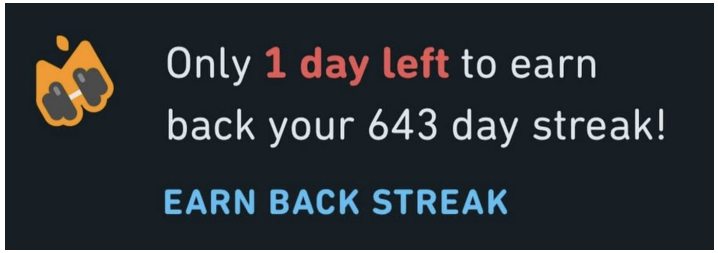
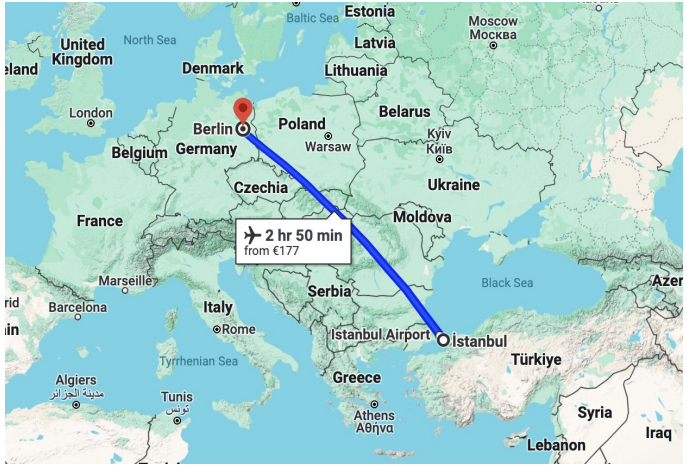
The State of the Web: Key Insights From the HTTP Almanac 2024

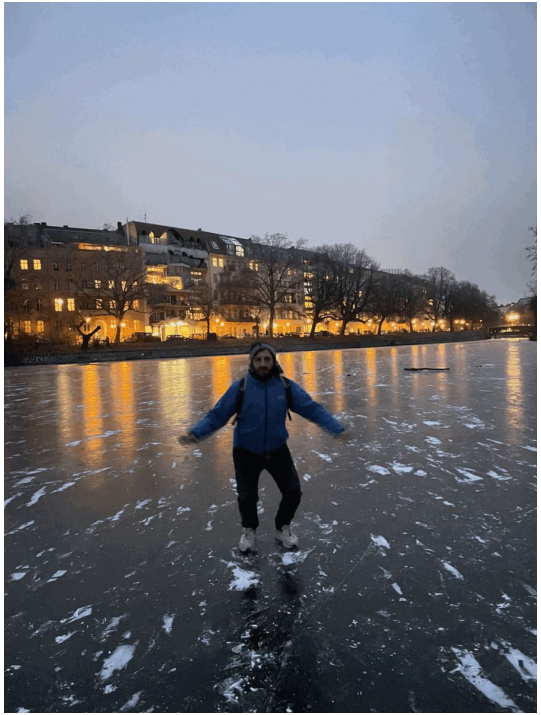
Burak Güneli

about me





uberall



My parents from the different city who want a Berlin cultural program and I get them the 6th Wegbier from Späti

Wegbier refers to a beer or beer-based drink that is consumed by residents and tourists on the way to or from work, to a celebration or between places of stay.

https://de.wikipedia.org/wiki/Wegbier

what is Web Almanac

- The Web Almanac is a project organized by HTTP Archive
- It evaluates the composition of millions of web pages on a monthly basis and makes its terabytes of metadata available for analysis on BigQuery
- URLs come from the Chrome UX report
- Web Almanac is an annual snapshot of web
- All data is available in Google BigQuery database
- Queries are public

Web Almanac
By HTTP Archive

2024

Sustainability

IS THE WEB SUSTAINABLE?

This is the second Web Almanac chapter about Sustainability and, guess what, climactic events didn't get any better. There are still a lot of opportunities to make digital more sustainable, starting with the web. We'll see that a lot happened since 2022 in the sustainability field and offer even more opportunities to make the web more resilient.

- Even if many people aren't aware of it, the internet has significant carbon emissions
- The digital world's contribution to humanity's carbon footprint may represent roughly 4% of primary energy consumption and greenhouse gas emissions
- The internet has several environmental impacts, and as developers/engineers, we can do our best to reduce them

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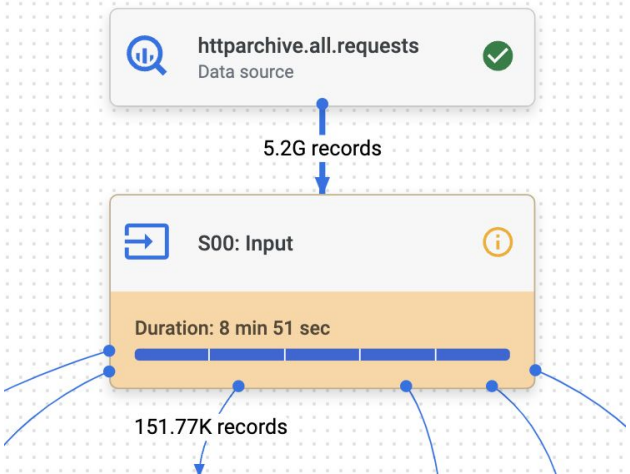
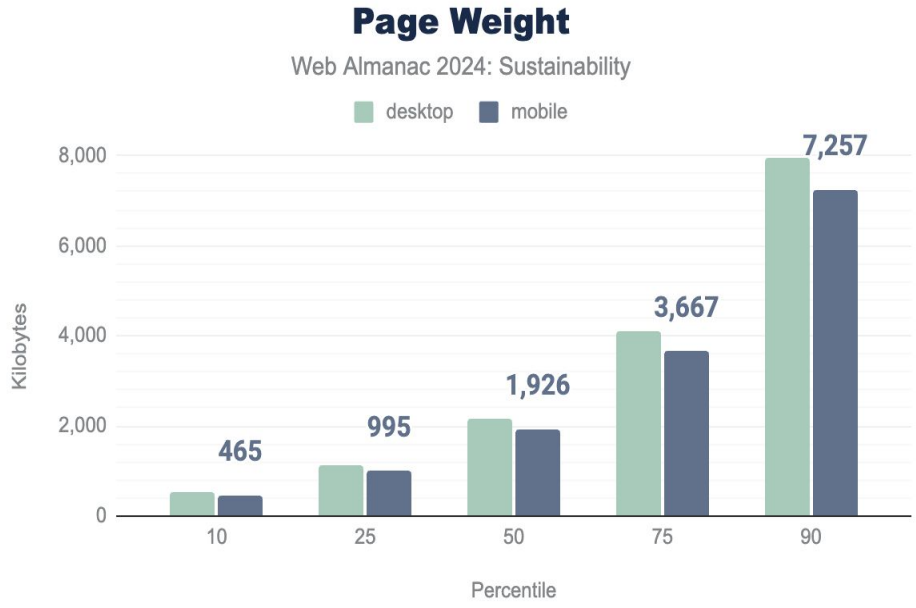


First of all, I am no one to judge!

