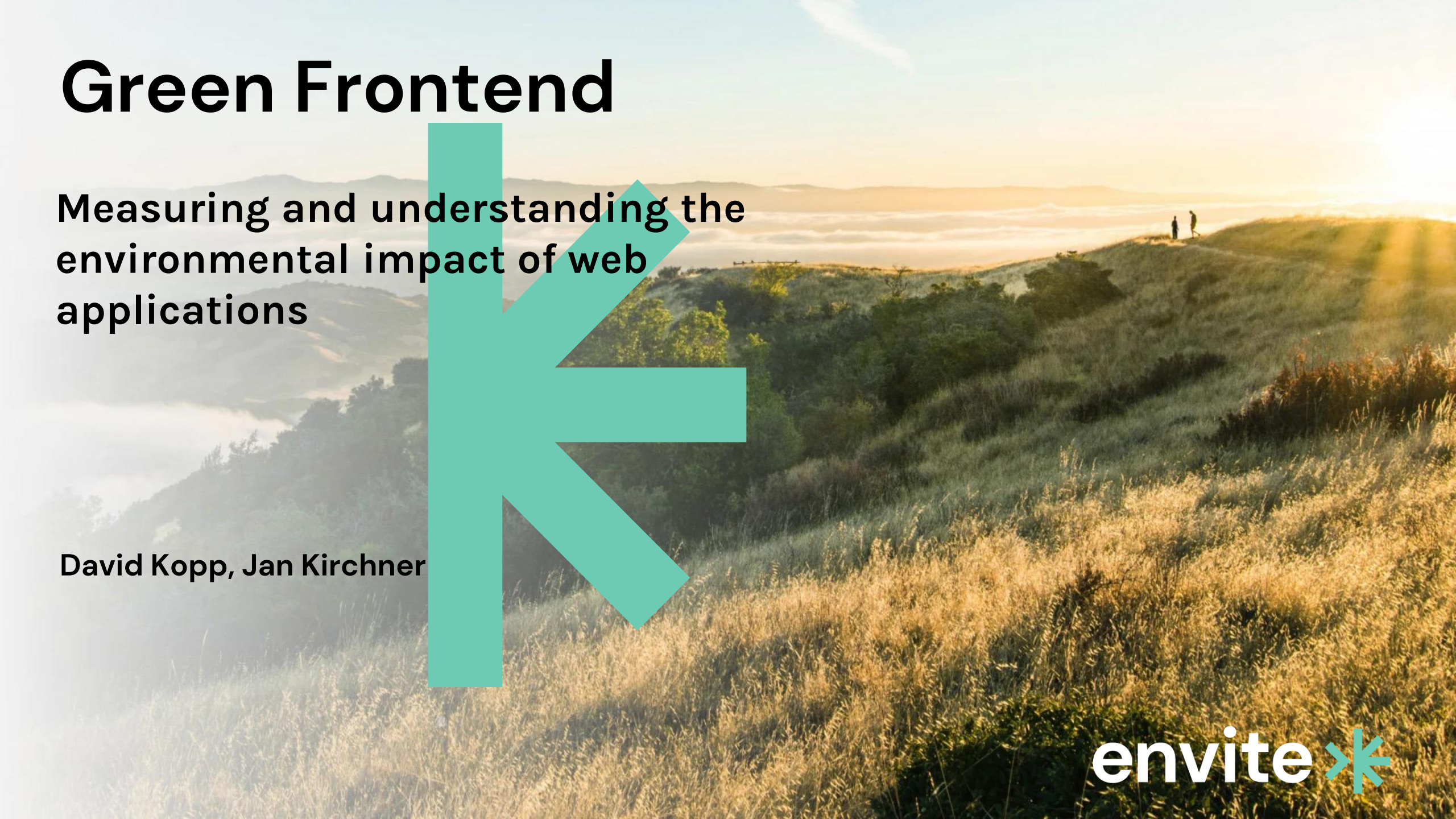
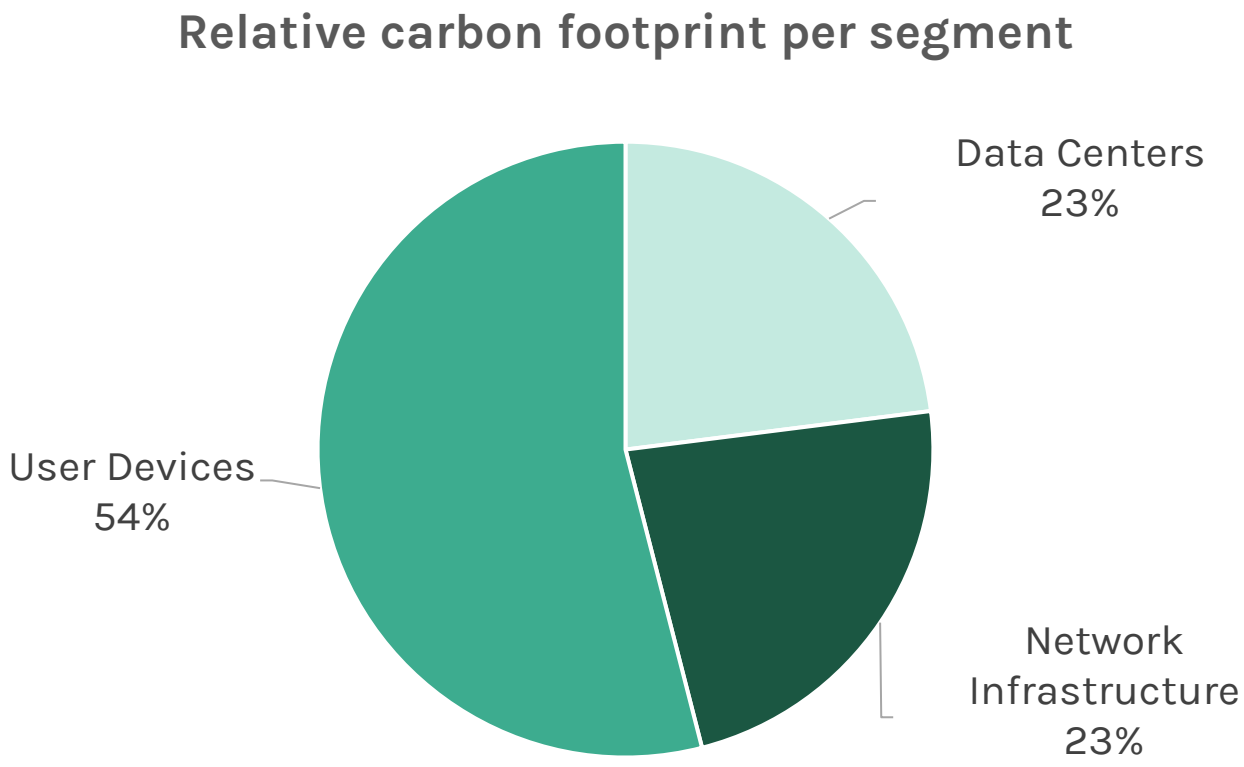
Green Frontend

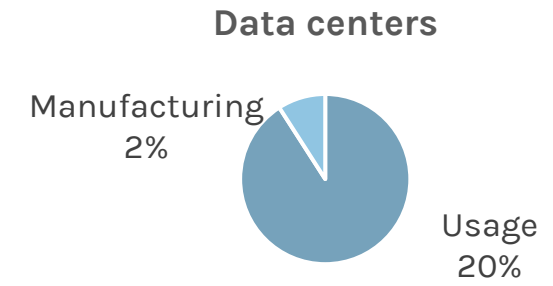
Measuring and understanding the environmental impact of web applications

