GreenOps para
Infraestructuras sustentables en la nube

Noviembre 2022

Temas

- Definiciones
- Greening of IT y Greening by IT
- ¿On prem o Cloud?
- GreenOps + FinOps
- Tus preguntas

GreenOps:

Responsabilidad organizacional con respecto a las emisiones de carbono

Inventario de Carbono: 3 alcances de emisiones consideradas

Los alcances 1, 2 y 3 miden las incidencias directas e indirectas del impacto ambiental

- Dióxido de Carbono
- Metano
- Oxido nitroso
- Hidrofluorocarburos
- Perfluorocarburos
- Hexafluoruro de azufre
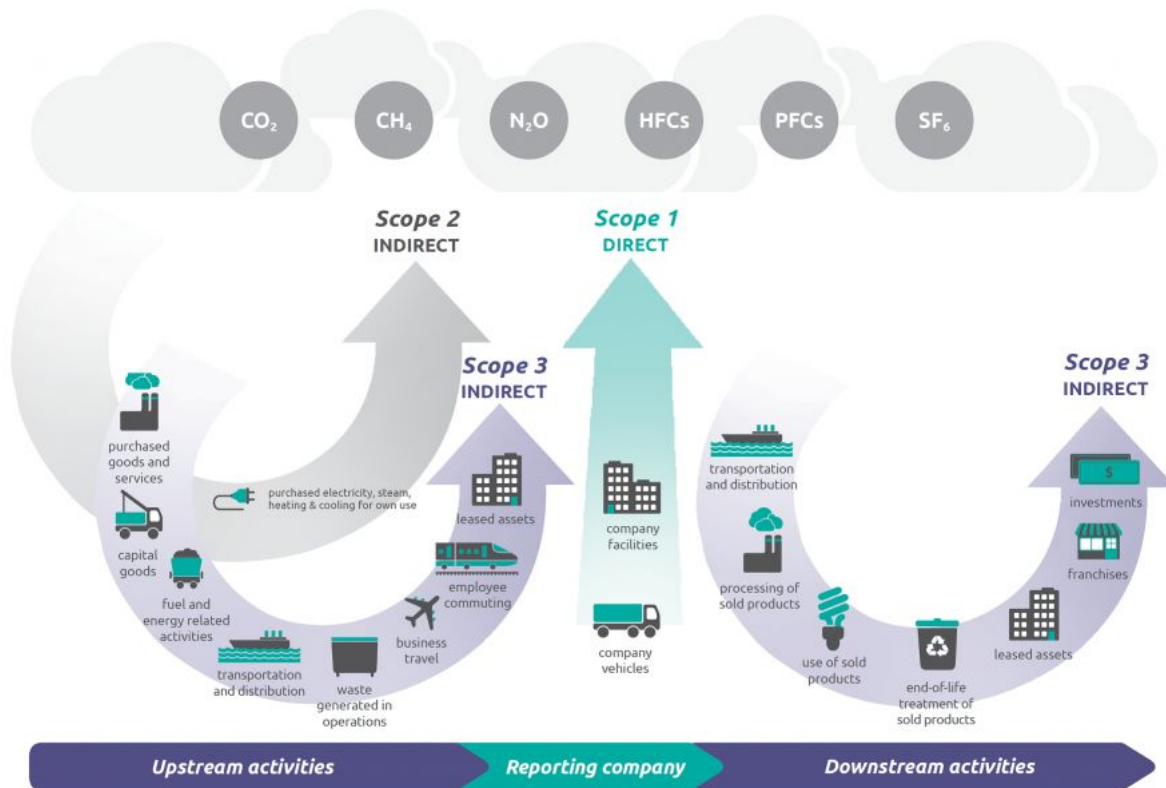
Compromisos de los Cloud Providers

	Google	Amazon	Microsoft
100% Net Operational Carbon Neutral	2007	Not Committed	2012
100% of Electricity Matched With Renewable Energy	2017	2025	2025
24x7 Carbon Free Energy	2030	Not Committed	2030
Net Zero on value chain	2030	2040	2030
Native Cloud Carbon Emission Reporting Dashboard Per Customer	Yes (In GCP Console)	No ("early next year")	Yes (Requires PowerBI)
CDP Climate Change Score (Latest - 2020)	A	F	A

Greening of IT y Greening by IT

¡Alcances diferentes!

