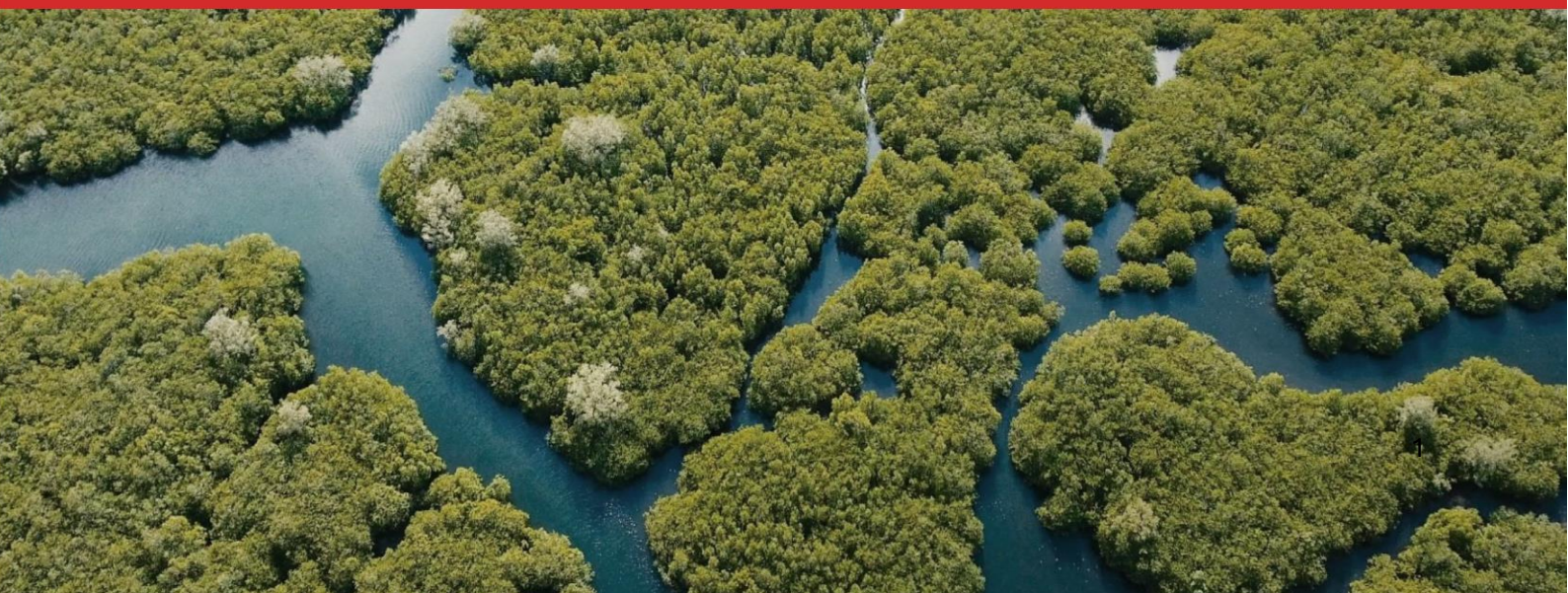


# **GSMA Intelligence Supply Chain Emissions Database**

**Technical annex**



Version Control			
Version	Author	Date	Changes
Version1.0	Vivek Gautam	July 28, 2025	Version 1.0 created

# Contents

<b>1. Introduction.....</b>	<b>4</b>
<b>2. Industry average emission factors.....</b>	<b>4</b>
<b>2.1. Data source.....</b>	<b>4</b>
<b>2.2. Calculating the emission factor.....</b>	<b>5</b>
<b>3. Supplier specific emission factors .....</b>	<b>5</b>
<b>3.1. Data collection and sources .....</b>	<b>7</b>
<b>3.2. Data quality assurance .....</b>	<b>7</b>
<b>3.3. Calculating the emission factor.....</b>	<b>8</b>
<b>3.4. Key assumptions.....</b>	<b>9</b>
<b>4. Product level emissions .....</b>	<b>15</b>
<b>4.1. Data collection and sources .....</b>	<b>15</b>
<b>4.2. Calculating the embodied emission .....</b>	<b>16</b>
<b>4.3. Key considerations for data usage .....</b>	<b>16</b>

## 1. Introduction

The GSMA Intelligence (GSMAi) Supply Chain Emissions Database for mobile network operators, collates the available data required to support assessment of operator scope 3 emissions for category 1 (purchased goods and services) and category 2 (capital goods). These datasets include:

- Industry average emission factors
- Supplier specific emission factors
- Product level emission factors

All datasets provide emission factors from 2019 onwards. To ensure consistency across datasets, all country names follow the GSMA country naming conventions. Country codes are represented by three-letter codes as defined in ISO 3166-1 alpha-3, and currency codes are represented by three-letter codes as defined in ISO 4217.

This document provides an overview of the methodology and assumptions made during the development process.

## 2. Industry average emission factors

This section of the database provides industry average emission factors which can be combined with the procurement spend data to assess emissions contribution arising from the purchased goods and services, and capital goods.

Following are the key fields (or columns) available in this dataset:

- **Country code** – three letter country code as defined in ISO 3166-1 alpha-3
- **Country** – name of the country as per GSMA country naming conventions
- **Sector code** – code corresponding to an industry sector
- **Sector name** – name of the industry sector
- **Unit** – reporting unit for the industry average factors (kgCO<sub>2</sub>e/USD)
- **2019 to latest year** – year corresponding to the column data

All emission factors have been rounded up to three significant digits.

