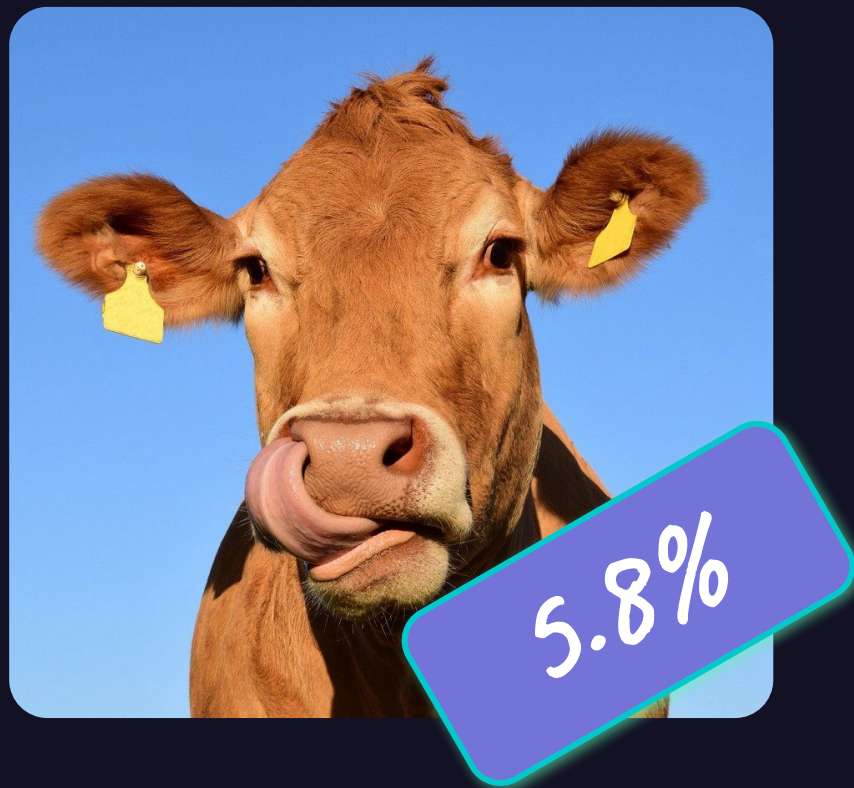


Designing Energy Efficient Websites

~4% of global
greenhouse
emissions





5.8%



3.2%

DIGITAL ~~≠~~ GREEN

2.2MB

average
page
weight

2.2MB

average
page
weight

1,000

monthly
views

2.2MB

average
page
weight

1,000

monthly
views

26.4GB

of data per
year

2.2MB