Greening of IT

Reducir el impacto inmediato de sus operaciones de IT y reducir sus emisiones asociadas

Greening by IT

Usar la innovación de IT para reimaginar sus soluciones y modelos de negocios 10X para ser más sostenibles

Power Usage Effectiveness (PUE)

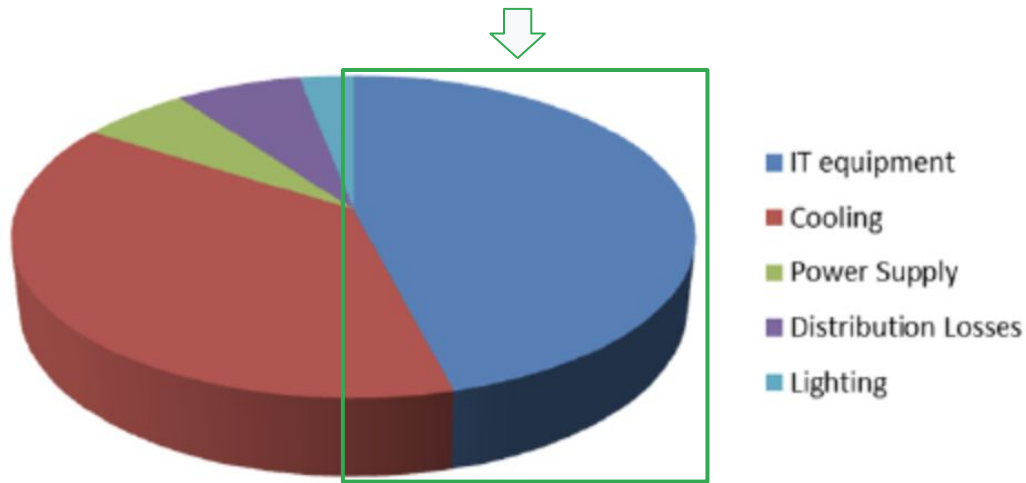$$PUE = \frac{\text{Total Facility Energy (kWh)}}{\text{IT Equipment Energy (kWh)}}$$

Figure: Energy usage breakdown of a typical data center

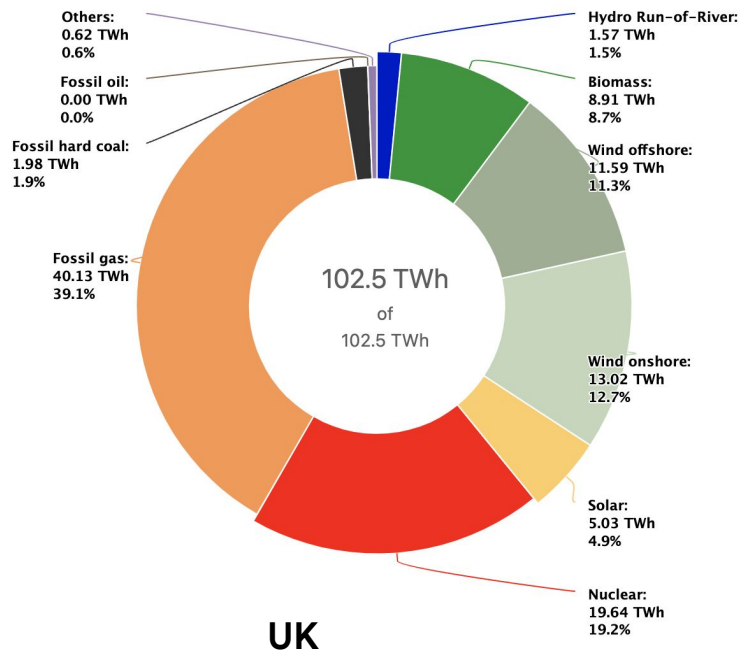# Power Usage Effectiveness (PUE)

PUE	Level of efficiency
3.0	Very inefficient
2.5	Inefficient
2.0	Average
1.5	Efficient
1.2	Very efficient