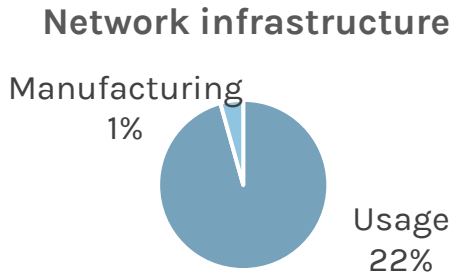
David Kopp, Jan Kirchner

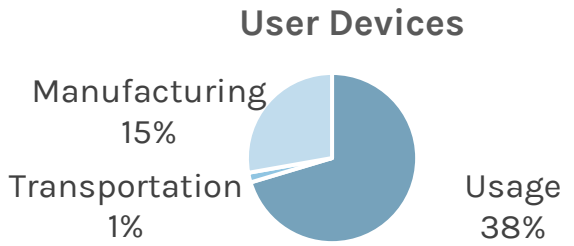


User devices: the biggest source of ICT's global CO_2 emissions



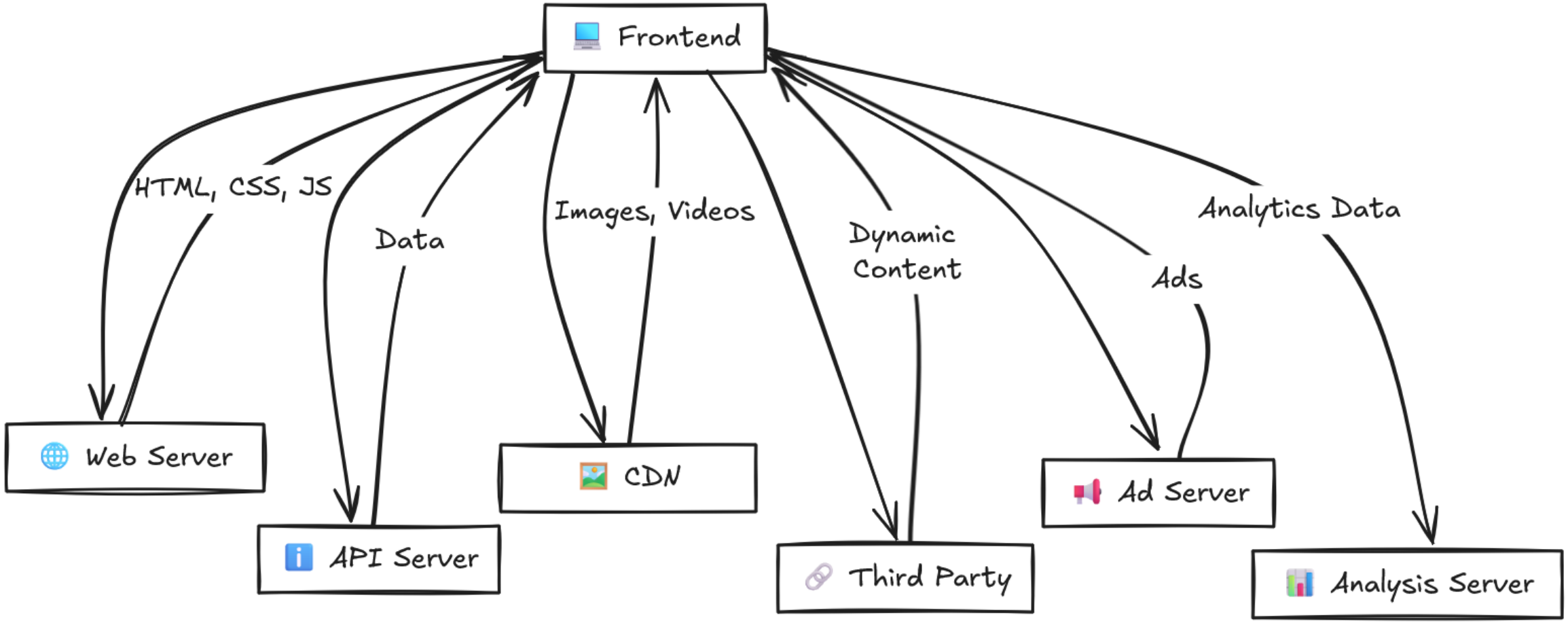




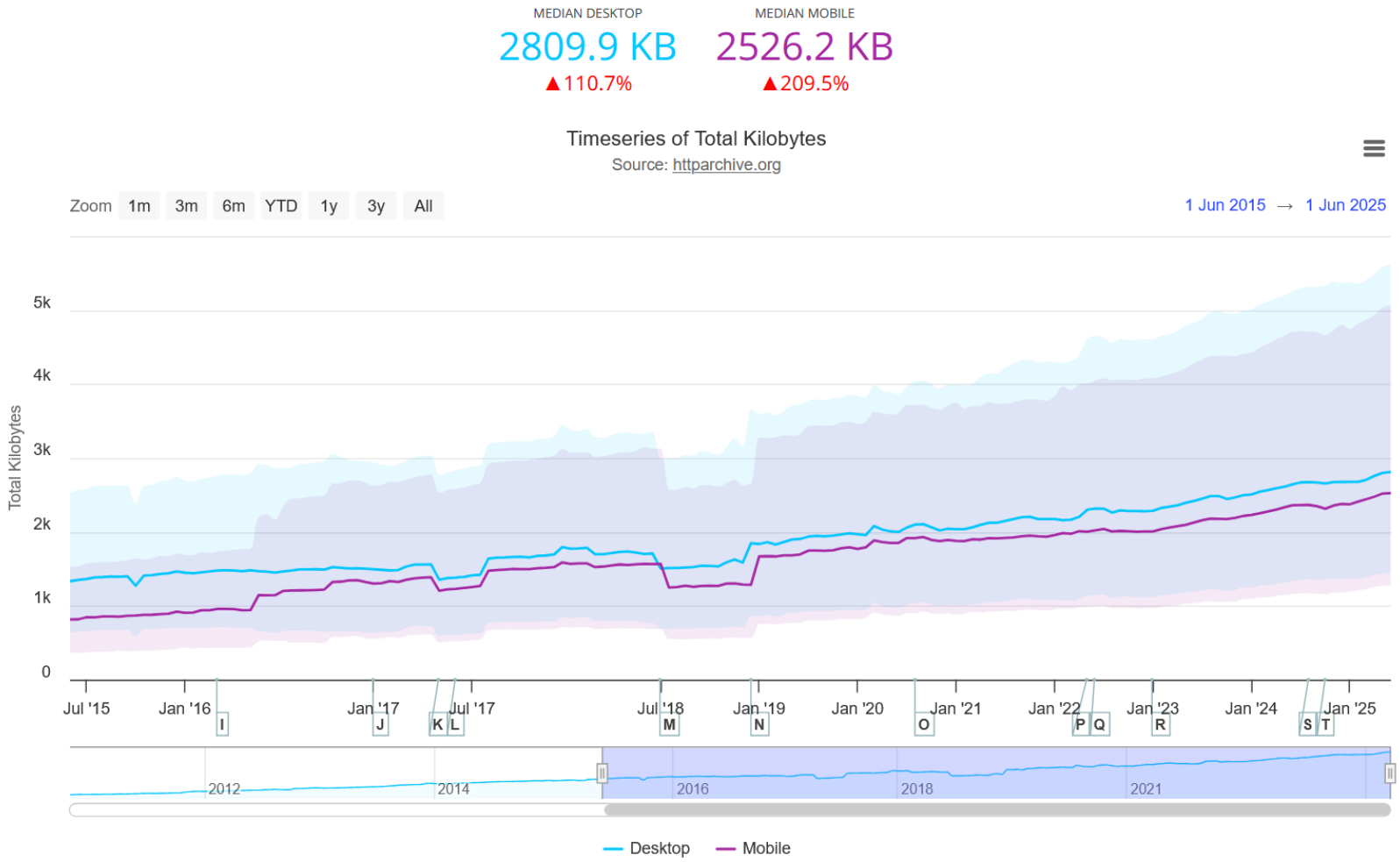


Environmental impacts of digital technology in the world, third edition, Green IT Association, 2025 (IENM 2025), https://t.ly/greeniteco.IENM2025

Frontends drive network and server load



Web pages become heavier



https://httparchive.org/reports/state-of-the-web?start=2015_06_01&end=latest&view=list

In the last 10 years, average web page size:

- has doubled (desktop)
- has tripled (mobile)

How to determine the environmental impact of a web application?

Measure!

Who are we?

envite

- Founded in 2022
- IT Consulting focuses on Sustainability IN IT & Sustainability BY IT

- Jan Kirchner
- Green IT Consultant
- Focus: Frontend/Fullstack development

- David Kopp
- Green IT Consultant
- Focus: Backend development, DevOps, ecological assessment of IT systems

Agenda

- **Introduction**
- Methodologies & Tools
- User Interactions
- Good & Bad Websites
- Conclusion

Agenda

- Introduction
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- User Interactions
- Good & Bad Websites
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From energy to carbon

energy consumption [Wh]

×

carbon intensity [g CO2/Wh]

+

embodied carbon [g CO2]

=

carbon emissions [g CO2]

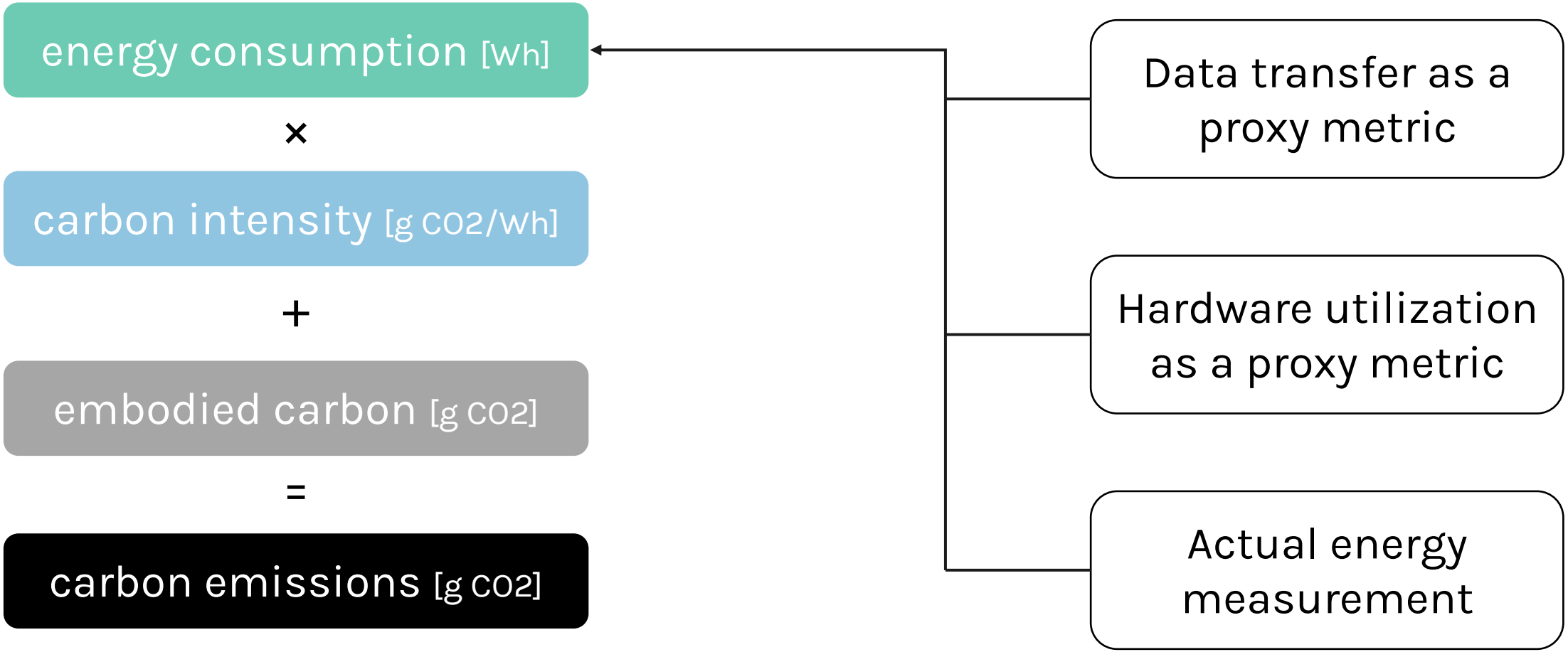
measured / estimated

static: global or regional average

dynamic: live, regional

LCA database

Capturing the energy consumption



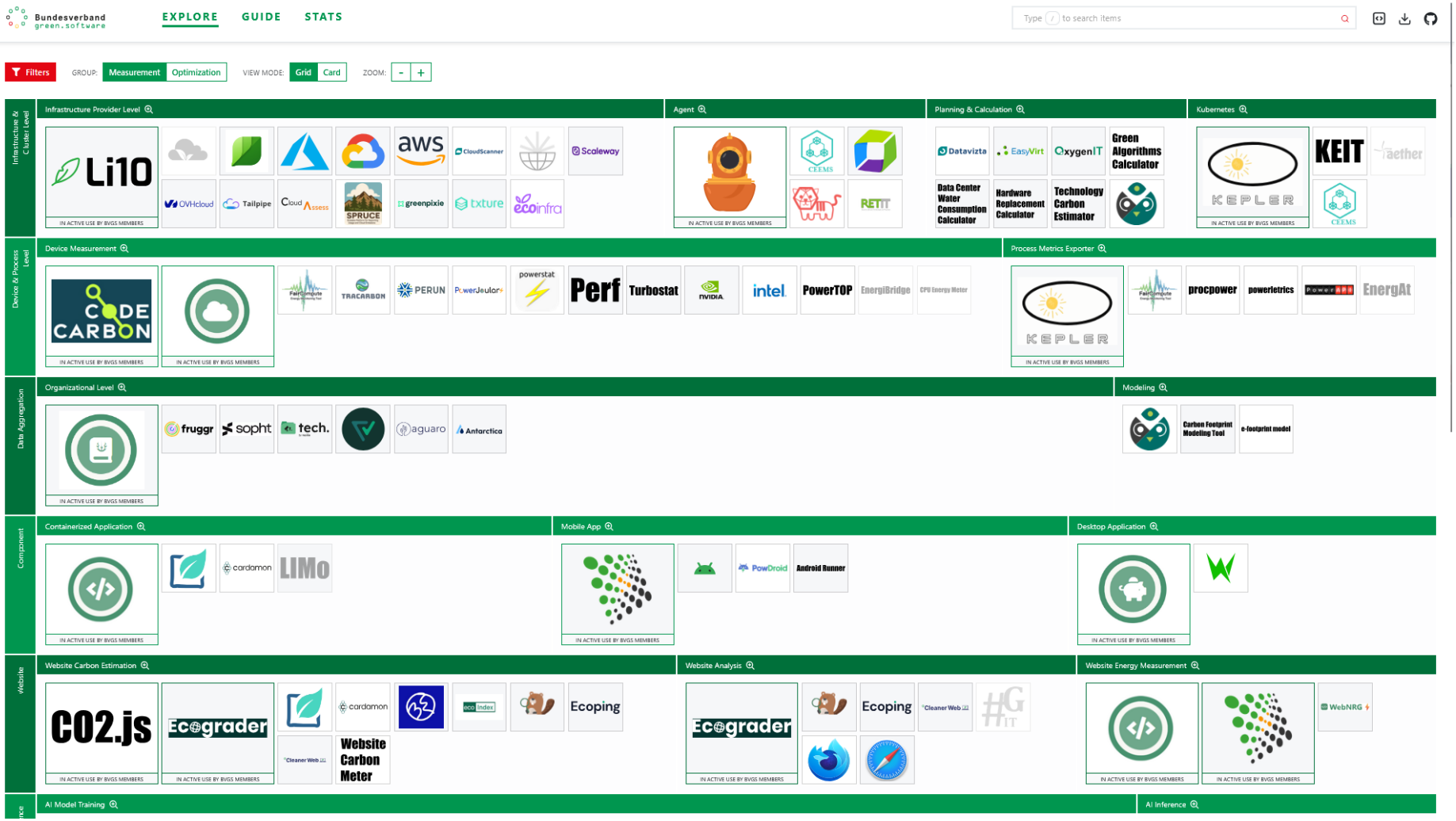
Server-side vs. client-side measurements

New challenges:

- Diverse hardware (from smartphones to desktops)
- No direct control over the runtime environment
- Devices' energy consumption depends on other factors
  - display brightness, network connection, background apps, energy-saving mode …

