



UK Health  
Security  
Agency

# GreenOps

# Overview

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5. Technology to Enable GreenOps

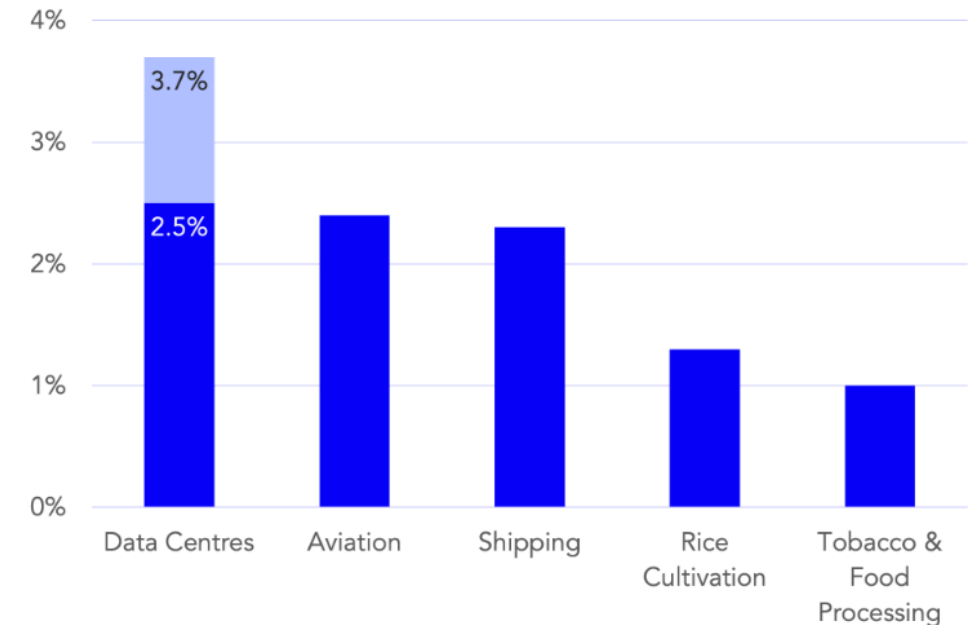
# Problem Statement

There are three main issues:

1. Global emissions from Cloud computing ranges from 2.5% to 3.7%. This exceeds both the Aviation and Shipping industries global emissions.
2. Native Cloud Provider telemetry does not give us an accurate picture.
3. Previously at UKHSA the calculations have been manual and time consuming.

## Global cloud computing emissions exceed those from commercial aviation

Share of global CO<sub>2</sub> emission generated by sector/category



Source: Climatiq Analysis, The Shift Project, OurWorldinData



# Renewable Energy Overview

## Renewable Energy Conversion Systems

- Solar
- Wind
- Hydropower

## Renewable Energy Credits - RECs

- A token representing a utilities green energy generation.
- RECs are how the big 3 claim their data centres are powered by 100% renewables whilst still being connected to grids that use fossil fuels.
- In reality only a fraction of each company's energy comes directly from solar or wind installations.

## Renewable Energy Storage

- Huge Battery Banks – Manufacturing of batteries is also detrimental to the environment but is out of scope.

## Amazon Web Services

- From 2018 it achieved 50% Renewable Energy usage with RECs factored in. This means **>50% of energy used was fossil fuels.**
- Known for keeping information about its carbon footprint out of public view.
- In 2019 grew operation by 59% over two years without adding new renewable energy.
- Although publishing its global carbon footprint for the first time it petitioned the Australian government to without data from its annual report on carbon emissions in the country
  - We know this is because Australian data centres have some of the highest carbon intensities in the world.
- **Total Renewable Energy portfolio: 1.6GW**

