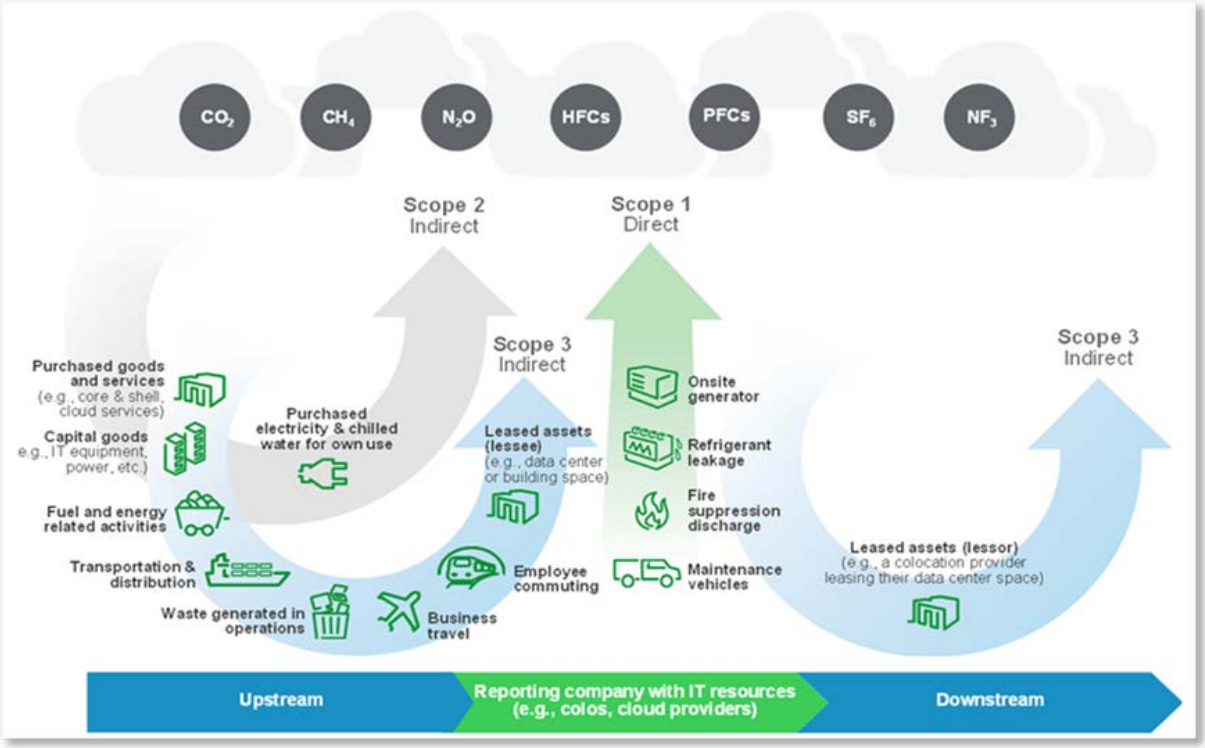
DataCenterBoom!

How are greenhouse gas emissions from a data center calculated?

November 2025.



Direct emissions are all GHG emissions generated by data center equipment and operations. This includes cooling systems and backup generators. Indirect emissions, on the other hand, cover energy sources, construction, and infrastructure, as well as emissions from the supply chain, which are often less visible but even more significant than direct emissions.

a. Scope 1 emissions

Direct emissions, also known as Scope 1 emissions, are emitted on-site and under the full control of data center operators. The main sources are:

- Backup power generation: Data centers often have generators (e.g., diesel, natural gas, or similar fuels) to provide emergency power when the grid fails. These units burn fuel on site, generating direct emissions of CO_2, NO_x, CO, etc.
- Cooling systems: Data centers use cooling systems (air conditioning, chillers, refrigerant circuits, heat pumps, etc.) to remove heat generated by IT equipment. Some of these systems can emit gases directly. For example, cooling systems use refrigerant gases (e.g., HFCs, HCFCs, or other mixtures) that, if leaked (due to failures in seals, gaskets, valves, connections, pipes, or accidental events), are released into the atmosphere.

b. Scope 2 emissions

These are indirect emissions, i.e., they do not occur at the entity's own facilities, but at power generation facilities.

