



Rules

Layout

Comp

```
* {  
    display: green;  
}
```



[News](#)[Opinion](#)[Sport](#)[Culture](#)[Lifestyle](#)

The Guardian

[World](#) [UK](#) [Climate crisis](#) [Ukraine](#) [Environment](#) [Science](#) [Global development](#) [Football](#) [Tech](#) [Business](#) [Obituaries](#)

The 89% project
The Guardian

Most of the world's population wants stronger climate action. They just don't realize that they are a majority

The Guardian is joining forces with dozens of newsrooms around the world to launch a year-long exploration of the 'silent majority' of people who want to fight climate change

Tue 22 Apr 2025 07.35
CEST

Share



The 89 Percent





hdv 🌟

Your profile

Dashboard

Project insights

Impact shop

Badges

Account

Help centre

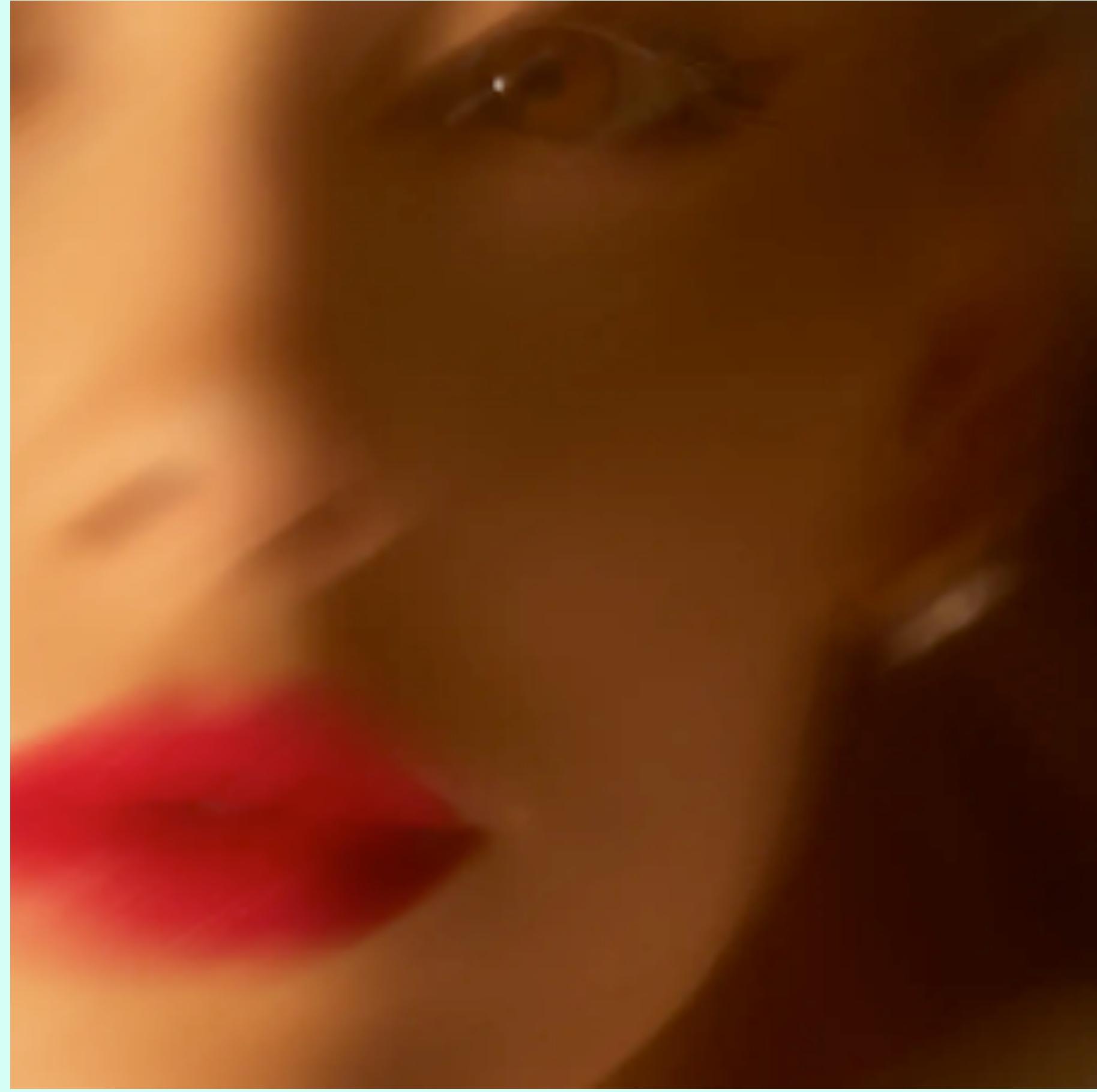
Logout

Hidde's forest 🌟

[Buy more impact](#)

Referral code





Cover of Ariana Grande's single "Yes, And?"

Yes, we're all
somewhat
hypocritical.

And...

We can make
the world
greener faster
at work

PARIS AGREEMENT

The Parties to this Agreement,

Being Parties to the United Nations Framework Convention on Climate Change, hereinafter referred to as “the Convention”,

Pursuant to the Durban Platform for Enhanced Action, under decision 1/CP.17 of the Conference of the Parties to the Convention at its sixteenth session, and the decision 1/CP.17/Add.1 of the Conference of the Parties to the Convention at its seventeenth session,

In pursuit of the objective of the Convention, and being guided by the principles, including the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of:

2015 Paris Agreement

EC Digital Strategy 2030

THIS IS EUROPE'S
DIGITAL DECADE

#DigitalEU



Hidde

@hdv@front-end.social

Joined the first meeting of the new Web Sustainability Interest Group today, very excited to see this work progressing at W3C, hope to make time to contribute.

December 5, 2024 at 4:30:40 PM ·  · Ivory for iOS





ICT emissions > aviation emissions

**“If the internet
was a country it
would be the 13th
largest emitter
between Mexico
and Brazil”**

- Sustainable Web Manifesto
(based on CO₂ emissions in Our World in Data vs
IT emissions data from Green Web Foundation)



We can make
the world
greener faster
at work



platforms a
design lan
got mark
as a serv
labeling,
sorts of
privileg
compa

Web Sustainability Guidelines

2. User Experience Design

- 2.1 Display any variables that have a negative impact on your project
- 2.2 Understand visitor requirements or constraints, resolving barriers to access
- 2.3 Understand the impact of non-visitors
- 2.4 Consider sustainability throughout the ideation process
- 2.5 Brainstorm ways to resolve any stakeholder issues
- 2.6 Minimize non-essential content, interactions or journeys
- 2.7 Use decorative design with care
- 2.8 Ensure that navigation and wayfinding is well-structured
- 2.9 Be attentive rather than distracting

3. Web Development

- 3.1 Set goals based on potential impact considerations
- 3.2 Remove unnecessary or redundant information
- 3.3 Modularize bandwidth-heavy components within projects
- 3.4 Tree shaking should be used to remove unnecessary code
- 3.5 Redundancy and duplication in code should be avoided
- 3.6 Third-party services should be assessed as first parties
- 3.7 Code must follow good semantic practices
- 3.8 Render blocking should be resolved
- 3.9 Information to help understand the usefulness of a page should exist

4. Hosting, Infrastructure and Systems

- 4.1 Choose a sustainable hosting provider
- 4.2 Optimize caching with offline access supported
- 4.3 Compress files where it is beneficial
- 4.4 Setup necessary error pages and redirection links
- 4.5 Unless required, avoid utilizing unnecessary environments
- 4.6 Allow automation but ensure it is tightly regulated
- 4.7 Define the frequency of data refreshes
- 4.8 Backup critical data at routine intervals
- 4.9 Consider the impact and requirements of processing information
- 4.10 CDN use must be proportionate and sustainable
- 4.11 Infrastructure decisions must meet business requirements
- 4.12 Store data according to the needs of your organization

6 principles

92 guidelines

253 success criteria

100+ contributors

User
Experience
Design

Hosting,
Infrastructure
& Systems

Web
Development

Business
Strategy &
Product
Management

Impact

Low

Quick wins

Medium

Noticeable
sustainable impact

High

Significant
long-term benefit

Effort

Low

Minimal
implementation

Medium

Some changes
are needed

High

Heavy refactoring
required

Progress over
perfection



Data centres

Emissions of server hardware (making and running)

What adds to the footprint of the WWW?



Consumer devices

Manufacturing laptops, phones, tablets that access the web

10100101010
101010101010
101010101010
101010101010
101010101010
10100101010

Networks
Data downloads/
uploads

Elimination
vs
offsetting

Elimination

vs

offsetting

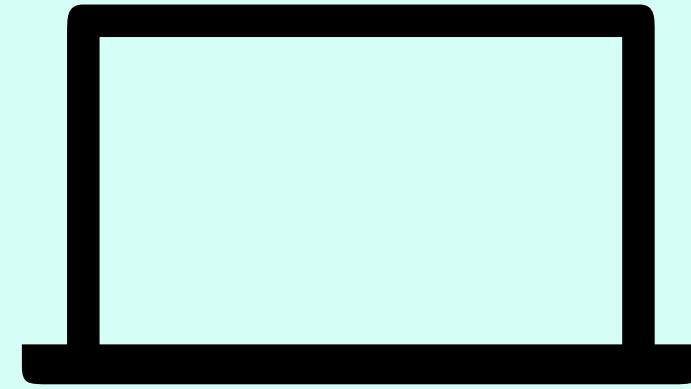
We can make
the world
greener faster
at work

1.

**Make smaller
web pages**

Median website size is growing and growing...

Data: HTTPArchive



2011
467 kB



2025
2678 kB

**“Shaving off 1kB in a file
that is loaded on 2 million
websites reduces CO₂
emissions by ~2950 kg
per month.”**

- Danny van Kooten

**“Shaving off 1kB in a file
that is loaded on 2 million
websites reduces CO₂
emissions by 2250 kg
per month.”**

- Danny van Kooten

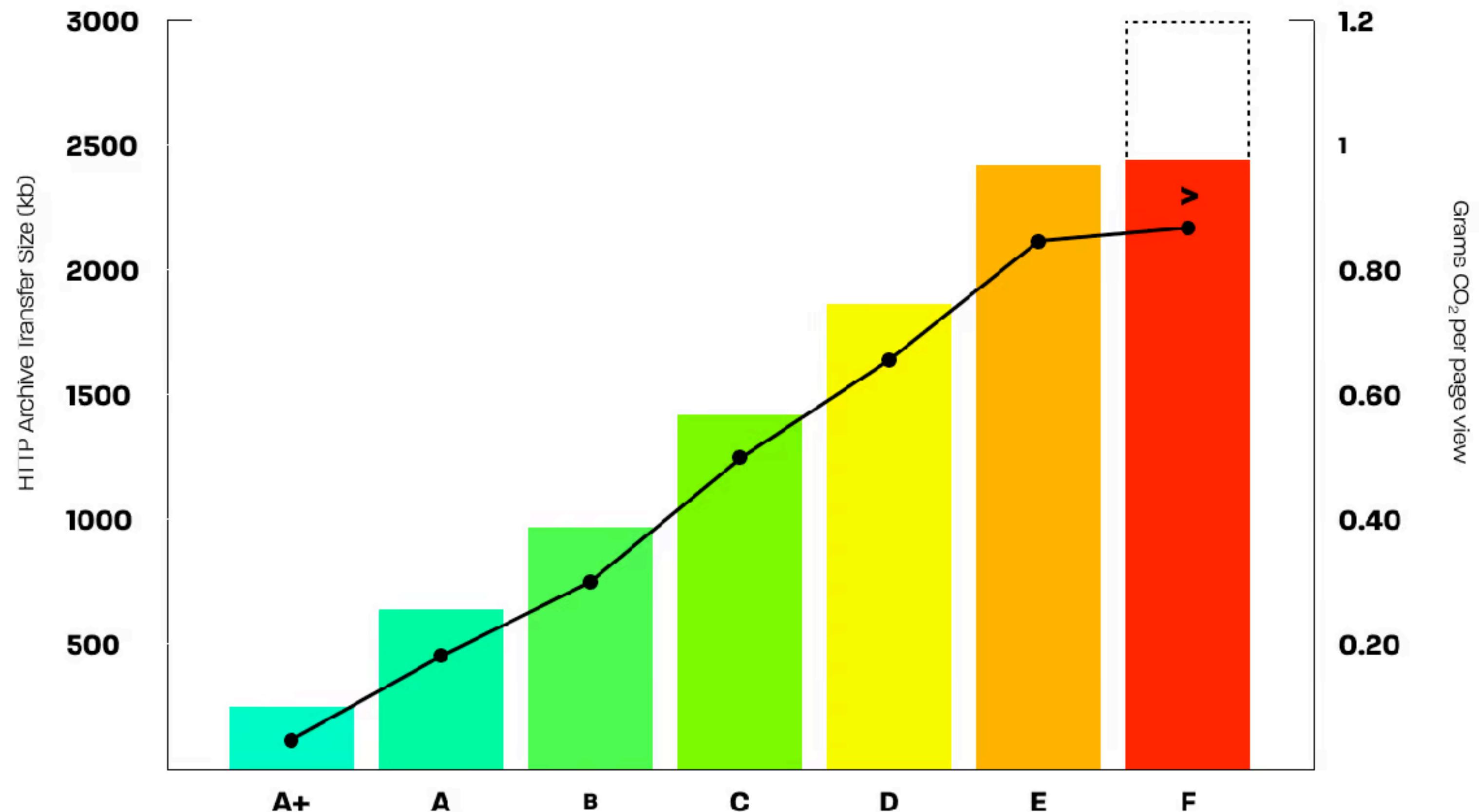
**~5 flights
(AMS-NYC)**

**~118 kg
of beef**

Website Carbon Rating Scale

based on Grams CO₂e per pageview

Key ■ HTTP Archive Transfer Size (kb) ● Upper Limit





1 tree

This web page emits the amount of carbon that 1 tree absorbs in a year.



5kWh of energy

That's enough electricity to drive an electric car 33km.

Over a year, with  **10,000** monthly page views, hidde.blog produces



1.99kg of CO2 equivalent.

As much CO2 as boiling water for 270 cups of tea

Note on the numbers

EASIER TO MEASURE

transferred data,
number of HTTP
requests, and DOM size

SOMETIMES MISSED

calculations in JS.
CPU/GPU, memory.
Real user journeys.