Green Software Tool Landscape

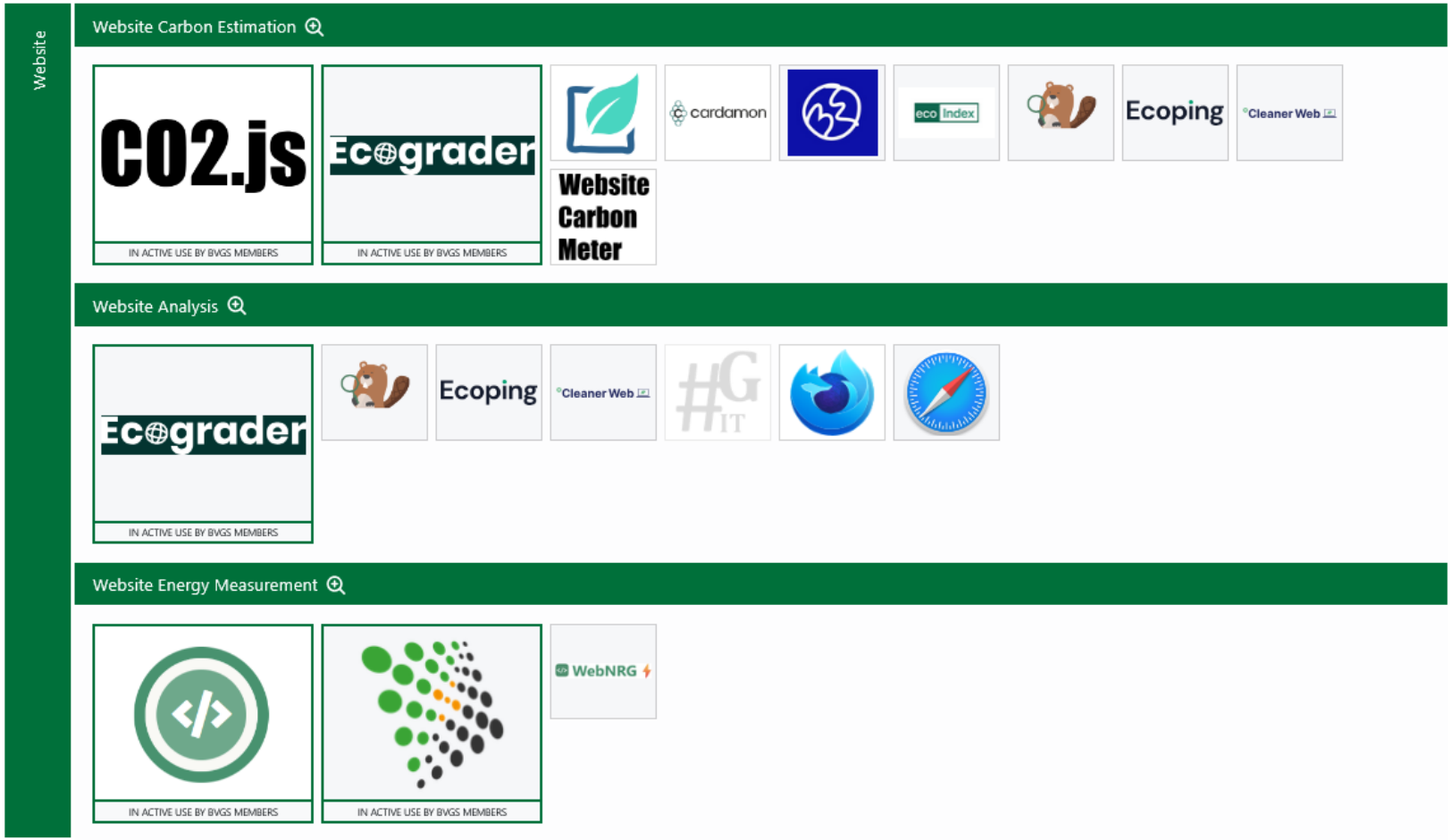
Bundesverband green.software



https://landscape.bundesverband-green-software.de

Green Software Tool Landscape
Category “Website”

Bundesverband green.software



https://landscape.bundesverband-green-software.de

Proxy Metric: Data Transfer

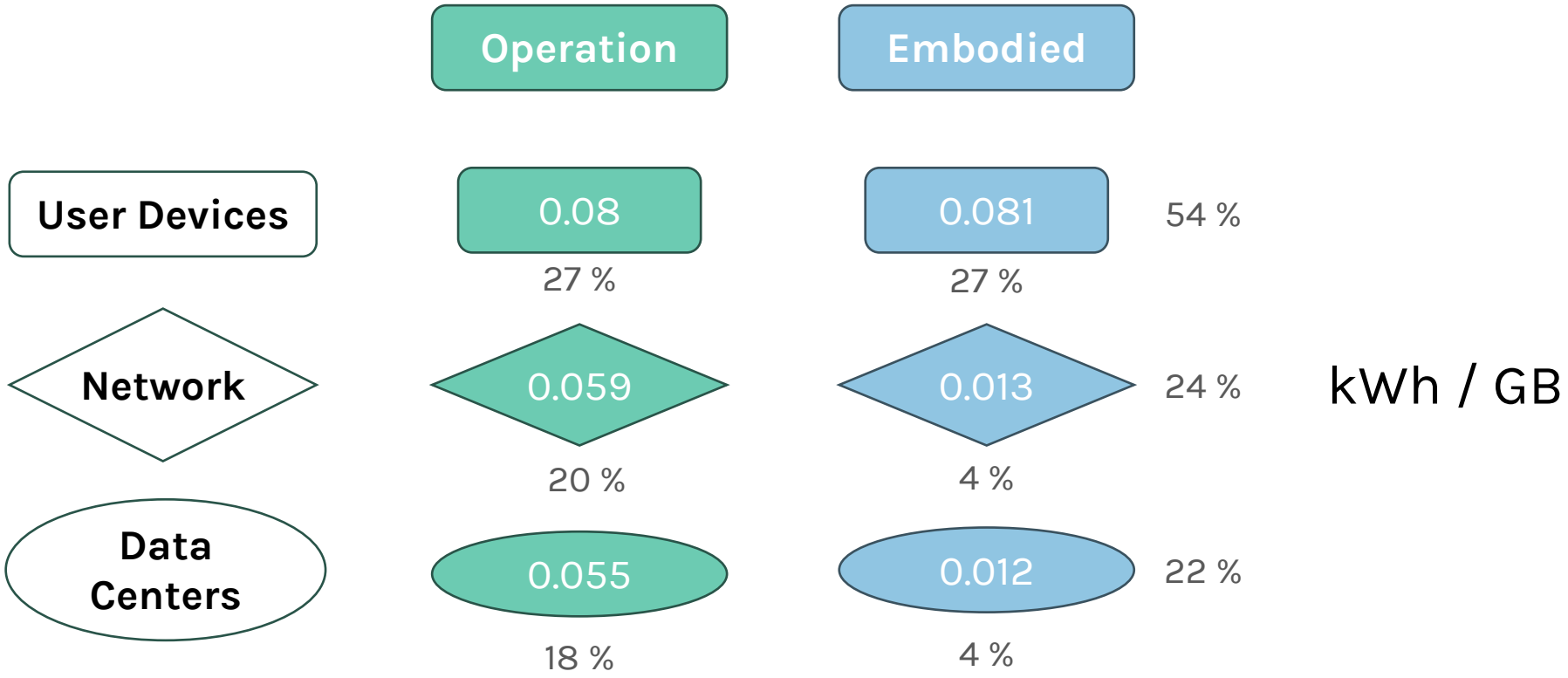
- Data transfer can be easily captured
- Used as proxy metric for energy consumption
- A conversion factor is needed (kWh / GB)
- Top-down approach based on global averages
  - Segments: user devices, network, data centers
  - Operational and embodied emissions
- Most widely used: Sustainable Web Design Model

Sustainable Web Design Model

- Input: amount of transferred data
- Additional variables:
  - carbon intensity of the grid (e. g. global: 494 g CO_2e / kWh)
  - Green hosting factor
  - Percentage of recurring visits + percentage of resources in cache
- Popular implementation: CO2.js
  - JavaScript library created by the Green Web Foundation

https://sustainablewebdesign.org/estimating-digital-emissions/

Sustainable Web Design Model – Coefficients

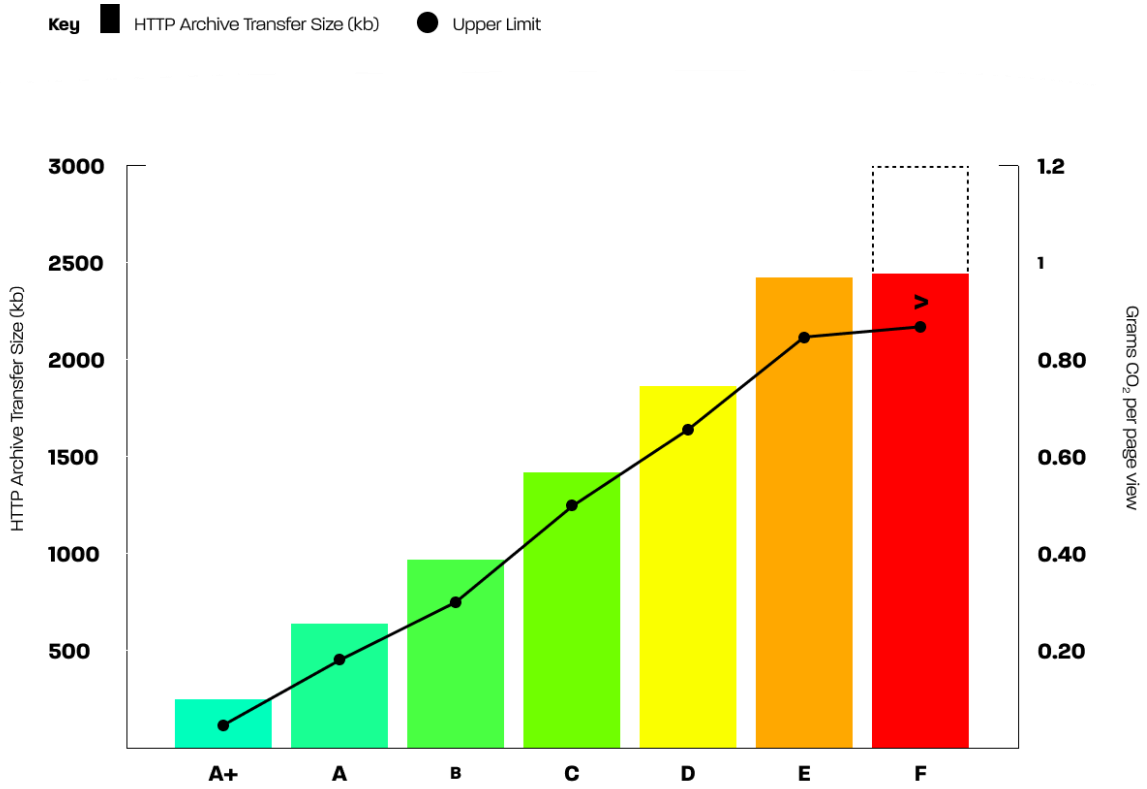


https://sustainablewebdesign.org/estimating-digital-emissions/

Digital Carbon Rating

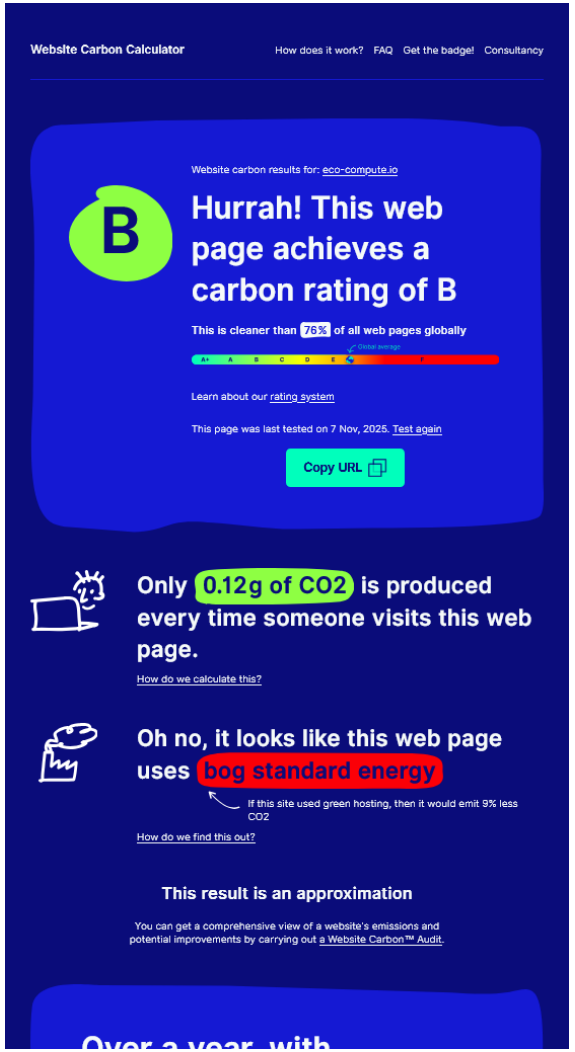
Converts estimated carbon emissions into an intuitive rating from A+ to F