Source: 42u.com

Fórmula de emisiones de Carbono

$$\text{Carbon Emission (kgCO2e)} = \text{Energy Consumption (kWh)} \times \text{Carbon Intensity Factor (kgCO2e/kWh)}$$

Perfil electrico

UK

Legend:
- Hydro Run-of-River
- Biomass
- Wind offshore
- Wind onshore
- Solar
- Nuclear
- Fossil gas
- Fossil hard coal
- Fossil oil
- Others

102.5 TWh of 102.5 TWh

- Others: 0.62 TWh 0.6%
- Fossil oil: 0.00 TWh 0.0%
- Fossil hard coal: 1.98 TWh 1.9%
- Fossil gas: 40.13 TWh 39.1%
- Hydro Run-of-River: 1.57 TWh 1.5%
- Biomass: 8.91 TWh 8.7%
- Wind offshore: 11.59 TWh 11.3%
- Wind onshore: 13.02 TWh 12.7%
- Solar: 5.03 TWh 4.9%
- Nuclear: 19.64 TWh 19.2%

Finlandia
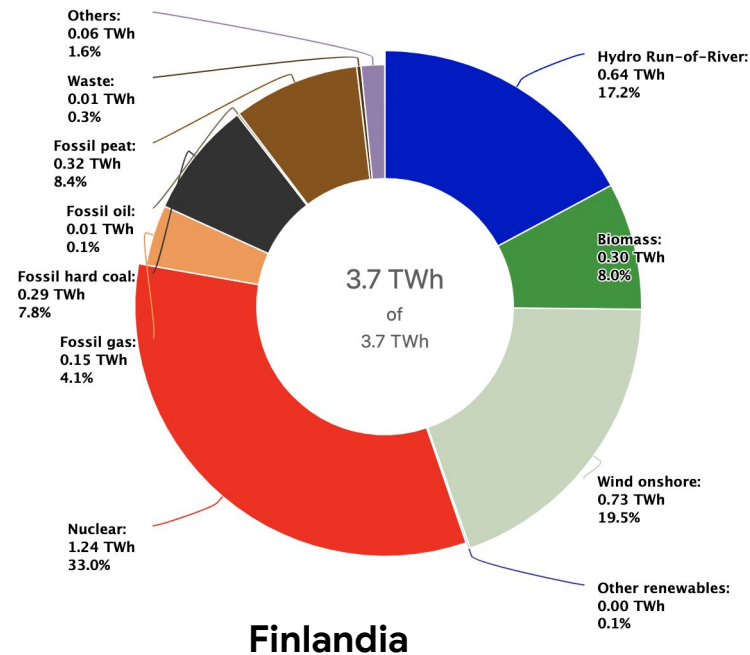
Legend:
- Hydro Run-of-River
- Biomass
- Wind onshore
- Other renewables
- Nuclear
- Fossil gas
- Fossil hard coal
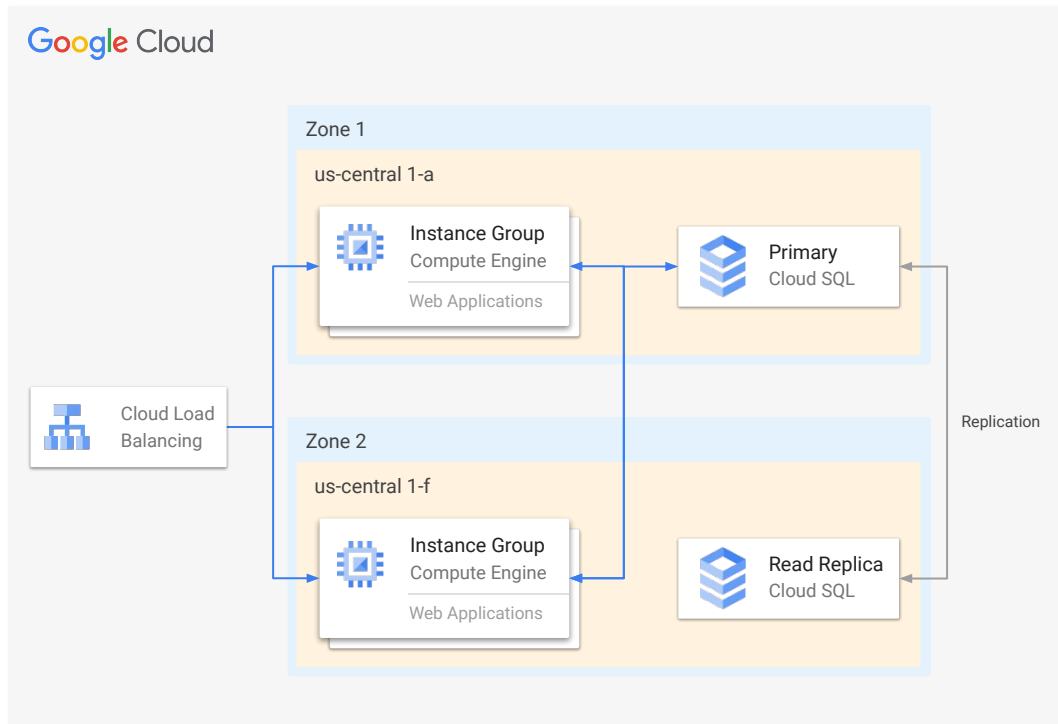- Fossil oil
- Fossil peat
- Waste
- Others