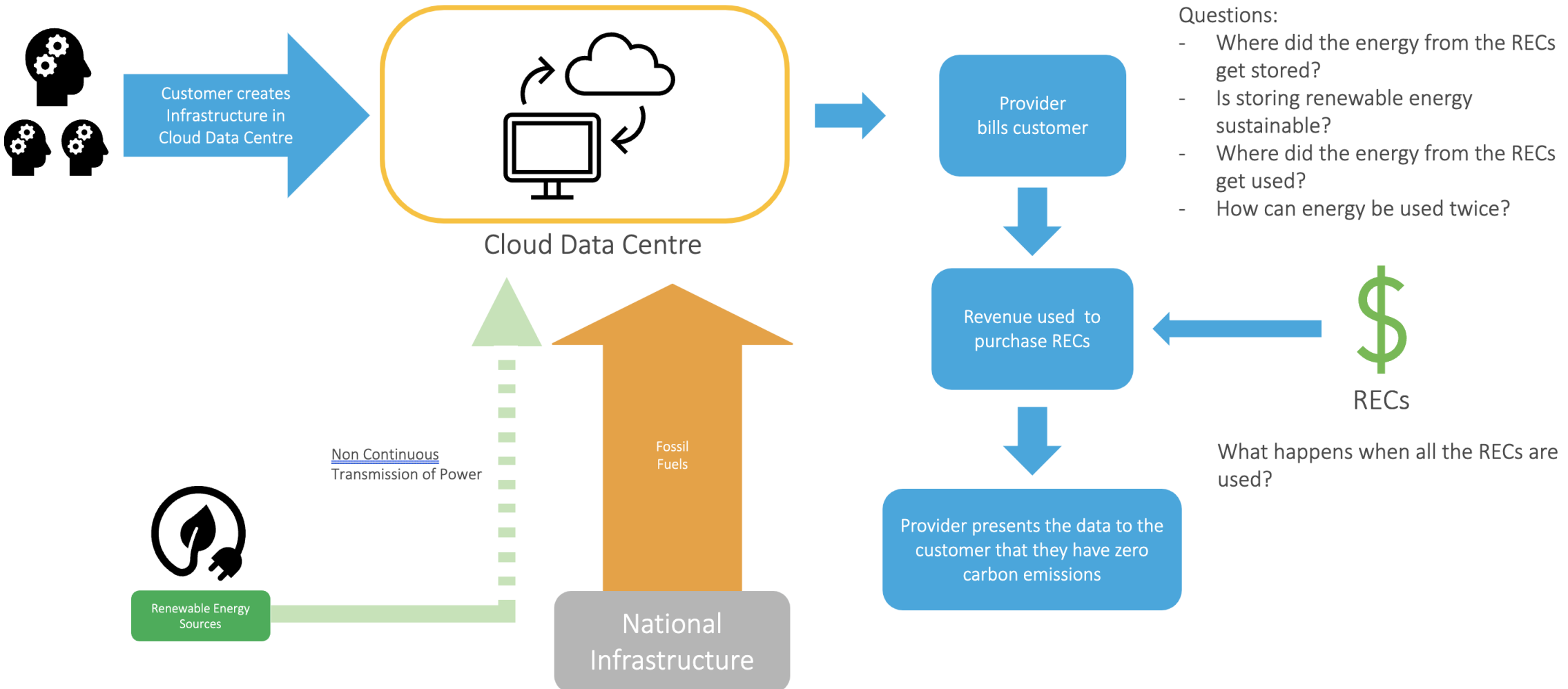
## Microsoft Azure

- With RECs – Microsoft run's 100% Renewable
- Without RECs – Microsoft Data Centres run on 60% Renewable Energy.
- **Total Renewable Energy Portfolio: 1.9GW**

## Google Cloud Platform

- The largest corporate buyer of Renewable Energy in the world.
- The want to be powered by 100% renewable on an hourly basis.
- **Total Renewable Energy Portfolio: 5.5GW**

# The Energy Journey



# The Future

To date, cloud data centres consume a large but consistent amount of energy based on current usage.

- What happens when cloud is fully adopted globally and energy usage in data centres increases?
- What happens when energy prices increase further?
- How will that affect the customers?
- How will this affect policy and legislation globally?
- How can you protect your companies' interests?

What happens when the total energy requirements of Data Centres exceeds the total amount of RECs that can be bought?