- HTTP Archive Web Almanac, Sustainability.

Sometimes measured, sometimes estimated

The screenshot shows a video player interface. In the top left corner, the apidays SINGAPORE logo is visible. The main title "Defining what you do" is centered above a horizontal line. Below this line, there are two large text blocks: "Estimating" on the left and "Measuring" on the right, separated by a vertical line. On the far left, there is a small video thumbnail of a man with glasses, identified as Fershad Irani. At the bottom of the screen, the Green Web Foundation logo is displayed above a progress bar. The video player includes standard controls like play, volume, and a timestamp showing 9:14 / 26:39. A decorative circuit board pattern is at the bottom of the player.

Defining what you do

Estimating Measuring

Fershad Irani

GREEN WEB FOUNDATION

9:14 / 26:39

- Fershad Irani, The Nuance
of Quantifying Digital
Carbon Emissions at Green
I/O Singapore, 2024.

I'm back
With New Abstractions

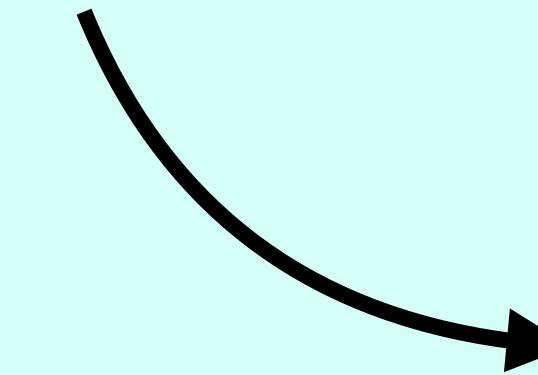
28/167

complicated, but now they're complicated over here. And that's sort of what the abstraction gives us. And it's a tradeoff. It's, like, we've got this complexity, can we just get rid of the complexity or can we at least manage it? So, abstractions make everything better and abstractions make everything worse. So, we're gonna



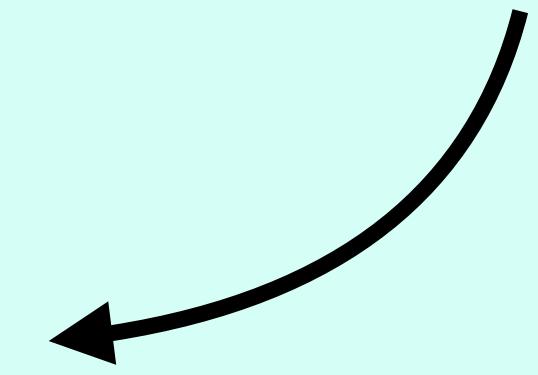
SWDM

Data transfer
Amount of GB transferred when using a service



Average Emissions per Page View (gCO₂e) =
$$[(OP_{DC} \times (1 - \text{Green Hosting Factor}) + EM_{DC}) + (OP_N + EM_N) + (OP_{UD} + EM_{UD})] \times \text{New Visitor Ratio} + [(OP_{DC} \times (1 - \text{Green Hosting Factor}) + EM_{DC}) + (OP_N + EM_N) + (OP_{UD} + EM_{UD})] \times \text{Return Visitor Ratio} \times (1 - \text{Data Cache Ratio})$$

Carbon intensity
Grams of carbon emitted per kWh at a given time.



co2.js

- **Estimate carbon emissions** produced by transferring data on the internet.
- Get different forms of **grid intensity data**, like annual average and marginal data by country.
- Check if a website uses a known **green web host**.

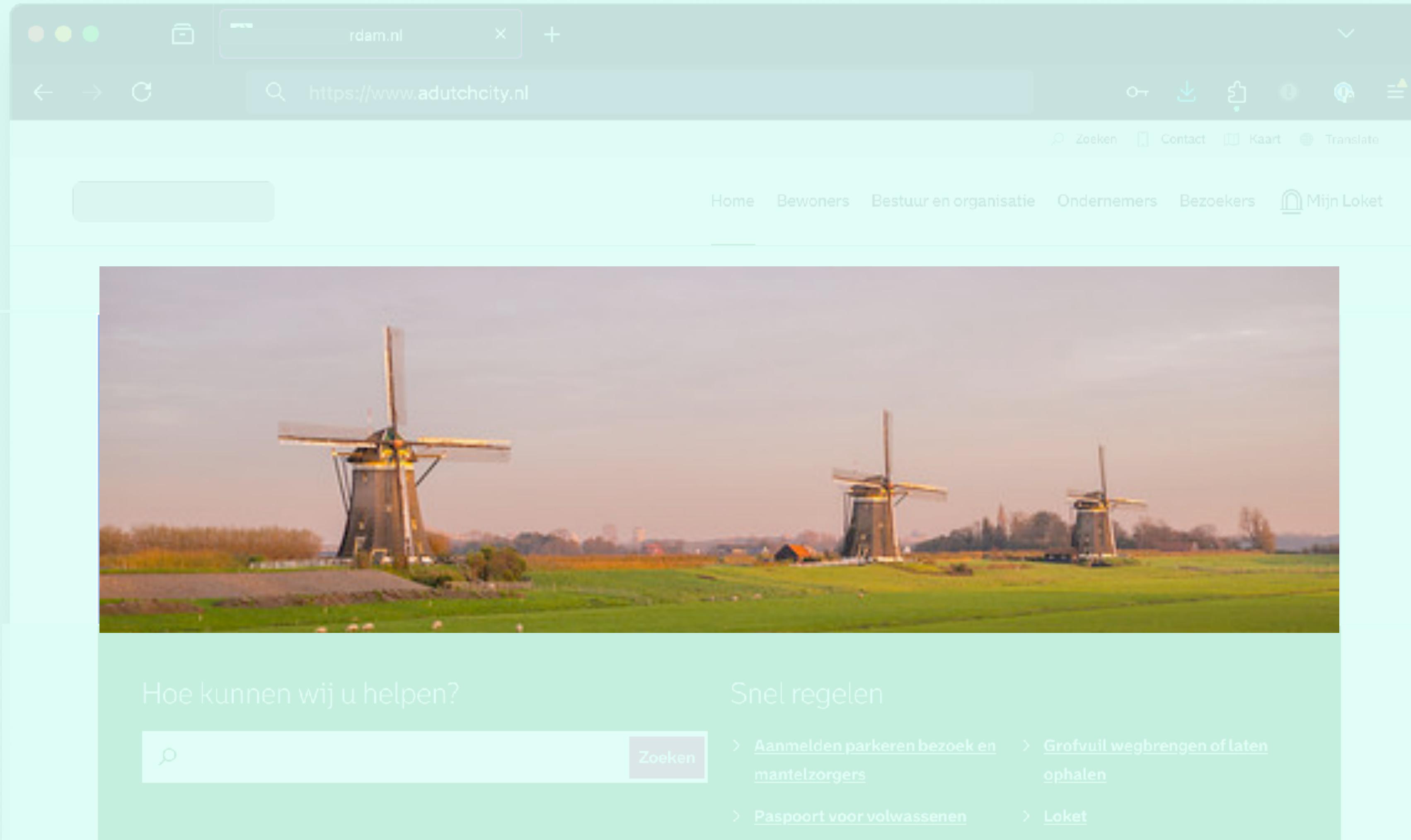
Minimise images and videos

A Dutch City Total page size: 1,2 MB

The screenshot shows a web browser window with the following details:

- Title Bar:** The address bar shows the URL <https://www.adutchcity.nl>. The browser interface includes standard controls like back, forward, and search.
- Header:** The page title is "rdam.nl". Below it, the URL <https://www.adutchcity.nl> is displayed again. A navigation bar contains links for Zoeken (Search), Contact, Kaart (Map), and Translate.
- Menu Bar:** A horizontal menu bar at the top of the page includes Home, Bewoners, Bestuur en organisatie, Ondernemers, Bezoekers, and Mijn Loket. The "Mijn Loket" link is underlined, indicating it is the active page.
- Content Area:** The main content features a large, scenic image of three traditional Dutch windmills standing in a green field under a clear sky. Below this image is a dark green footer section containing two columns of text and links.
- Footer Left Column:** Contains the text "Hoe kunnen wij u helpen?" followed by a search input field with a magnifying glass icon and a pink "Zoeken" (Search) button.
- Footer Right Column:** Contains the text "Snel regelen" followed by a list of quick service links:
 - > [Aanmelden parkeren bezoek en mantelzorgers](#)
 - > [Grofvuil wegbrengen of laten ophalen](#)
 - > [Paspoort voor volwassenen](#)
 - > [Loket](#)

A Dutch City Hero image: 367 KB (32%)



The screenshot shows a web browser window with the URL <https://www.adutchcity.nl> in the address bar. The page features a large, scenic image of three traditional Dutch windmills standing in a row across a green field under a clear sky. Below the image, there are two main sections: 'Hoe kunnen wij u helpen?' (How can we help you?) and 'Snel regelen' (Quickly arrange). The 'Hoe kunnen wij u helpen?' section includes a search bar with a magnifying glass icon and a 'Zoeken' (Search) button. The 'Snel regelen' section lists several services with arrows pointing to them: 'Aanmelden parkeren bezoek en mantelzorgers', 'Grofvuil wegbrengen of laten ophalen', 'Paspoort voor volwassenen', and 'Loket'.

rdam.nl

https://www.adutchcity.nl

Zoeken Contact Kaart Translate

Home Bewoners Bestuur en organisatie Ondernemers Bezoekers Mijn Loket

Hoe kunnen wij u helpen?

Snel regelen

Zoeken

- > [Aanmelden parkeren bezoek en mantelzorgers](#)
- > [Grofvuil wegbrengen of laten ophalen](#)
- > [Paspoort voor volwassenen](#)
- > [Loket](#)

“Detail is data”

- Emily Trotter (Nomensa) on images
in Planet Centred Design

Ways to save images

Blur or blur parts

Remove some background

Simplify image

Use image compression

```
<img src="" alt="" loading="lazy" />
```

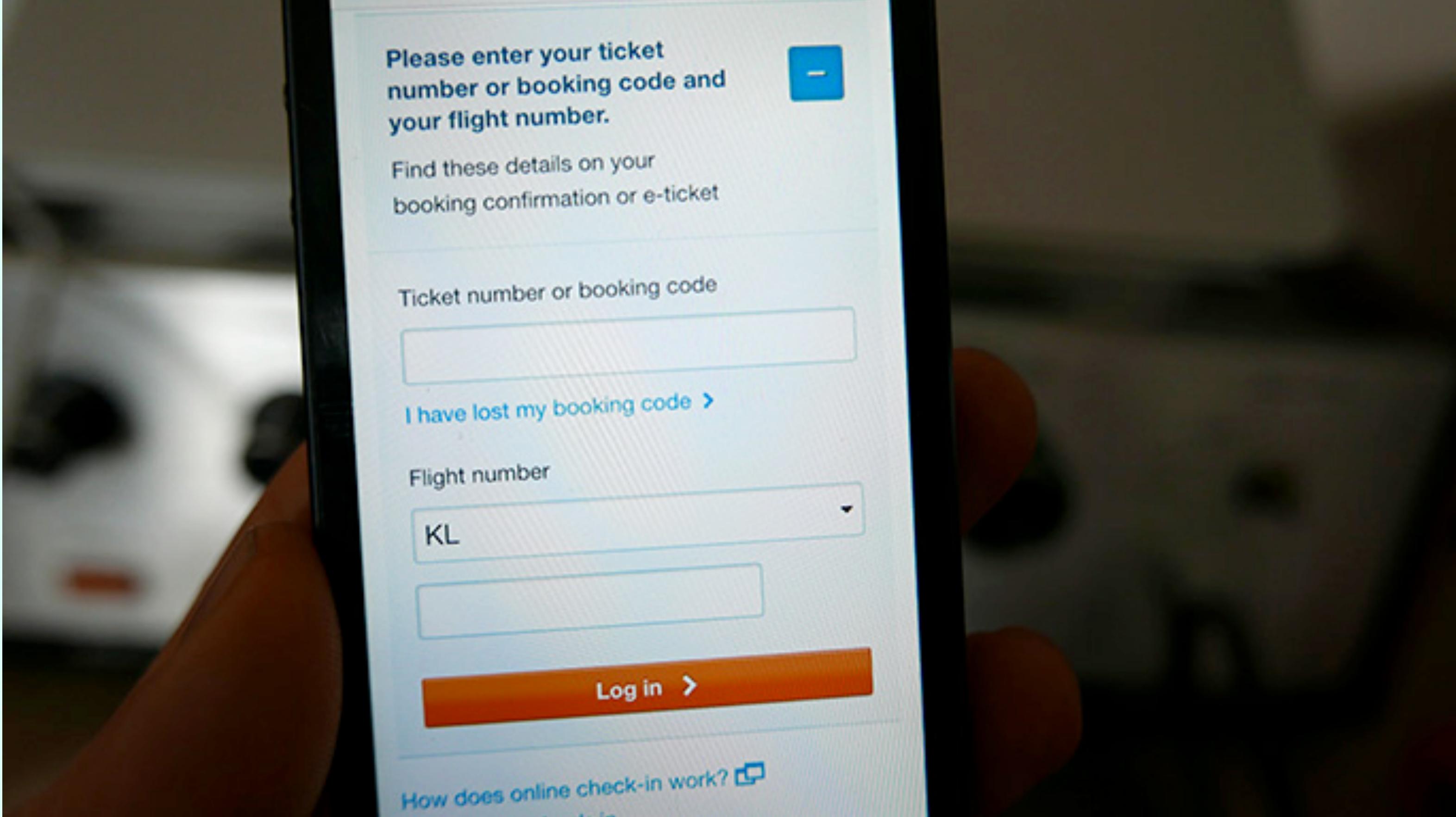
**Reduce assets
(especially
JavaScript)**

A screenshot of a web browser window displaying a blog post. The browser has a light blue header bar with standard window controls (red, yellow, green buttons, close, minimize, maximize) and a search/address bar showing the URL "css-tricks.com". The main content area has a dark background. On the left, there is a circular profile picture of a woman with long brown hair, smiling. To the right of the image, the text "Michelle Barker answers:" is written in a small, white, sans-serif font. Below this, the main title of the article is displayed in a large, bold, white, sans-serif font. The title reads: "Reduce Your Website's Environmental Impact With a Carbon Budget". At the bottom of the main content area, there is a block of black text describing the current international climate change conference. To the right of this text, there is a small, gold-colored circular icon with a stylized four-pointed star or flower design.