Rating	Data Transfer (kB)	g CO_2e per Page View
A+	272	0.040
A	531	0.079
B	975	0.145
C	1410	0.209
D	1875	0.278
E	2419	0.359
F	≥ 2419	≥ 0.360



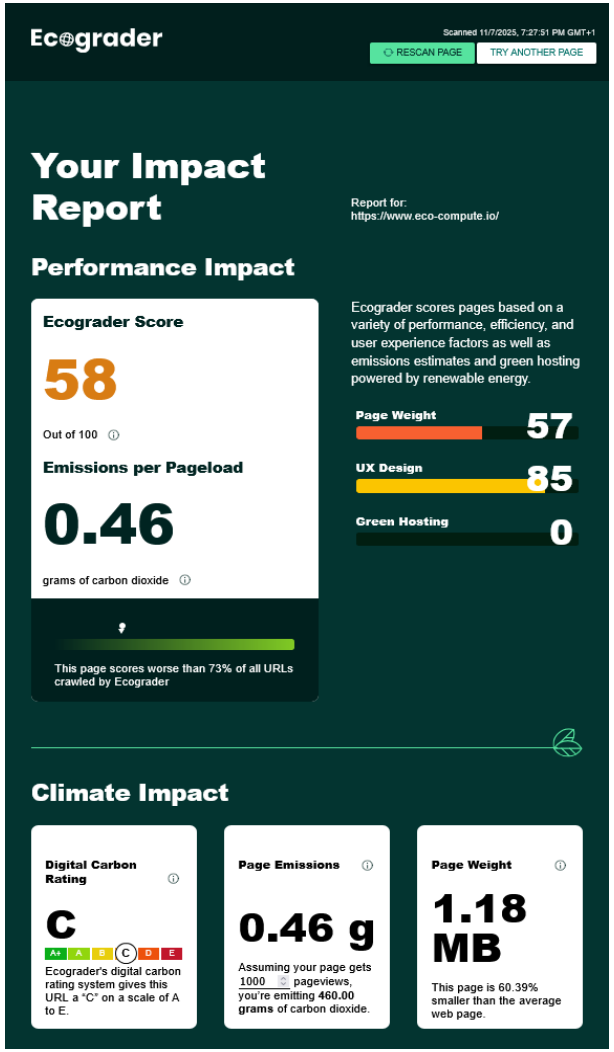
https://sustainablewebdesign.org/digital-carbon-ratings/

WebsiteCarbon.com



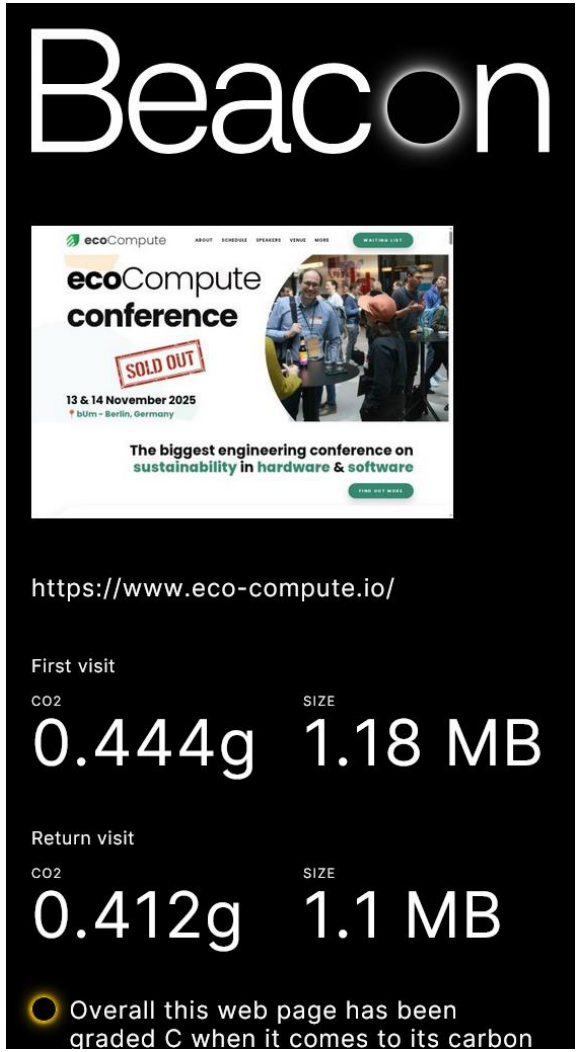
https://www.websitecarbon.com/website/eco-compute-io/

Ecograder



https://ecograder.com/report/0D7go8uhRsXltVWwJx9PFfYR

Beacon



https://digitalbeacon.co/report/eco-compute-io

Optimization Recommendations

Kastor

65 Ecodesign score

Kastor advises you to prioritize

- Do not download images if they are not visible
- Avoids an excessive DOM size
- Prefer standard fonts

Frontend

- Reduce the impact of third-party code - Third-party code blocked the main thread for 1,200 ms
  0% of compliance
- Defer off-screen images - Potential savings of 494 KiB
  0% of compliance
- Avoid serving legacy JavaScript to modern browsers
  0% of compliance
- You should include specials print fonts in your print css
  5% of compliance
- Do not download images if they are not visible - 11 images
  6% of compliance

Ecograder

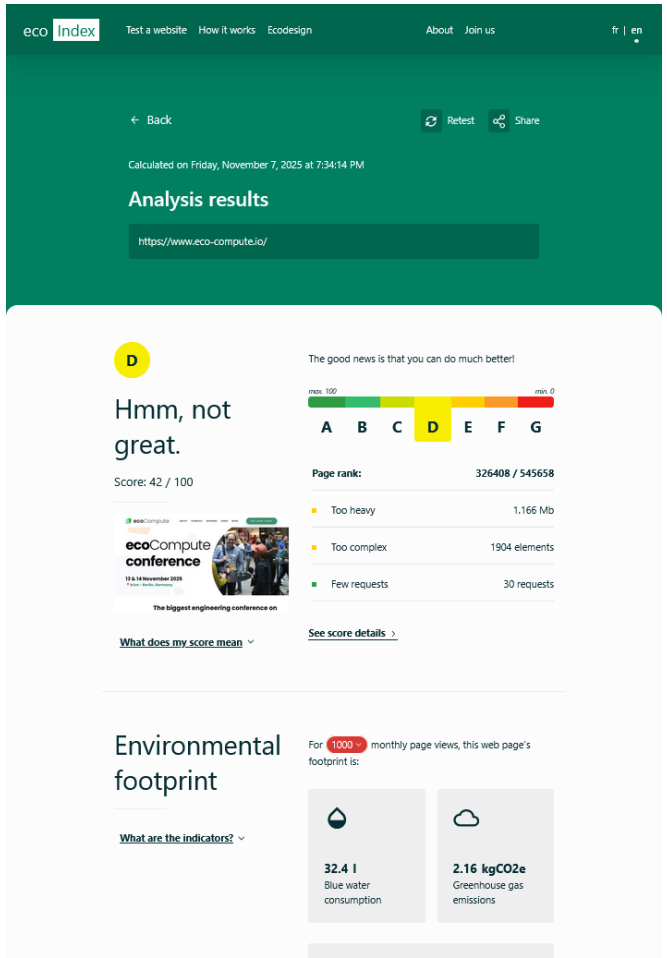
1 Page Weight

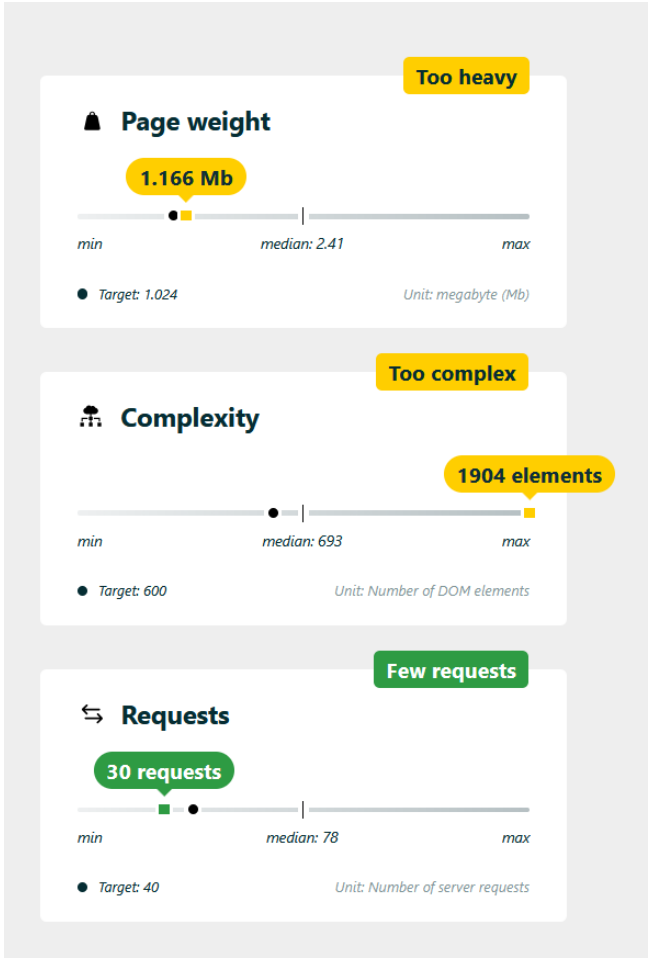
By compressing image file size and removing unused items from a page you'll not only reduce emissions but faster-downloading pages make users happier as well. Below are some things you can do to reduce the size of this page.

87 out of 100

Optimize Media	97 OUT OF 100
Reduce Overall Page Weight	73 OUT OF 100
Remove Unused Code	75 OUT OF 100
Properly size images	94 OUT OF 100

ecoIndex
Data Transfer + Complexity + Requests



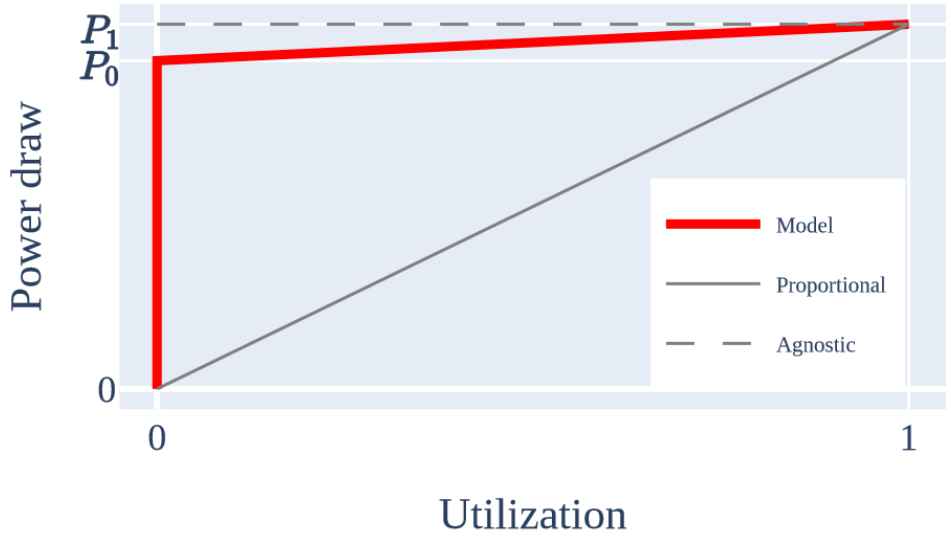


https://www.ecoindex.fr/en/result/?id=ec243ed4-737c-4754-9f3b-d811cc6cfe47#score-details

Data transfer as proxy: problems

No proportionality

- Data ≁ Network energy
- Data ≁ User devices energy



Typical power profile of network hardware

Source: Jacob, R., & Vanbever, L. (2023). The internet of tomorrow must sleep more and grow old. https://doi.org/10.1145/3630614.3630620

Average values, concrete context is ignored

- Physical distance
  - between user device and server
- Transmission path
  - DSL, WiFi, mobile communications, satellite etc.