3.7 TWh of 3.7 TWh

- Others: 0.06 TWh 1.6%
- Waste: 0.01 TWh 0.3%
- Fossil peat: 0.32 TWh 8.4%
- Fossil oil: 0.01 TWh 0.1%
- Fossil hard coal: 0.29 TWh 7.8%
- Fossil gas: 0.15 TWh 4.1%
- Nuclear: 1.24 TWh 33.0%
- Hydro Run-of-River: 0.64 TWh 17.2%
- Biomass: 0.30 TWh 8.0%
- Wind onshore: 0.73 TWh 19.5%
- Other renewables: 0.00 TWh 0.1%

Source

Carbon free energy % per regions (2020)

Oregon 90%
Salt Lake City 28%
Los Angeles 54%
Las Vegas 19%
Iowa 93%
Toronto
Montréal
N. Virginia 58%
S. Carolina 27%

São Paulo 88%
Santiago

Finland 94%
Netherlands 60%
London 59%
Belgium 79%
Paris
Zurich
Madrid
Warsaw
Frankfurt 63%
Milan

Doha
Delhi
Mumbai 12%
Hong Kong
Singapore 4%
Jakarta

Seoul 31%
Osaka
Tokyo 12%
Taiwan 18%

Sydney 11%
Melbourne

Carbon Free Energy

- 🟢 75-100%
- 🟢 50-75%
- 🟡 25-50%
- 🟡 0-25%
- 🔵 Current region CFE tbd*
- ⚪ Future region

*TBD means that not enough data is currently available to calculate the CFE scores

El mayor impacto en sustentabilidad es en el momento del diseño
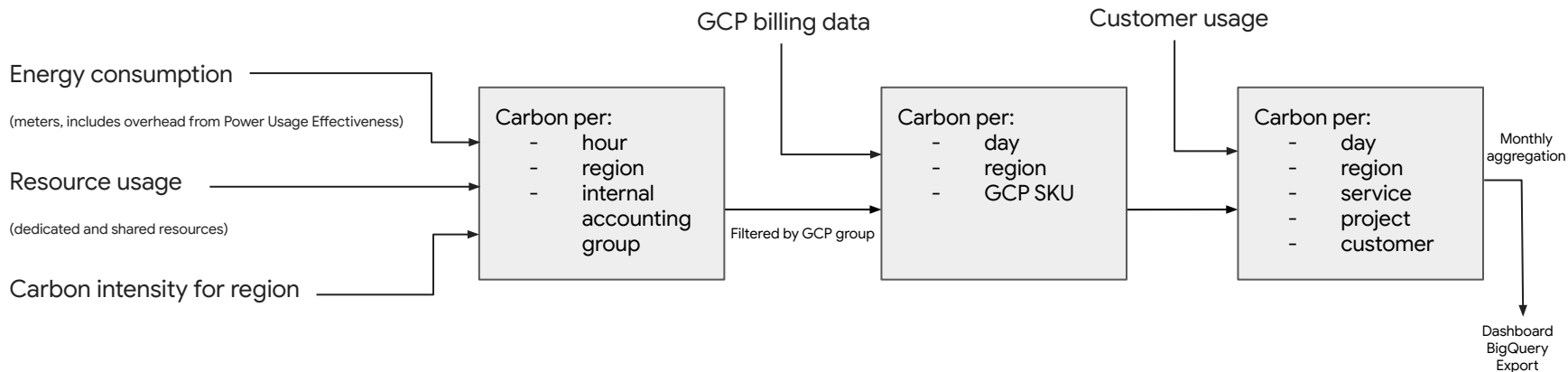
Hosting dinámico simple en la nube