Michelle Barker answers:

Reduce Your Website's Environmental Impact With a Carbon Budget

As I write this, world leaders are gathering in Glasgow for COP26, the international climate change conference, in the attempt to halt (or at least slow down) catastrophic climate change by pledging to end their countries' dependence on fossil fuels. Only time will tell



- 151 requests
- 1.3 MB transferred
- over 20 JavaScript files
- pictures of palm trees

Check-in

Please enter your ticket number or booking code and your flight number. Find these details on your booking confirmation or e-ticket

Ticket number or booking code

Flight number

Go to step 2

What if we optimised for simplicity (radically)?

- 2 KB
- 0.2 seconds to load

Check-in

Please enter your ticket number or booking code and your flight number. Find these details on your booking confirmation or e-ticket

Ticket number or booking code

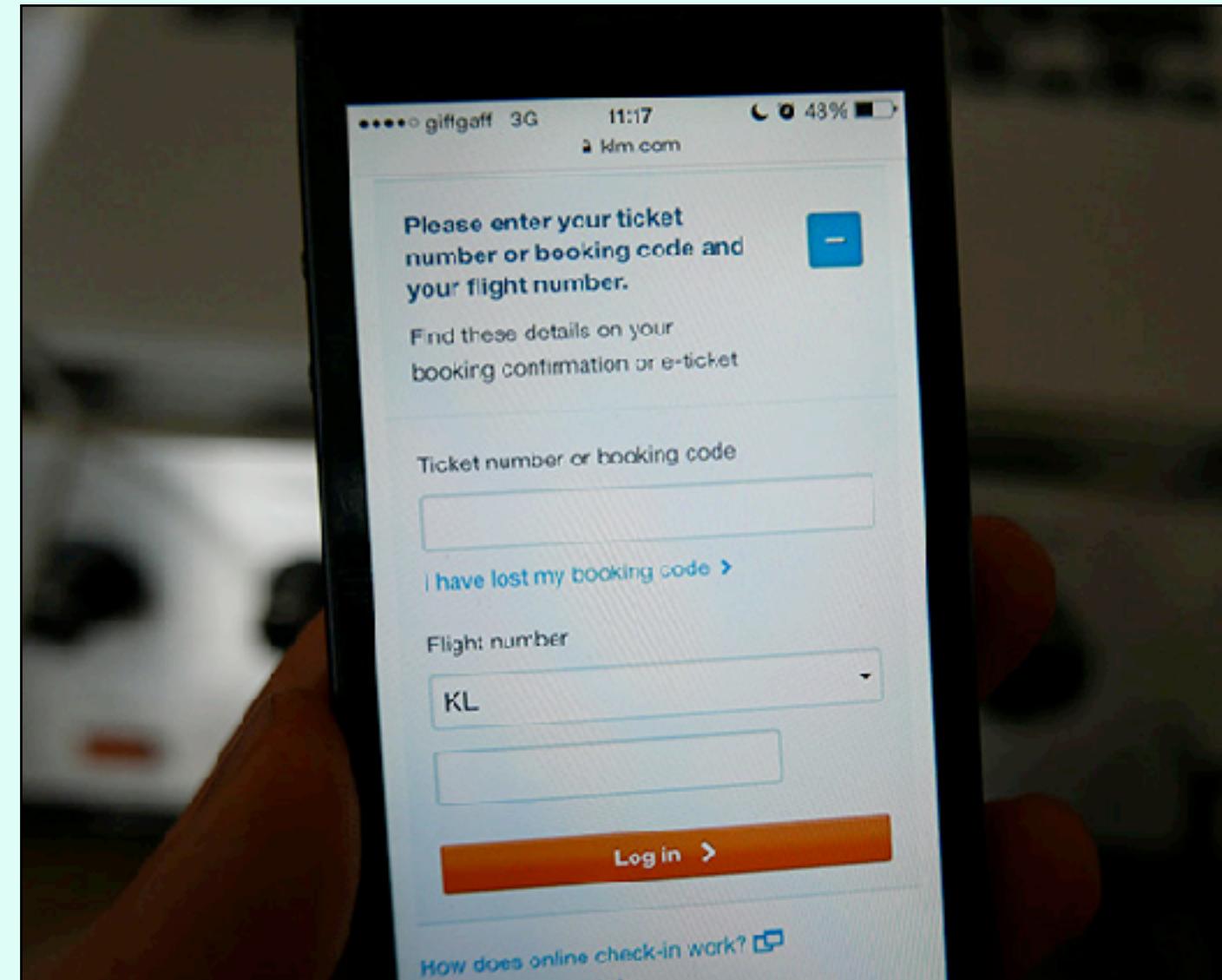
Flight number

[Go to step 2](#)

there is **so**
much in
between



(this is also
about attitude)



A screenshot of a flight booking website interface. At the top, there's a header with a user icon, a network status icon, a notification badge (54), and standard window controls. Below the header, the main content area shows a search form for booking a return flight from Amsterdam to Taipei. The search results show two flight segments: one from Amsterdam Schiphol Airport to Taipei International Airport, and another from Taipei back to Amsterdam. A "Ga verder" button is visible below the search results. In the bottom right corner of the main content area, there's a large black box displaying the text "8.01 MB / 2.42 MB transferred". Overlaid on the entire page is a browser developer tools Network tab. The Network tab has a toolbar with icons for trash, filter, search, and cache control (with "Disable Cache" checked). It also includes dropdown menus for Network, Headers, and Other. The main table in the Network tab lists five script files under the "All" tab. The table columns are: Status, Method, Domain, File, Initiator, Transfered, and Size. The listed files are:

S...	Me	Domain	File	Initiator	T...	Transfe...	Size
200	GET	ww...	chunk-KRQND7E	script	js	1.92 kB	1.68 kB
200	GET	ww...	chunk-CPRQZH4	script	js	11.44 kB	44.04 ...
200	GET	ww...	chunk-MGGQSW	script	js	2.24 kB	2.82 kB
200	GET	ww...	chunk-OLPMGZ'	script	js	6.30 kB	23.72 ...
200	GET	ww...	chunk-KVQBTHF	script	js	1.46 kB	273 B

The same website today. It's even bigger.

JAVASCRIPT DUN GOT BIG.



people doing frontier
we're all sort of working
theoretically in the same
doing things differently
I've internalized that
heard this yet, but I use
JavaScript done it yet. But I use

trust selectors

the few as many

```
/* ❌ JavaScript state management */
form.addEventListener('input', (e) => {
  if (!form.checkValidity()) {
    form.classList.add('error');
  } else {
    form.classList.remove('error');
  }
});

.error { border-color: red; }

/* ✅ Pure CSS reactivity */
form:has(:invalid:not(:placeholder-shown)) {
  border-color: #e91e63;
  background: #fef0f3;
}

form:has(:valid) {
  border-color: #0a7;
  background: #f0fdf4;
}
```

Try typing in the form...

john@webd

Phone (optional)

Submit

Form reacts to validity with zero JavaScript.
Red = invalid | Green = valid

WSG

4.3. Compress files where it is beneficial

WSG

5.2. Assign a sustainability representative

As people in
tech, for us a
large part of this
is a **people**
problem

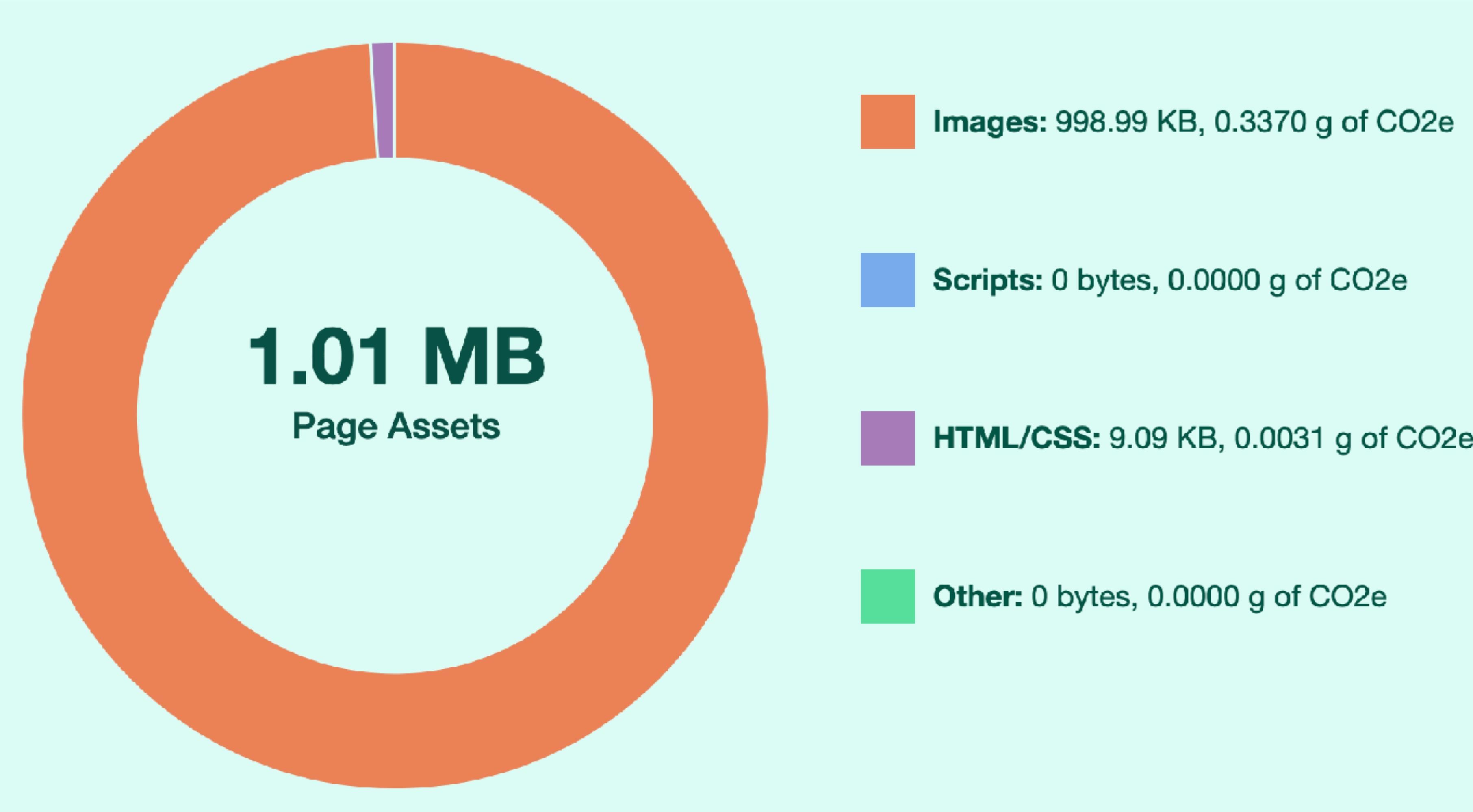
ecograder.com

The screenshot shows a dark-themed web browser window for Ecograder. The title bar says "Ecograder". The address bar shows "https://ecograder.com". The main content area features the "Ecograder" logo in white. Below it is a grid of six icons in white against a dark teal background, representing cloud storage, global connectivity, databases, energy, mobile devices, and microprocessors. Below the grid, large white text reads: "Reduce emissions, improve performance, meet your website goals faster."

Ecograder

Reduce emissions, improve performance, meet your website goals faster.

ecograder.com: CSSDay.nl breakdown



**Use Web Platform
features instead
of libraries**

WSG

3.16 Dependencies are
appropriately used and
maintained

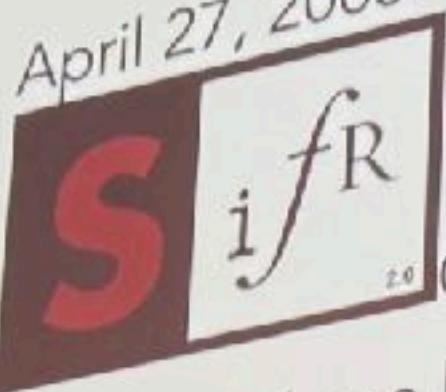
WSG

3.21. Take advantage of
native features and
functionality

sIFR

sIFR 2.0: Rich Accessible Typography for the Masses

April 27, 2005



Over the last several months, a small group of web developers and designers have been hard at work perfecting a method to insert rich typography into web pages without sacrificing accessibility, search engine friendliness, or



UI should be stylable

face and a smile can be priceless. That's my daughter. Dedicated project manager and tester for my demos. A smile can be priceless. And I know that UIs should be controllable. It should definitely be accessible. And I love it that it's becoming more and more styleable. And if there one more thing that I would



2.