This is the most relevant source: the data center purchases electricity from an external supplier, and that energy has a carbon footprint linked to the energy mix (combination of renewable sources, fossil fuels, nuclear, etc.).

c. Scope 3 emissions

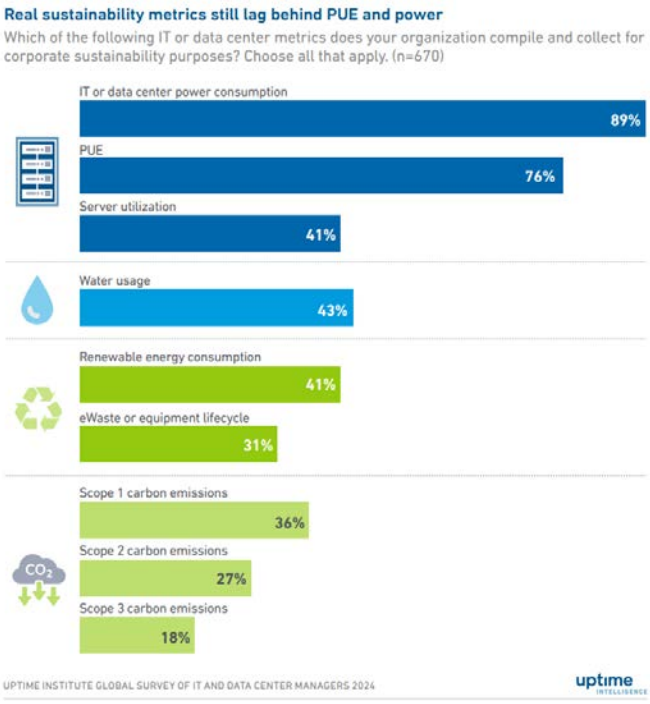
These are indirect emissions that come from outside the organization's direct control but are connected to its value chain. In other words, they are emissions that do not happen at its facilities or from generating the electricity it directly uses, but instead come from upstream and downstream activities (before or after its operations).

In data centers, Scope 3 emissions often account for a significant share of the total footprint, and as a facility uses more renewable energy (reducing Scope 2), Scope 3 emissions take on an even more important role.

Only a minority of data centers report carbon emissions

The Uptime Institute, a globally recognized organization that focuses on advising, certifying, and promoting best practices in critical infrastructure, especially data centers, released the results of its 2024 survey—conducted annually among data center owners and operators mainly in Europe and the US—which reveals a trend: data center operators are only able to report on two well-established metrics: energy consumption and PUE (Power Usage Effectiveness). However, as the organization itself points out, these alone are not sufficient to track progress toward sustainability.

For the Uptime Institute, the above metrics are the most reported for two main reasons: the data is easy to collect and is of most interest to executives. This is because the energy used or wasted has a direct impact on operating costs, and improving efficiency has a direct impact on business performance and environmental impact. The rest of the metrics related to facility sustainability are reported by less than half of the respondents.



In accordance with this, only a small number of operators report their carbon emissions according to the Greenhouse Gas (GHG) Protocol, even though it is a crucial part of verifying claims of progress toward carbon neutrality. This data is also required under climate reporting laws in the European Union, the United Kingdom, many Asian countries, and parts of the United States.

The results of this survey suggest that most operators lack the necessary data to file these reports or to support their corporate net-zero emissions goals.

In its report, the Uptime Institute acknowledges that in 2023, it predicted that reporting on sustainability metrics would increase rapidly: “This has not yet happened, but legislation and public pressure will continue to demand this information.”