Access Network	kWh/GB (2020)
Wide (WAN)	0.007
Fixed (FAN)	0.07
Radio (RAN)	0.2

Energy intensity of network transfer in different access networks

Source: Coroama, V. (2021). Investigating the inconsistencies among energy and energy intensity estimates of the internet. Swiss Federal Office of Energy SFOE. https://vs.inf.ethz.ch/publ/papers/Coroama2021_InternetEnergy.pdf

Data transfer as proxy: what‘s it worth?

What it's NOT good for:

- ❌ Detailed carbon accounting → too imprecise
- ❌ Consequential claims → not credible
  - Example: "By reducing data volume by X MB, you saved Y kg CO_2"

What it IS good for: "Attributional Reasoning"

- ✅ Internal allocation: "Department X is responsible for Y% of our data footprint"
- ✅ Identifying hotspots and key drivers
- ✅ Creating incentives to optimize

Data transfer as proxy: positive effects

- **Direct:**

  Less data = less processing, transmission, storage

- **Indirect:**

  Leaner apps → longer device lifespans, less hardware waste

- **Cultural shift:**

  Encourages efficiency mindset

Estimating carbon emissions of network impact

Use the **Energy Intensity Model** (kWh/GB) for

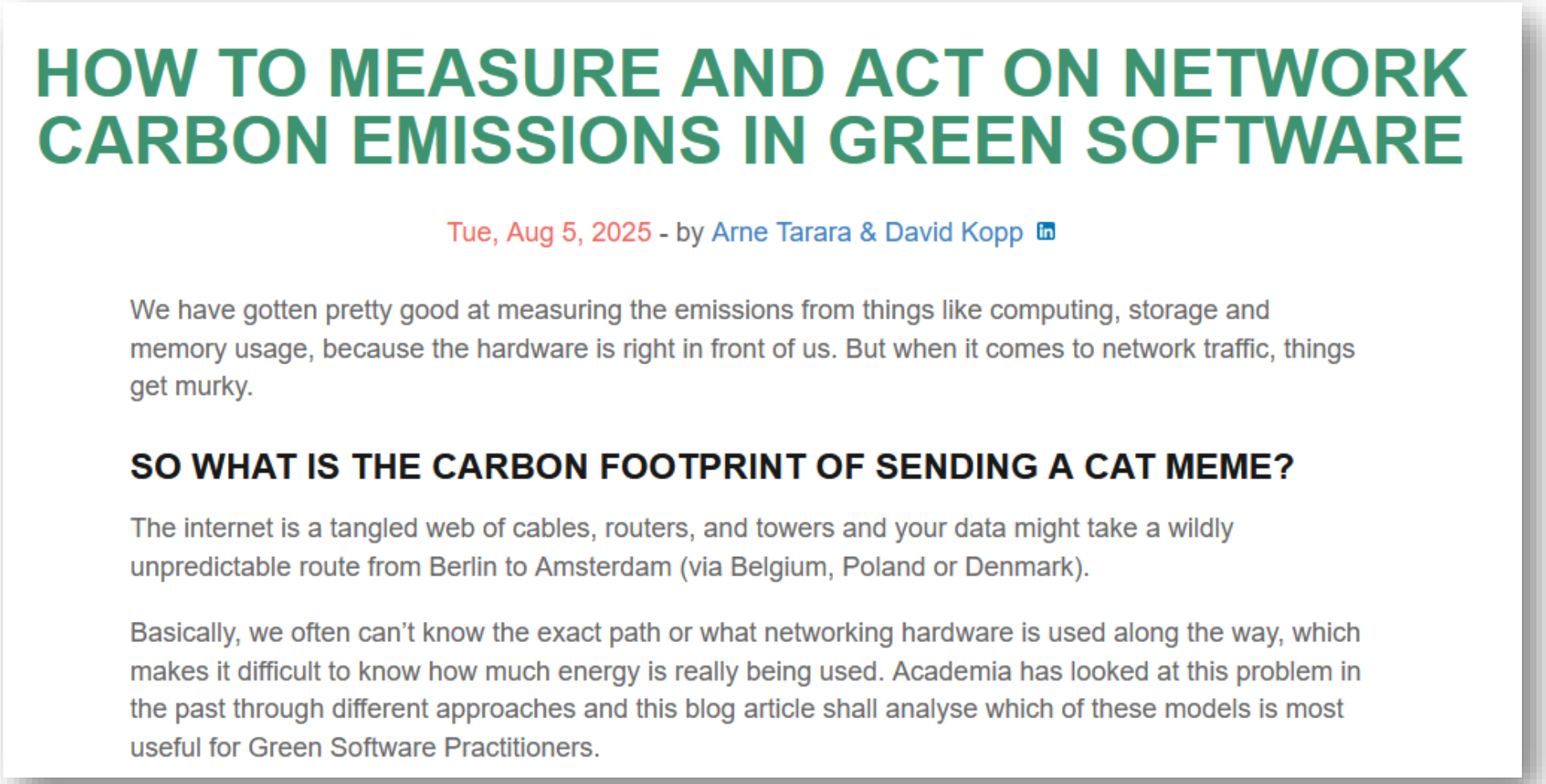
- optimization
- tracking relative improvements

But:

- ⚠️ Estimates ≠ actual savings (networks don't scale linearly)
- ⚠️ Report separately — don't add the network impacts to client-side or SCI scores
- ⚠️ Use as directional compass, not precise measurement

Bottom line: Guide optimization decisions, don't claim exact savings

Estimating CO_2 emissions of network impact



HOW TO MEASURE AND ACT ON NETWORK CARBON EMISSIONS IN GREEN SOFTWARE

Tue, Aug 5, 2025 - by Arne Tarara & David Kopp

We have gotten pretty good at measuring the emissions from things like computing, storage and memory usage, because the hardware is right in front of us. But when it comes to network traffic, things get murky.

SO WHAT IS THE CARBON FOOTPRINT OF SENDING A CAT MEME?

The internet is a tangled web of cables, routers, and towers and your data might take a wildly unpredictable route from Berlin to Amsterdam (via Belgium, Poland or Denmark).

Basically, we often can't know the exact path or what networking hardware is used along the way, which makes it difficult to know how much energy is really being used. Academia has looked at this problem in the past through different approaches and this blog article shall analyse which of these models is most useful for Green Software Practitioners.

https://www.green-coding.io/blog/network-carbon-emissions-in-green-software/

Website Carbon Calculators – Conclusion

- **Benefits:**
  - Estimation of the carbon footprint per website visit with little effort
  - Easy comparison with other websites
- **Problems:**
  - Data transfer as the main proxy metric
    - may lead to false conclusions
  - Important factors are left out
    - User interactions: Accepting cookies, lazy loading, visiting multiple pages, etc.
    - Compute-intensive background activities: Animations, JavaScript calculations, etc.
    - Colors used, dark mode (affect the energy consumption of the screen)
  - Lack of detailed analysis options
- **Positive:**
  - Creates an incentive to reduce data volume

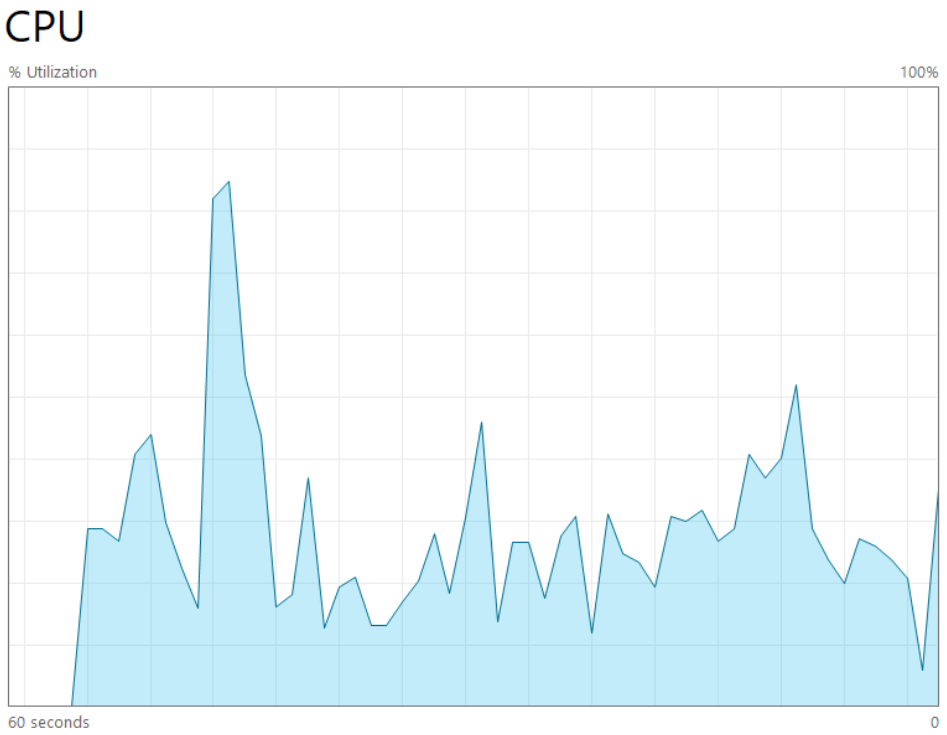
How can we better measure environmental impacts?