Support older devices



Only more sustainable once you've read

~100 books

Gerry McGovern, World Wide Waste



Product Environmental Report

iPhone 14 Pro

Date introduced

September 7, 2022

Made with better materials

100%

recycled gold in the
wire of all cameras

100%

recycled rare earth
elements in all magnets



Tackling climate change

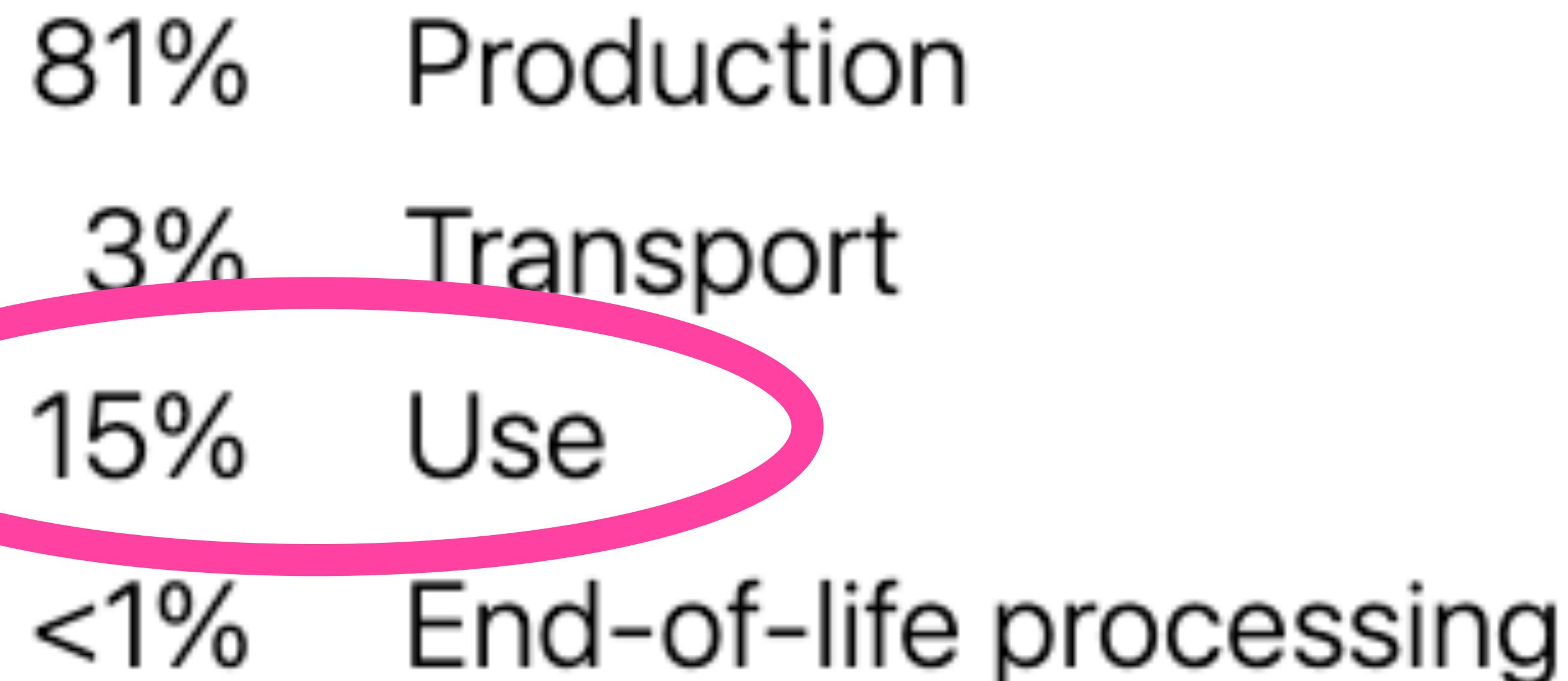
100%

We're committed to transitioning our entire
manufacturing supply chain to 100 percent
renewable electricity by 2030.

iPhone 14 Pro life cycle carbon emissions

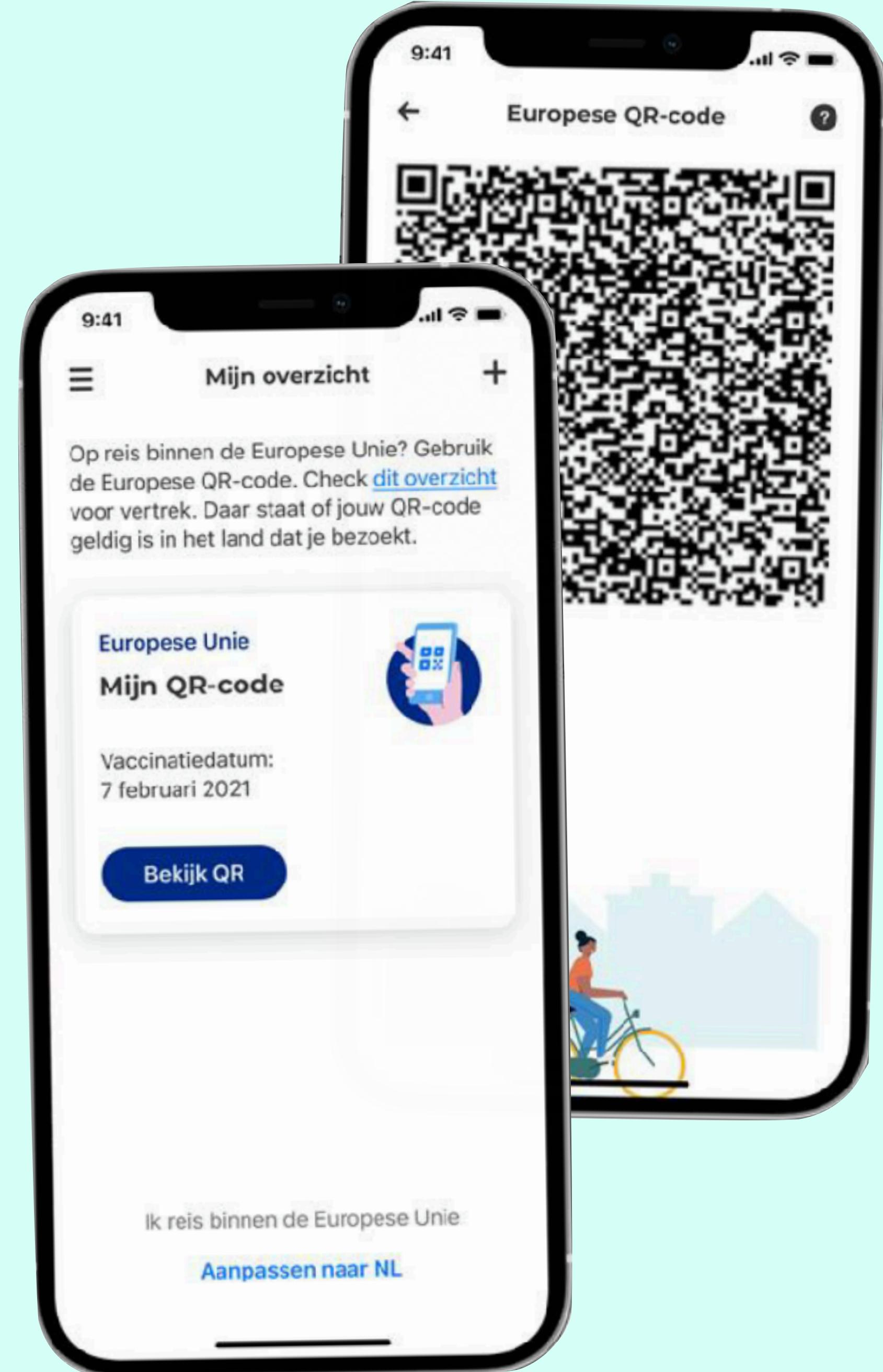
81%	Production
3%	Transport
15%	Use
<1%	End-of-life processing

iPhone 14 Pro life cycle carbon emissions



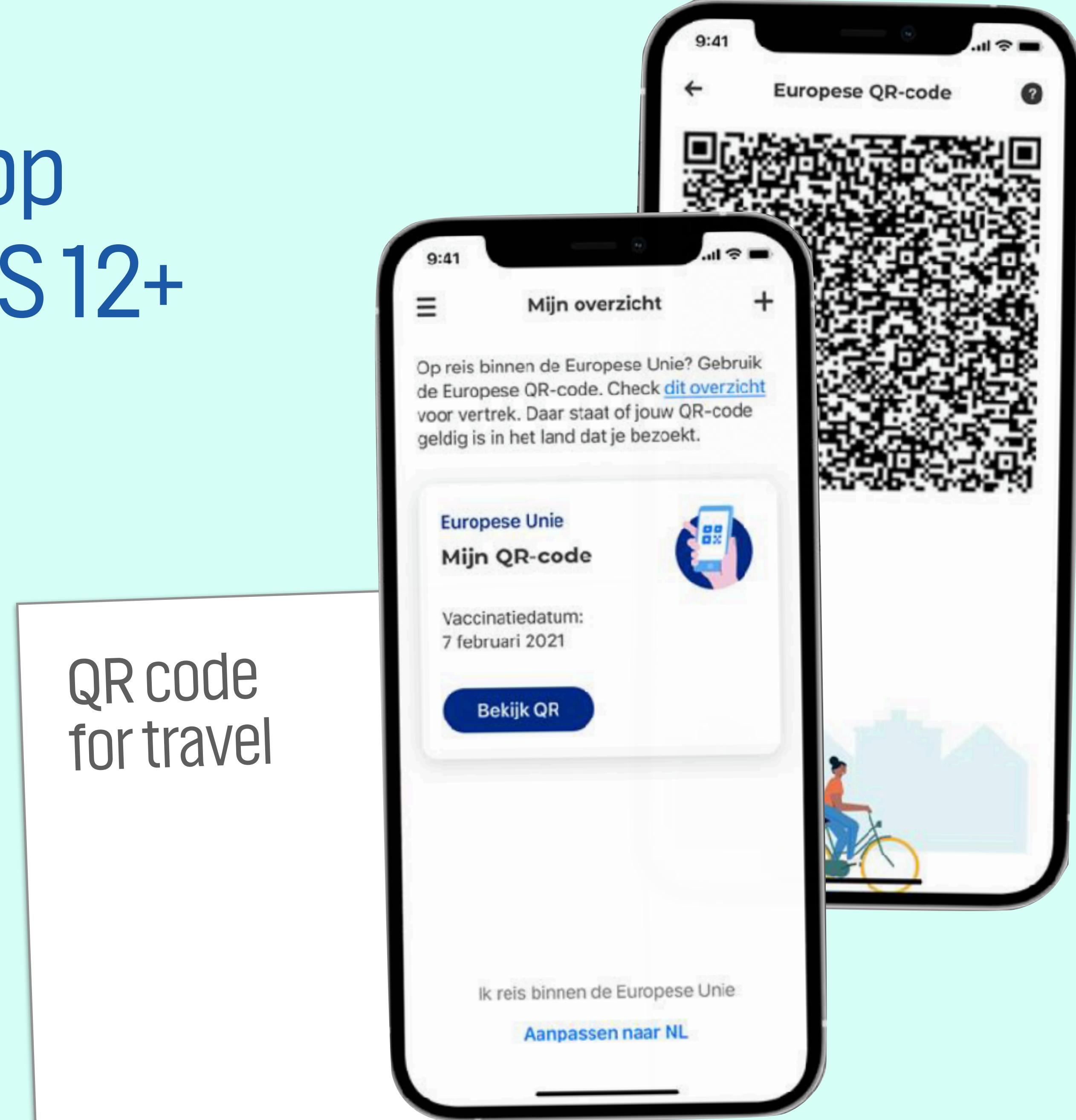
**Don't be
the reason
users
upgrade**

Dutch CoronaCheck app required Android 6+, iOS 12+



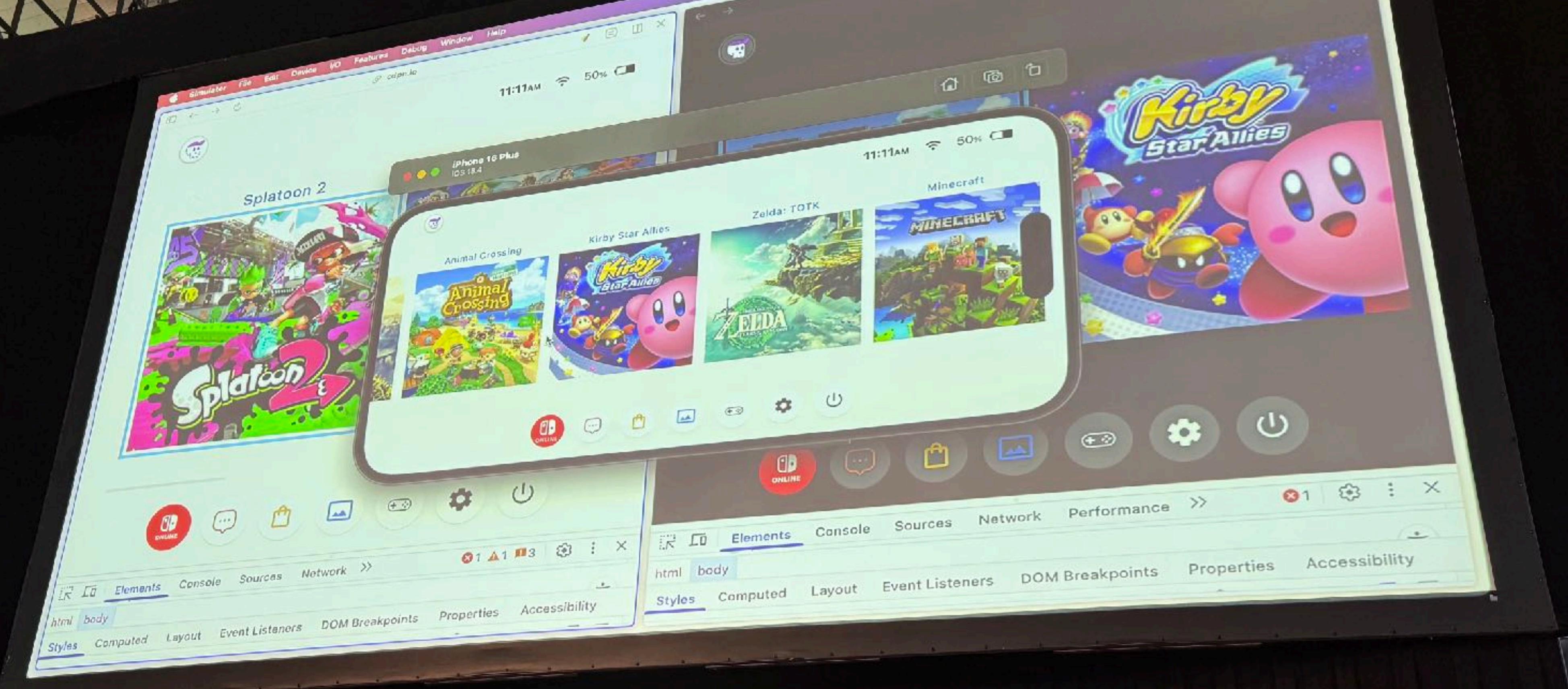
Dutch CoronaCheck app required Android 6+, iOS 12+

There was a paper fallback.



