco | | | | | 1 | |
| | | 4 | Commercial & Professional Services | | | | | 1 | |
| | | 5 | Software & Services | | | | | 1 | |

Rows: 6