### 2.1. Data source

This dataset publishes emission factors sourced directly from Open CEDA, a free and open to use version of comprehensive environmental data archive (CEDA) released by Watershed on May 22<sup>nd</sup>, 2025. Open CEDA is based on CEDA framework, a multi-regional, environmentally extended input-output (EEIO) model developed by reconciling data from over 100 different sources. These include national and OECD input-output tables (e.g., BEA, ONS, NBS), national greenhouse gas (GHG) inventories (e.g., EPA, ONS, UNFCCC), and global trade data from UN COMTRADE.

Consistent with the original Open CEDA release, this dataset provides comprehensive coverage across 400 industry sectors and 148 countries, along with an aggregated Rest of World (RoW) region. The description of these 400 industry sectors is available in the "Documentation" section of the database tool.

GSMA will update this dataset annually, in line with the update schedule of Open CEDA, which Watershed plans to update on the same annual cadence as the commercial version, CEDA.

For further details on CEDA and Open CEDA, please refer to the official documentation [here](#).

## 2.2. Calculating the emission factor

The current release of Open CEDA provides spend-based emission factors for the year 2022. In contrast, this dataset supports emissions reporting over a broader time frame, from 2019 through to the most recent year. To ensure accuracy when applying 2022-based emission factors to other reporting years, adjustments for inflation or deflation are made using country-specific inflation data.

For the reporting year 2022, emission factors are used as published in Open CEDA, without any modification.

For past years (2019 – 2021) emission factors are adjusted using the below formula, with 2021 shown as an example:

$$\text{Emission Factor, 2021} = \text{Emission Factor, 2022} * (1 + \text{Inflation Rate})$$

For future years (2023 – 2025) below formula, showing an example for 2023, is used:

$$\text{Emission Factor, 2023} = \frac{\text{Emission Factor, 2022}}{(1 + \text{Inflation Rate})}$$

Inflation rates used for these adjustments are sourced from the International Monetary Fund (IMF) ([link here](#)). In cases where complete inflation data is unavailable for a specific country, the average inflation rate across available years (2019–2025) for that country is applied. The inflation data used for computation is available in the "Documentation" section of the database tool.

## 3. Supplier specific emission factors

This section of the database provides supplier specific emission factors, which can be combined with the organisation's procurement spend data to assess the contribution of different suppliers towards Scope 3 category 1 and category 2 emissions.

Following are the key fields (or columns) available in this dataset

- **Company** – legal company name
- **Legal entity identifier (LEI)** – legal entity identifier corresponding to the company
- **Country** – name of registration country as per GSMA country naming conventions
- **Metric** – metric name (or label) corresponding to the row data
- **Unit** – reporting unit for the row data. For instance, currency for reported revenue, Metric Tons CO2e for reported emissions, and so on.
- **2019 to latest year** – year corresponding to the column data

The below table provides the description of all distinct metric names (labels) available in the “Metric” column

**Table 3.1**

Metric	Description
Revenue	Reported annual revenue of the company in their reporting (or local) currency unit (RCU)
Scope 1 (total)	Total reported GHG emissions for Scope 1
Scope 2 (market based)	Total reported GHG emission for Scope 2, calculated considering specific energy contracts and purchases
Scope 2 (location based)	Total reported GHG emissions for Scope 2, calculated using average intensity of local power grids in the consumption location
Scope 3 (total)	Total reported GHG emission for Scope 3
Scope 3: Upstream (C1 to C8)	Total of reported emissions for upstream stream categories as per GHG protocol
Scope 3: Downstream (C9 to C15)	Total of reported emissions for downstream categories as per GHG protocol
Scope 3: C1 – Purchased goods and services	Total reported emissions under respective category
Scope 3: C2 – Capital goods	
Scope 3: C3 – Fuel and energy related activities not included in scope 1 or scope 2	
Scope 3: C4 – Upstream transportation and distribution	
Scope 3: C5 – Waste generated in operations	
Scope 3: C6 – Business travel	
Scope 3: C7 – Employee commuting	
Scope 3: C8 – Upstream leased assets	
Scope 3: C9 – Downstream transportation and distribution	
Scope 3: C10 – Processing of sold products	
Scope 3: C11 – Use of sold products	
Scope 3: C12 – End of life treatment of sold products	
Scope 3: C13 – Downstream leased assets	
Scope 3: C14 – Franchises	
Scope 3: C15 – Investments	
Assurance Status	Assurance or audit status of the reported emission numbers
Supplier Emission Factor (RCU)	A value specific to supplier and a reporting period calculated using formula provided in section 3.2 and expressed in kgCO <sub>2</sub> e/RCU
Supplier Emission Factor (USD)	Supplier Emission Factor expressed in kgCO <sub>2</sub> e/USD calculated by converting the Supplier Emission Factor (RCU) value to per USD using IMF published currency exchange rates ( <a href="#">here</a> ) The currency exchange rates data used for computation is available in the “Documentation” section of the database tool.

The grey highlighted rows in the table 3.1 indicate metrics necessary to compute supplier specific emission factors.

### 3.1. Data collection and sources

GSMAi relied on robust data collection processes, established over years, to collate necessary company specific data such as revenue, organisational identifiers, emissions inventory, and other firmographic information. Below, table 3.2 lists different types of sources accessed for data collection.

**Table 3.2**

Data Type	Sources(s)
Company name	Corporate filings
Country/ location of registration	Company websites
Legal entity identifier (LEI)	<a href="#">Global Legal Entity Identifier Foundation (GLEIF)</a>
Revenue	Financial statements
Emissions inventory	Sustainability reports
Assurance Status	ESG reports and data books
	CDP submission (wherever available)

All documents are accessed and downloaded from company's official website ensuring only officially reported data is processed for database inclusion.