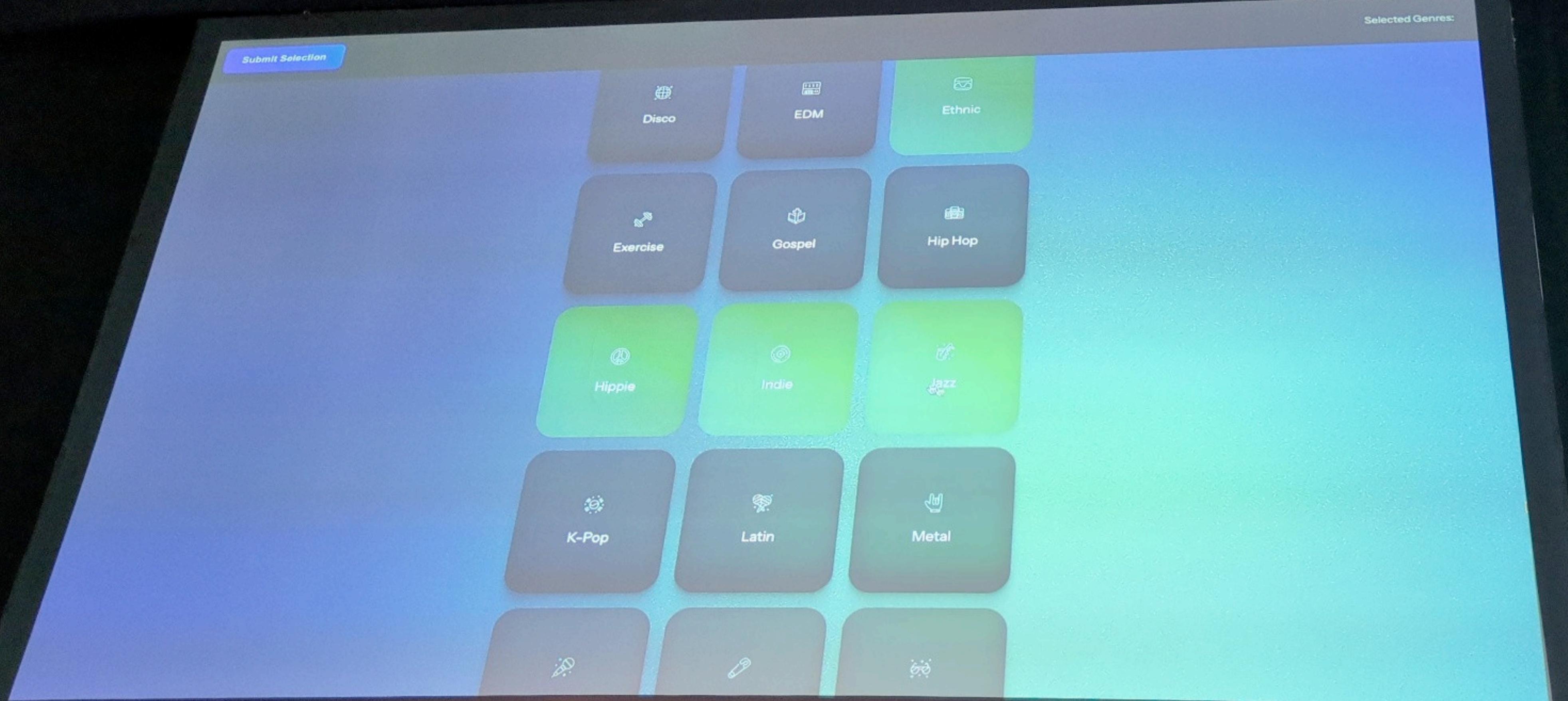
QR code
for travel

Progressive enhancement
is a good approach



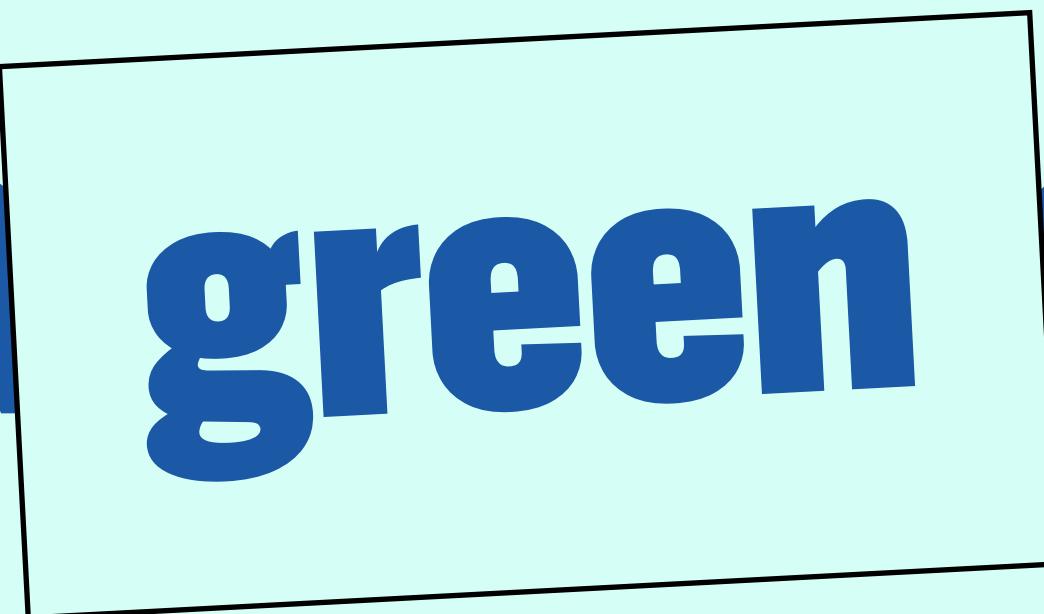
KISS
CSS DAY

work to
IOS, p
Yeah!
nice a
end.
enh
this
Exc



multiple select? Hasn't been really talked about. So, here actually, that's the thing. And created a move to select one of those elements that were not reusable. Now, do keep in mind, this is an experiment. But with the current experiment, I was able to create the big grid and placing the multi-

Progressive enhancement is a green approach



3.

choose green
hosting

WSG

4.1. Choose a sustainable hosting provider



A wide-angle photograph of a rural landscape under a vast blue sky filled with scattered white clouds. A paved road runs horizontally across the bottom of the frame, bordered by green grass and small, isolated trees. The terrain appears flat and open, typical of a prairie or coastal area.

The
cloud
is
real





Colocation data centres

100 kW-1 MW,
1-200,000 m²

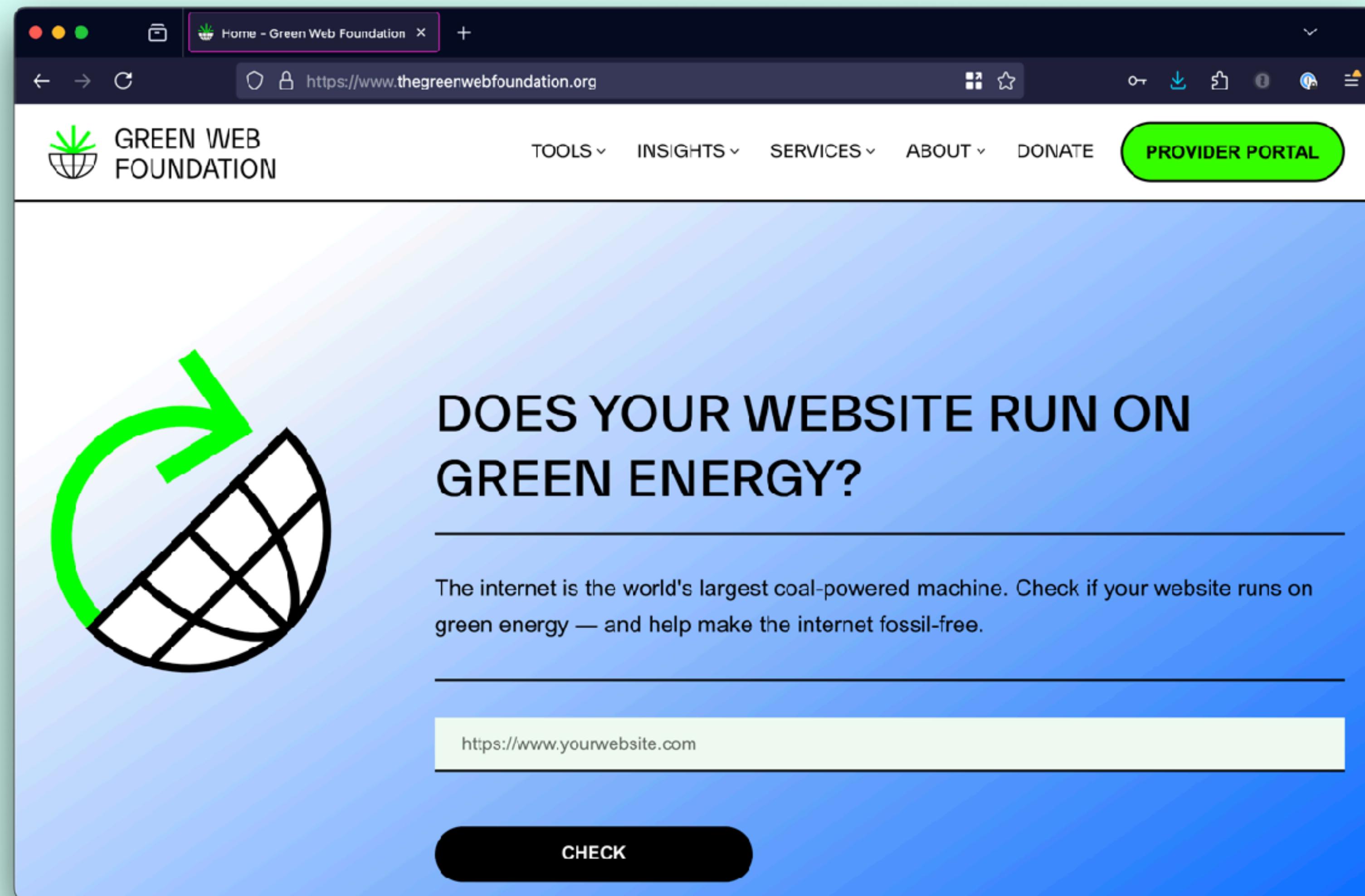


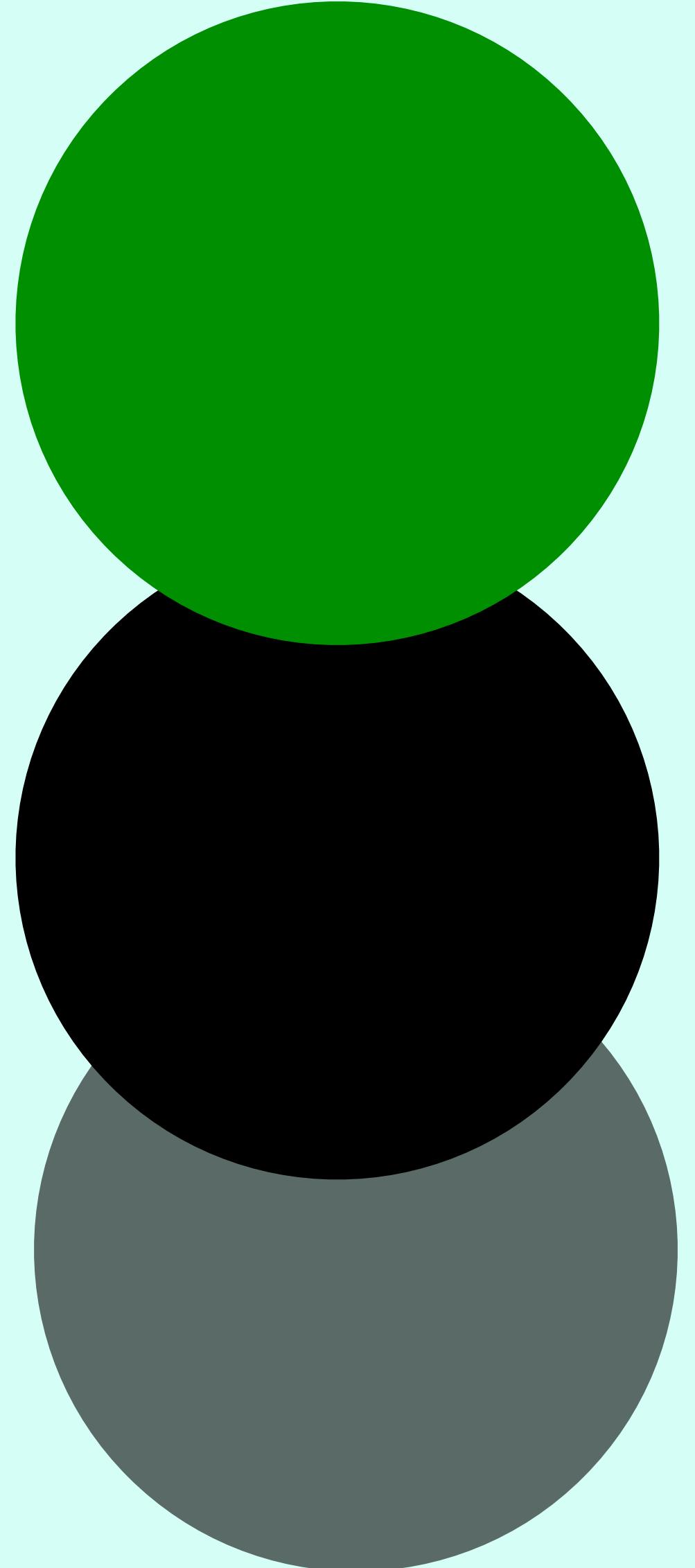
Secaucus, New Jersey (Equinix)

**Use or move to a
green provider**

Find out current state

[thegreenwebfoundation.org](https://www.thegreenwebfoundation.org)





GWF lists **329** verified
green hosting providers
in **34** countries.