average
page
weight

1,000

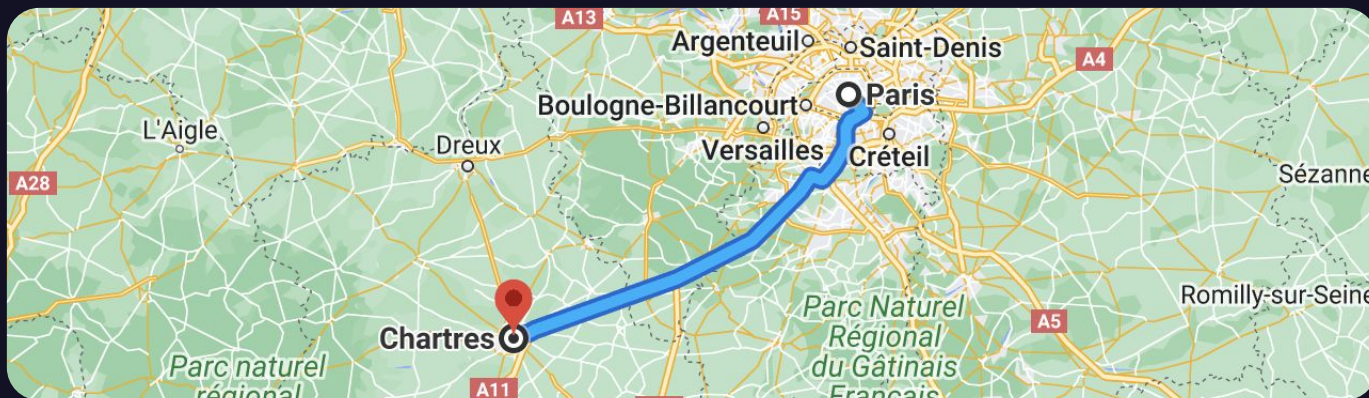
monthly
views

26.4GB

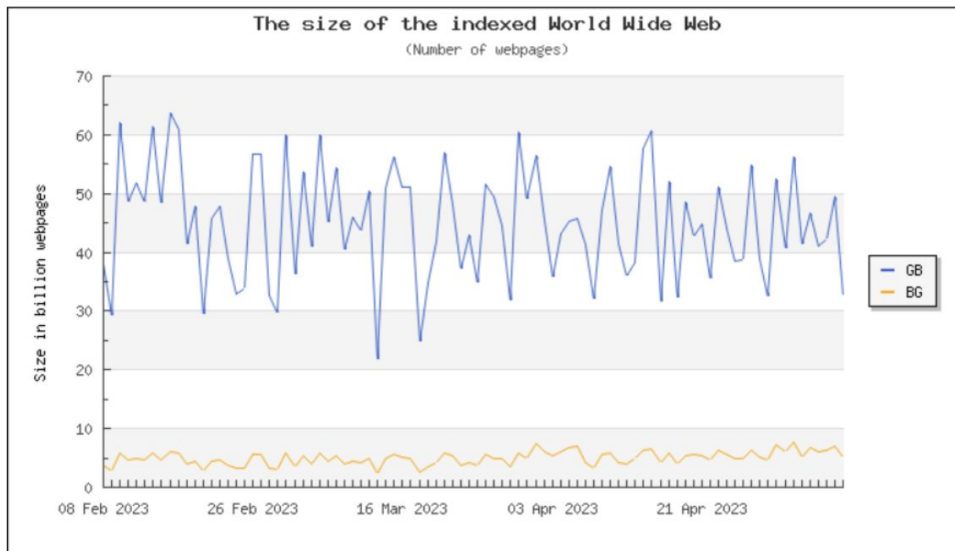
of data per
year

9.5

KG of CO2
per year



The Total Number of Indexed Web Pages



30 billion

As of 21 April 2023, there are over 30 billion web pages indexed on the world wide web.