Metodología

Internal carbon apportionment

GCP carbon apportionment

Per customer footprint

GCP billing data

Customer usage

Energy consumption

(meters, includes overhead from Power Usage Effectiveness)

Resource usage

(dedicated and shared resources)

Carbon intensity for region

Carbon per:
- hour
- region
- internal accounting group

Filtered by GCP group

Carbon per:
- day
- region
- GCP SKU

Carbon per:
- day
- region
- service
- project
- customer

Monthly aggregation

Dashboard
BigQuery
Export

cloud.google.com/carbon-footprint/docs/methodology/

ELECTRICITY MAPS

Questions? Reach out to us

Routes

Zones

This endpoint returns all zones available if no auth-token is provided.

If an auth-token is provided, it returns a list of zones and routes available with this token.

ⓘ   `["*"]` means that all routes on a zone is accessible.

HTTP Request

`GET https://api.electricitymap.org/v3/zones`

Used **without** an auth-token

```
curl 'https://api.electricitymap.org/v3/zones'
```

Above commands returns a json object containing all zones:

```json
{
  "AD": {
    "zoneName": "Andorra"
  },
  "AE": {
    "zoneName": "United Arab Emirates"
  },
  ...
  "US-CAR-DUK": {
    "countryName": "United States of America",
    "zoneName": "Duke Energy Carolinas"
  }
}
```
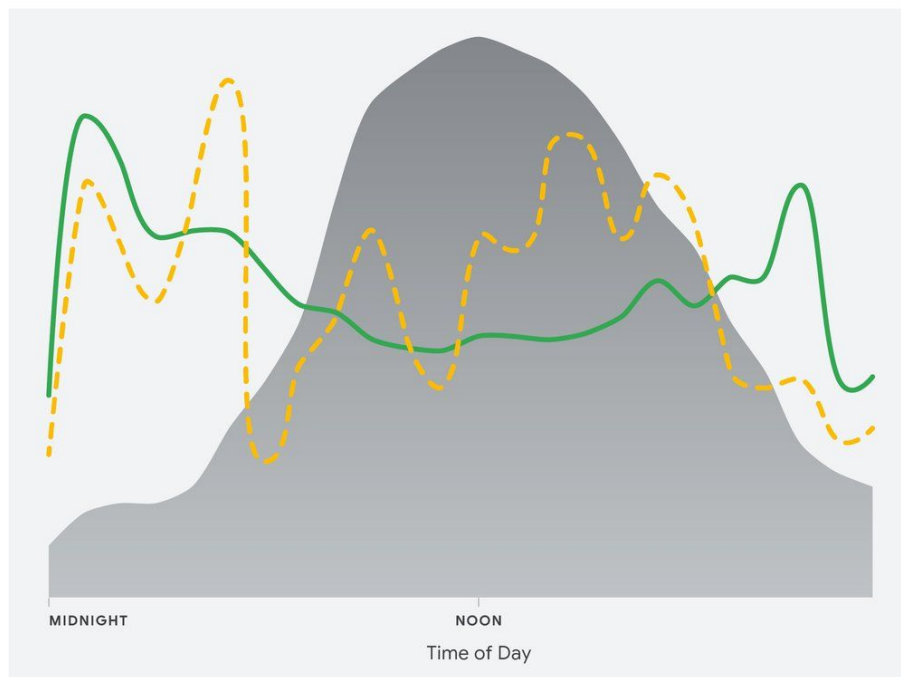
Used **with** an auth-token:

```
curl 'https://api.electricitymap.org/v3/zones' \
  -H 'auth-token: myapitoken'
```