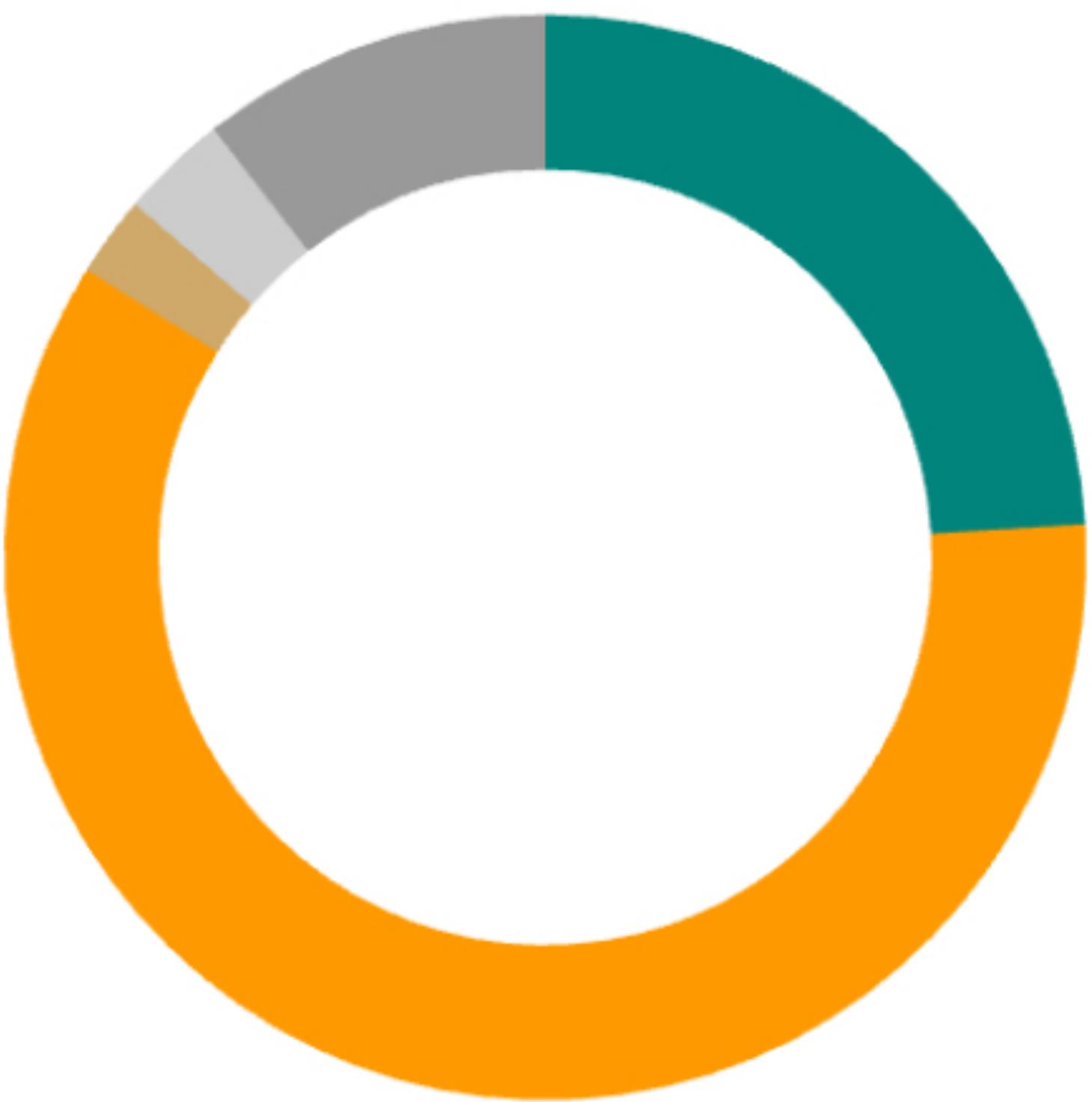
Ask sales reps how
theirs compares.

Factors include:
renewable energy
equipment longevity
waste recycling

From: WSG, 4.1

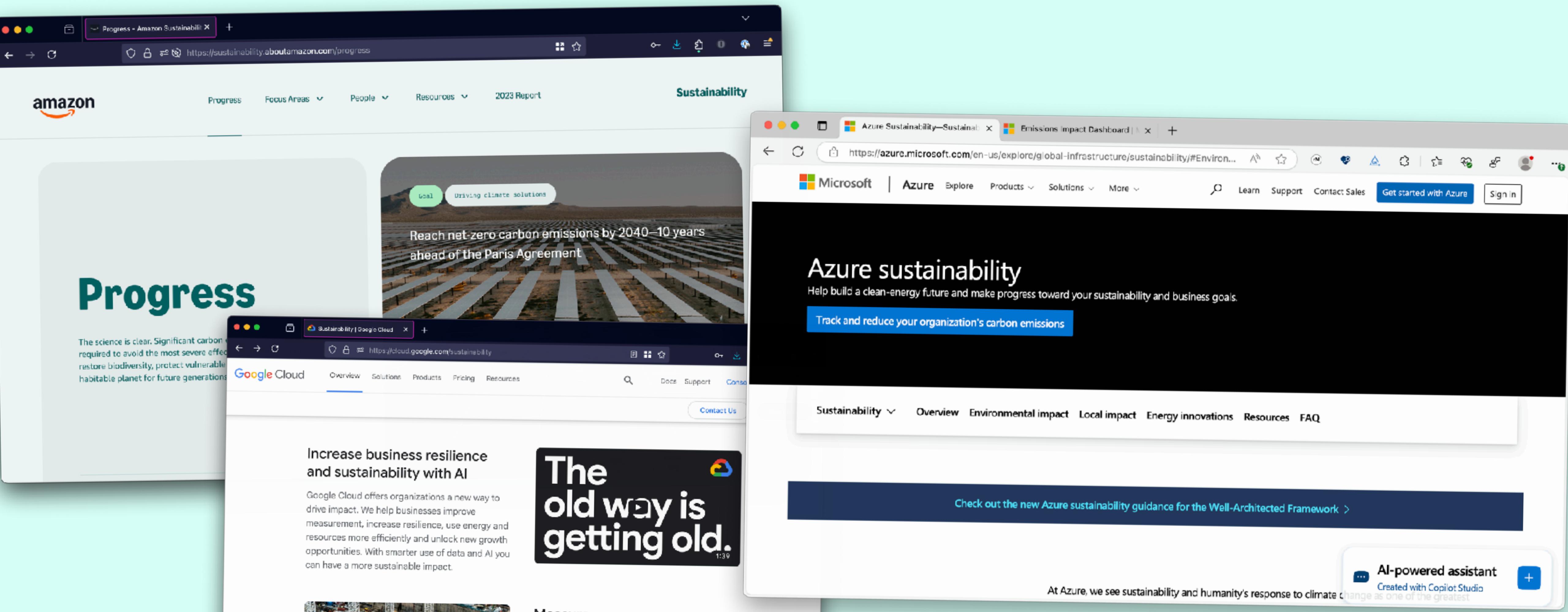
There
is only
one
grid

Energy sources



- Wind - 24%
- Solar - 60%
- Hydro - 0%
- Nuclear - 2%
- Biomass - 0%
- Other - 3%
- Gas - 11%
- Oil - 0%
- Coal - 0%

Green goals easier to find than stats



Consider timing

Carbon intensity

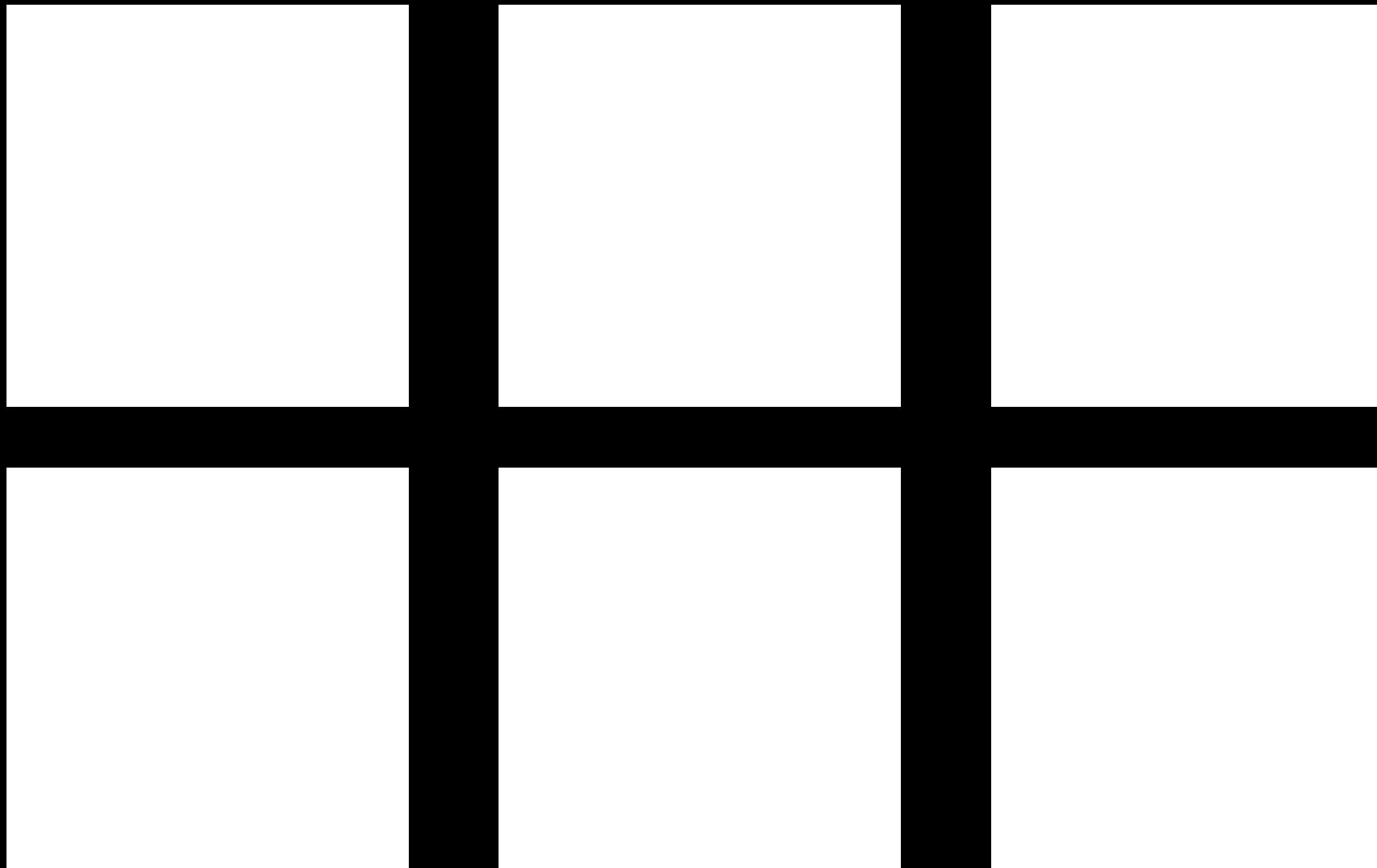
How clean energy is
at a given time

(eg CO₂/kWh)

Our team



Our team



Our team

Anna

Mei

Jacob

Ouiam

David

George

[Shop Women](#)[Shop Men](#)

organicbasics

[About](#)[Our Impact Website](#)[English](#)

Organic Sweat

[Shop women](#)[Shop men](#)

• • •

[Shop Women](#)

[Shop Men](#)

organicbasics

[Regular store](#)

[Manifesto](#)

EUR



more tap to learn ↗



[Shop women](#)
[Shop men](#)

4.

**Only necessary
features**

**Avoid technology
that has relatively
large energy use**



AI

Largest data centres
("campuses") until recently

$\sim 150 \text{ MW}$

Colocation data centres

up to 1 MW

New developments ("megacampuses")

$\sim 1\text{-}2000 \text{ MW}$



Eemshaven, the Netherlands



Middenmeer, the Netherlands

AI

Hoeveel stroom AI precies verbruikt is geheim. Maar niet voor deze onderzoeker

Hans Nauta

redactie duurzaamheid&economie

Datawetenschapper Alex de Vries-Gao (35) wilde 'een getalletje plakken' op het energieverbruik van AI en ontdekte hoe lastig dat is. "Het is eigenlijk absurd wat daarvoor nodig is. Je moet je verdiepen in de productie van chips, een beetje Chinees leren en op zoek naar brokken informatie van analisten en bedrijven."

AI rekenend kwam de onderzoeker uit Amsterdam tot de conclusie dat AI dit jaar met zo'n 9,4 gigawatt (GW) al meer elektriciteit vraagt dan landen zoals Zwitserland, Oostenrijk of Finland. AI is hard op weg om ook de gemiddelde stroomvraag van Nederland, circa 15 GW, voorbij te streven. Zelfs de stroomvraag van bitcoin, zo'n 20 GW, komt in zicht.

Het onderzoek zou zoveel makkelijker kunnen. Maar techbedrijven vertellen zelf niet hoeveel elektriciteit hun AI-diensten vragen. Google

bijvoorbeeld noemt zo'n onderscheid in de stroomrekening 'niet betekenisvol'. Het elektriciteitsverbruik is flink gestegen, schreef het techbedrijf in het milieurapport over 2024, en AI was daarvan een belangrijke oorzaak. Maar veel meer details liet Google niet los.

Van de Europese AI-wet hoeven ze daar niet alles over te vertellen. "Deze wet verplicht bedrijven om energiegebruik te rapporteren, maar alleen voor de trainingsfase van speciale AI-modellen. Het daadwerkelijke gebruik valt buiten die verplichting," zegt De Vries-Gao.

Van dat gezien de enorme opmars van AI is het zeer relevant om te weten hoeveel energie er nodig is", zegt hij. Bijvoorbeeld voor wie het stroomnet op orde moet houden, of om een maatschappelijke discussie over AI te kunnen voeren.

Hoe is hij te werk gegaan? Door bij speciale AI-chips te beginnen. Nvidia en AMD zijn belangrijke leveranciers daarvan. Deze bedrijven laten ze pro-

duceren door Taiwan Semiconductor Manufacturing Company (TSMC).

"Nvidia stuurt het ontwerp van de chip naar TSMC en die drukt het als het ware in een siliconenplaat. Een beetje zoals je visitekaartjes laat drukken. Bij AI-chips worden het geheugen en de processor vlak bij elkaar op een verpakking gezet, want door de korte onderlinge afstand wordt de chip sneller. TSMC heeft deze techniek ontwikkeld en is wereldleider in het verpakken van AI-chips."

Omdat de totale capaciteit van TSMC is geschat door analisten, en AI-chips vrijwel allemaal dezelfde maat hebben, kon De Vries-Gao de jaarlijkse chipsproductie van TSMC uitrekenen. Zelf vermeldt dit bedrijf de jaarlijkse verkopen niet, net zoals techbedrijven niet vertellen hoeveel chips ze kopen. De capaciteit van TSMC wordt volledig benut omdat de vraag zo hoog is. Ook is het energieverbruik bekend van de systemen die chips gebruiken.