The most likely scenario:

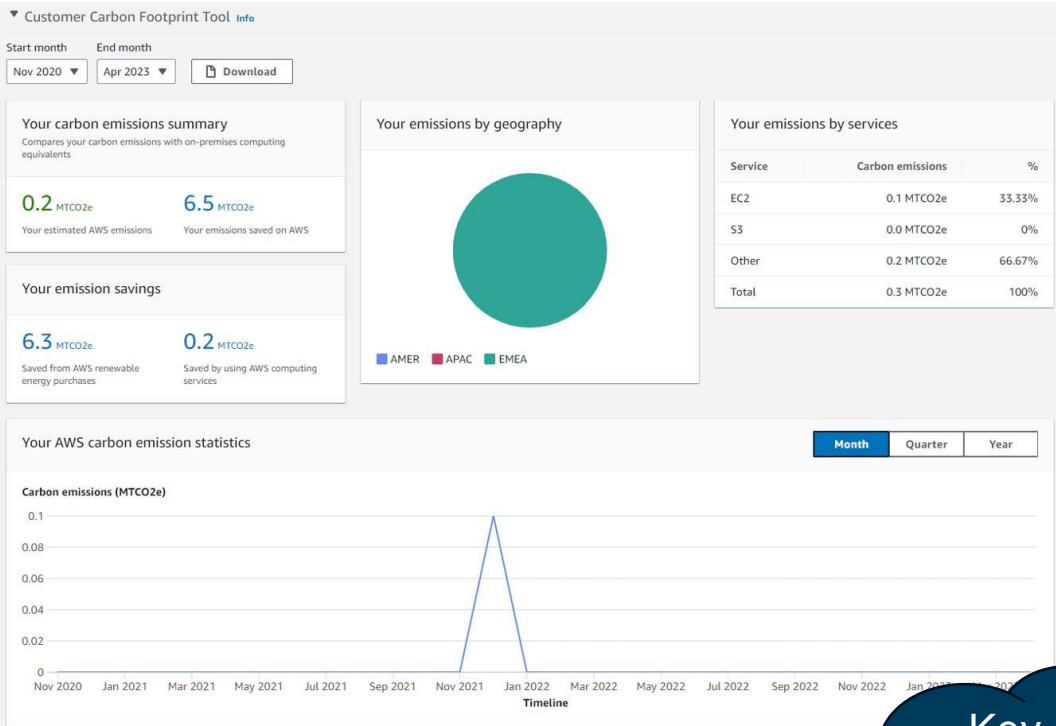
- Cloud cost will change, dependant on demand and power consumption.
- Preferential rates will be given to data centres that are underutilised.
- They will change T&Cs – customers will become responsible stakeholders of the data centres they're using.
- Cloud Providers will pass on Carbon Emission responsibilities to their customers for their individual usage.

Responding to this change will require:

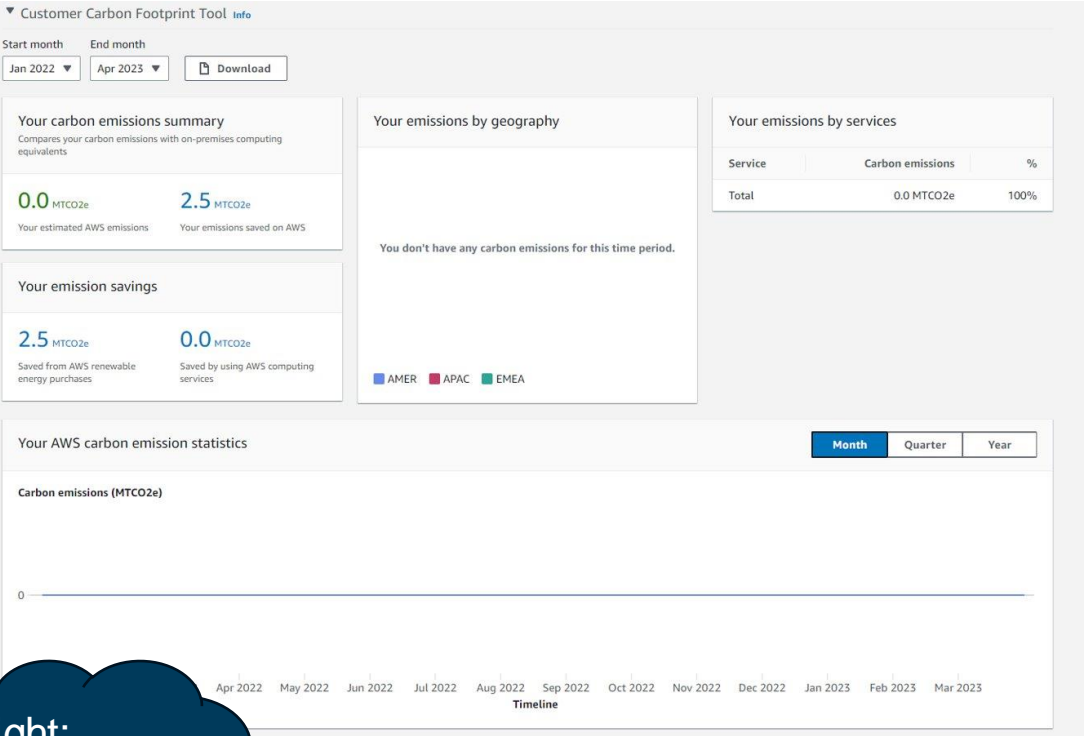
- Strong DevOps culture
- Cloud Agnostic Technology
- A Cloud Partner that can ensure business continuity.