- **Direct measurement on the client side**
  - CPU/GPU/memory/energy monitoring
  - Make the costs of complex DOM and CSS structures and JS parsing visible
- **Recording of aspects other than “just” loading**
  - Real usage scenarios with interactions
    - Acceptance of cookies
    - Lazy loading of resources
  - Background activities
  - Animations, etc.
- **Profiling for detailed analysis**
  - Identification of bottlenecks
- However: Estimation of network impact is still necessary

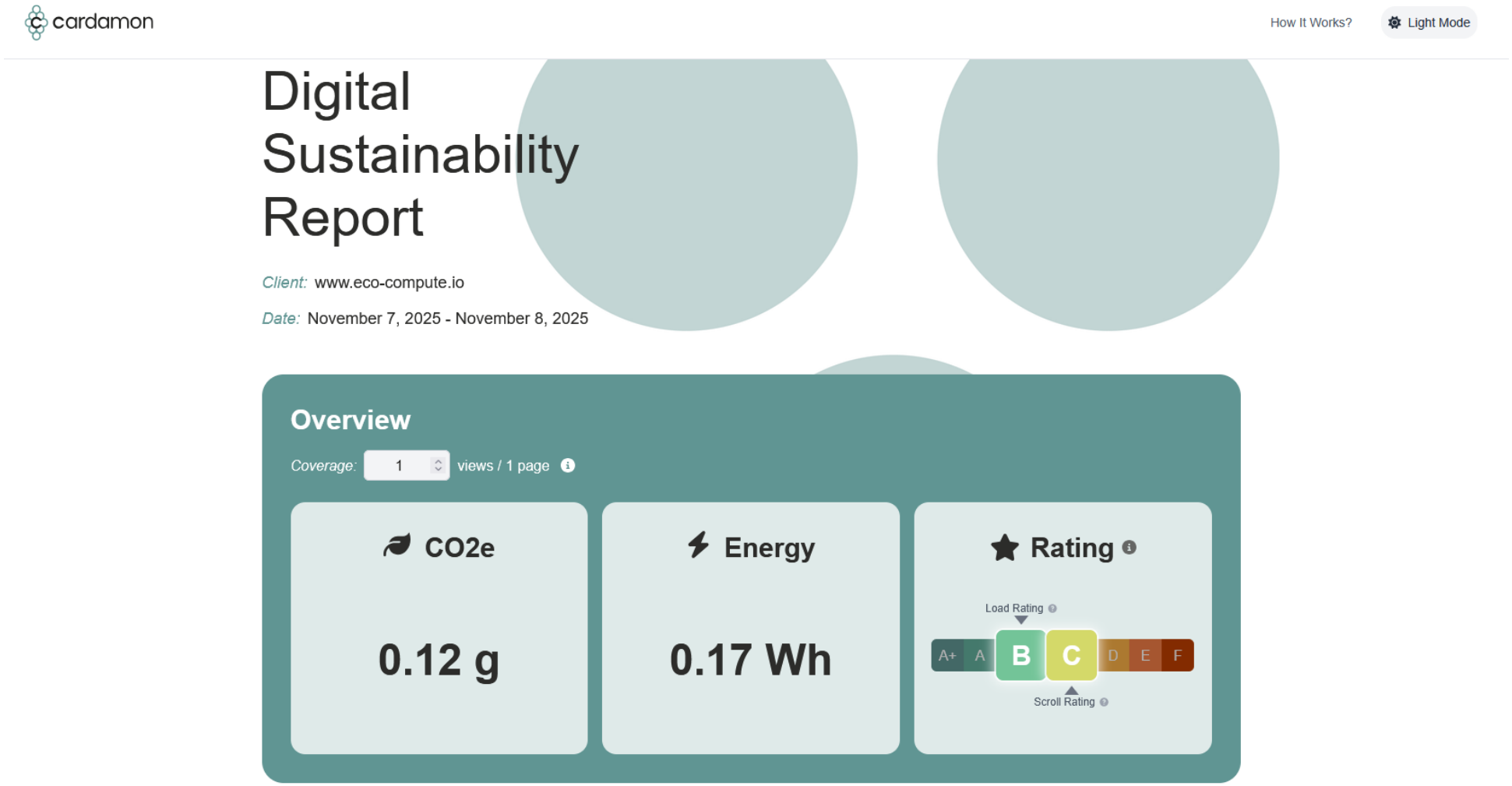
Proxy Metric: Hardware Utilization

- Bottom-up approach
- Measure the **utilization** of hardware components on a **reference device** and convert it into energy values

- Big advantage:
  - It actually measures what happens on the client!
- Yet, energy consumption needs to be calculated



Cardamon Web



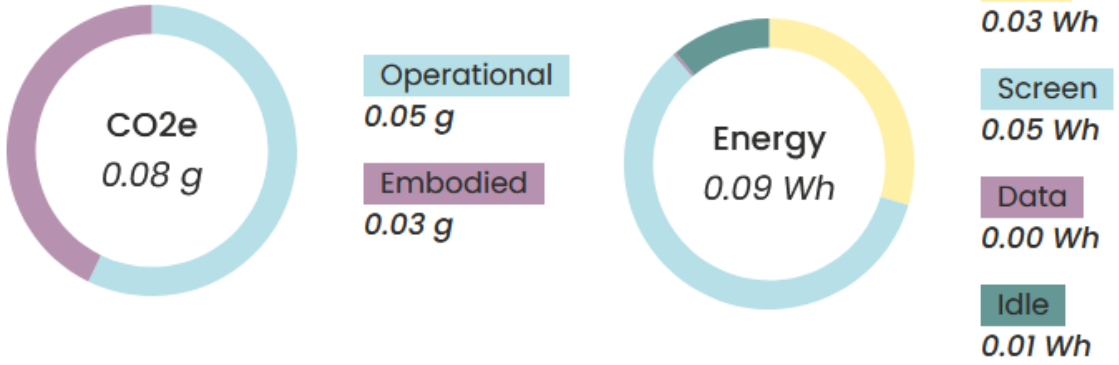
https://web.cardamon.io/reports/ANvF7

Cardamon Web

Frontend

CO2e
0.08 g

Energy
0.09 Wh



Network

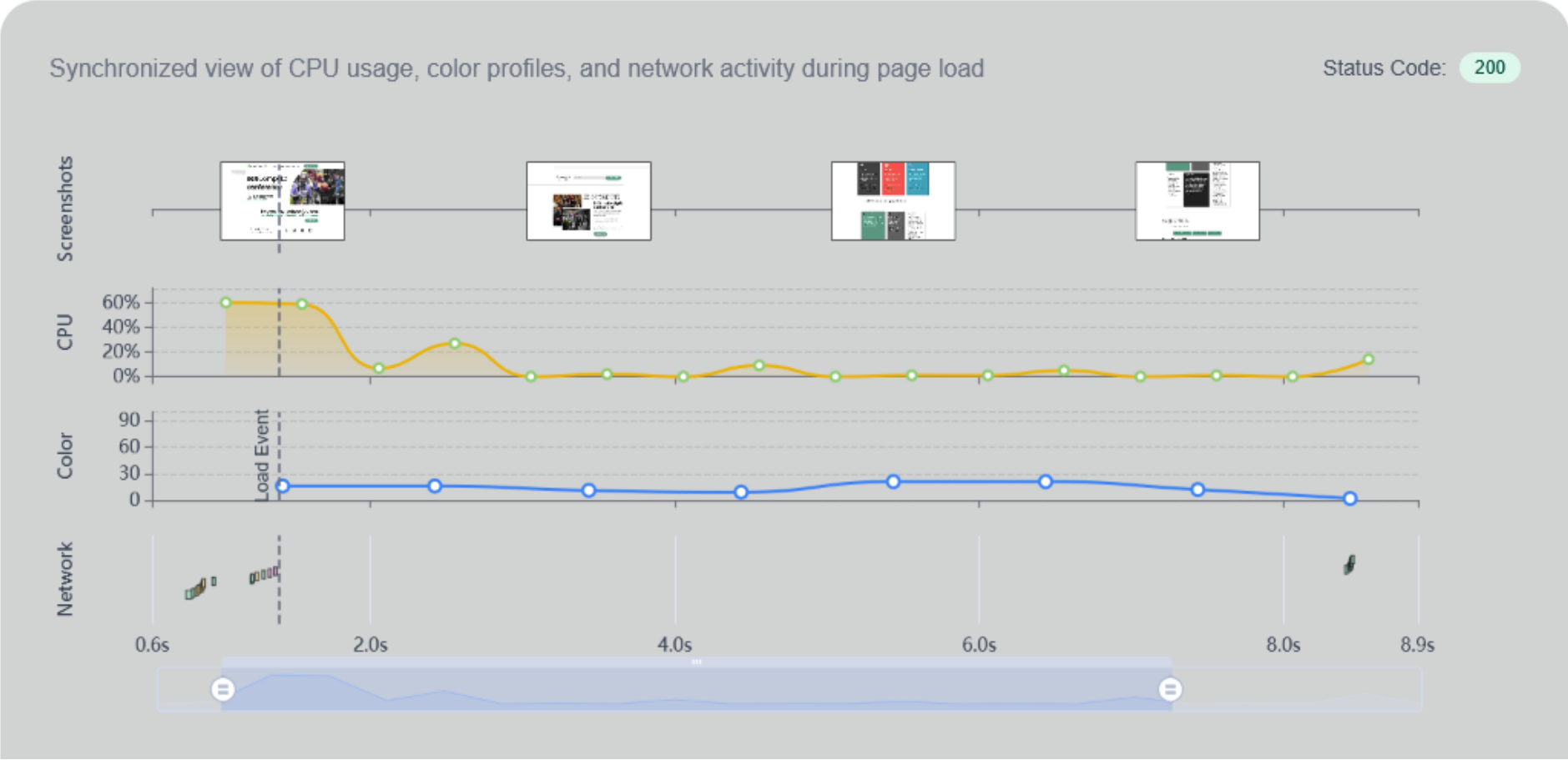
CO2e
0.04 g

Energy
0.08 Wh

https://web.cardamon.io/reports/ANvF7

Cardamon Web – Analysis

Page Load Timeline



https://web.cardamon.io/reports/ANvF7

GreenFrame CLI

- Installation

```
$ curl https://assets.greenframe.io/install.sh | bash
```

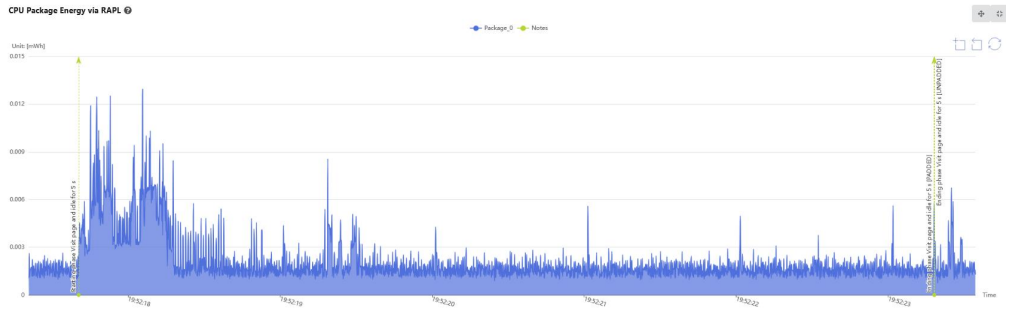
- Measurement

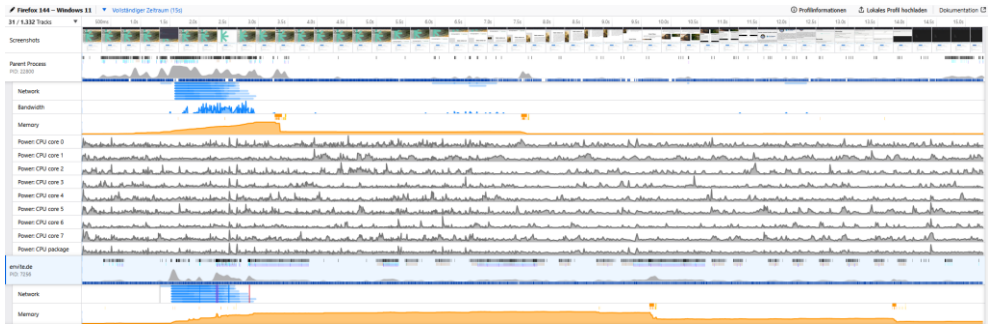
```
$ greenframe analyze https://www.eco-compute.io/

✓ Check configuration file
✓ Retrieving Git information
✓ Analysis is in progress locally
  ✓ Docker version 27.2.0, build 3ab4256
  ✓ Running 1 scenario(s)...

Analysis complete !

Result summary:

✅ main scenario completed
The estimated footprint is 16.66 mg eq. co2 ± 2.6% (37.693 mWh).
```

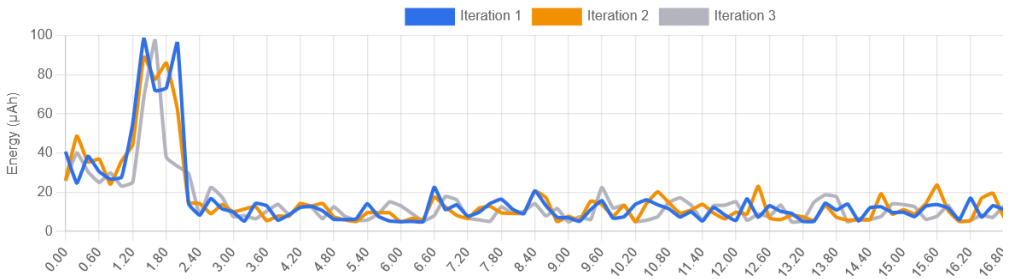
https://docs.greenframe.io/commands/

Direct Energy Measurement

- **on a generic device:**
  - Green Metrics Tool / webNRG
  - Firefox Profiler
- **on a real end user device:**
  - Greenspector Studio