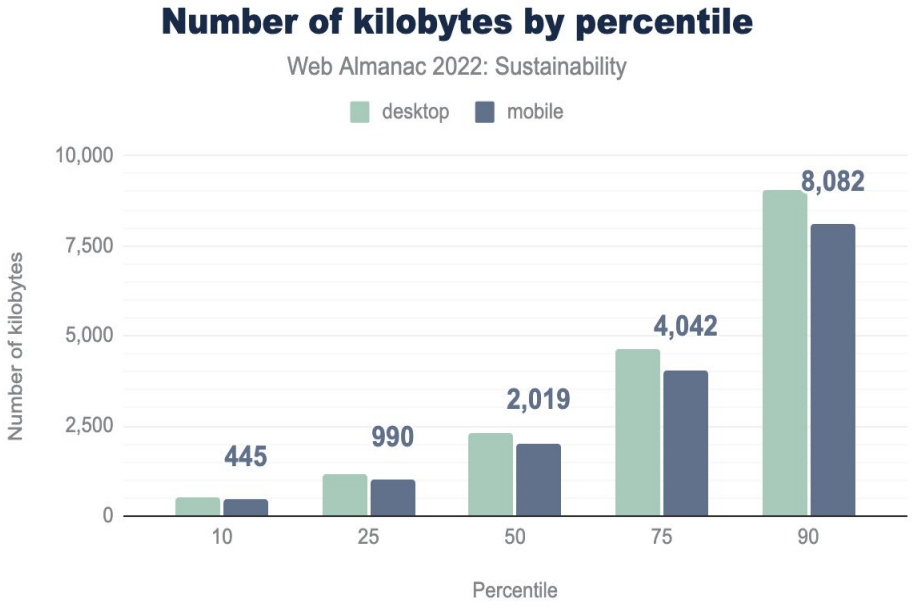
let's see the statistics - PAGE WEIGHT

- The average website dumps 8 MB (desktop) of data for a single page view. Which is 16 times larger than it should be for sustainability. Ideally it should be under 1 MB.
- The slightly good news is that in 2022 it was 9 MB (desktop)

2024



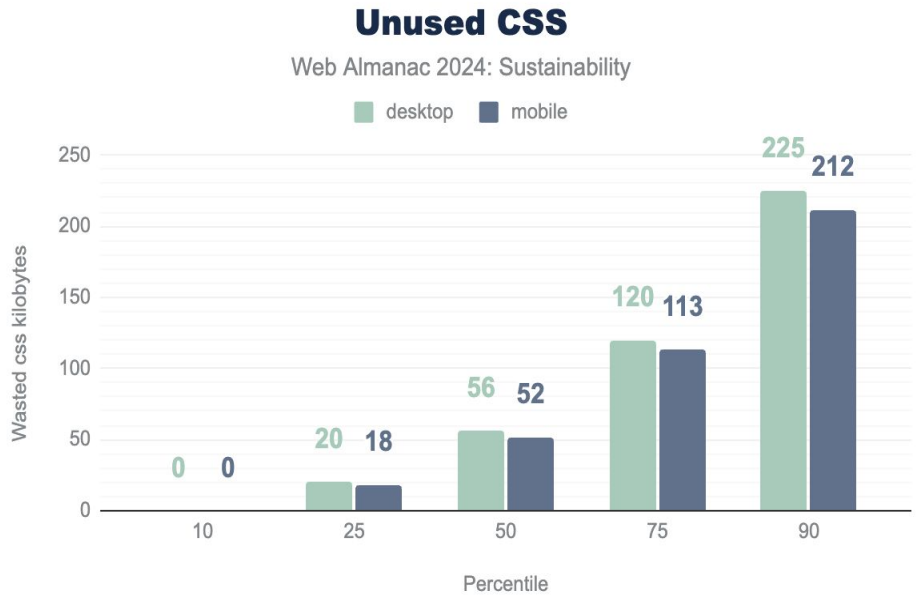
2022



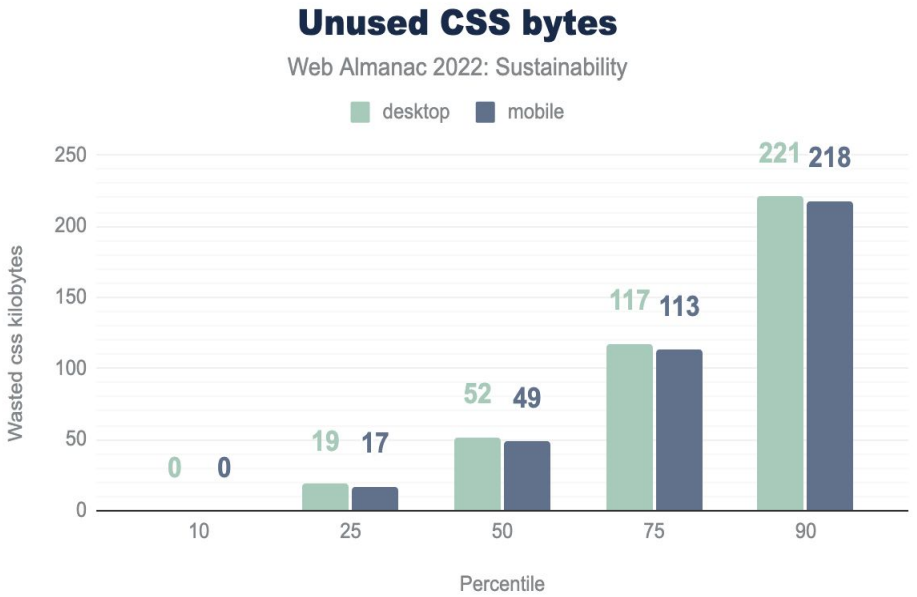
let's see the statistics - UNUSED CSS

- We found that the average website is carrying over 225 kilobytes of unused JavaScript on desktop. That code which is downloaded but never executed.
- Unfortunately there's a slight increase in unused CSS in compare to 2022