# AWS – Customer Carbon Footprint Tool

## Cloud Emissions from an individual Environment to Date



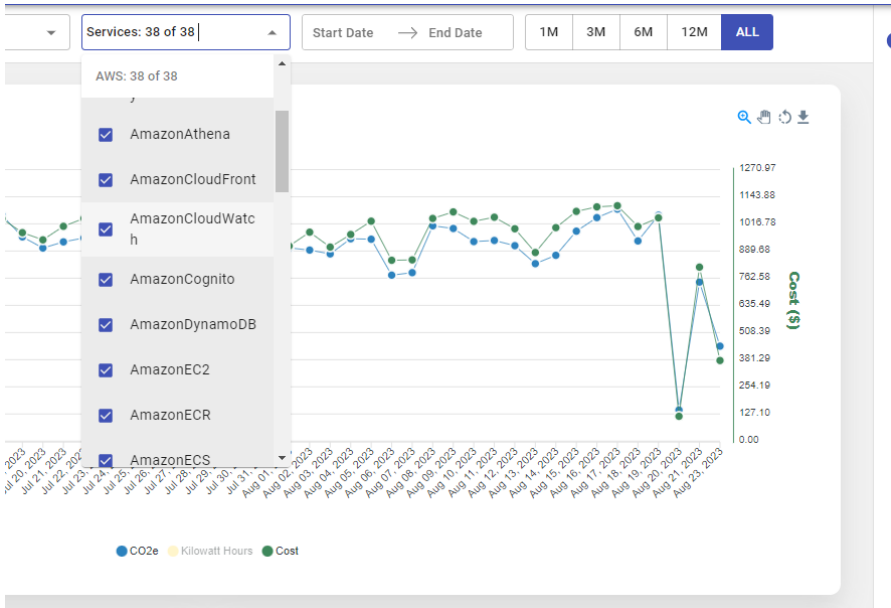
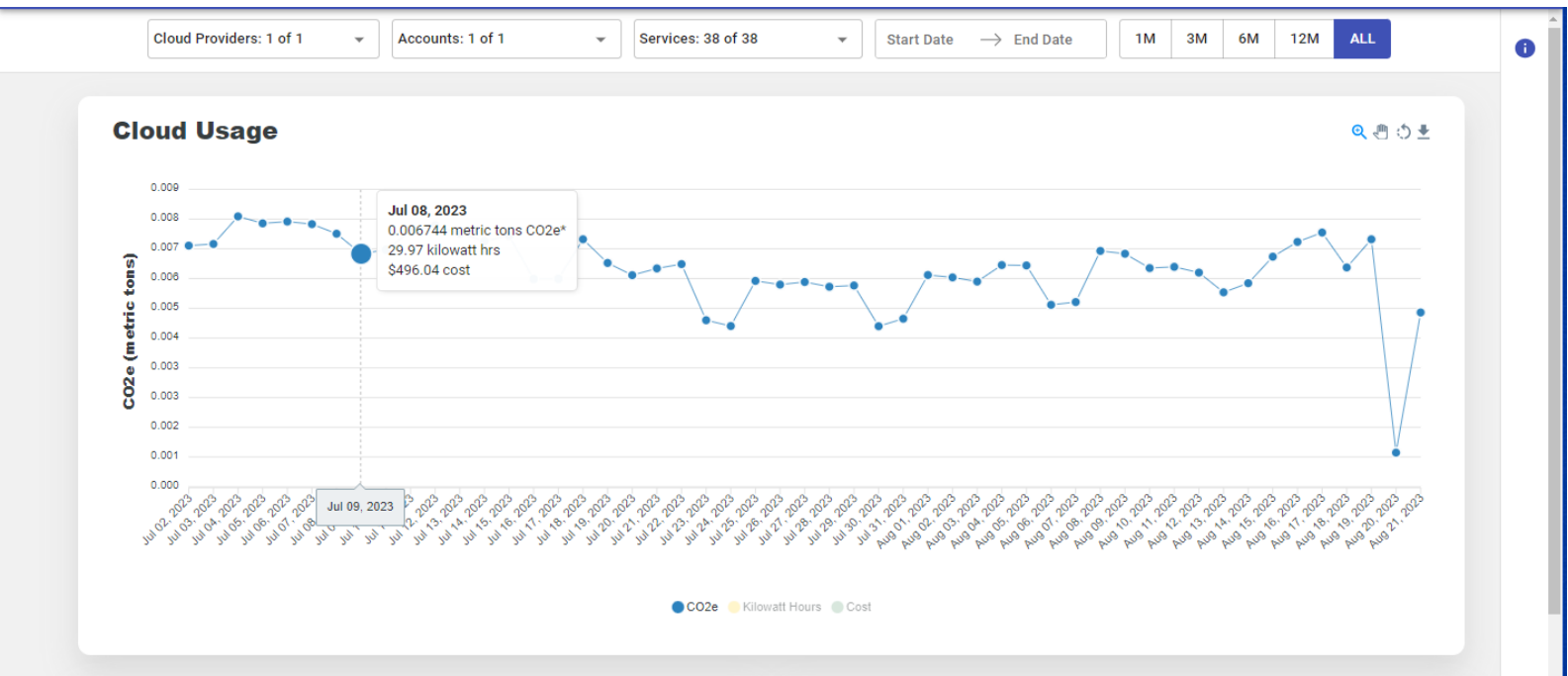
## Cloud Emissions from the same environment since 2022