500 pageviews

500 pageviews

141.7 Million metric tonnes CO2

500 pageviews

141.7 Million metric tonnes CO2

30 Million cars

500 pageviews

141.7 Million metric tonnes CO₂

30 Million cars



Claire Thornewill

Senior Web Performance Consultant

W3C Susty Web: Business and Product



Ines Akrap

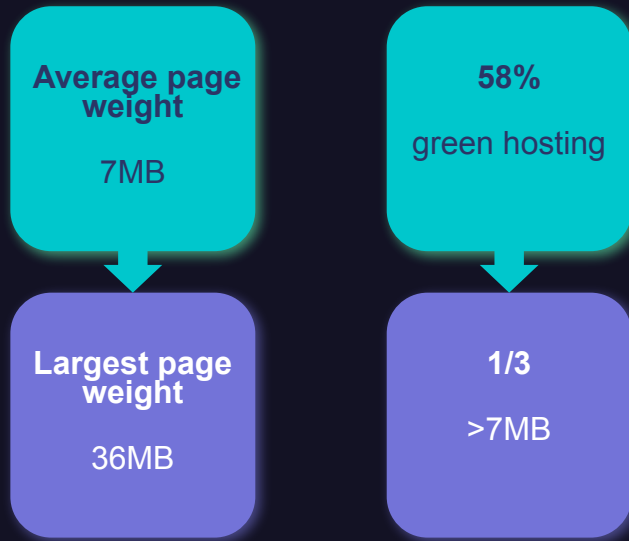
Senior Web Performance Engineer

W3C Susty Web: Web Development



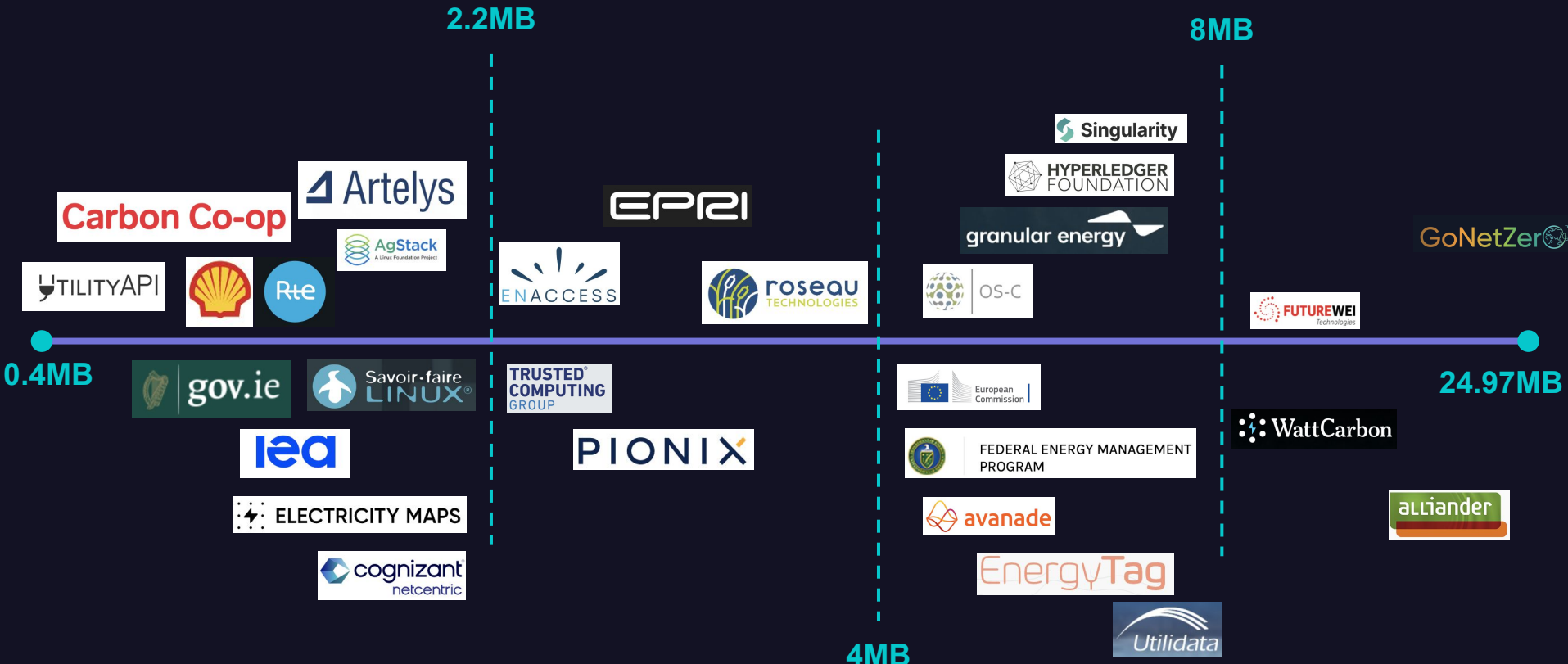
How to make our websites more efficient











75% green hosted

Content = Data

Product Bloat.

So much content and so many features are built that are not used and never removed.

Carbon heavy products.

The more efficient technology has become the less efficient websites have become.

Step 1: Measure

Website Carbon Calculator



The original Website Carbon calculator

Estimate your web page carbon footprint:

Your web page address

Calculate

By using this carbon calculator, you agree to the information that you submit being stored and published in our public database.



Oh my, **0.55g of CO2** is produced every time someone visits this web page.