### 3.2. Data quality assurance

A data quality check is the process of identifying inaccurate, incorrect, or unsuitable data within a dataset and taking corrective action to improve overall reliability and accuracy of the processed data. Common data quality issues include:

- Data entry or capture errors: Human error in recording data cannot be ruled out, especially while part of the data capturing process is manual. For instance, analysts could report data in incorrect units or value (different from reported numbers)
- Reporting inconsistencies: Values reported for a period may not be consistent with historical data. This could be due to changes in reporting boundaries (mergers & acquisitions), calculation methodology or discovery of errors. Such inconsistencies are not necessarily errors but demand careful review by the data collection analyst.

In dealing with reporting inconsistencies, one key consideration is the treatment of rebaselined or restated data. To ensure data comparability over different time periods, consistency in reporting boundaries, and calculation methodology, rebaselined or restated data is prioritised over previously reported values and is included in the database.

The data quality check process involves two key steps. Firstly, all the collected data is peer reviewed against source documents to minimise human error. Post the peer review, the data accuracy and reliability are evaluated at two levels: Company, and Peer level. For each level, a range of checks and tests are performed.

Company level: To prevent data fragmentation, for each company, a single data file (excel workbook) with built-in checks and data validations is maintained. These include following key checks and validations:

- Gross emissions should be consistent with the sum of breakdowns

- Reported Scope 3 (total) emissions should comprise bulk of the total reported (scope 1 + scope 2 + scope 3) emissions
- Check for data completeness i.e. spotting any missing data using formulas/dashboards
- Comparing a reported value with historical data (mean or median) to identify anomalies (e.g. sudden drop in emissions without operational changes)

Once an error or data anomaly is identified, data collection analysts investigate to understand the reasons of variance and ensure only correct data is processed. For instance, where a company's Scope 3 (total) emissions as percent of total reported emissions is less than 75%, the analyst performs additional validations such as cross-referencing data from various sources and comparing the reported numbers with other similar companies. If a record is deemed unreliable it is not included in the database.

Peer level: This involves comparing data recorded for a company with other similar companies to spot outliers. For easy comparison, a common standardised data capture format with consistent units, categories and time periods is used across all companies. To resolve identified discrepancies reported data for a company is cross-referenced from various sources. If a discrepancy is not resolved satisfactorily, the record is not included in the database.

After all the data has gone through quality check process, the cleaned data set can be used to compute supplier specific emission factors.

### 3.3. Calculating the emission factor

For each supplier, emission factors are computed in line with the guidance available in "Scope 3 Guidance for Telecommunication Operators". Specifically, the calculation formula used is as below:

$$\text{Supplier's Emission Factor, kgCO}_2\text{e per Currency Unit} = \frac{\text{Scope 1 (total) + Scope 2 (market based) + Scope 3 (Category 1 to 8) emissions}}{\text{Annual revenue (Reporting currency)}}$$

Considering Accenture Plc as a model organisation and using data published in its 2023 sustainability report, the calculation steps are illustrated below. Metrics from the grey highlighted rows in the table 3.1 are required to compute Accenture specific emission factor for the year 2023.

$$\text{Annual revenue, 2023 (USD)} = 64,100,000,000$$

$$\begin{aligned} &\text{Scope 1 (total) + Scope 2 (market based) + Scope 3 (Category 1 to 8) emissions} \\ &= (22,038 + 4,786 + 515,371) \text{ Metric tons CO}_2\text{e} \\ &= 542,195 \text{ Metric tons CO}_2\text{e} \end{aligned}$$

$$= 542,195 * 1,000 \text{ kgCO}_2\text{e} = 542,195,000 \text{ kgCO}_2\text{e}$$

$$\text{Supplier Emission Factor, } \frac{\text{kgCO}_2\text{e}}{\text{USD}} = \frac{542,195,000}{64,100,000,000} = 0.0084585803$$

All emission factors presented in the dataset have been rounded up to the seven significant digits. Therefore, the published value of Accenture's 2023 emission factor is 0.0084586.

**Table 3.3: Accenture 2023 emissions**

Metric	Unit	2023
Revenue (Reporting currency)	USD	64,100,000,000
Scope1 (total)	Metric Tons, CO2e	22,038
Scope2 (market based)	Metric Tons, CO2e	4,786
Scope2 (location based)	Metric Tons, CO2e	-
Scope3 (total)	Metric Tons, CO2e	515,371
Scope 3: Upstream (C1 to C8)	Metric Tons, CO2e	515,371
Scope 3: Downstream (C9 to C15)	Metric Tons, CO2e	-
Scope 3: C1 – Purchased goods and services	Metric Tons, CO2e	218,240
Scope 3: C2 – Capital goods	Metric Tons, CO2e	31,068
Scope 3: C3 – Fuel and energy related activities not included in scope 1 or scope 2	Metric Tons, CO2e	28,164
Scope 3: C4 – Upstream transportation and distribution	Metric Tons, CO2e	-
Scope 3: C5 – Waste generated in operations	Metric Tons, CO2e	-
Scope 3: C6 – Business travel	Metric Tons, CO2e	195,246
Scope 3: C7 – Employee commuting	Metric Tons, CO2e	42,653
Scope3: C8 – Upstream leased assets	Metric Tons, CO2e	-
Scope3: C9 – Downstream transportation and distribution	Metric Tons, CO2e	-
Scope3: C10 – Processing of sold products	Metric Tons, CO2e	-
Scope3: C11 – Use of sold products	Metric Tons, CO2e	-
Scope3: C12 – End of life treatment of sold products	Metric Tons, CO2e	-
Scope3: C13 – Downstream leased assets	Metric Tons, CO2e	-
Scope3: C14 – Franchises	Metric Tons, CO2e	-
Scope3: C15 – Investments	Metric Tons, CO2e	-

### 3.4. Key assumptions

Despite growing pressure for climate transparency, there remains significant gaps and inconsistencies in carbon emissions disclosures. While many companies are reporting Scope 1 and 2 emissions, Scope 3 emissions are often underreported or missing entirely. Lack of comprehensive, granular, and consistent data presents a key challenge in developing a supply chain emission factors database.