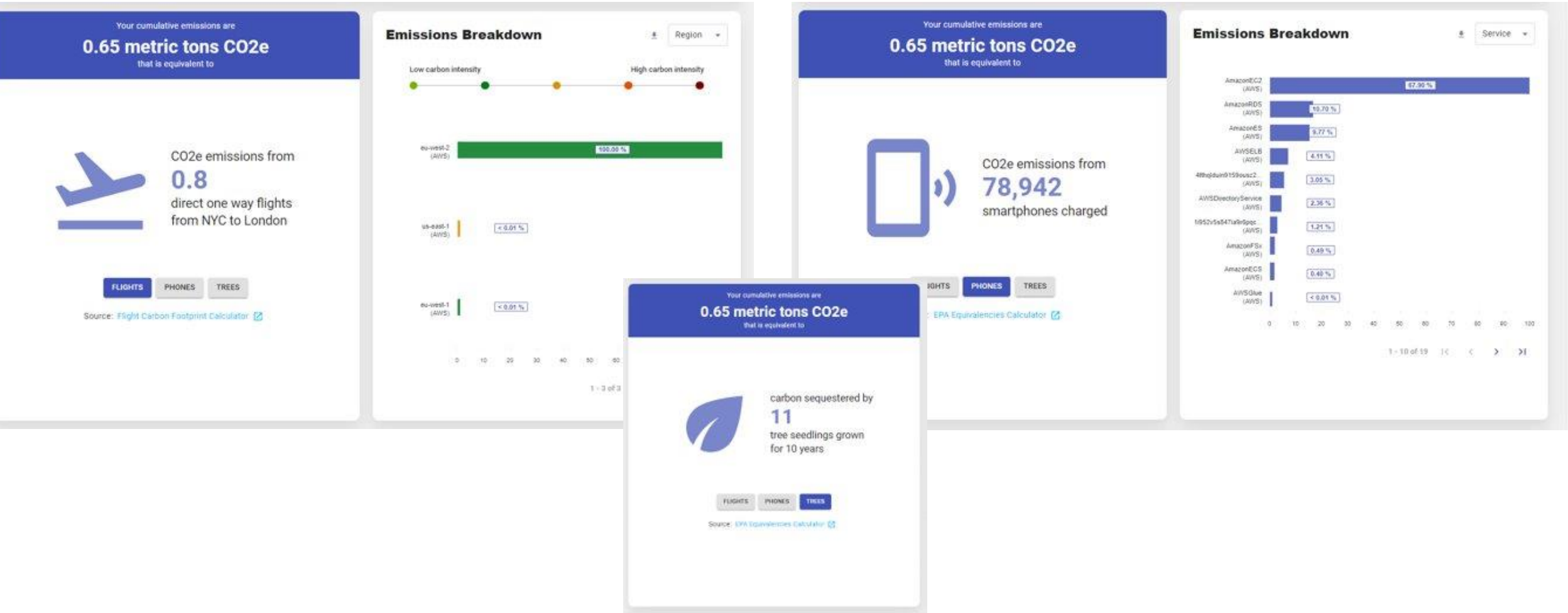
**Key Insight:**  
These stats are inaccurate and not relevant to truly cloud native technologies that were born in the cloud