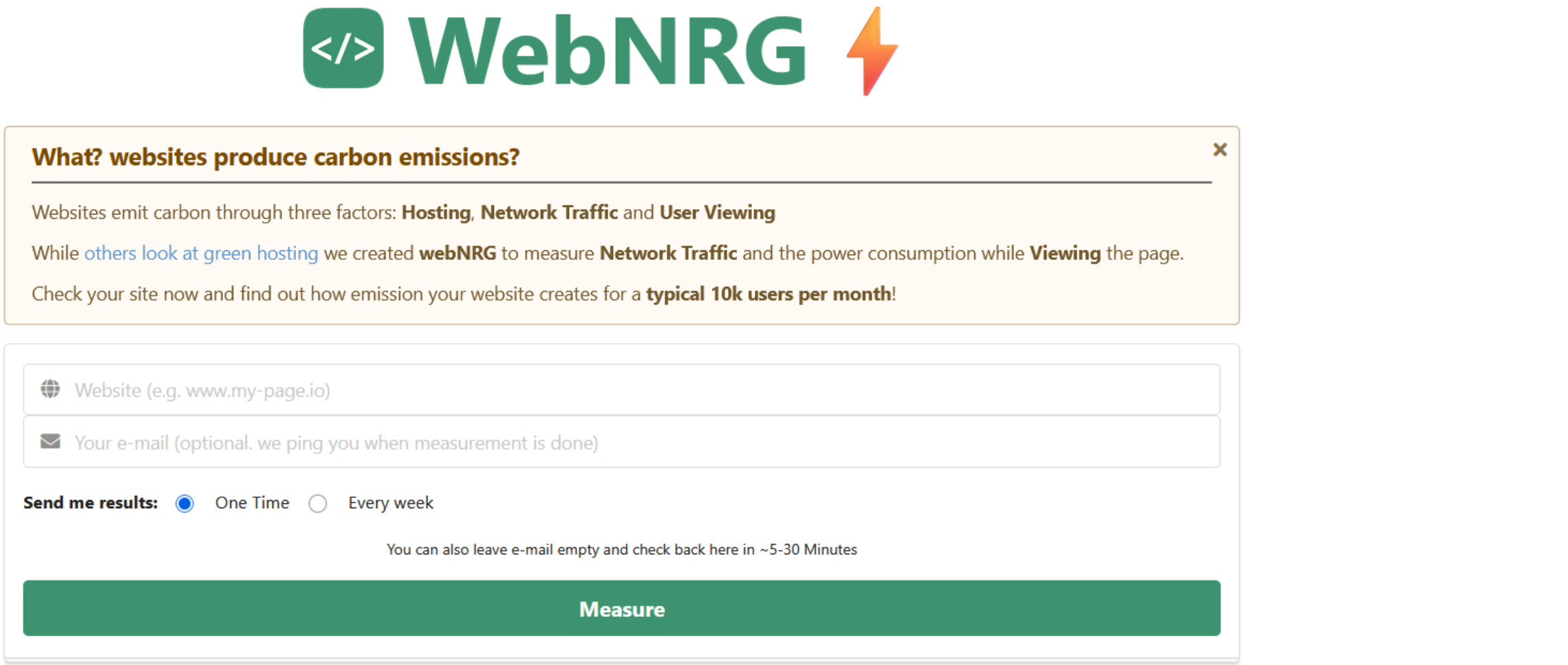






WebNRG

WebNRG



WebNRG – Methodology

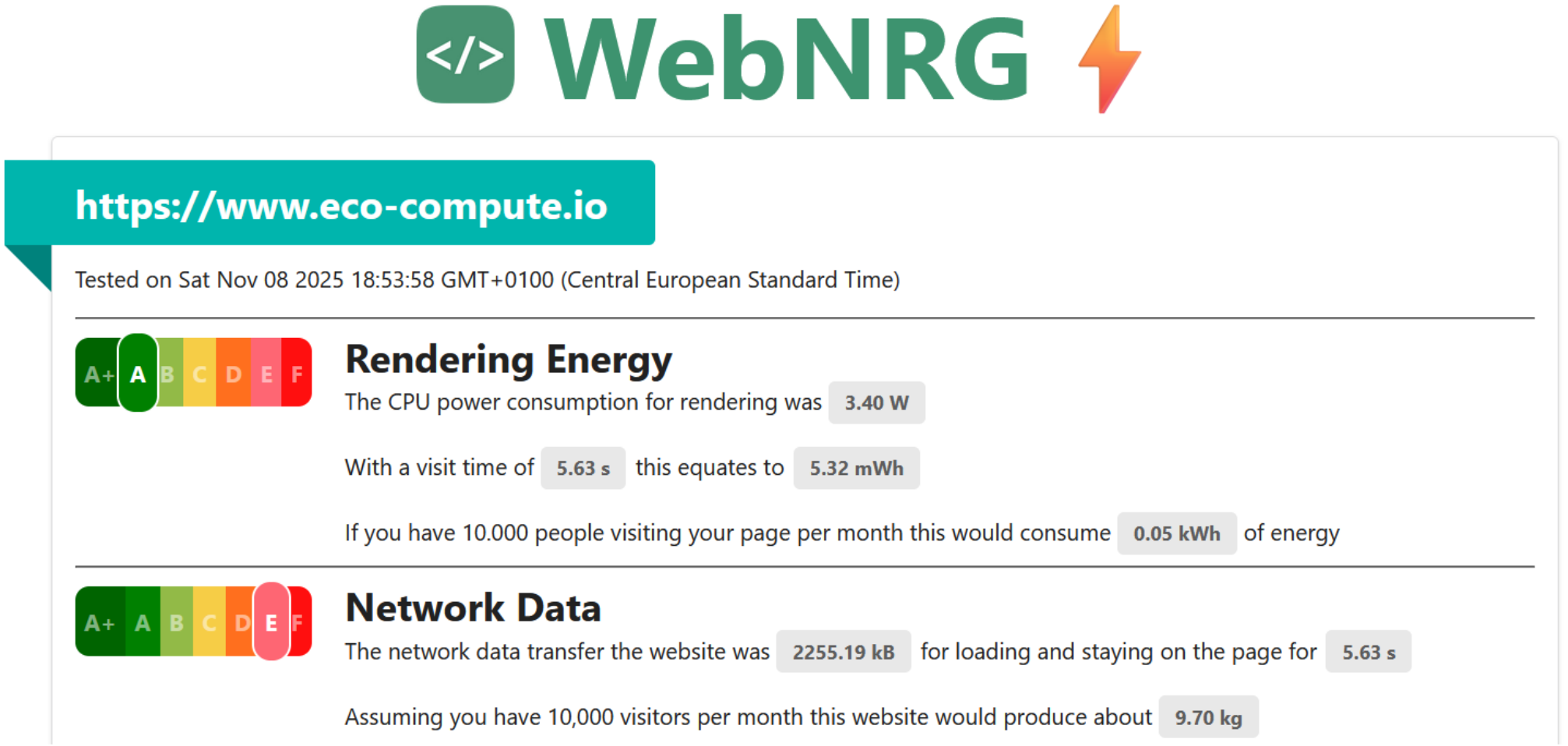
- **Energy Measurement using the Green Metrics Tool**
  - Loads the page using Playwright and waits for 5 seconds
  - CPU + DRAM energy is captured via RAPL (2ms intervals)
  - Cached reverse proxy: Isolation from browser startup and network latency
  - Rendering Energy Label: A+ (best) to F
    (25% power increments per grade)

- **Network Traffic & Carbon**
  - Captured at adapter level (actual transferred data)
  - Network Data Label: Same grading system as the SWDM
  - Carbon calculated using energy intensity model
    (constant: 41 Wh/GB)

https://website-tester.green-coding.io/methodology.html

WebNRG – Results

WebNRG



https://website-tester.green-coding.io/details.html?page=https%3A%2F%2Fwww.eco-compute.io