Zo kwam de datawetenschapper

aan zijn conclusies. Mo

11 tot 20 procent van

teitsverbruik van alle

aan AI, zegt De Vries-

Omdat TSMC de ca
verdubbelt, kan dit
naar de helft van het
van de datacenters. A
nen dan 23 GW aa
hebben en zo de str
coin, zo'n 20 GW.
Vries-Gao heeft zi
'een ondoorzichti
bliceerd in het v
tijdschrift Joule.

De groei van
ook wat kunnen
Vries-Gao. Niet
teitsproblemen
gelijkheid is dat
tacenters moei
ties te vinden.

Niet alle
stroomnet k
Google van e
daar heeft he
capaciteit vo



Nu gaat 11 tot 20 procent van het elektriciteitsverbruik van alle datacenters op aan AI

Alex de Vries-Gao

Hoeveel stroom AI precies verbruikt is voor deze onderzoeker

Al rekenend kwam hij tot de conclusie dat AI dit jaar met zo'n 9,4 gigawatt al meer elektriciteit vraagt dan landen zoals Zwitserland, Oostenrijk of Finland. AI is hard op weg om ook de gemiddelde

genlijk absurd wat daarvoor nodig is. Je moet je verdiepen in de productie van chips, een beetje Chinees leren en op zoek naar brokken informatie van analisten en bedrijven."

Al rekenend kwam de onderzoeker van de Vrije Universiteit in Amsterdam tot de conclusie dat AI dit jaar met zo'n 9,4 gigawatt (GW) al meer elektriciteit vraagt dan landen zoals Zwitserland, Oostenrijk of Finland. AI is hard op weg om ook de gemiddelde stroomvraag van Nederland, circa 15 GW, voorbij te streven. Zelfs de stroomvraag van bitcoin, zo'n 20 GW, komt in zicht.

Het onderzoek zou zoveel makkelijker kunnen. Maar techbedrijven vertellen zelf niet hoeveel elektriciteit hun AI-diensten vragen. Google

Google niet los.

Van de Europese AI-wet hoeven ze daar niet alles over te vertellen. "Deze wet verplicht bedrijven om energiegebruik te rapporteren, maar alleen voor de trainingsfase van specifieke AI-modellen. Het daadwerkelijke gebruik valt buiten die verplichting", zegt De Vries-Gao.

"Maar gezien de enorme opmars van AI is het zeer relevant om te weten hoeveel energie er nodig is", zegt hij. Bijvoorbeeld voor wie het stroomnet op orde moet houden, of om een maatschappelijke discussie over AI te kunnen voeren.

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Omdat de TSMC is gespecialiseerd in AI-chips vrijdag heeft de firma de jaarlijkse chipuitrekenen. De jaarlijkse techbedrijven hebben de chips ze gekocht. De capaciteit van TSMC wordt volledig benut omdat de vraag zo hoog is. Ook is het energieverbruik bekend van de systemen die chips gebruiken.

Zo kwam de datawetenschapper



conclusies. Momenteel gaat 11 tot 20 procent van het elektriciteitsverbruik van alle datacenters op aan AI, zegt De Vries-Gao, gebruikmakend van informatie van

op aan AI

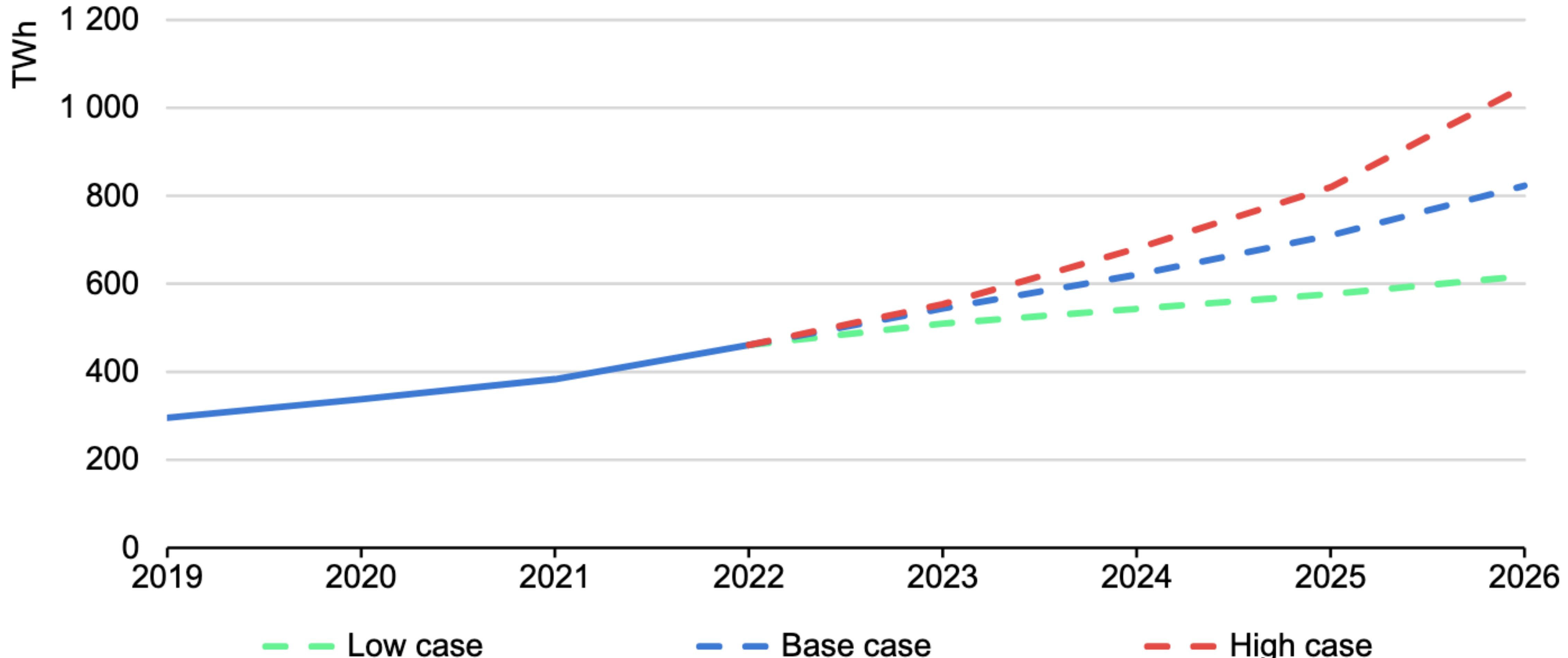
Alex de Vries-Gao

Niet alleen het stroomnet kan Google van energie verbruiken. Daar heeft het een capaciteit van

aan zijn conclusies. Momenteel gaat 11 tot 20 procent van het elektriciteitsverbruik van alle datacenters op aan AI, zegt De Vries-Gao.

Omdat TSMC de capaciteit verdubbelt, kan dit aantal naar de helft van het elektriciteitsverbruik van de datacenters. Alleen dan 23 GW aan energie hebben en zo de stroomvraag van bitcoin, zo'n 20 GW, kunnen we goed voorzien. Vries-Gao heeft zijn conclusies. Momenteel gaat 11 tot 20 procent van het elektriciteitsverbruik van alle datacenters op aan AI, zegt De Vries-Gao.

Global electricity demand from data centres, AI, and cryptocurrencies, 2019-2026



IEA. CC BY 4.0.

AI

**“Emissions would increase
by 60× for a GPT-3 style
model**

- Wim Vanderbauwhede

“Emissions would increase by 60× for a GPT-3 style model; for a GPT-4 style model, it could be 200×.”

- Wim Vanderbauwhede

AI

“AGI”



Empire of AI

Dreams and Nightmares
in Sam Altman's OpenAI

Karen Hao

“AGI”

- Not well defined
- Not sure if it can solve global warming
- Not in extince



Log in

Your search

global warming



Your search

global warming

Summary

It looks like your question goes beyond what we can assist with here.

Advanced search is designed to help you find information on openai.com, such as our products, research, and updates.

▼ Disclaimer: Beta feature in testing. [Learn more](#)

CSS @Mixin Rule



❖ **unknown support**

From Efficiency Gains to Rebound Effects: The Problem of Jevons' Paradox in AI's Polarized Environmental Debate

ALEXANDRA SASHA LUCCIONI, Hugging Face, Canada

EMMA STRUBELL, Carnegie Mellon University, USA

KATE CRAWFORD, Microsoft Research; University of Southern California, USA

As the climate crisis deepens, artificial intelligence (AI) has emerged as a contested force: some champion its potential to advance renewable energy, materials discovery, and large-scale emissions monitoring, while others underscore its growing carbon footprint, water consumption, and material resource demands. Much of this debate has concentrated on direct impacts—energy and water usage in data centers, e-waste from frequent hardware upgrades—without addressing the significant indirect effects. This paper examines how the problem of Jevons' Paradox applies to AI, whereby efficiency gains may paradoxically spur increased consumption. We argue that understanding these second-order impacts requires an interdisciplinary approach, combining lifecycle assessments with socio-economic analyses. Rebound effects undermine the assumption that improved technical efficiency alone will ensure net reductions in environmental harm. Instead, the trajectory of AI's impact also hinges on business incentives and market logics, governance and policymaking, and broader social and cultural norms. We contend that a narrow focus on direct emissions misrepresents AI's true climate footprint, limiting the scope for meaningful interventions. We conclude with recommendations that address rebound effects and challenge the market-driven imperatives fueling uncontrolled AI growth. By broadening the analysis to include both direct and indirect consequences, we aim to inform a more comprehensive, evidence-based dialogue on AI's role in the climate crisis.

Additional Key Words and Phrases: Artificial intelligence, Environmental Impacts, Lifecycle Assessment, Rebound Effects, Sustain-

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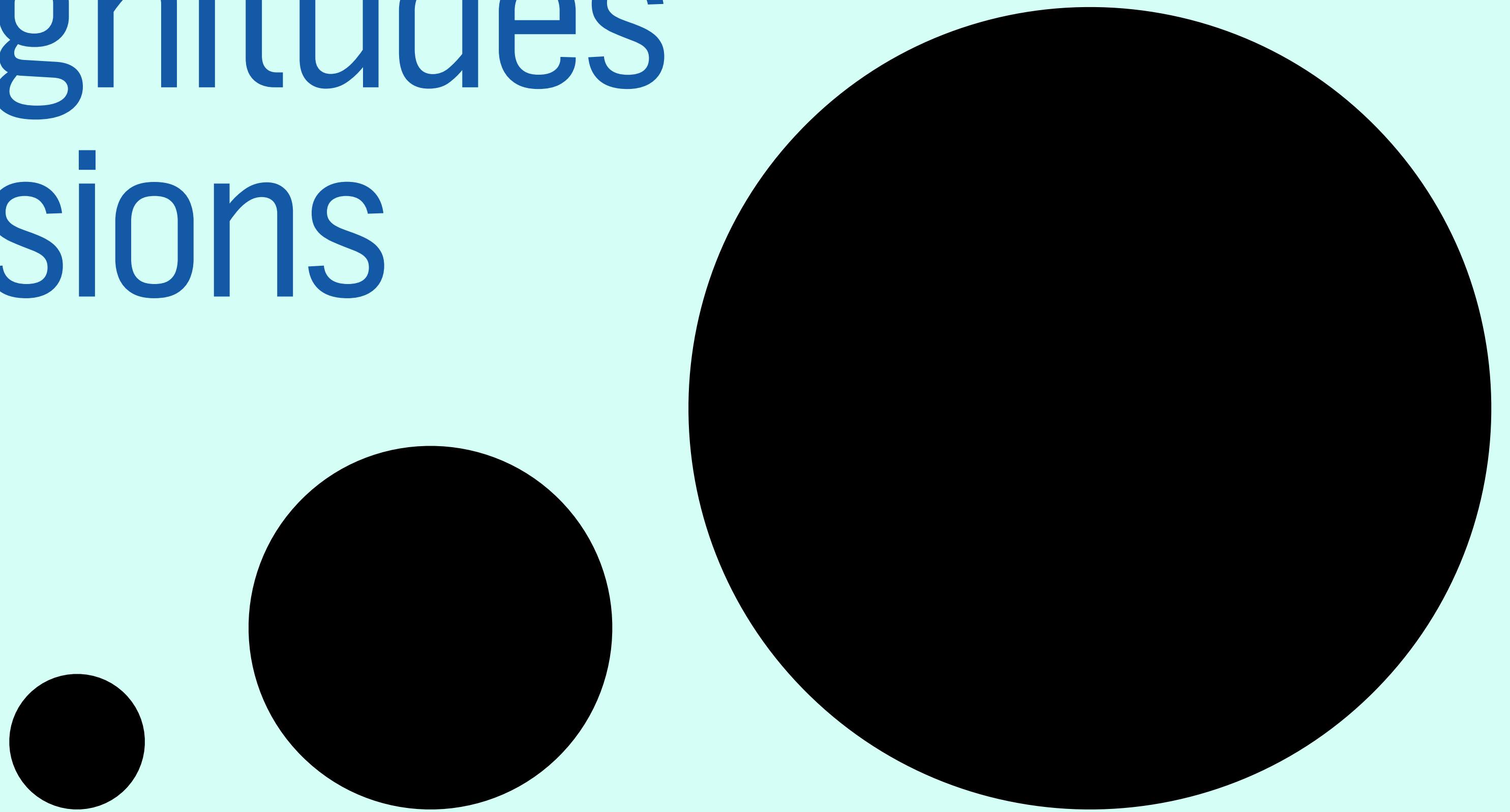
~~innovations, AI could serve as a crucial tool in climate adaption.~~

ng. Yet we cannot simply hope for the best outcome. The

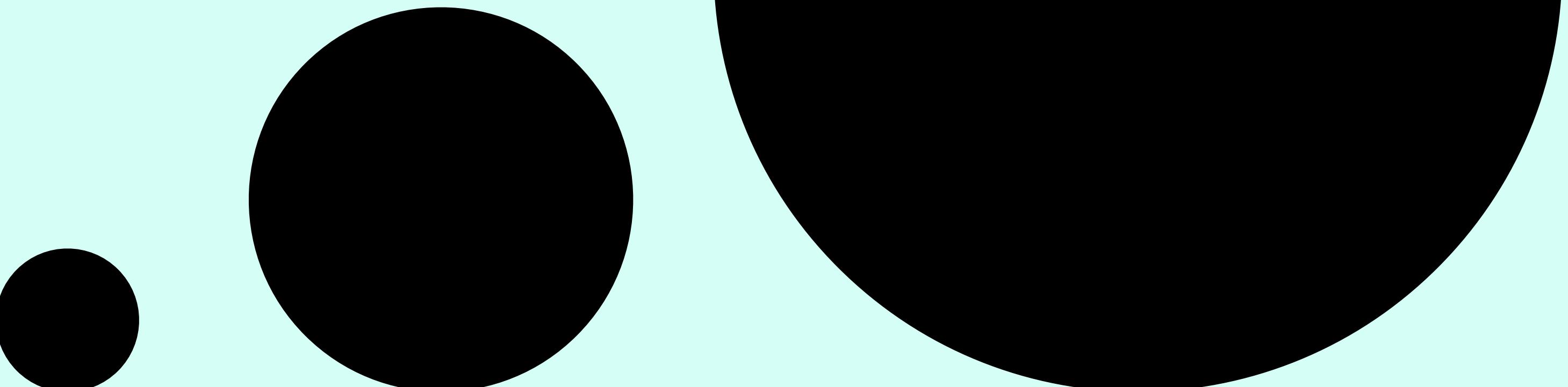
~~environmental harm. Instead, the trajectory of AI's impact also hinges on business incentives and market logics, governance and policymaking, and broader social and cultural norms. We contend that a narrow focus on direct emissions misrepresents AI's true climate footprint, limiting the scope for meaningful interventions. We conclude with recommendations that address rebound effects and challenge the market-driven imperatives fueling uncontrolled AI growth. By broadening the analysis to include both direct and indirect consequences, we aim to inform a more comprehensive, evidence-based dialogue on AI's role in the climate crisis.~~