# GreenOps Dashboard

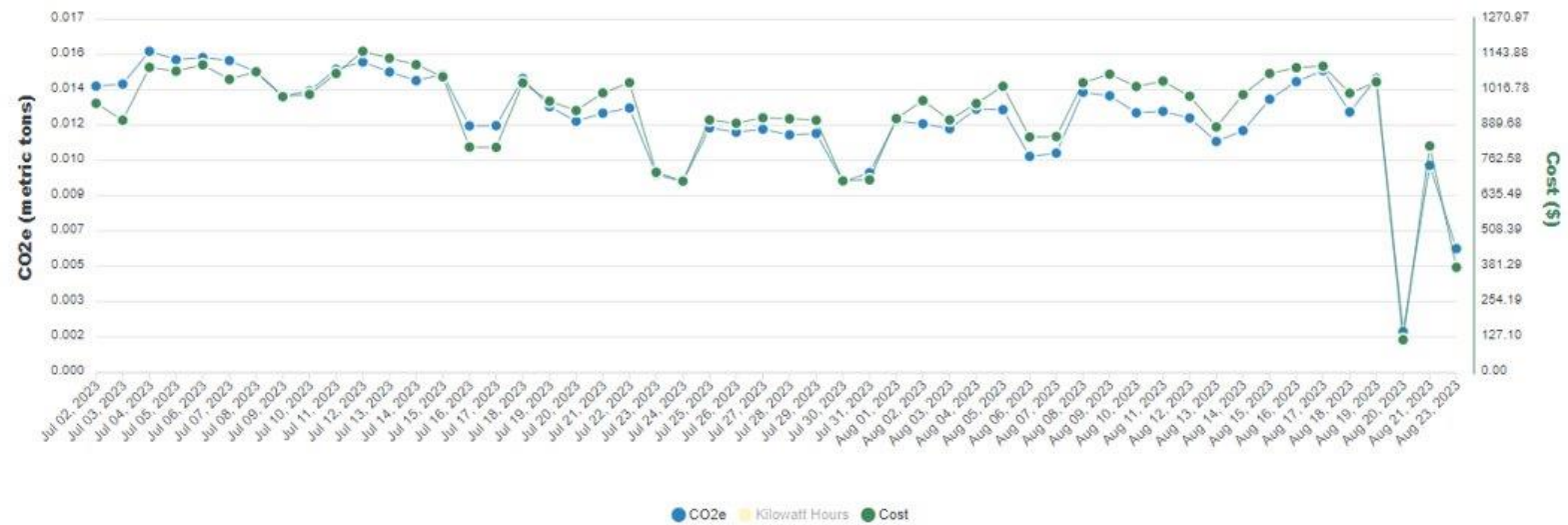
Granular Carbon Emissions that can even be filters by individual services