2024



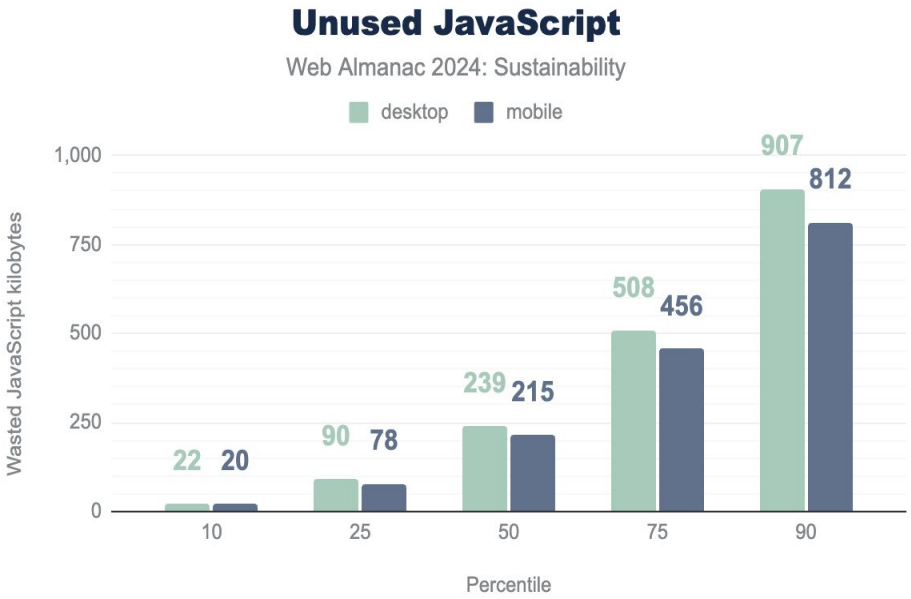
2022



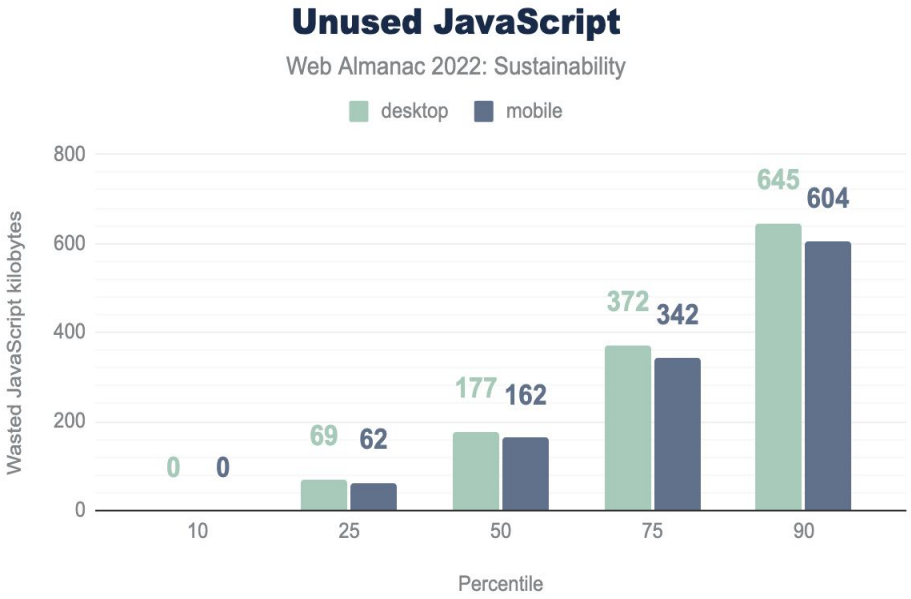
let's see the statistics - UNUSED JAVASCRIPT

- We found that the average website is carrying over 900 kilobytes of unused JavaScript on desktop. That code which is downloaded but never executed.
- Unfortunately the data reveals there is a significant increases across all percentiles