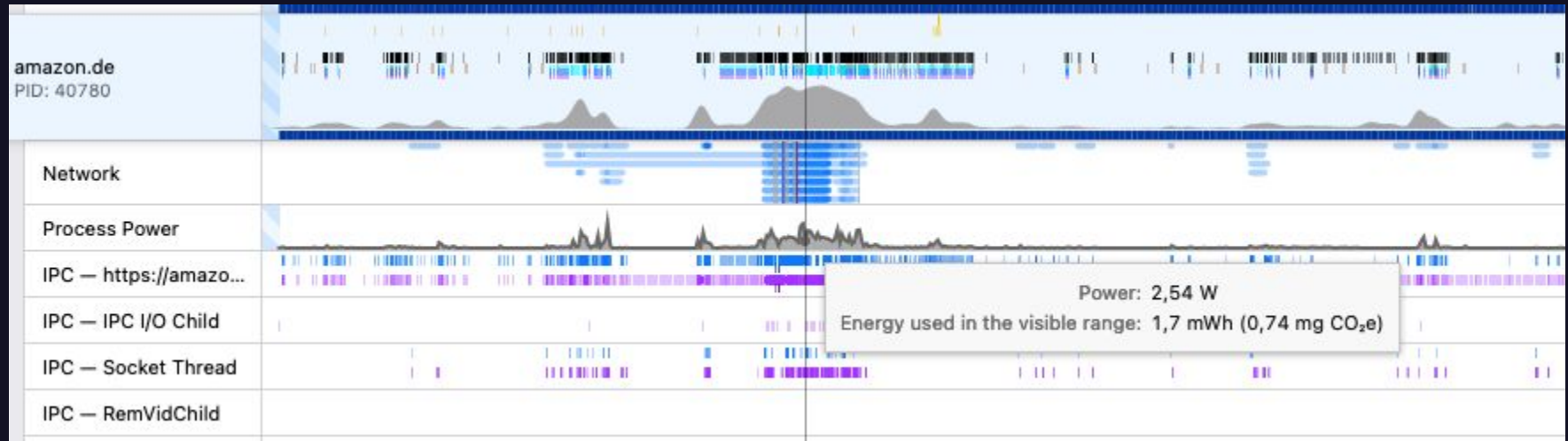


This web page appears to be running on **sustainable energy**

Tools for measurement

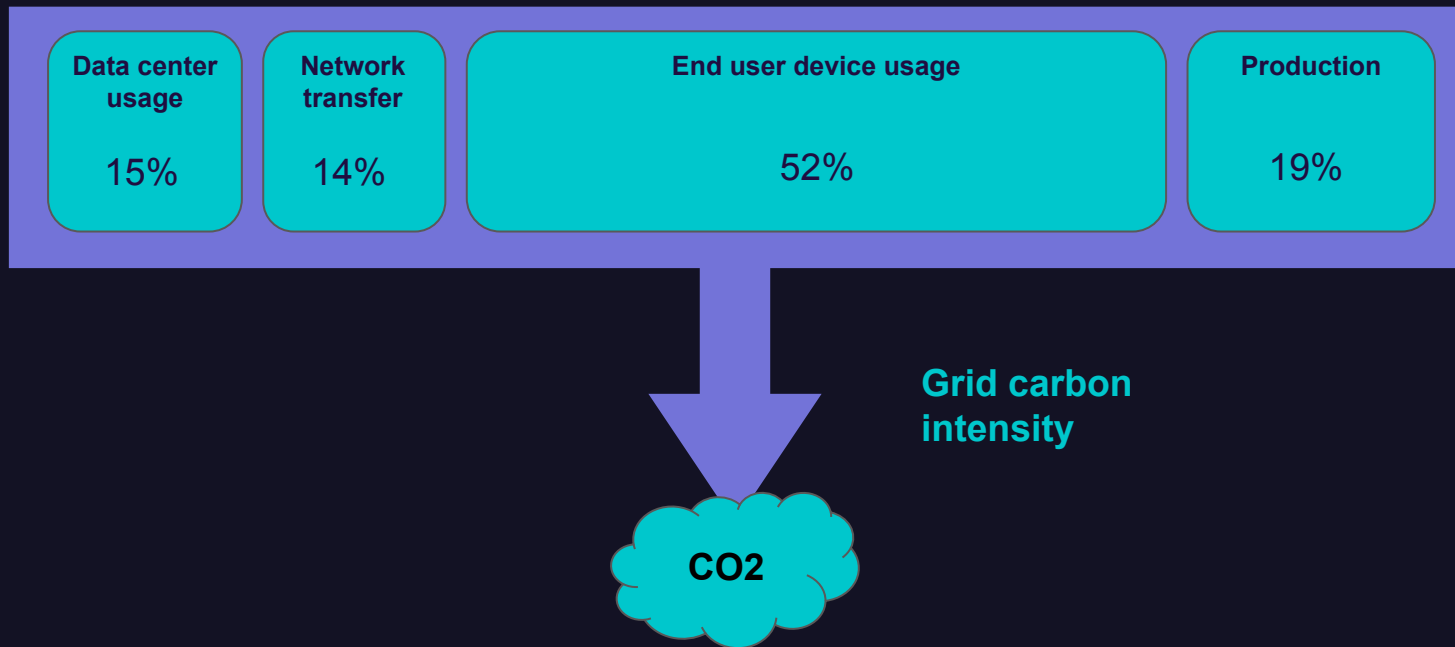
- www.ecograder.com
- www.websitecarbon.com
- www.ecoping.earth/
- www.webpagetest.org/
- www.beta.backspace.eco/
- www.digitalbeacon.co/