Accenture's data presented in table 3.3 represents an ideal scenario where a detailed breakdown of Scope 3 (total) carbon emissions by various upstream and downstream categories has been reported. However, not all suppliers are reporting carbon emissions

at this level of granularity. In such cases, assumptions are made to calculate supplier-specific emission factors.

Numerical data in the database is colour-coded to differentiate three types of values: reported, directly calculated, and estimated. Dataset users can quickly and easily identify any estimated values using the key, explained in Table 3.4.

**Table 3.4**

Key
<p><b>Reported:</b> figures in “<b>Black font</b>” indicate publicly reported data</p>
<p><b>Directly calculated:</b> figures in “<b>Blue font</b>” indicate a directly calculated value from the reported data and formulas, without making any assumptions. This is to differentiate it from the reported data</p> <p><i>For instance, Scope 3: Upstream (C1 to C8) is often a directly-calculated value arrived at by adding reported data for Scope 3 categories C1 – Purchased good and services through C8 – Upstream leased assets</i></p>
<p><b>Estimated:</b> figures in “<b>Orange font</b>” indicate an estimated value that is derived from the reported data, and key assumptions. Often these are assumed or computed based on related metrics to fill the missing data</p>
<p><b>Dash:</b> a dash in black font colour “<b>—</b>” indicates data is not available or not reported</p>

Additionally, users can check assumptions behind an estimated value by hovering their mouse over it. Wherever the metric “Supplier Emission Factor” is computed using one or more estimated values, it is also deemed as an “estimated value” and colour coded in **orange font**.

The rest of this section describes different data gap (i.e. missing data) scenarios and the corresponding assumptions made to plug the gaps.

Table 3.5

<b>Data gap scenario:</b>	Scope 2 (market based) emissions data is not reported, but Scope 2 (location based) data is reported for a year																																																																																												
<b>Assumption:</b>	<p>Scope 2 (market based) emissions are considered equal to the Scope 2 (location based) emissions for that year i.e.</p> <p><i>Scope 2 (market based) = Scope 2 (location based)</i></p>																																																																																												
<b>Illustration:</b>	<p>For a sample company, reported emissions data for 2024 is presented in the below table. Scope 2 (market based) emissions are not reported for any of the reporting periods in the public domain; however, Scope 2 (location based) emissions data is reported. To compute Supplier specific emission factor, it is assumed that</p> <p><i>Scope 2 (market based) = Scope 2 (location based) = 68,088</i></p> <p><i>Supplier Emission Factor = (10,574 +68,088 + 27,834) *1000/519,955,000,000 kgCO2e/INR</i></p> <table><tr><th></th><th>Metric</th><th>Unit</th><th>2024</th></tr><tr><td></td><td>Revenue</td><td>INR</td><td>519,955,000,000</td></tr><tr><td></td><td>Scope 1 (total)</td><td>Metric Tons, CO2e</td><td>10,574</td></tr><tr><td></td><td><b>Scope 2 (market based)</b></td><td><b>Metric Tons, CO2e</b></td><td><b>68,088</b></td></tr><tr><td></td><td><b>Scope 2 (location based)</b></td><td><b>Metric Tons, CO2e</b></td><td>68,088</td></tr><tr><td></td><td>Scope 3 (total)</td><td>Metric Tons, CO2e</td><td>33,277</td></tr><tr><td></td><td>Scope 3: Upstream (C1 to C8)</td><td>Metric Tons, CO2e</td><td>27,834</td></tr><tr><td></td><td>Scope 3: Downstream (C9 to C15)</td><td>Metric Tons, CO2e</td><td>5,445</td></tr><tr><td></td><td>Scope 3: C1 - Purchased goods and services</td><td>Metric Tons, CO2e</td><td>389</td></tr><tr><td></td><td>Scope 3: C2 - Capital goods</td><td>Metric Tons, CO2e</td><td>1,043</td></tr><tr><td></td><td>Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2</td><td>Metric Tons, CO2e</td><td>436</td></tr><tr><td></td><td>Scope 3: C4 - Upstream transportation and distribution</td><td>Metric Tons, CO2e</td><td>22</td></tr><tr><td></td><td>Scope 3: C5 - Waste generated in operations</td><td>Metric Tons, CO2e</td><td>42</td></tr><tr><td></td><td>Scope 3: C6 - Business travel</td><td>Metric Tons, CO2e</td><td>11,034</td></tr><tr><td></td><td>Scope 3: C7 - Employee commuting</td><td>Metric Tons, CO2e</td><td>14,548</td></tr><tr><td></td><td>Scope 3: C8 - Upstream leased assets</td><td>Metric Tons, CO2e</td><td>320</td></tr><tr><td></td><td>Scope 3: C9 - Downstream transportation and distribution</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C10 - Processing of sold products</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C11 - Use of sold products</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C12 - End of life treatment of sold products</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C13 - Downstream leased assets</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C14 - Franchises</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C15 - Investments</td><td>Metric Tons, CO2e</td><td>5,445</td></tr></table>		Metric	Unit	2024		Revenue	INR	519,955,000,000		Scope 1 (total)	Metric Tons, CO2e	10,574		<b>Scope 2 (market based)</b>	<b>Metric Tons, CO2e</b>	<b>68,088</b>		<b>Scope 2 (location based)</b>	<b>Metric Tons, CO2e</b>	68,088		Scope 3 (total)	Metric Tons, CO2e	33,277		Scope 3: Upstream (C1 to C8)	Metric Tons, CO2e	27,834		Scope 3: Downstream (C9 to C15)	Metric Tons, CO2e	5,445		Scope 3: C1 - Purchased goods and services	Metric Tons, CO2e	389		Scope 3: C2 - Capital goods	Metric Tons, CO2e	1,043		Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2	Metric Tons, CO2e	436		Scope 3: C4 - Upstream transportation and distribution	Metric Tons, CO2e	22		Scope 3: C5 - Waste generated in operations	Metric Tons, CO2e	42		Scope 3: C6 - Business travel	Metric Tons, CO2e	11,034		Scope 3: C7 - Employee commuting	Metric Tons, CO2e	14,548		Scope 3: C8 - Upstream leased assets	Metric Tons, CO2e	320		Scope 3: C9 - Downstream transportation and distribution	Metric Tons, CO2e	-		Scope 3: C10 - Processing of sold products	Metric Tons, CO2e	-		Scope 3: C11 - Use of sold products	Metric Tons, CO2e	-		Scope 3: C12 - End of life treatment of sold products	Metric Tons, CO2e	-		Scope 3: C13 - Downstream leased assets	Metric Tons, CO2e	-		Scope 3: C14 - Franchises	Metric Tons, CO2e	-		Scope 3: C15 - Investments	Metric Tons, CO2e	5,445
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Table 3.6