2024



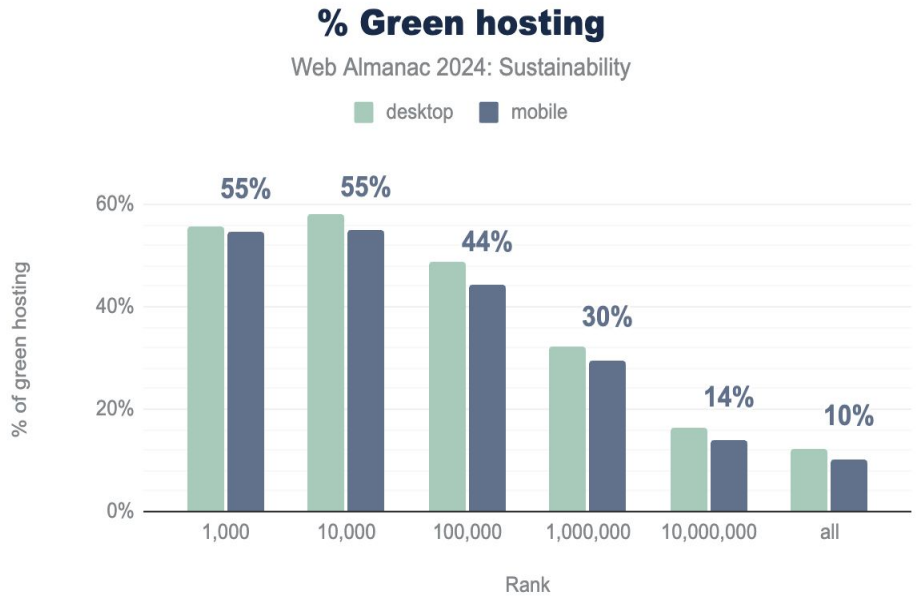
2022



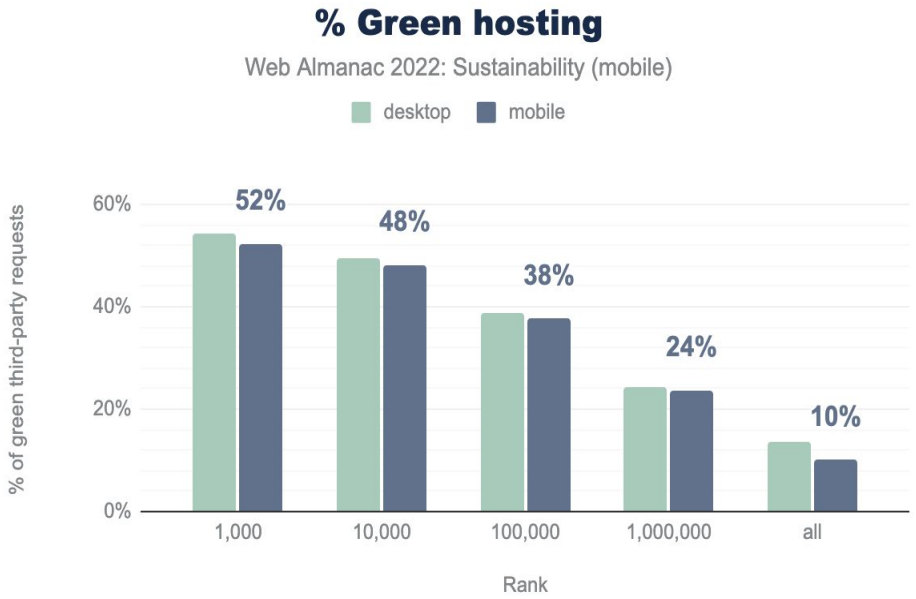
let's see the statistics - GREEN HOSTING

- In desktop, only 12% of the websites are using green hosting. Which was 13% last year
- In mobile the percentage of green hosting stayed the same at 10%

2024

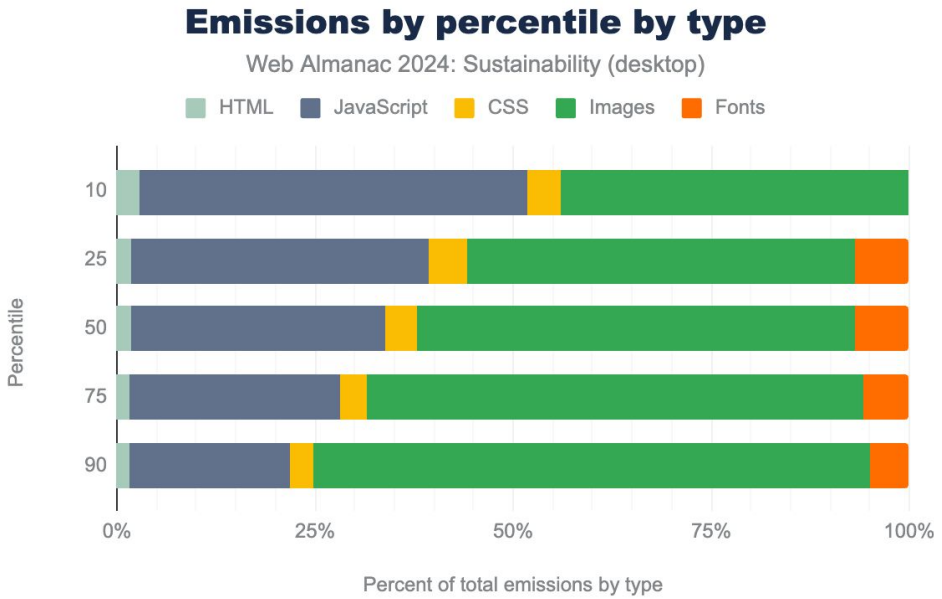


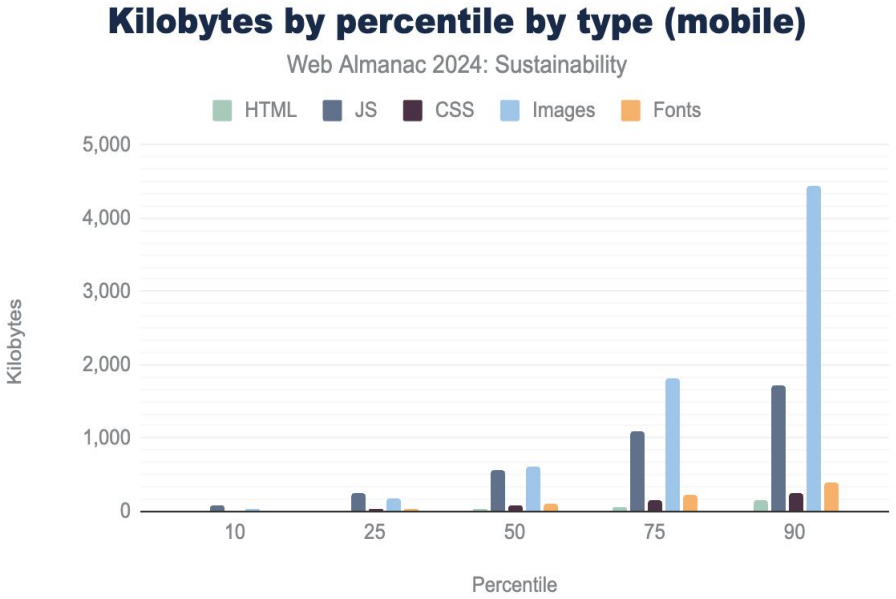
2022



let's see the statistics - IMAGE WEIGHT

- Our research shows that images make up more than half of a typical webpage's total weight. At the 90th percentile, we're looking at over 4.4 megabytes just in images
- Images are responsible for the largest portion of the total emissions footprint
- However images are usually easier to process than JS and CSS. (Not yet considered in SWDM V4)