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Adding AI means
adding magnitudes
more emissions



...so finding
ways to not
use it is green



ASS CANE FOR MY JOB

THE BORING
& HARD
PARTS OF

**Maybe let users
opt-out of what's
carbon-intense**

WSG

5.4 Communicate the ecological impact of user choices

You could give users choice

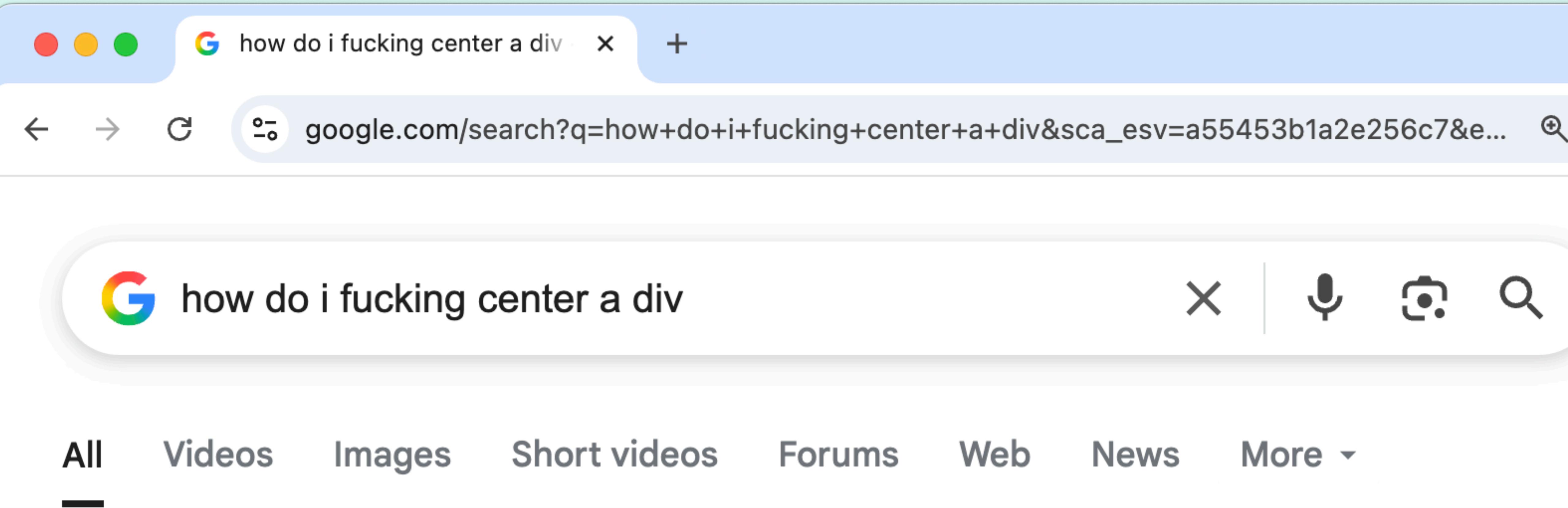
A screenshot of a Google search results page. The search bar at the top contains the query "how do i sustainable". Below the search bar, there are several navigation links: All, Images, Videos, Short videos, News, Forums, Web, More, and Today. The "All" link is underlined, indicating it is the active category.

The main content area displays two distinct options:

- Chat about it with our chatbot**: This option is presented in a white box. Below it, text reads: "Find out in a conversation how to sustainable, it will be quick and easy."
- Browse the search results**: This option is also in a white box. To its right is a green button labeled "Greener option" with a small tree icon.

Below these options, a larger text block says: "Look at different sites that talk about how to sustainable and choose the one you want to read more about."

“If you add profanity to your query, it filters out AI results” – Bruce Lawson, yesterday



Reddit · r/ProgrammerHumor

You are allowed to have fun

controllable. It should be accessible. And I think more and more we're going to need one more thing to make sure all of you as a developer have fun. This afternoon is the first time you're allowed to do demos. It's not just a presentation.



**Work on removing
rather than adding**

5.

Stylesheets

5.

CSS, CSS, CSS!



Colours

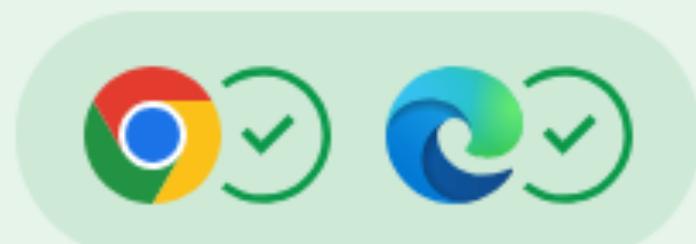
WSG

3.12 Sustainable CSS
user preference media
queries are used

```
@media (prefers-color-scheme:  
dark) {  
  /* provide dark mode */  
}
```



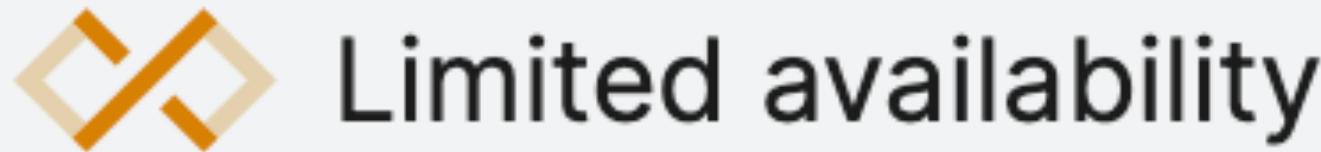
Baseline Widely available



**Dark mode
good, eco
mode better?**

**Most OLEDs can
turn off pixels
(needs full black)**

```
@media (prefers-reduced-data: reduce) {  
  /* offer lighter version */  
}
```



Limited availability



```
@media (monochrome) {  
  /* all monochrome devices */  
}
```



Baseline Widely available

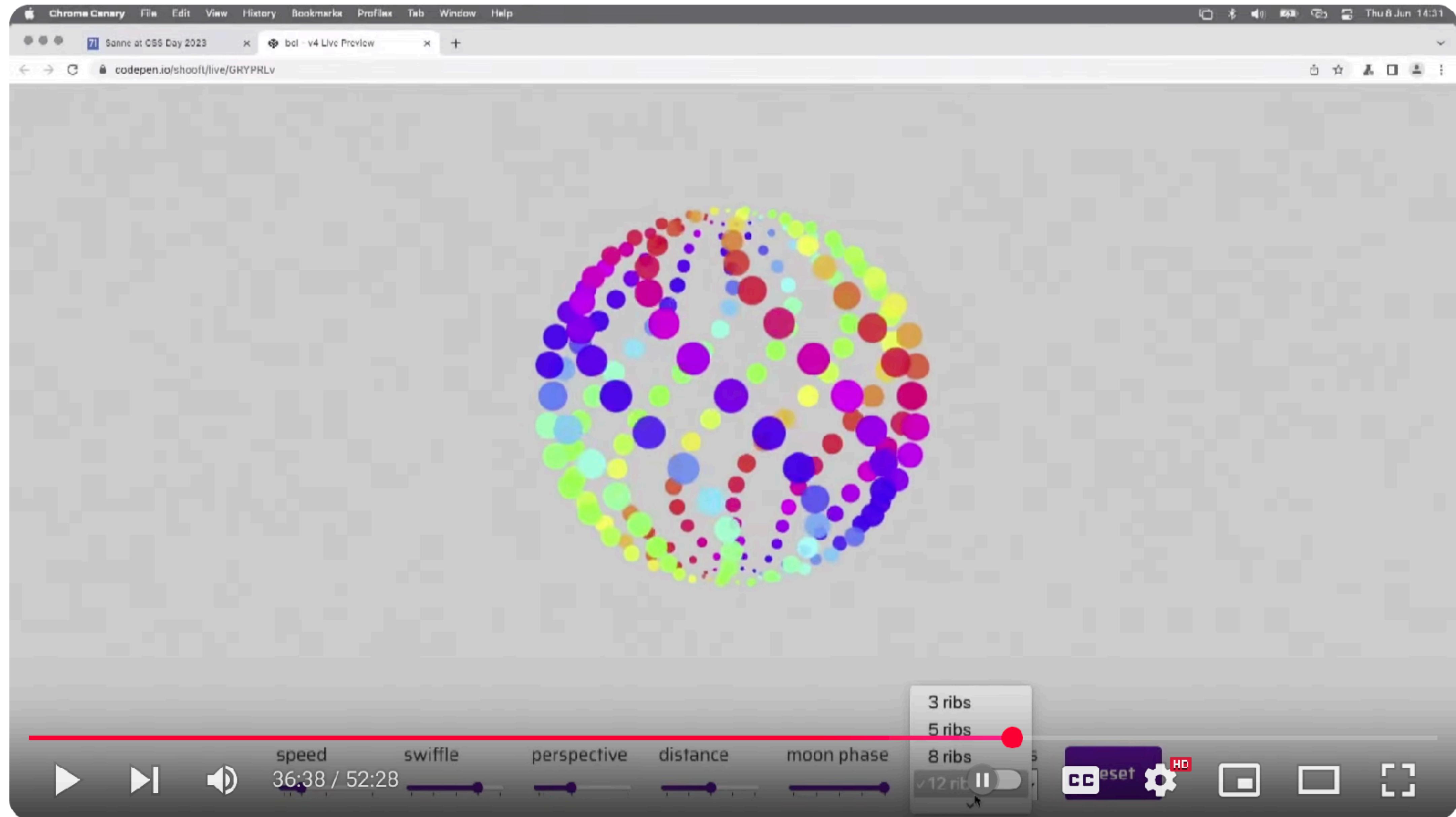


Greener print styles

css for print



CPU/GPU usage



Tinkerer by Night | Sanne 't Hooft | CSS Day 2023

```
1 @view-transition {  
2   navigation: auto;  
3 }
```

```
document.startViewTransition(() => {  
  filterItems();
```

```
@media (prefers-reduced-  
        motion: reduce) {  
    /* don't impact CPU/GPU if  
     isn't preferred */  
}
```

**Find what's
unused**

Online CSS Analyzer - Project W X +

https://www.projectwallace.com/analyze-css?prettify=1&url=cssday.nl

W CSS Analyzer CSS Code Quality Design Tokens CSS Scraper Visualize @layer Custom properties ⌘ K ☀

ANALYZE CSS

Analyze URL Analyze File Analyze CSS input

URL to analyze

cssday.nl

ANALYZE URL

Prettify CSS?

Prettifying makes inspecting the CSS easier, but very slightly changes the numbers.

Stylesheet

LINE OF CODE	FILESIZE	RULES	SELECTORS	DECLARATIONS
769	28.3 KB	666	666	171

Navigate this page

Stylesheet

Composition

ever wondered...  **TONG SECRETS REVEALED!**

can my WHAT font DO?

- What CSS do I need!
- Does it have ligatures!
- Or other stuff I can use!
- How does it look, anyway!
- What languages are supported!
- Who made this font!
- Is it a variable font!
- Can I animate it!
- And lots more fonty details!
- As an AI language model, I cannot f



then maybe you should stick
your font in the

keep calm and fondue on

wakamai fondue

keep calm and fondue on

very
adequate!

"The only font tool
you will ever need!"

PIXEL
AMBACHT

- Hank Helvetica
Inventor of jones

We can make
the world
greener faster
at work

Summary

Make smaller web pages

Support older devices

Choose green hosting

Only necessary features (probably avoid AI)

Use greener CSS



Thank you!

Thanks to Alexander Dawson,
Tantek Çelik, Rose Newell,
Fershad Irani, Matijs Brinkhuis,
Michelle Barker.

Slides + links are live on
hidde.blog/slides

Links

HTTP Archive Web Almanac 2024, Sustainability. <https://almanac.httparchive.org/en/2024/sustainability>

Green Software Foundation, <https://learn.greensoftware.foundation/>.

GOV.UK, Greening Government Commitments ICT annual report 2023 to 2024, <https://www.gov.uk/government/publications/greening-government-ict-annual-report-2023-to-2024/greening-government-commitments-ict-annual-report-2023-to-2024>

Tools

Ecograder, <https://ecograder.com/>.

Are My Third Parties Green, <https://aremythirdpartiesgreen.com/>.

Website Carbon, <https://www.websitcarbon.com/>.

Books

Gerry McGovern, World Wide Waste (2020).

Anne Currie, Sarah Hsu, Sara Bergman, Building Green Software (2024).

Tom Greenwood, Sustainable Web Design (2021).

Tim Frick, Designing for Sustainability (2016).

Technical specifications

Software Carbon Intensity (SCI) Specification. <https://sci.greensoftware.foundation/>.

Digital Services Ecodesign ISO standard. <https://www.iso.org/standard/86105.html>

Web Sustainability Guidelines. <https://w3c.github.io/sustainableweb-wsg/>