<b>Data gap scenario:</b>	Scope 3 (total) emissions data is reported, but no breakdown by upstream and downstream categories is reported for any of the periods																																																																																												
<b>Assumption:</b>	Scope 3: Upstream (C1 to C8) emissions for a year are considered equal to the Scope 3 (total) emissions for that year  Scope 3: Upstream (C1 to C8) = Scope 3 (total)																																																																																												
<b>Example:</b>	<p>For a sample company, reported emissions data for 2019 is presented in the below table. Scope 3 (total) emissions breakdown by upstream and downstream categories is not available for any of the reporting periods in the public domain. To compute Supplier specific emission factor, it is assumed that</p> <p style="text-align: center;"><i>Scope 3: Upstream (C1 to C8) = Scope 3(total) = 1,311,000 Metric Tons, CO2e</i> <i>Supplier Emission Factor = (40,700 + 306,000 + 1,311,000) *1000/5,562,140,000</i> <i>kgCO2e/USD</i></p> <table><tr><th></th><th><b>Metric</b></th><th><b>Unit</b></th><th><b>2019</b></th></tr><tr><td>Revenue</td><td>USD</td><td></td><td>5,562,140,000</td></tr><tr><td>Scope 1 (total)</td><td>Metric Tons, CO2e</td><td></td><td>40,700</td></tr><tr><td>Scope 2 (market based)</td><td>Metric Tons, CO2e</td><td></td><td>306,000</td></tr><tr><td>Scope 2 (location based)</td><td>Metric Tons, CO2e</td><td></td><td>2,079,000</td></tr><tr><td><b>Scope 3 (total)</b></td><td><b>Metric Tons, CO2e</b></td><td></td><td><b>1,311,000</b></td></tr><tr><td><b>Scope 3: Upstream (C1 to C8)</b></td><td><b>Metric Tons, CO2e</b></td><td></td><td><b>1,311,000</b></td></tr><tr><td>Scope 3: Downstream (C9 to C15)</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C1 - Purchased goods and services</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C2 - Capital goods</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C4 - Upstream transportation and distribution</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C5 - Waste generated in operations</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C6 - Business travel</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C7 - Employee commuting</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C8 - Upstream leased assets</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C9 - Downstream transportation and distribution</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C10 - Processing of sold products</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C11 - Use of sold products</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C12 - End of life treatment of sold products</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C13 - Downstream leased assets</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C14 - Franchises</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr><tr><td>Scope 3: C15 - Investments</td><td>Metric Tons, CO2e</td><td></td><td>-</td></tr></table>		<b>Metric</b>	<b>Unit</b>	<b>2019</b>	Revenue	USD		5,562,140,000	Scope 1 (total)	Metric Tons, CO2e		40,700	Scope 2 (market based)	Metric Tons, CO2e		306,000	Scope 2 (location based)	Metric Tons, CO2e		2,079,000	<b>Scope 3 (total)</b>	<b>Metric Tons, CO2e</b>		<b>1,311,000</b>	<b>Scope 3: Upstream (C1 to C8)</b>	<b>Metric Tons, CO2e</b>		<b>1,311,000</b>	Scope 3: Downstream (C9 to C15)	Metric Tons, CO2e		-	Scope 3: C1 - Purchased goods and services	Metric Tons, CO2e		-	Scope 3: C2 - Capital goods	Metric Tons, CO2e		-	Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2	Metric Tons, CO2e		-	Scope 3: C4 - Upstream transportation and distribution	Metric Tons, CO2e		-	Scope 3: C5 - Waste generated in operations	Metric Tons, CO2e		-	Scope 3: C6 - Business travel	Metric Tons, CO2e		-	Scope 3: C7 - Employee commuting	Metric Tons, CO2e		-	Scope 3: C8 - Upstream leased assets	Metric Tons, CO2e		-	Scope 3: C9 - Downstream transportation and distribution	Metric Tons, CO2e		-	Scope 3: C10 - Processing of sold products	Metric Tons, CO2e		-	Scope 3: C11 - Use of sold products	Metric Tons, CO2e		-	Scope 3: C12 - End of life treatment of sold products	Metric Tons, CO2e		-	Scope 3: C13 - Downstream leased assets	Metric Tons, CO2e		-	Scope 3: C14 - Franchises	Metric Tons, CO2e		-	Scope 3: C15 - Investments	Metric Tons, CO2e		-
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Scope 3: C15 - Investments	Metric Tons, CO2e		-																																																																																										