Execution energy



CO2 calculation models

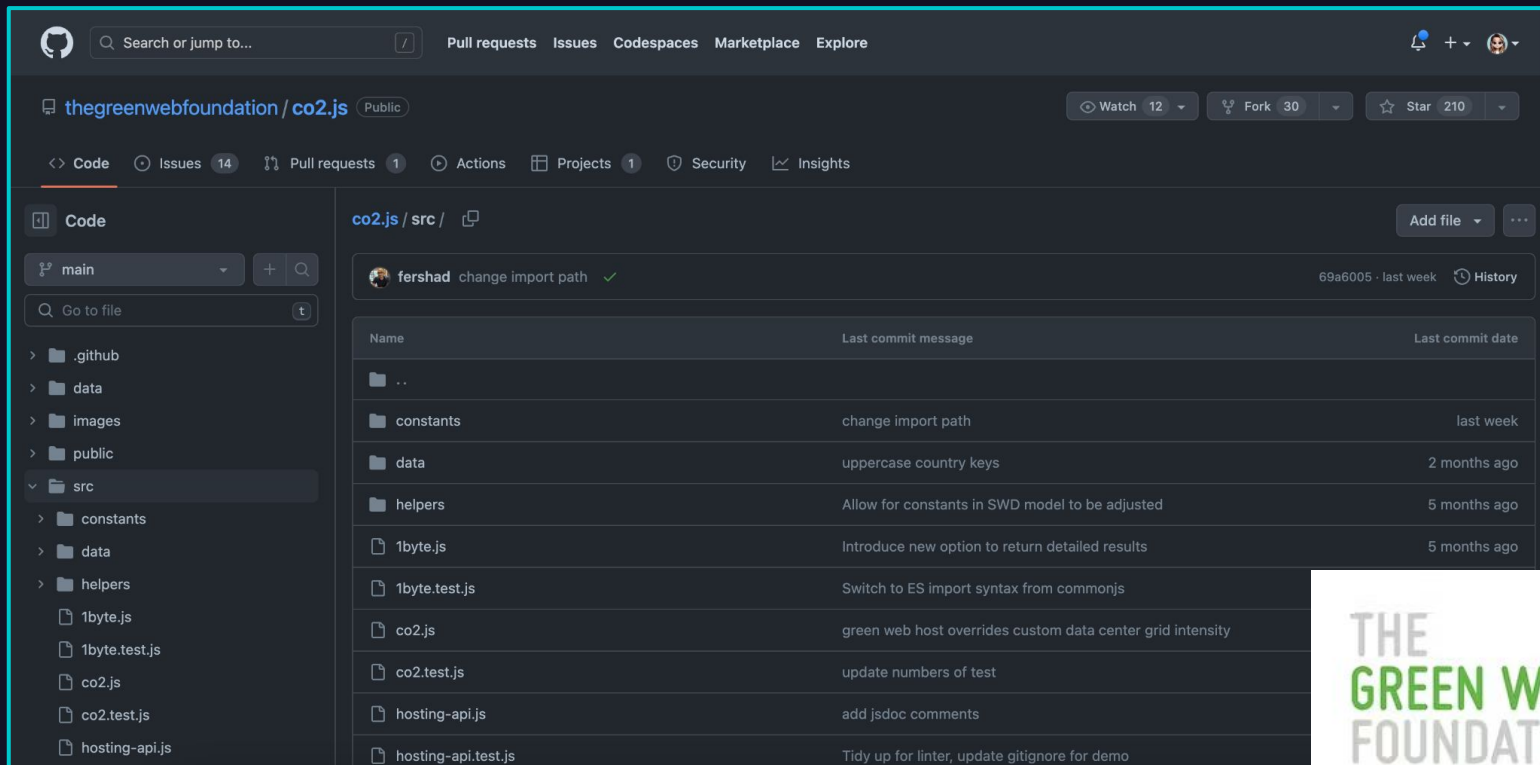
Sustainable Web Design (SWD) Model



OneByte Model

Action	Time spent on the action (min)	Data size (byte, B)	Device used	Network used	Energy Impact (kWh)	Hypothesis
To send an email	3	1E+06	Smartphone	FAN Wired	8E-04	1 MB email, 3 minutes
				FAN WIFI	5E-04	
				Mobile Network	1E-03	
			Laptop	FAN Wired	1E-03	
				FAN WIFI	1E-03	
				Mobile Network	2E-03	
To watch a video online	10	2E+08	Smartphone	FAN Wired	9E-02	10 minutes video, 1080p quality
				FAN WIFI	4E-02	
				Mobile Network	2E-01	