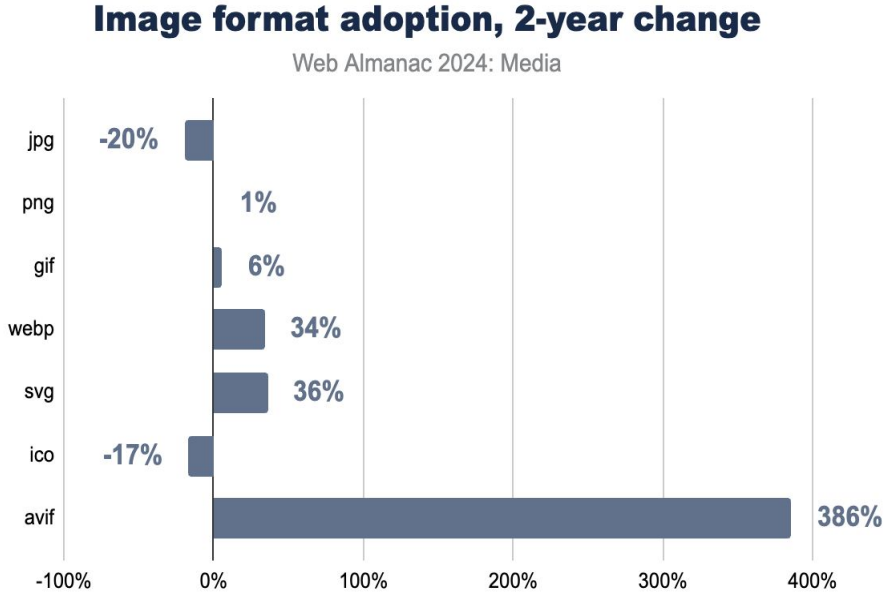




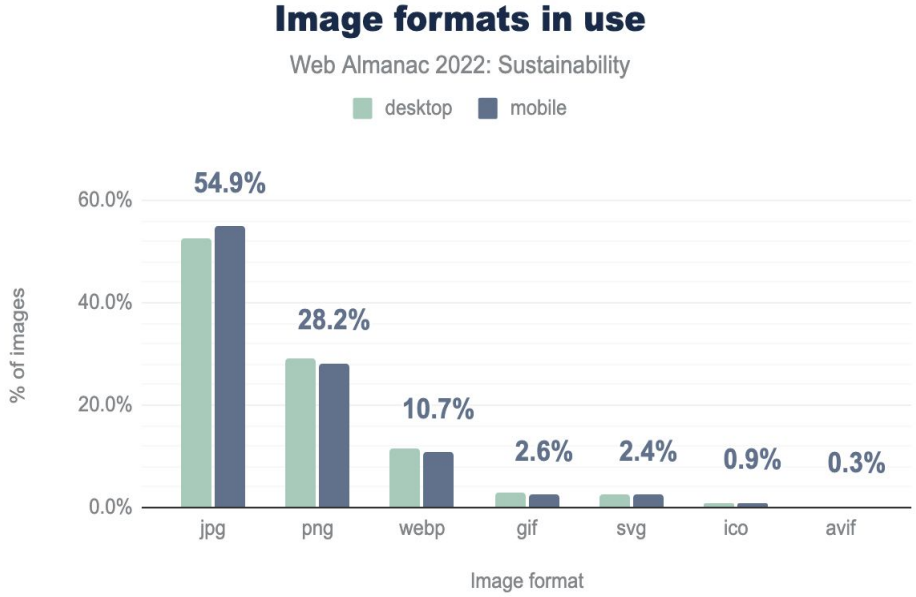
let's see the statistics - IMAGE FORMATS

- AVIF shows an impressive 386% increase, it can be misleading since the usage of AVIF format is only increased to 1.40% from 0.3%
- WebP has grown significantly, with a 34% increase in usage but still we need to reduce JPG, PNG