Table 3.7

<b>Data gap scenario:</b>	Scope 3 (total) emissions and breakdown by upstream and downstream categories is reported, but a single value for total transportation and distribution emissions including both up and down stream is reported. In other words, transportation and distribution emissions breakdown by Scope 3: C4 – Upstream transportation and distribution and Scope 3: C9 – Downstream transportation and distribution is unavailable.																																																																																												
<b>Assumption:</b>	<p>Scope 3: C4 – Upstream transportation and distribution emissions are considered equal to the total reported transportation and distribution emissions</p> <p>Scope 3: C4 – Upstream transportation and distribution = Total transportation and distribution emissions</p> <p>Scope 3: C9 – Downstream transportation and distribution = 0</p>																																																																																												
<b>Illustration:</b>	<p>For a sample company, reported emissions data for 2023 is presented in the below table. The company has been reporting a single value for transportation and distribution emissions and no breakdown between C4 and C9 is provided. To compute the Supplier Emissions Factor following assumption is made:</p> <p><i>Scope 3: C4 – Upstream transportation and distribution = Total transportation and distribution emissions = 542000 Metric Tons, CO2e</i></p> <p><i>Scope 3: C9 – Downstream transportation and distribution = 0</i></p> <p><i>Supplier Emission Factor = (52,100 + 94,300 + 12,610,000) *1000/5,562,140,000 kgCO2e/USD</i></p> <table><tr><th></th><th>Metric</th><th>Unit</th><th>2023</th></tr><tr><td></td><td>Revenue</td><td>USD</td><td>53,718,000,000</td></tr><tr><td></td><td>Scope 1 (total)</td><td>Metric Tons, CO2e</td><td>52,100</td></tr><tr><td></td><td>Scope 2 (market based)</td><td>Metric Tons, CO2e</td><td>94,300</td></tr><tr><td></td><td>Scope 2 (location based)</td><td>Metric Tons, CO2e</td><td>193,300</td></tr><tr><td></td><td>Scope 3 (total)</td><td>Metric Tons, CO2e</td><td>19,618,000</td></tr><tr><td></td><td><b>Scope 3: Upstream (C1 to C8)</b></td><td><b>Metric Tons, CO2e</b></td><td><b>12,610,000</b></td></tr><tr><td></td><td>Scope 3: Downstream (C9 to C15)</td><td>Metric Tons, CO2e</td><td>7,008,000</td></tr><tr><td></td><td>Scope 3: C1 - Purchased goods and services</td><td>Metric Tons, CO2e</td><td>11,856,000</td></tr><tr><td></td><td>Scope 3: C2 - Capital goods</td><td>Metric Tons, CO2e</td><td>29,000</td></tr><tr><td></td><td>Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2</td><td>Metric Tons, CO2e</td><td>53,000</td></tr><tr><td></td><td><b>Scope 3: C4 - Upstream transportation and distribution</b></td><td><b>Metric Tons, CO2e</b></td><td><b>542,000</b></td></tr><tr><td></td><td>Scope 3: C5 - Waste generated in operations</td><td>Metric Tons, CO2e</td><td>1,000</td></tr><tr><td></td><td>Scope 3: C6 - Business travel</td><td>Metric Tons, CO2e</td><td>32,000</td></tr><tr><td></td><td>Scope 3: C7 - Employee commuting</td><td>Metric Tons, CO2e</td><td>97,000</td></tr><tr><td></td><td>Scope 3: C8 - Upstream leased assets</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td><b>Scope 3: C9 - Downstream transportation and distribution</b></td><td><b>Metric Tons, CO2e</b></td><td><b>0</b></td></tr><tr><td></td><td>Scope 3: C10 - Processing of sold products</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C11 - Use of sold products</td><td>Metric Tons, CO2e</td><td>6,656,000</td></tr><tr><td></td><td>Scope 3: C12 - End of life treatment of sold products</td><td>Metric Tons, CO2e</td><td>323,000</td></tr><tr><td></td><td>Scope 3: C13 - Downstream leased assets</td><td>Metric Tons, CO2e</td><td>29,000</td></tr><tr><td></td><td>Scope 3: C14 - Franchises</td><td>Metric Tons, CO2e</td><td>-</td></tr><tr><td></td><td>Scope 3: C15 - Investments</td><td>Metric Tons, CO2e</td><td>-</td></tr></table>		Metric	Unit	2023		Revenue	USD	53,718,000,000		Scope 1 (total)	Metric Tons, CO2e	52,100		Scope 2 (market based)	Metric Tons, CO2e	94,300		Scope 2 (location based)	Metric Tons, CO2e	193,300		Scope 3 (total)	Metric Tons, CO2e	19,618,000		<b>Scope 3: Upstream (C1 to C8)</b>	<b>Metric Tons, CO2e</b>	<b>12,610,000</b>		Scope 3: Downstream (C9 to C15)	Metric Tons, CO2e	7,008,000		Scope 3: C1 - Purchased goods and services	Metric Tons, CO2e	11,856,000		Scope 3: C2 - Capital goods	Metric Tons, CO2e	29,000		Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2	Metric Tons, CO2e	53,000		<b>Scope 3: C4 - Upstream transportation and distribution</b>	<b>Metric Tons, CO2e</b>	<b>542,000</b>		Scope 3: C5 - Waste generated in operations	Metric Tons, CO2e	1,000		Scope 3: C6 - Business travel	Metric Tons, CO2e	32,000		Scope 3: C7 - Employee commuting	Metric Tons, CO2e	97,000		Scope 3: C8 - Upstream leased assets	Metric Tons, CO2e	-		<b>Scope 3: C9 - Downstream transportation and distribution</b>	<b>Metric Tons, CO2e</b>	<b>0</b>		Scope 3: C10 - Processing of sold products	Metric Tons, CO2e	-		Scope 3: C11 - Use of sold products	Metric Tons, CO2e	6,656,000		Scope 3: C12 - End of life treatment of sold products	Metric Tons, CO2e	323,000		Scope 3: C13 - Downstream leased assets	Metric Tons, CO2e	29,000		Scope 3: C14 - Franchises	Metric Tons, CO2e	-		Scope 3: C15 - Investments	Metric Tons, CO2e	-
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Table 3.8

