Cloud Carbon Footprint

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What we'll talk about today

- The current landscape
- What is the CCF
- How we use the CCF in Oda
- Applications and limitations
- Further reading

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The current landscape

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Global greenhouse gas emissions from the tech sector are on par or larger than the aviation industry, at around 3% for ICT and 2% for aviation respectively.*

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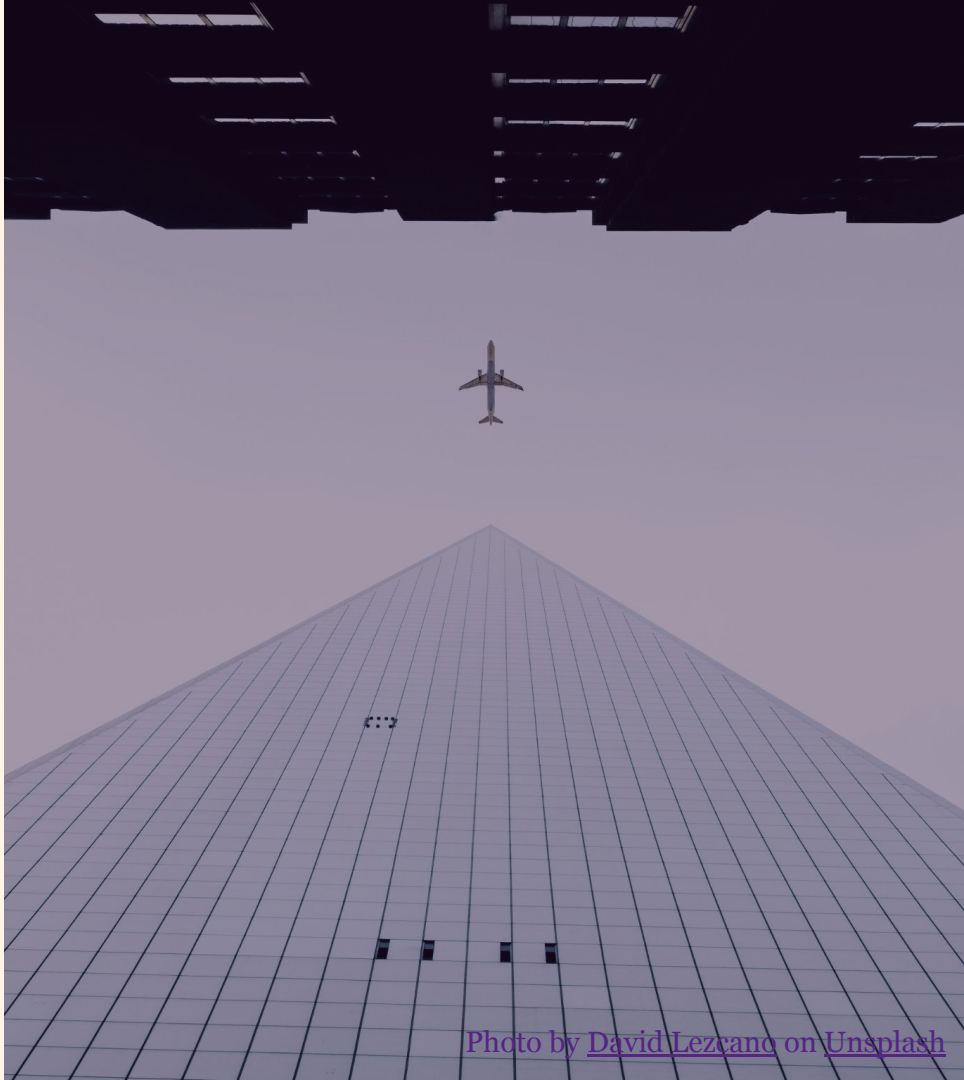

Photo by David Lezcano on Unsplash

To align with global climate objectives, emissions from the broader digital sector must be slashed **by nearly half** by 2030.*

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You can’t change what you can’t measure.

How can we lower our **carbon footprint** if we don’t know what our starting point is?