			Laptop	FAN Wired	9E-02	
				FAN WIFI	4E-02	
				Mobile Network	2E-01	

CO2.js



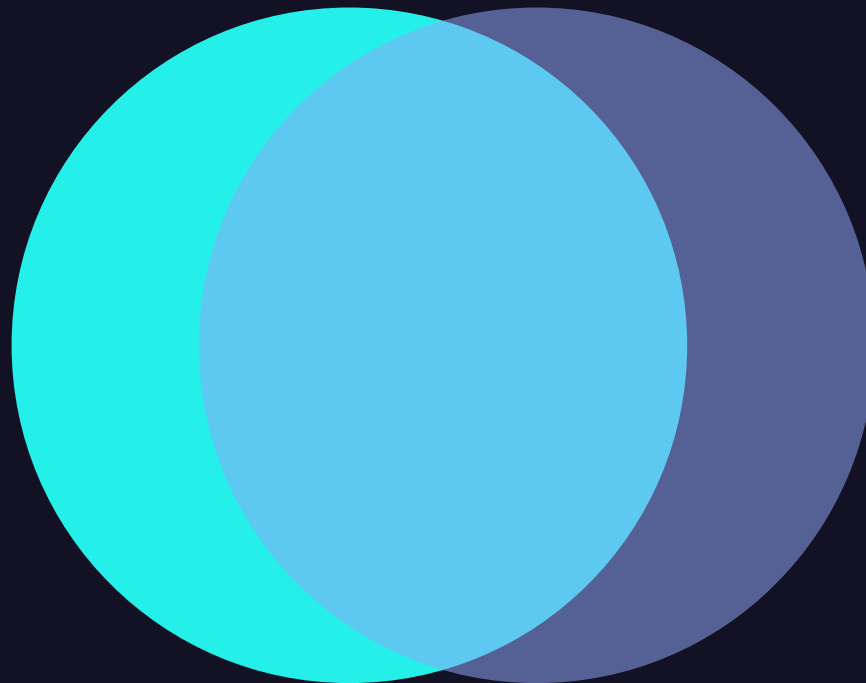
The screenshot shows the GitHub repository page for `thegreenwebfoundation / co2.js`. The repository is public and has 12 watchers, 30 forks, and 210 stars. The main branch is `main`. The file explorer on the left shows the directory structure: `.github`, `data`, `images`, `public`, and `src`. The `src` directory contains `constants`, `data`, `helpers`, `1byte.js`, `1byte.test.js`, `co2.js`, `co2.test.js`, `hosting-api.js`, and `hosting-api.test.js`.