2024-2022

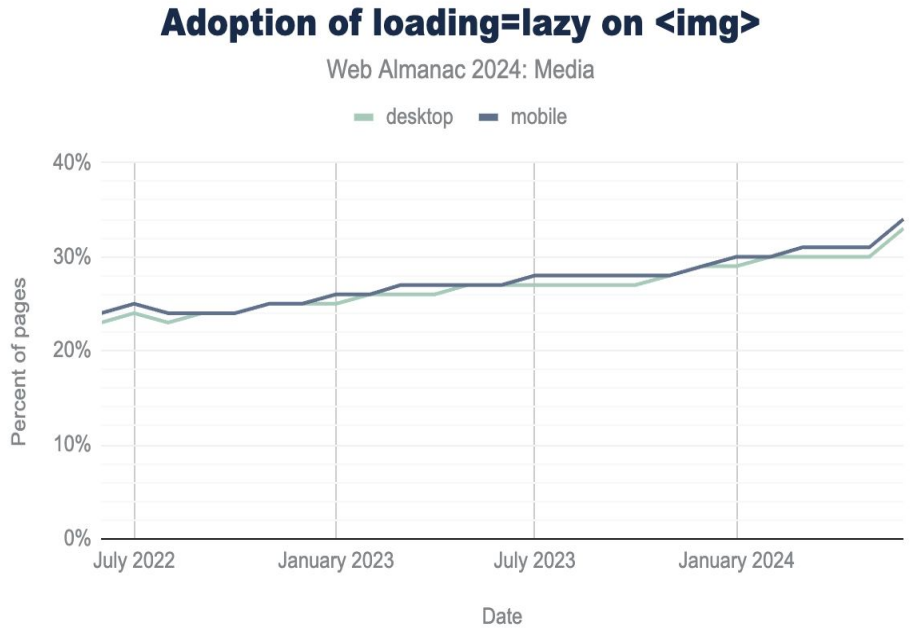


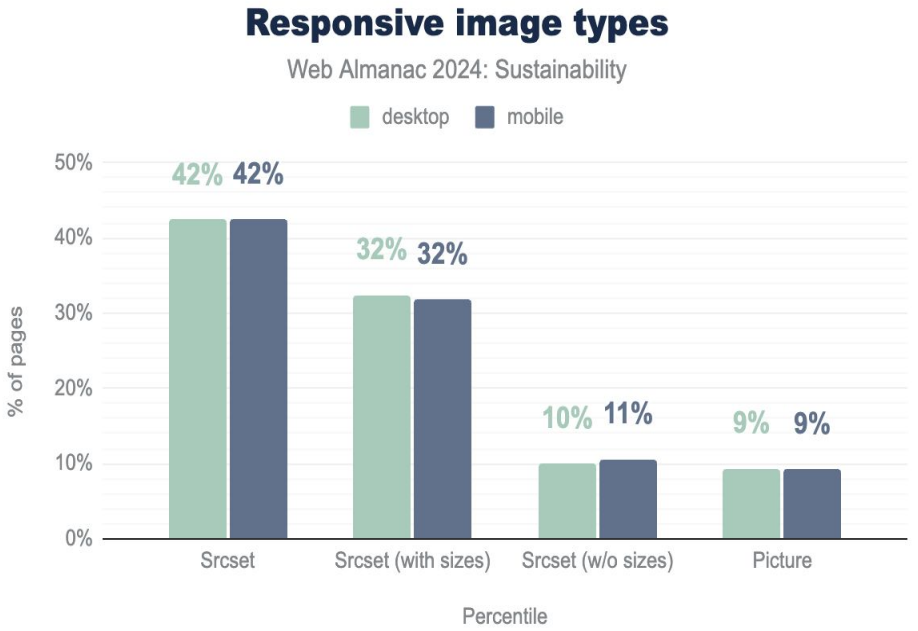
2022



let's see the statistics - IMAGE OPTIMIZATIONS

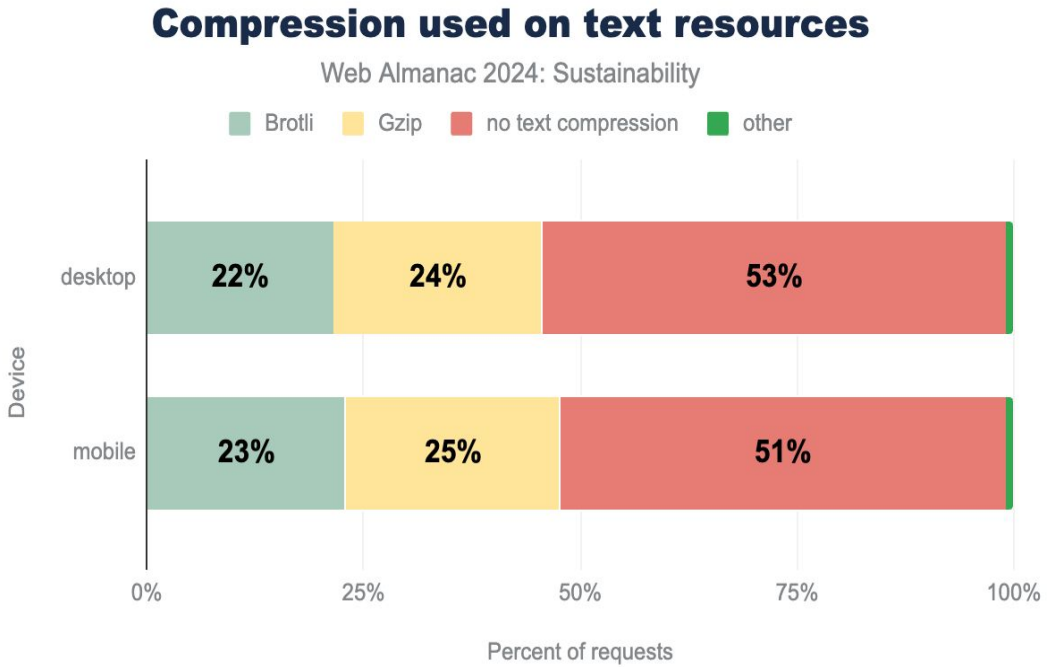
- There is an increasing trend for lazy loading adaptation. By 2024, we're seeing only a bit more than 30% of sites implementing lazy loading for images
- The data shows that only 42% of websites are using the srcset attribute. Only 32% of sites are using srcset with the sizes attribute, which is crucial for optimal image delivery





let's see the statistics - TEXT COMPRESSION

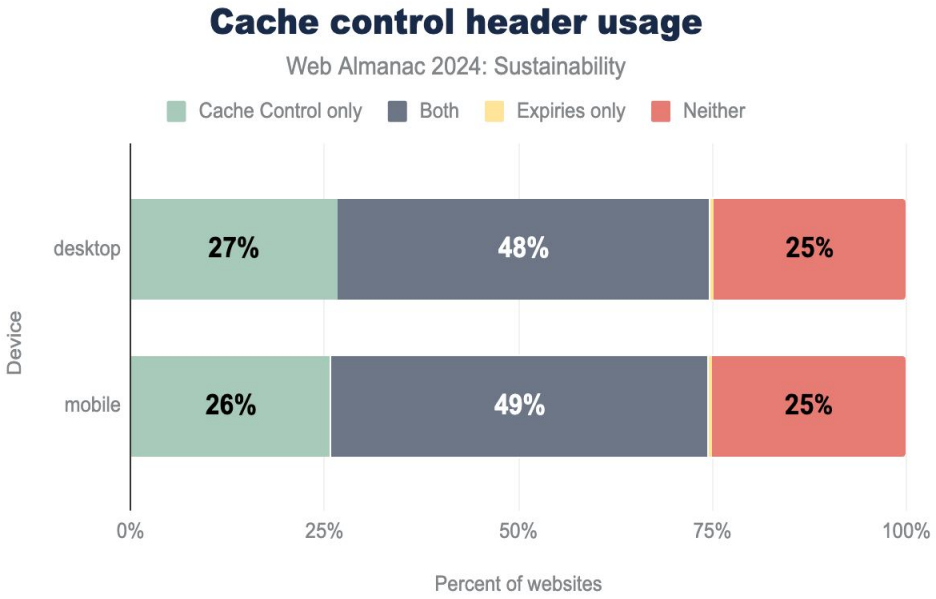
- Over half of all websites aren't using any form of text compression.
- Implementing compression could significantly reduce data transfer and energy consumption, yet only about 24% of websites use Gzip and 21% use Brotli



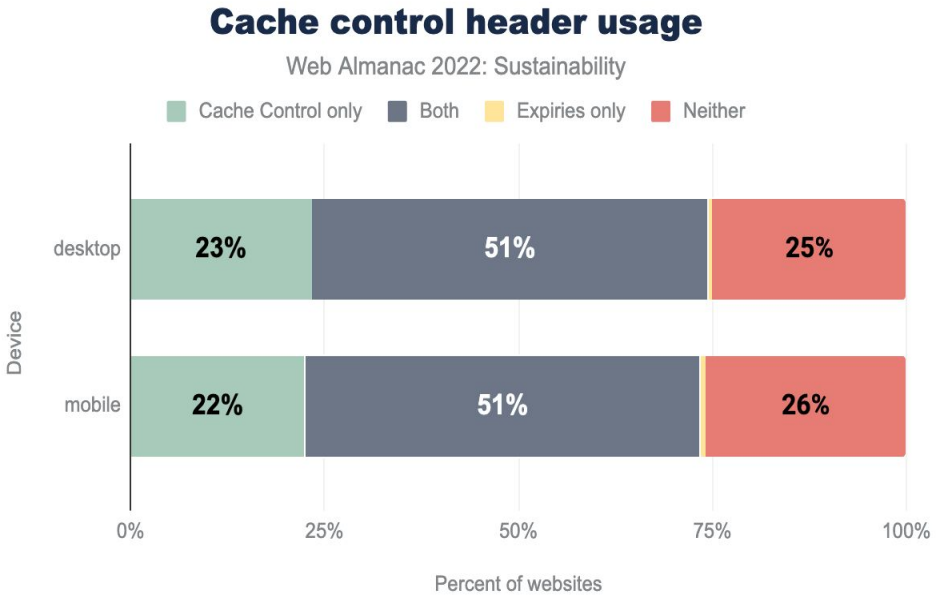
let's see the statistics - CACHING

- There is a move towards more modern caching practices
- 25% aren't using any caching headers at all