<b>Data gap scenario:</b>	Scope 3 (total) breakdown by upstream and downstream categories is either not reported or partially reported for a year, however detailed breakdown has been reported for other years																																																																																																																			
<b>Assumption:</b>	<p>For the year where data is not reported or partially reported, Scope 3: Upstream (C1 to C8) as percent of Scope 3 (total) is equal to the average of values observed for other years i.e.</p> <p><i>Scope 3: Upstream (C1 to C8) as % of Scope 3 (total), missing data year = Average Scope 3: Upstream (C1 to C8) as % of Scope 3 (total) for years where data is reported</i></p>																																																																																																																			
<b>Illustration:</b>	<p>For a sample company, reported emissions data for 2019 and 2020 is presented in the below table. The company has reported Scope 3 (total) and breakdowns by upstream and downstream categories 2020 onwards; however, this level of data is not disclosed for 2019. Following assumption is made in this scenario:</p> <p><i>Scope 3: Upstream (C1 to C8) as % of Scope 3 (total), 2019 = Average Scope 3: Upstream (C1 to C8) as % of Scope 3 (total), 2020 and subsequent years</i></p> <p><i>Here, Scope 3: Upstream (C1 to C8), 2020 / Scope 3 (total), 2020 = 575910/ 575910 = 100%</i> <i>Similarly, this value is computed for all subsequent years where the data is reported, and average value is computed = 100% (in this case)</i></p> <p><i>Scope 3: Upstream (C1 to C8) as % of Scope 3 (total), 2019 = 100% * Scope 3 (total), 2019 = 100% * 932,653 = 932,653</i></p> <p><i>With this assumption, Supplier Emissions Factor, 2019 can be computed using formula from section 3.3</i></p> <table><tr><th></th><th>Metric</th><th>Unit</th><th>2019</th><th>2020</th></tr><tr><td></td><td>Revenue</td><td>USD</td><td>43,215,013,000</td><td>44,300,000,000</td></tr><tr><td></td><td>Scope 1 (total)</td><td>Metric Tons, CO2e</td><td>18,923</td><td>13,945</td></tr><tr><td></td><td>Scope 2 (market based)</td><td>Metric Tons, CO2e</td><td>214,680</td><td>162,983</td></tr><tr><td></td><td>Scope 2 (location based)</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3 (total)</td><td>Metric Tons, CO2e</td><td>932,653</td><td>575,910</td></tr><tr><td></td><td><b>Scope 3: Upstream (C1 to C8)</b></td><td><b>Metric Tons, CO2e</b></td><td><b>932,653</b></td><td>575,910</td></tr><tr><td></td><td>Scope 3: Downstream (C9 to C15)</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C1 - Purchased goods and services</td><td>Metric Tons, CO2e</td><td>-</td><td>208,711</td></tr><tr><td></td><td>Scope 3: C2 - Capital goods</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C4 - Upstream transportation and distribution</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C5 - Waste generated in operations</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C6 - Business travel</td><td>Metric Tons, CO2e</td><td>-</td><td>339,459</td></tr><tr><td></td><td>Scope 3: C7 - Employee commuting</td><td>Metric Tons, CO2e</td><td>-</td><td>27,740</td></tr><tr><td></td><td>Scope 3: C8 - Upstream leased assets</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C9 - Downstream transportation and distribution</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C10 - Processing of sold products</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C11 - Use of sold products</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C12 - End of life treatment of sold products</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C13 - Downstream leased assets</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C14 - Franchises</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr><tr><td></td><td>Scope 3: C15 - Investments</td><td>Metric Tons, CO2e</td><td>-</td><td>-</td></tr></table>		Metric	Unit	2019	2020		Revenue	USD	43,215,013,000	44,300,000,000		Scope 1 (total)	Metric Tons, CO2e	18,923	13,945		Scope 2 (market based)	Metric Tons, CO2e	214,680	162,983		Scope 2 (location based)	Metric Tons, CO2e	-	-		Scope 3 (total)	Metric Tons, CO2e	932,653	575,910		<b>Scope 3: Upstream (C1 to C8)</b>	<b>Metric Tons, CO2e</b>	<b>932,653</b>	575,910		Scope 3: Downstream (C9 to C15)	Metric Tons, CO2e	-	-		Scope 3: C1 - Purchased goods and services	Metric Tons, CO2e	-	208,711		Scope 3: C2 - Capital goods	Metric Tons, CO2e	-	-		Scope 3: C3 - Fuel and energy related activities not included in scope 1 or scope 2	Metric Tons, CO2e	-	-		Scope 3: C4 - Upstream transportation and distribution	Metric Tons, CO2e	-	-		Scope 3: C5 - Waste generated in operations	Metric Tons, CO2e	-	-		Scope 3: C6 - Business travel	Metric Tons, CO2e	-	339,459		Scope 3: C7 - Employee commuting	Metric Tons, CO2e	-	27,740		Scope 3: C8 - Upstream leased assets	Metric Tons, CO2e	-	-		Scope 3: C9 - Downstream transportation and distribution	Metric Tons, CO2e	-	-		Scope 3: C10 - Processing of sold products	Metric Tons, CO2e	-	-		Scope 3: C11 - Use of sold products	Metric Tons, CO2e	-	-		Scope 3: C12 - End of life treatment of sold products	Metric Tons, CO2e	-	-		Scope 3: C13 - Downstream leased assets	Metric Tons, CO2e	-	-		Scope 3: C14 - Franchises	Metric Tons, CO2e	-	-		Scope 3: C15 - Investments	Metric Tons, CO2e	-	-
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	Scope 3: C6 - Business travel	Metric Tons, CO2e	-	339,459																																																																																																																
	Scope 3: C7 - Employee commuting	Metric Tons, CO2e	-	27,740																																																																																																																
	Scope 3: C8 - Upstream leased assets	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C9 - Downstream transportation and distribution	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C10 - Processing of sold products	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C11 - Use of sold products	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C12 - End of life treatment of sold products	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C13 - Downstream leased assets	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C14 - Franchises	Metric Tons, CO2e	-	-																																																																																																																
	Scope 3: C15 - Investments	Metric Tons, CO2e	-	-																																																																																																																

