

Sitigreen x CO2.js



Website carbon calculations in the Italian context

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Hello, I'm Ferhad!

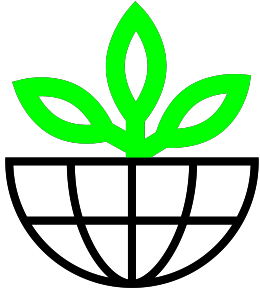
Stuff I do

- Work with the [Green Web Foundation](#)
- Maintainer of **CO2.js**
- Creator of [Are my third parties green?](#)
- Writer of [COP Website Reviews](#)

I also ...

- Play, referee, coach and organise **Touch Football in Taiwan**



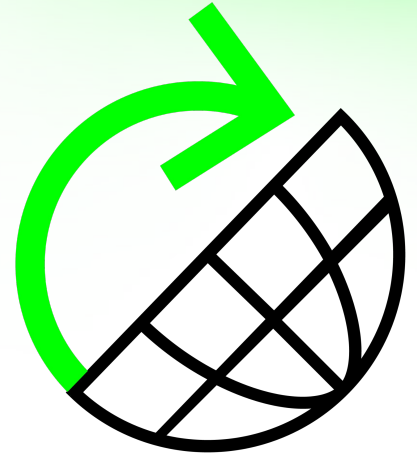


About the project

Update the Sitigreen website carbon calculator to return results that can be tailored for an Italian audience.

Why?

- Sitigreen's main audience is the Italian market.
- However, it originally **did not have the flexibility** to customise results for an Italian audience.



Why?

- It also lacked context:
 - About the location of the server.
 - About the location of the users.
- It used global averages in calculations.

In the end, all carbon emissions calculations look like a version of this:

$$\mathbf{Emissions\ (g\ CO_2e) = Energy\ Used\ (kWh) \times Grid\ Intensity\ (g\ CO_2e/kWh)}$$

Under or over estimation

World: 437.67 g CO₂e/kWh

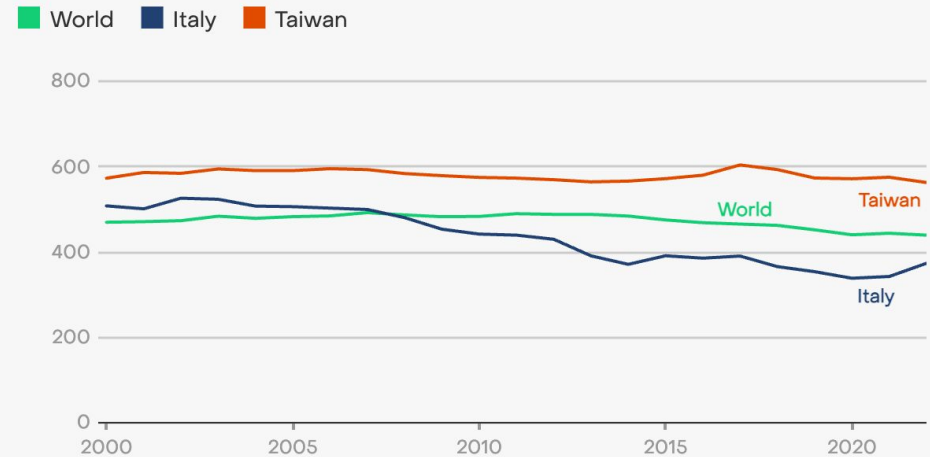
Italy: 371.69 g CO₂/kWh

Taiwan: 560.98 g CO₂/kWh

Average annual grid intensity, 2022.

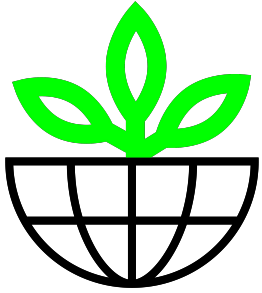
Emissions intensity

gCO₂e per kWh



Source: Ember Electricity Data Explorer, ember-climate.org

EMBER



The project in detail

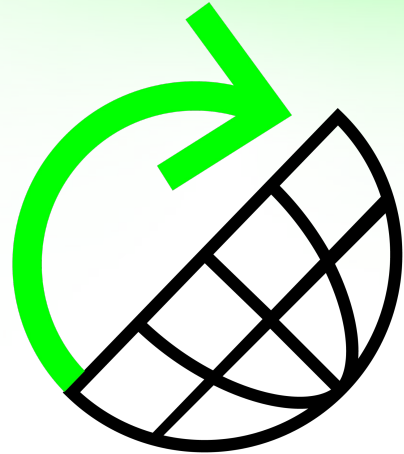
What changed. What didn't.