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Green Software Principles

Energy Efficiency

Consume the least amount of electricity possible

Hardware Efficiency

Use the least amount of embodied carbon possible

Carbon Awareness

Do more when the electricity is clean and less when it's dirty

The Cloud Carbon Footprint application

https://cloudcarbonfootprint.org

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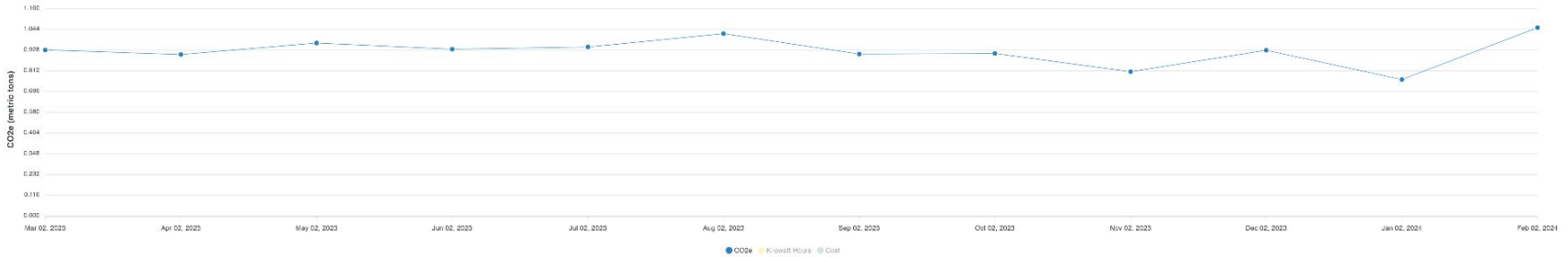
Cloud Carbon Footprint

RECOMMENDATIONS

Cloud Providers: 4 of 4 | Accounts: 16 of 16 | Services: 8 of 8 | Start Date → End Date | 1M | 3M | 6M | 12M | ALL

Cloud Usage



Your cumulative emissions are

11.1 metric tons CO2e

that is equivalent to

CO2e emissions from

14

direct one way flights

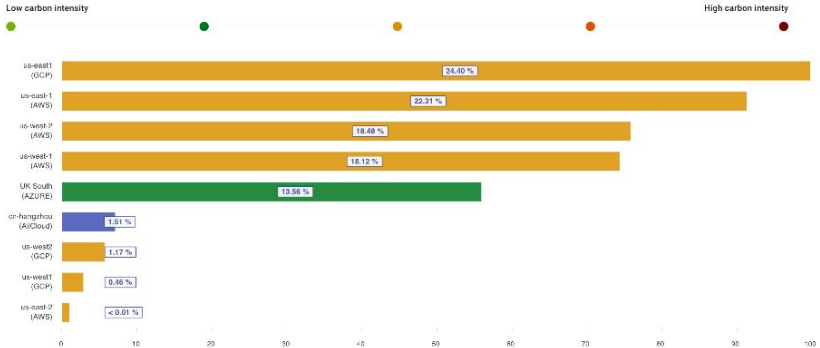
from NYC to London

FLIGHTS | PHONES | TREES

Source: Flight Carbon Footprint Calculator

Emissions Breakdown

Region



Carbon Intensity Map

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How it works

- available as an install-it-yourself dashboard, CLI tool, and API,

- pulls usage data (compute, storage, networking) from billing data,

- calculates estimated energy (Wh)*, and greenhouse gas emissions (metric tons CO_2e),

- presents data as graphs or in csv format.

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How it works

Total CO_2e = operational emissions + embodied emissions

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embodied emissions = estimated metric tons CO_2e emissions from the manufacturing of datacenter servers, for compute usage*

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How it works

Total CO_2e = operational emissions + embodied emissions

operational emissions = (Cloud provider service usage) x
(Cloud energy conversion factors [kWh]) x
(Cloud provider Power Usage Effectiveness (PUE)) x
(Grid emissions factors [metric tons CO_2e])

embodied emissions = estimated metric tons CO_2e emissions from the manufacturing of datacenter servers, for compute usage*

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CCF case study: Oda

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Demo time

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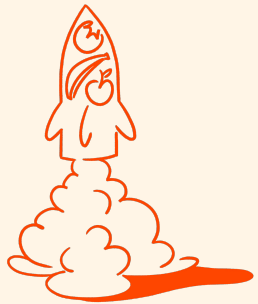
To summarize

Right now we report, but don’t act on the data.

We can already identify areas for slashing our emissions:

- Observability stack is our most carbon costly GCP project.
- Compute is our most carbon costly GCP resource - is it utilized enough?
- Our chosen cloud region’s carbon intensity could be lowered.



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Further reading

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Further reading

Listen to this episode of **Environment Variables** about the Cloud Carbon Footprint: https://podcast.greensoftware.foundation/e/1n23mkx8-cloud-footprints-with-ccf

Take the free **Green Software for Practitioners** course: https://training.linuxfoundation.org/training/green-software-for-practitioners-lfc131/

Read Etsy's **"Cloud Jewels"** cloud energy usage methodology: https://www.etsy.com/codeascraft/cloud-jewels-estimating-kwh-in-the-cloud/

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Limitations

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Estimations and averages

- CCF methodology is based on estimations and averages.

- That’s generally ok, as long as you use the same methodology every time.

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(William Stanley) Jevons paradox

occurs when technological progress or government policy **increases the efficiency** with which a resource is used, but the falling cost of use induces **increases in demand** enough that resource use is increased, rather than reduced.*

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Photo by Christian Dubovan on Unsplash

Thank you

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