2024



2022



let's see the statistics - AI

- The energy and water requirements to power these AI enabled searches are significant.
- While traditional search simply matches keywords, AI powered search is now actively generating content in real time, it is estimated that it consumes 30 times more energy per search
- Many providers who made ambitious green commitments are now struggling to balance their environmental goals with the surging power demands of AI workloads

enough negativity - let's see how we can reduce it

let's fix it - low hanging fruits - IMAGE OPTIMIZATIONS

Image optimization stands out as the biggest opportunity. Since images make up more than half of most pages' weight, simple optimizations can have dramatic effects

- Use **WebP** as your primary format, falling back to **JPEG** or **PNG** for older browsers
- Consider implementing **AVIF** for browsers that support it (with a fallback), as it often provides superior compression. Use <**picture**> tag to have fallback.
- For **JPEG**/**PNG** you can aim for 80-85% quality; adjust based on visual inspection
- Implement **srcset** attribute to serve appropriately sized images for different viewport sizes
- Lazy load non-critical images. Use **loading**=**"lazy"** (native HTML attribute)

AVIF

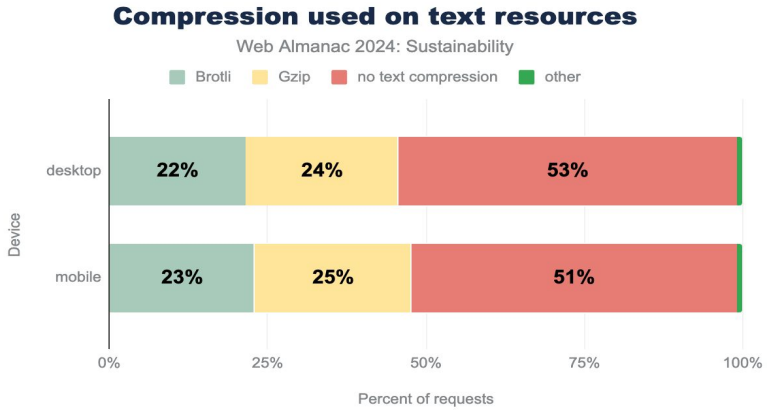
WebP

let's fix it - low hanging fruits - TEXT COMPRESSION

Text compression is another surprisingly easy win that's widely underutilized. Our data shows over 50% of websites aren't using any compression at all

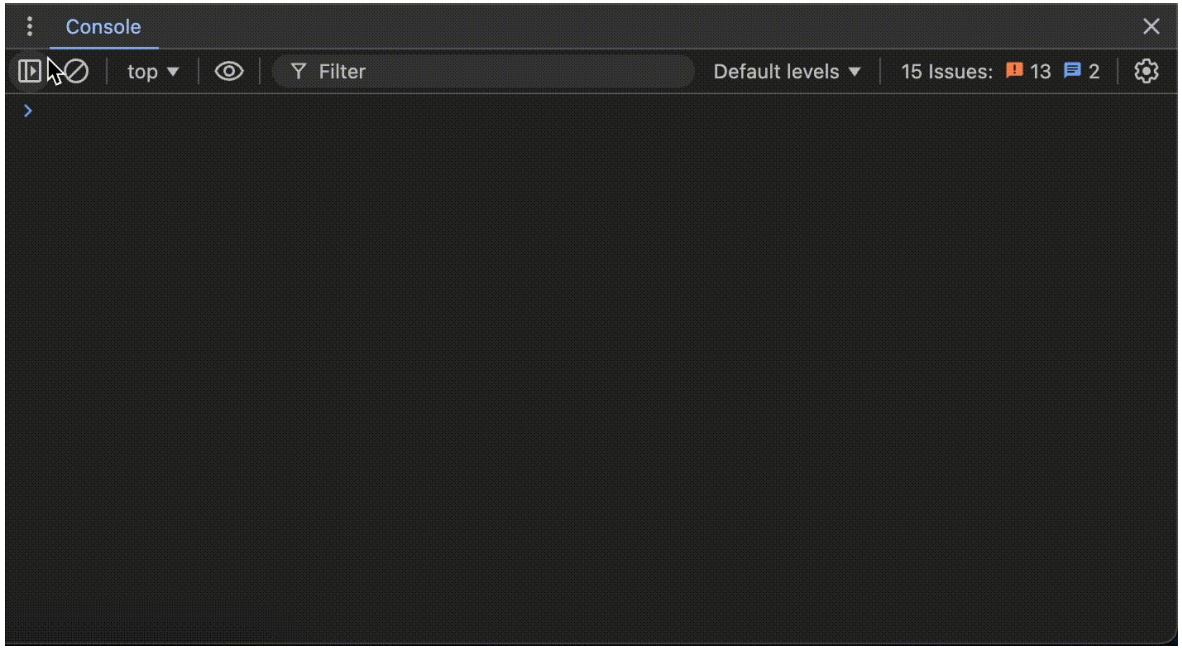
Common text compression methods include:

- **Gzip**: Widely supported and effective for most text-based content, typically achieving 60-80% compression ratios.
- **Brotli**: A newer algorithm that often outperforms Gzip, especially for smaller files, with potential compression improvements of 15-25% over Gzip.
- **Zopfli**: A Gzip-compatible algorithm that can achieve better compression ratios but at the cost of longer compression times, making it suitable for static content.