## 4. Product level emissions

This section of the database provides emissions data for common industry products, which can be combined with physical activity data to assess category 1 and category 2 emissions arising from the procurement of such products.

Following are the key fields available in this dataset

- **Product type** – Type of the device e.g. smartphone, headset, laptop, tablet, etc.
- **Manufacturer** – Manufacturer of the product
- **Model** – Common or commercial name of a product assigned by the manufacturer
- **Year** – Launch or release year of a product
- **Storage** – *Data storage capacity of the device*
- **Unit** – Unit in which the emission values are expressed
- **Embodied emissions** – Emissions upstream of use phase, hence raw material acquisition, production/manufacturing, and assembly as well as upstream transportations, including the distribution of the product
- **Total emissions** – Total average emissions across all four phases of the product lifecycle: material & manufacturing, transportation, use and end-of-life
- **Phase: Material & manufacturing** – Emissions corresponding to production/manufacturing and assembly of a product
- **Phase: Transportation** – Emissions corresponding to transportation (includes both upstream and downstream) phase of the product lifecycle
- **Phase: Use** – Emissions corresponding to the use phase of the product lifecycle
- **Phase: End-of-life** – Emissions corresponding to the end-of-life phase of the product lifecycle
- **Phase: Material & manufacturing (as % of total emission)** – Emissions corresponding to the material & manufacturing phase of the product lifecycle expressed as percent of the total emission
- **Phase: Transportation (as % of total emission)** – Emissions corresponding to the transportation phase of the product lifecycle expressed as percent of the total emission
- **Phase: Use (as % of total emission)** – Emissions corresponding to the use phase of the product lifecycle expressed as percent of the total emission
- **Phase: End-of-life (as % of total emission)** – Emissions corresponding to the end-of-life phase of the product lifecycle expressed as percent of the total emission
- **Source type** – Indicates the source type for the data in a row

### 4.1. Data collection and sources

Data is collected from two types of secondary sources: scientific research papers, and manufacturer published Product Carbon Footprint (PCF)/ Life Cycle Assessment (LCA) information sheets and reports. Latest PCF/LCA reports published by device manufacturers were accessed and downloaded for their official websites, and relevant research papers were sourced from scientific publications.

For data presented in a row, the type of source used can be identified through the field “Source type”. Two distinct values corresponding to the two types of secondary sources are available: Research paper, and Manufacturer published data.

Numerical data in this dataset is colour-coded to enable users to quickly and easily identify any calculated values using the below key.

**Table 4.1**

Key
Figures in “ <b>Black font</b> ” indicate publicly reported data
Figures in “ <b>Blue font</b> ” indicate values directly calculated from formulas and publicly reported PCF/LCA data
<b>Dash:</b> “ <b>■</b> ” indicates data is not reported or is not relevant

#### 4.2. Calculating the embodied emission

Embodied emission refers to any emissions upstream of the use phase, hence raw material acquisition, production/manufacturing, and assembly as well as upstream transportations, including the distribution of the product. For each product model, this is computed as below:

$$\text{Embodied emission} = \text{Phase: Material \& manufacturing} + \text{Phase: Transportation}$$

Where a manufacturer has reported a product’s total emission value with uncertainty i.e. as a range instead of one single value, the embodied emission is computed based on the reported average value.

#### 4.3. Key considerations for data usage

When using “Product level emissions” dataset for assessing Scope 3 emissions users must bear in mind following important aspects on the PCF/ LCA data:

- Companies may use different system boundaries, allocation methods, and reporting standards (e.g., ISO 14040 or GHG protocol) leading to variations in what is included or excluded from the footprint. Hence the data is not comparable across products and suppliers. For instance:
  - Apple reports LCA data for various products by different storage configurations
  - Lenovo reports the 95<sup>th</sup> percentile of the carbon footprint estimate
- Assumptions around emission factors, product usage, and end-of-life scenarios can significantly affect the total and phase wise emission assessment.
- PCF/LCA data can become quickly outdated due to changes in technology, supply chains, or energy mixes. Users must use the latest available data.