The commit history table shows the following commits:

Name	Last commit message	Last commit date
..		
constants	change import path	last week
data	uppercase country keys	2 months ago
helpers	Allow for constants in SWD model to be adjusted	5 months ago
1byte.js	Introduce new option to return detailed results	5 months ago
1byte.test.js	Switch to ES import syntax from commonjs	
co2.js	green web host overrides custom data center grid intensity	
co2.test.js	update numbers of test	
hosting-api.js	add jsdoc comments	
hosting-api.test.js	Tidy up for linter, update gitignore for demo	

THE
GREEN WEB
FOUNDATION

**Web
Performance**

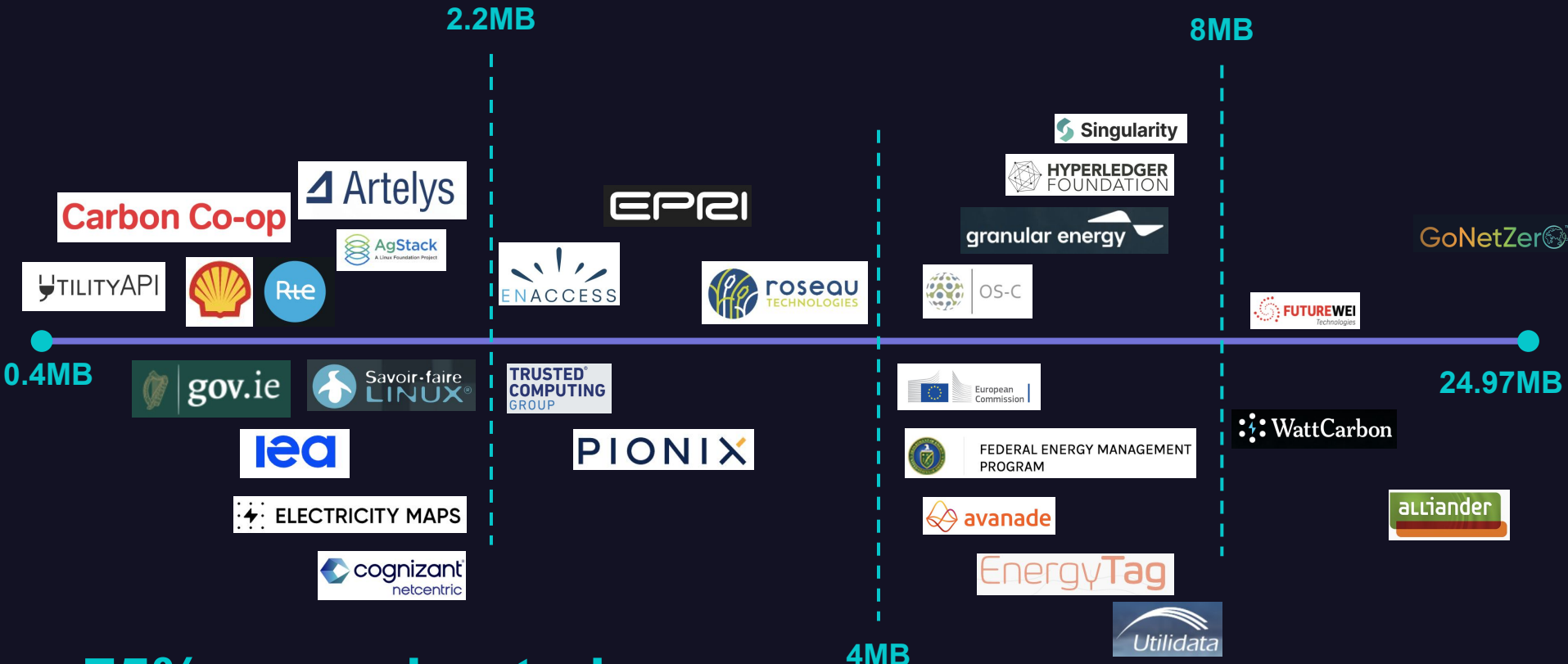


**Web
Sustainability**