let's fix it - low hanging fruits - PAGE WEIGHT, UNUSED JS & CSS

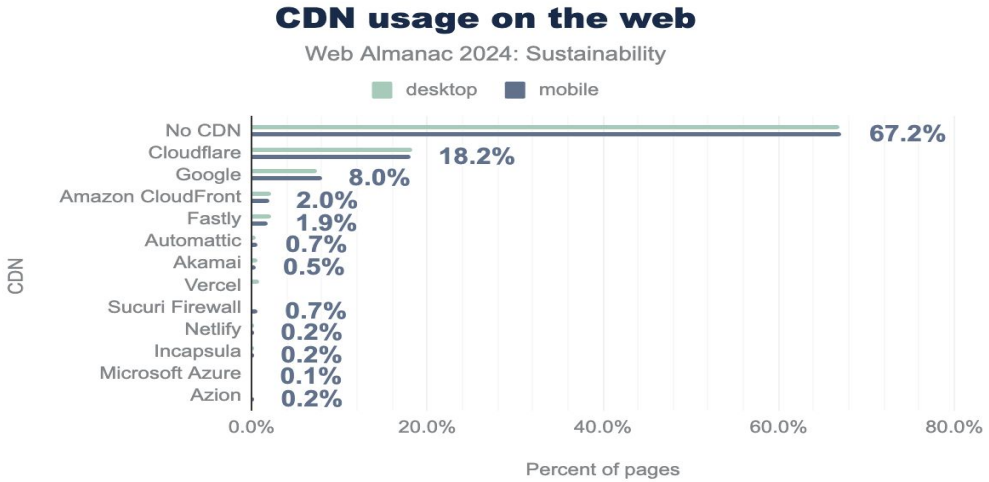
- Tree shaking eliminates dead code from the final bundle, particularly effective with ES6 modules
- Code splitting breaks code into smaller chunks, loading only what's necessary for the current functionality



let's fix it - low hanging fruits - GREEN HOSTING

Making the switch to a provider that uses renewable energy can reduce your site's carbon footprint without requiring any code changes at all

- no provider can truly be 100% carbon neutral
- providers that generate their energy requirements from nuclear, solar, wind, and other natural sources tend to be more environmentally friendly than those relying on traditional power sources
- check https://app.greenweb.org/directory/ for verified green hosting providers
- combining green hosting with properly configured CDN services, ensuring both infrastructure and content delivery are optimized for sustainability



further information about green hosting: https://dodonut.com/blog/how-to-choose-the-best-green-web-hosting-provider/

let’s fix it - low hanging fruits - CACHING

By reducing the need for repeated data transfers and server processing, caching plays a vital role in minimizing the energy consumption associated with web operations.

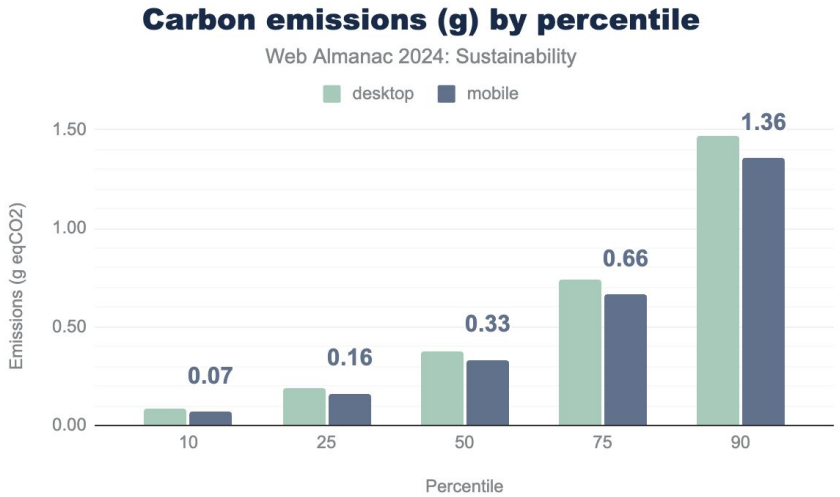
- 25% of websites use no caching headers at all
- Reduces server load
- Decreases network traffic
- Lowers energy consumption
- Proper caching can dramatically reduce unnecessary data transfer with minimal development effort.

last but not least - EMISSIONS OF WEBSITES

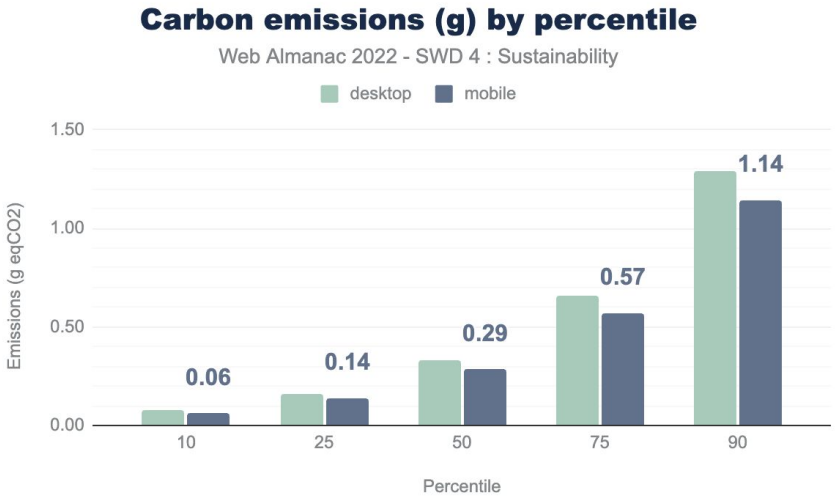
Looking at our 2024 data, median page emissions show concerning trends. While these numbers might seem small, consider the scale. Billions of page loads happening daily

- In average, websites generate 1.47 g of CO_2. it was 1.29 g in 2022
- Traditional CMS platforms average 0.38g CO_2 per visit
- E-commerce sites produce even higher emissions, up to 0.50g
- Static site generators show significantly lower emissions, some as low as 0.12g

2024



2022



the cost of Web Almanac in terms of CO2 emissions

We ran a query on the data collected for the 2024 Web Almanac and found that the total amount of transferred data would be around 201,66 TB. Using the SWD model, this would amount to 27,7 trillion CO2

This is approximately as many carbon emissions as a thermal car driving for 127 298 km (going around the Earth for more than 3 times) or manufacturing 323 smartphones

the end.

If you have any questions you can find my socials from the QR code below

want to contribute Web Almanac?

https://github.com/HTTPArchive/almanac.httparchive.org/blob/main/CONTRIBUTING.md

additional links

BigQuery

https://console.cloud.google.com/bigquery?inv=1&invt=Abj7IA&project=httparchive

Web Sustainability Guidelines

https://w3c.github.io/sustyweb/

Green Web Foundation

https://www.thegreenwebfoundation.org