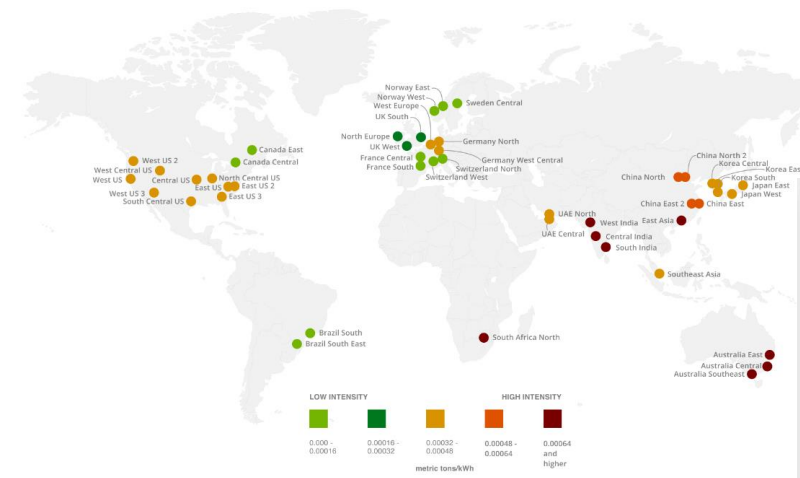


### Cloud Usage



Carbon Intensity Map

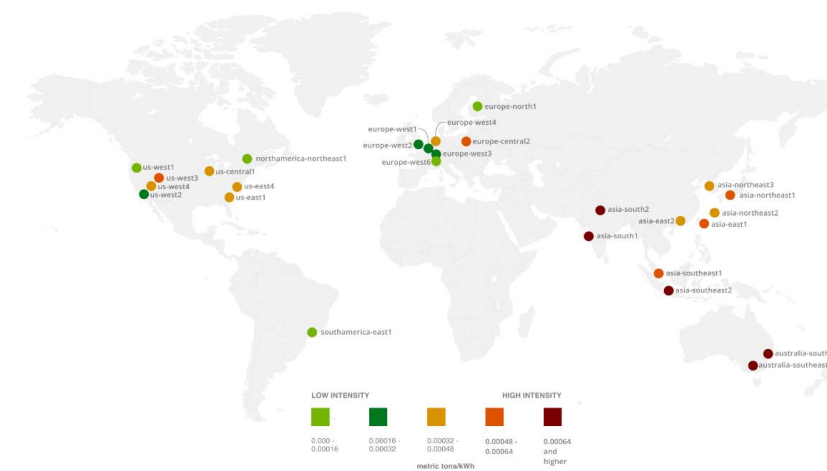
Azure



Make informed cloud decisions based on individual data centre efficiencies and carbon intensity figures.