Cognizant Web Vitals Monitoring



Step 2: Green Hosting



75% green hosted

Step 3: Optimise

Define the purpose of the Website

Keep content up to date

Reduce the amount of heavy assets

Reduce the amount of JavaScript

**Keep tech stack
up to date**

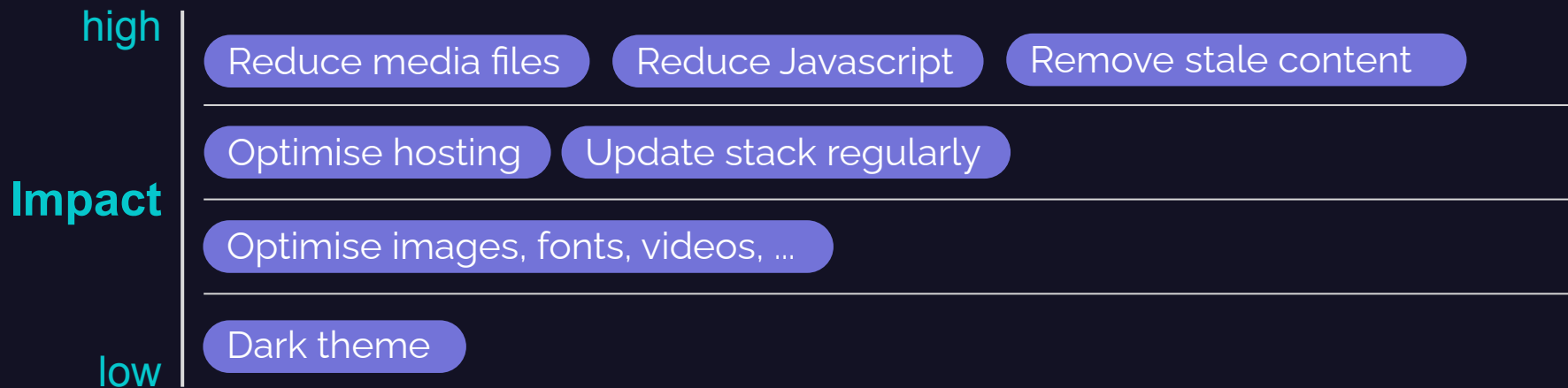
Browser caching

Progressive design

Dark theme

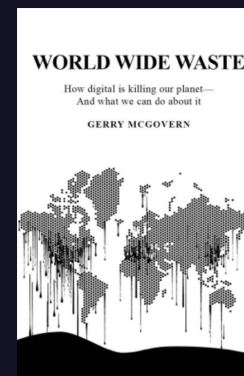
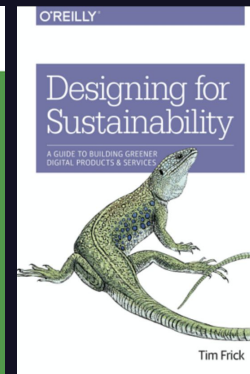
European Parliament:
**Energy Efficiency means using less energy to
produce the same result.**

Energy Efficient Web

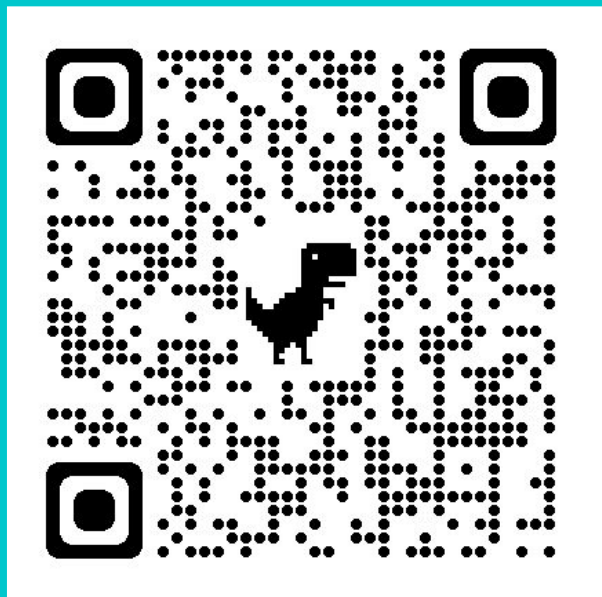


Energy Efficient Websites:
Using less energy to produce better result.

Learn more



Claire Thornewill



Ines Akrap