Above command returns a json object containing the zones and routes accessible with the token:
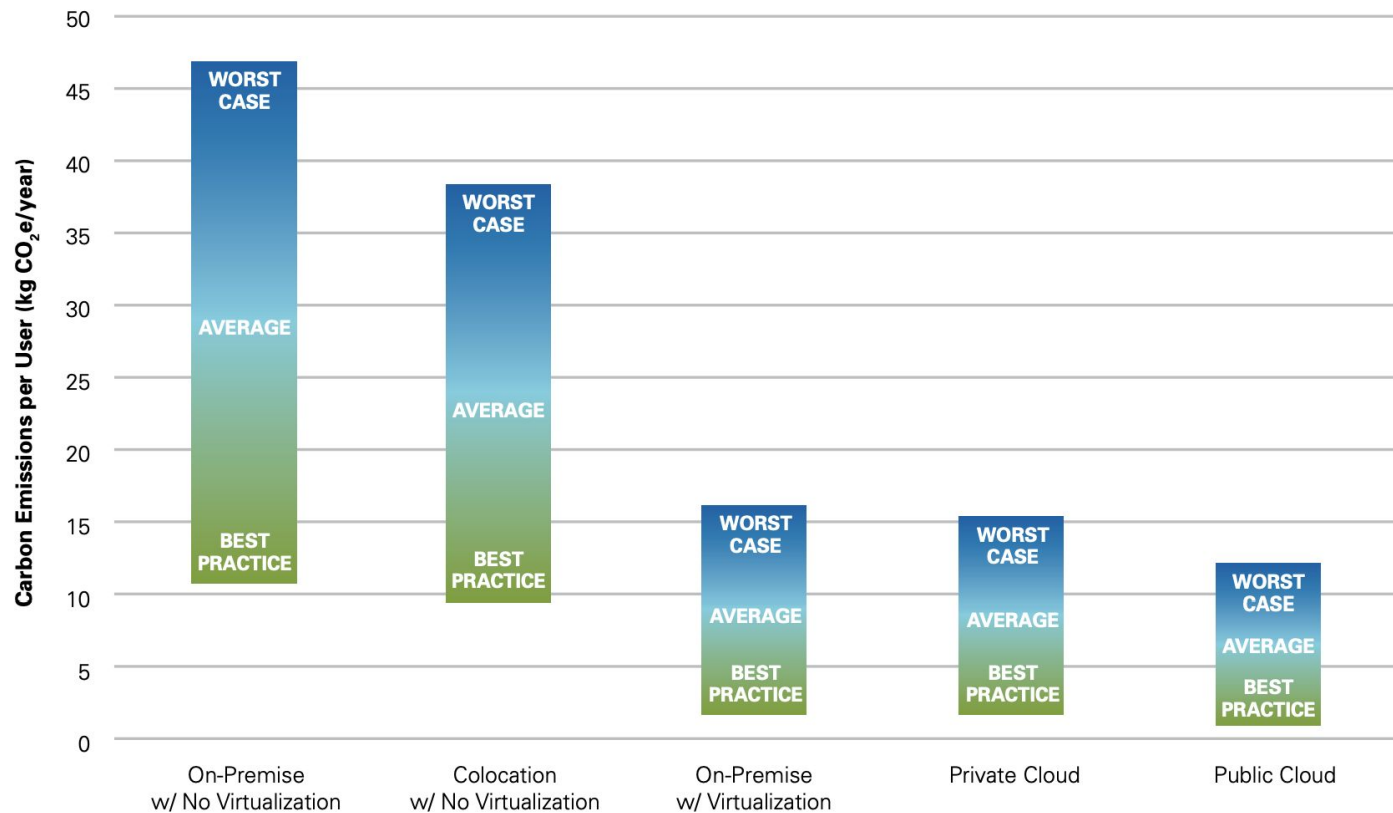
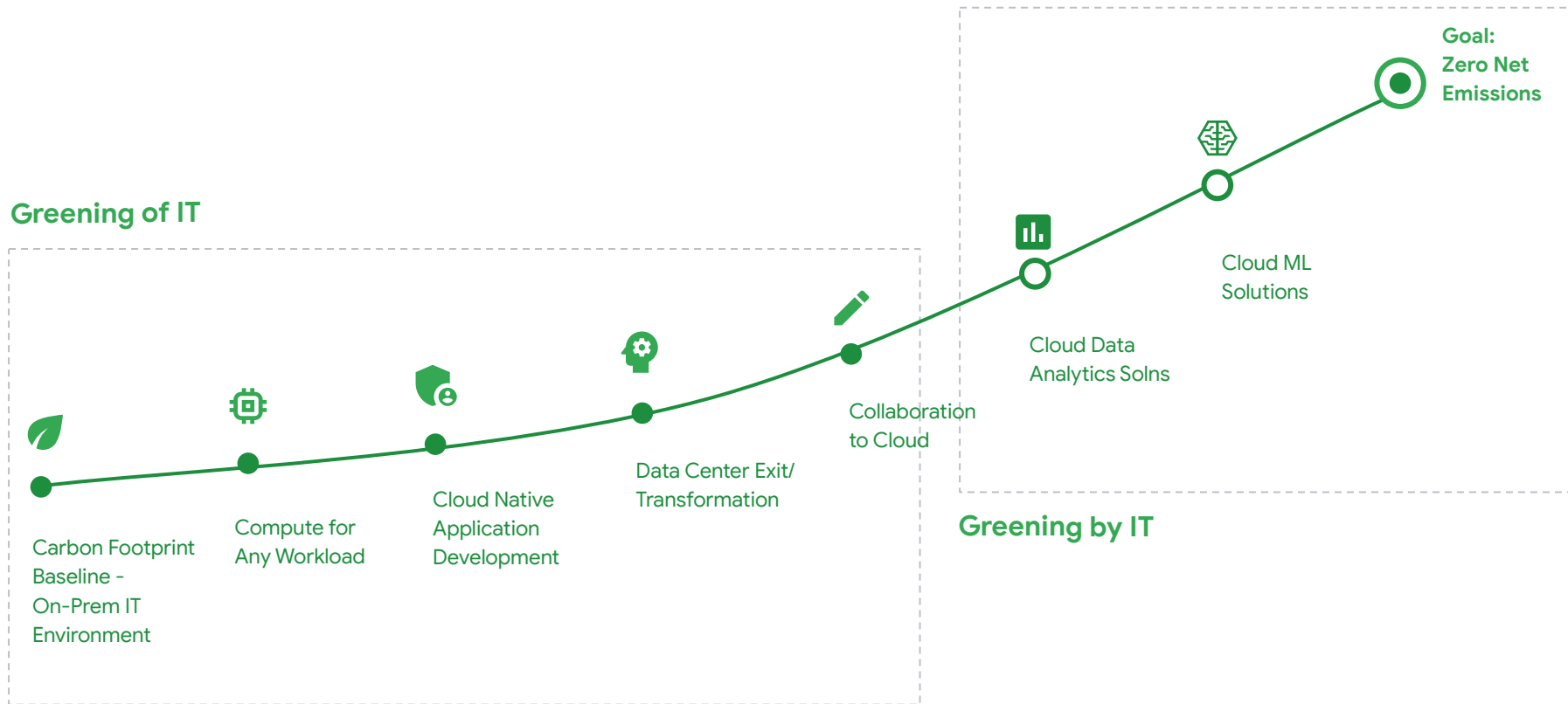# Baseline vs. Carbon-aware load

Baseline versus Carbon-aware Load

¿On prem o Cloud?

Comparación de escenarios de implementaciones de IT

Source:

GreenOps + FinOps

Adopción de soluciones de Sustentabilidad

Greening of IT

Greening by IT

Carbon Footprint Baseline - On-Prem IT Environment

Compute for Any Workload

Cloud Native Application Development

Data Center Exit/ Transformation

Collaboration to Cloud

Cloud Data Analytics Solns

Cloud ML Solutions

Goal: Zero Net Emissions

sustainableitdecoded.withgoogle.com

Tus preguntas