What we changed

- Replaced previous API with [CO2.js](#) (Code)
- Added a field for users to select their location (UI)
- Check for website server location with [IP 2 CO2 Intensity API](#) (Code)
- Surface additional context to the results (UI)

What didn't change

- Use the Sustainable Web Design (SWD) model for calculations
- The website is still written in PHP



Replace previous API with CO2.js

Why change?

- Needed a way to *change grid intensity* used for calculating:
 - User device emissions
 - Website server emissions

Why CO2.js?

- **Drop in replacement.** Uses the SWD model by default just like other popular calculators.
- Allows developer to **adjust** server, network, and device segment **grid intensity**.
- Includes annual average **grid intensity for 209 countries & 13 regions**.

A few extra changes

The previous API did a lot of stuff behind the scenes. Sitigreen now had to do that itself.

Check for green web hosting

- Using Green Web Foundation's [Greencheck API](#).

Get data transfer of web page on load

- Using Google's PageSpeed Insight API.

Allow users to set their location

Four options:

- Italy
- Europe
- World
- Unknown

Fed into CO2.js for calculating emissions for user devices.

Valuta l'impatto ambientale del tuo sito web

Inserisci l'URL di una pagina web per verificare le emissioni di CO₂ che sta generando

Inserisci l'URL della pagina web da testare

L'utenza del sito è in maggioranza:

Calcola

Questo calcolatore si basa sui dati forniti dal [Sustainable Web Design Model](#) e utilizza CO2.js e [Google PageSpeed Insights](#).
Non salviamo i risultati delle pagine testate.
Per maggiori informazioni visita la pagina "[Come funziona](#)".

That achieved our MVP.
But we added a few extra
touches.

Check web server location

Why?

- If we can include context about the server location, then it improves the output we can generate.

How?

- *If* the website being tested is **not green** when checked by the GreenCheck API.
 - Use a PHP function (`gethostbyname`) to find the web host IP address.
 - Check for the location of that IP address using the IP 2 CO2 Intensity API.
 - Fed into CO2.js for calculating emissions for website hosting.

Additional context in the results

This gives the user a clear picture of what went into the calculation.

It helps provide clarity around *why* the results here might differ from other website carbon calculators.

Il tuo sito web emette circa **0.49g** di CO₂.
Il tuo sito web non è ospitato su una server farm green.

Dettagli

Variabili

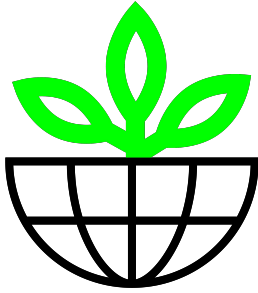
Queste variabili possono cambiare per ogni test che viene eseguito.

- Peso della pagina: 1.9 MB
- Server farm green: No
- Server location: WORLD
(Grid intensity: 435.99g CO₂/kWh)
- Posizione dell'utente: ITA
(Grid intensity: 371.692g CO₂/kWh)

Costanti

Queste sono le costanti utilizzate nel modello di calcolo.

- Rete dati: 442g CO₂/kWh
- Produzione: 442g CO₂/kWh
- Nuovi visitatori: 75%
- Visitatori di ritorno: 25%
- Dati non in cache per visitatori di ritorno: 2%



Summary

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What we accomplished in this project

- Integrated CO2.js into Sitigreen's WordPress PHP code base.
- Provided a way for users to include context about *their* location in carbon estimates.
- Include additional context about the website server location in carbon estimates.

Raise the awareness of Italian people about the environmental impact of the digital sector.

Resources

Green Web Foundation Libraries & APIs

- [CO2.js](#)
- [Greencheck API](#)
- [IP to CO2 Intensity API](#)

Other APIs

- [PageSpeed Insights](#)
-

Other Data Sets

- [Ember Climate](#)

Talks.
Workshops.
Training.
Consulting.

SERVICES

Our services are designed to support organisations at any stage of their digital sustainability journey.

Whether you're just starting to learn about the concepts or looking to transform more deeply, Green Web Foundation is your trusted partner. Our mission as a non-profit is to leverage the power of open-source code and data to help others make impactful responses to the climate crisis and achieve a fossil-free internet by 2030.

STAGE 1: AWARENESS BUILDING

For those new to digital sustainability who want to understand the concepts and issues before starting.

SEE OPTIONS

STAGE 2: SCOPING DIGITAL SUSTAINABILITY

For those already aware of the issues and want their organisation to begin taking positive action now.

SEE OPTIONS

STAGE 3: MAKING TRANSFORMATIVE CHANGES

For those already practicing digital sustainability and looking for a trusted partner to deepen their own actions.

SEE OPTIONS

thegreenwebfoundation.org/services

THANK YOU



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