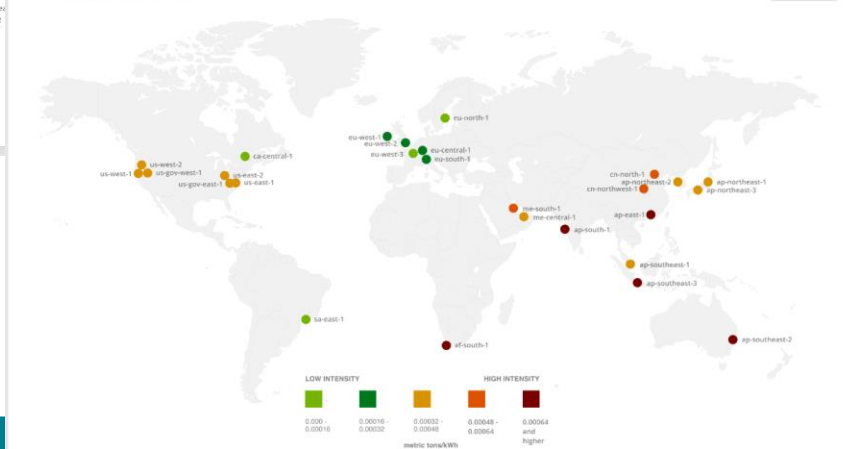
Carbon Intensity Map

GCP



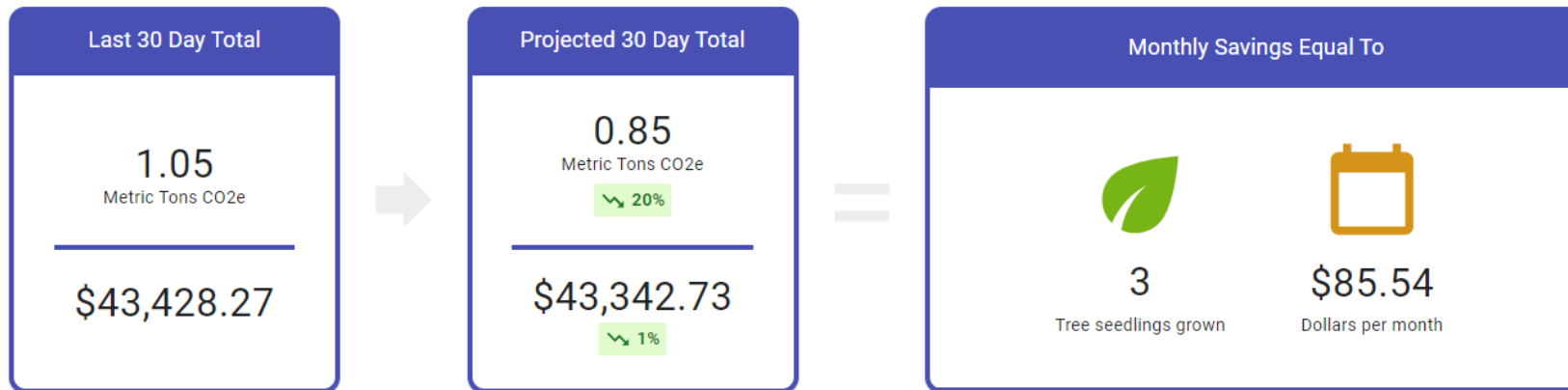
Carbon Intensity Map

AWS



# Recommendation and Forecasting Functionality

## Forecast



# Automatic Recommendations based on Usage Reports to streamline your cloud estate

Recommendations

Aug 10, 2023 - Aug 23, 2023

Search

Cloud Provider	Account Name	Region	Recommendation Type	Potential Cost Savings (\$)	Potential Carbon Savings (t)
AWS	aws account 0	us-west-1	Modify	15.64	0.038
AWS	aws account 1	us-east-2	Modify	19.671	0.047
AWS	aws account 2	us-east-1	Modify	2.909	0.007
AWS	aws account 3	us-west-2	Delete	1.503	0.004
AWS	aws account 4	us-west-1	Delete	14.996	0.036
GCP	gcp account 0	us-west1	DELETE_IMAGE	0.393	0.001
GCP	gcp account 1	us-west1	SNAPSHOT_AND_DELETE_DISK	0.609	0.001
GCP	gcp account 2	us-west1	CHANGE_MACHINE_TYPE	0.552	0.001
GCP	gcp account 3	us-east1	DELETE_ADDRESS	3.989	0.01
GCP	gcp account 4	us-west2	DELETE_DISK	1.98	0.005
GCP	gcp account 2	us-east1	STOP_VM	23.297	0.056

Recommendation Details

Cloud Provider

AWS

Account Name

aws account 0

Account ID

aws account 0

Region

us-west-1

Resource Name

example-instance-5

Resource ID

i-0f12345678912b12i

Recommendation Type

Modify

Recommendation Detail

Modify instance: example-instance-5.

Cost Savings

(USD)

15.64

CO2e Savings

(Metric Tons)

0.038

Energy Savings

(kilowatt hours)

116.513