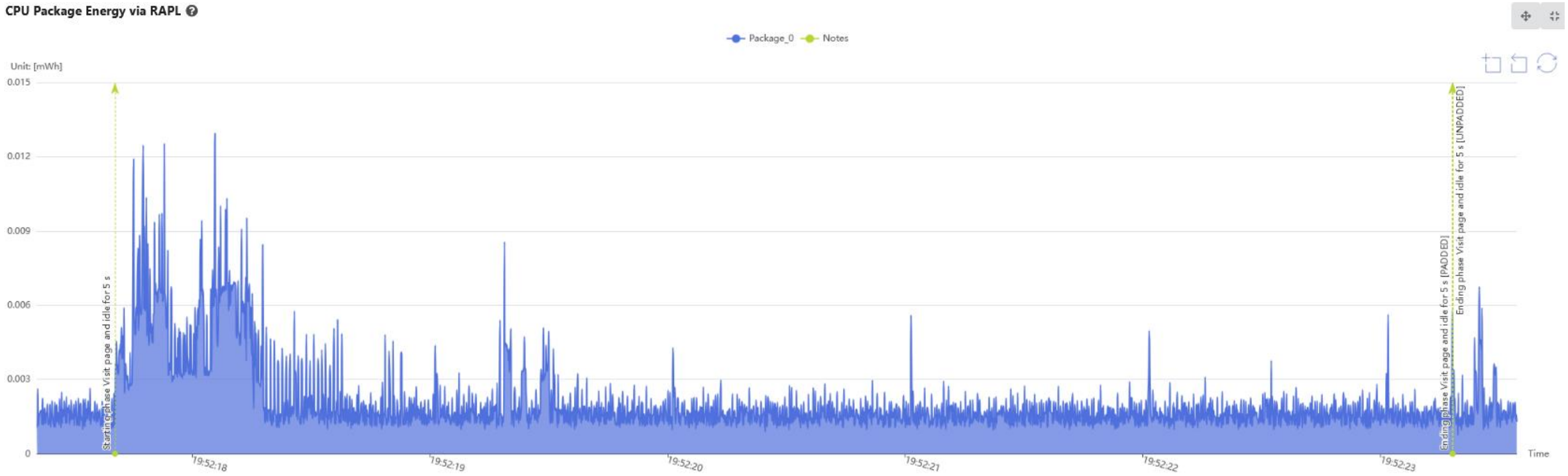
WebNRG – Measurement Details

Phase Duration	via Syscall
5.63 s	

Network Traffic	via cgroup
2.26 MB	

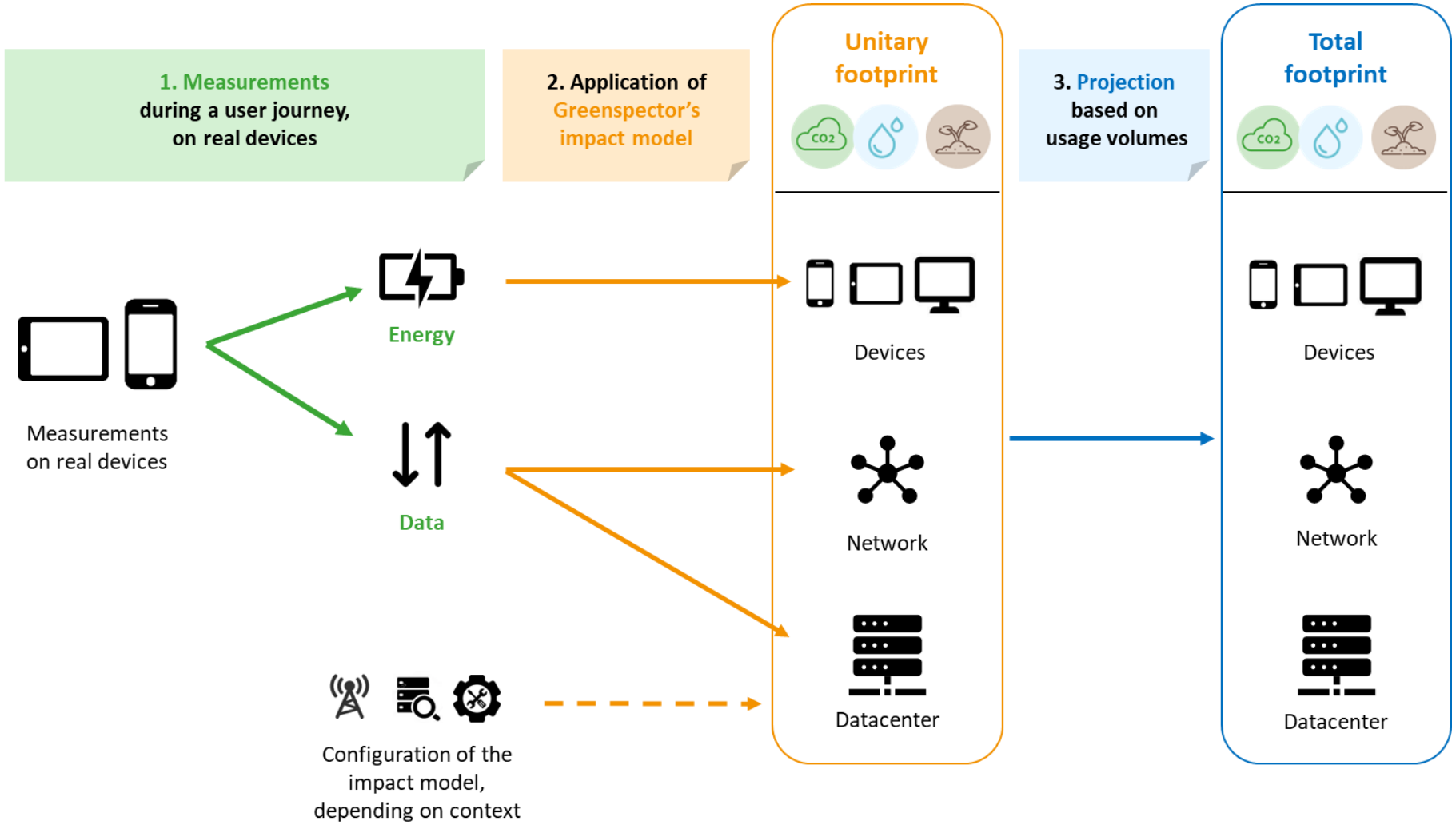
CPU Package Energy	via RAPL
5.32 mWh	

DRAM Energy	via RAPL
1.42 mWh	

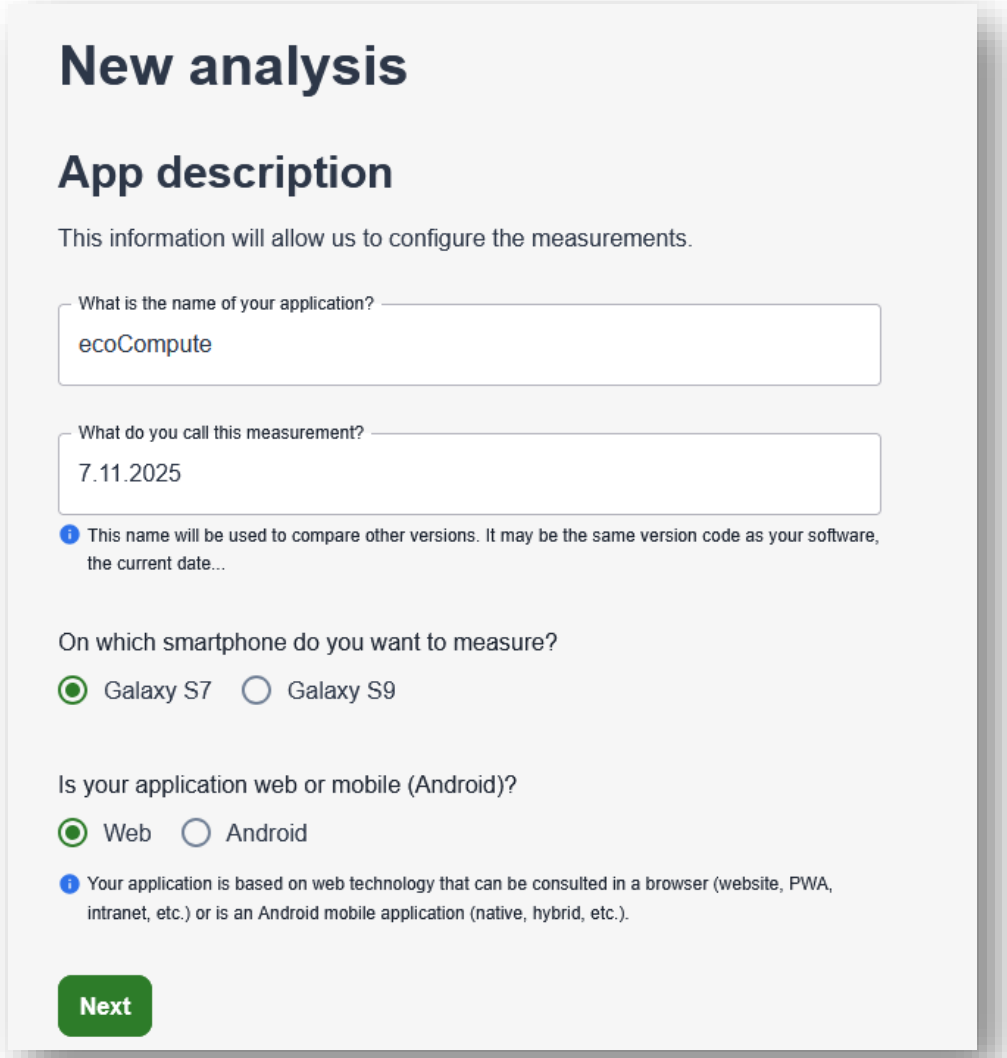


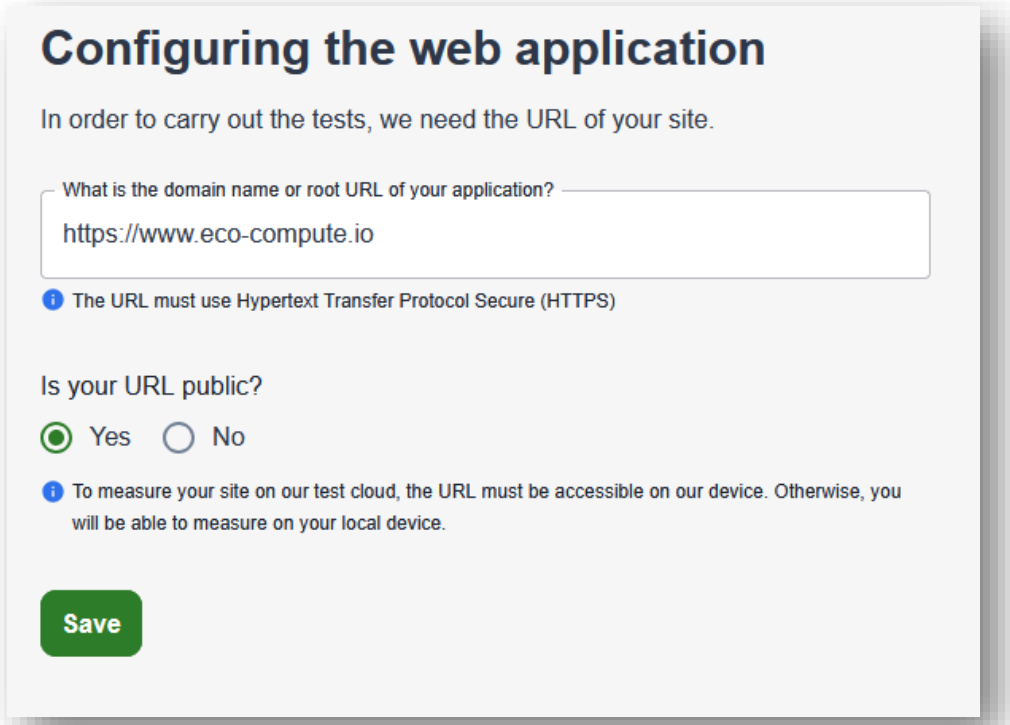
https://metrics.green-coding.io/stats.html?id=dc49d51a-b89f-4c8a-943e-e4c001dad428

Greenspector Studio – Methodology

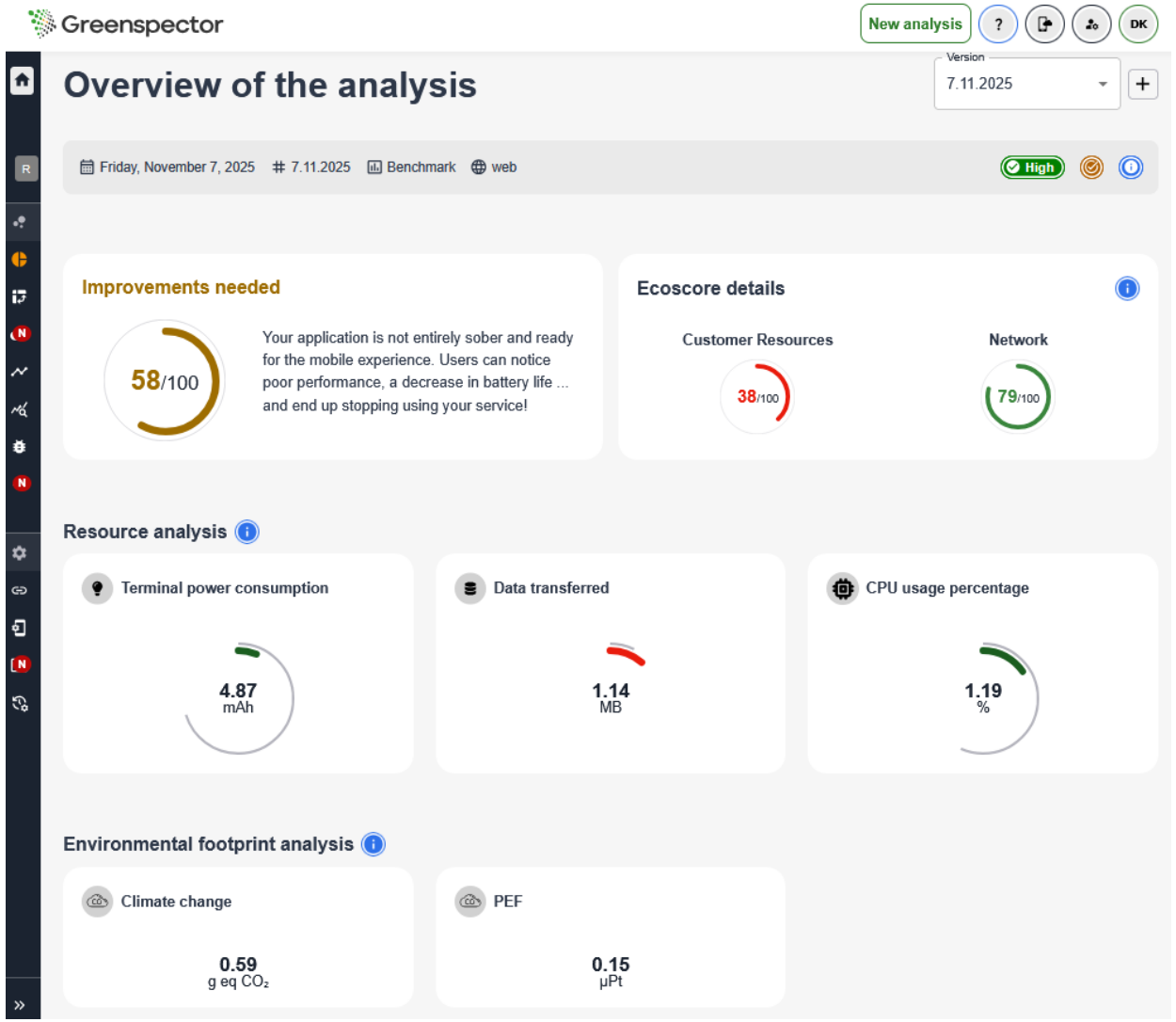


Greenspector Studio – Benchmark

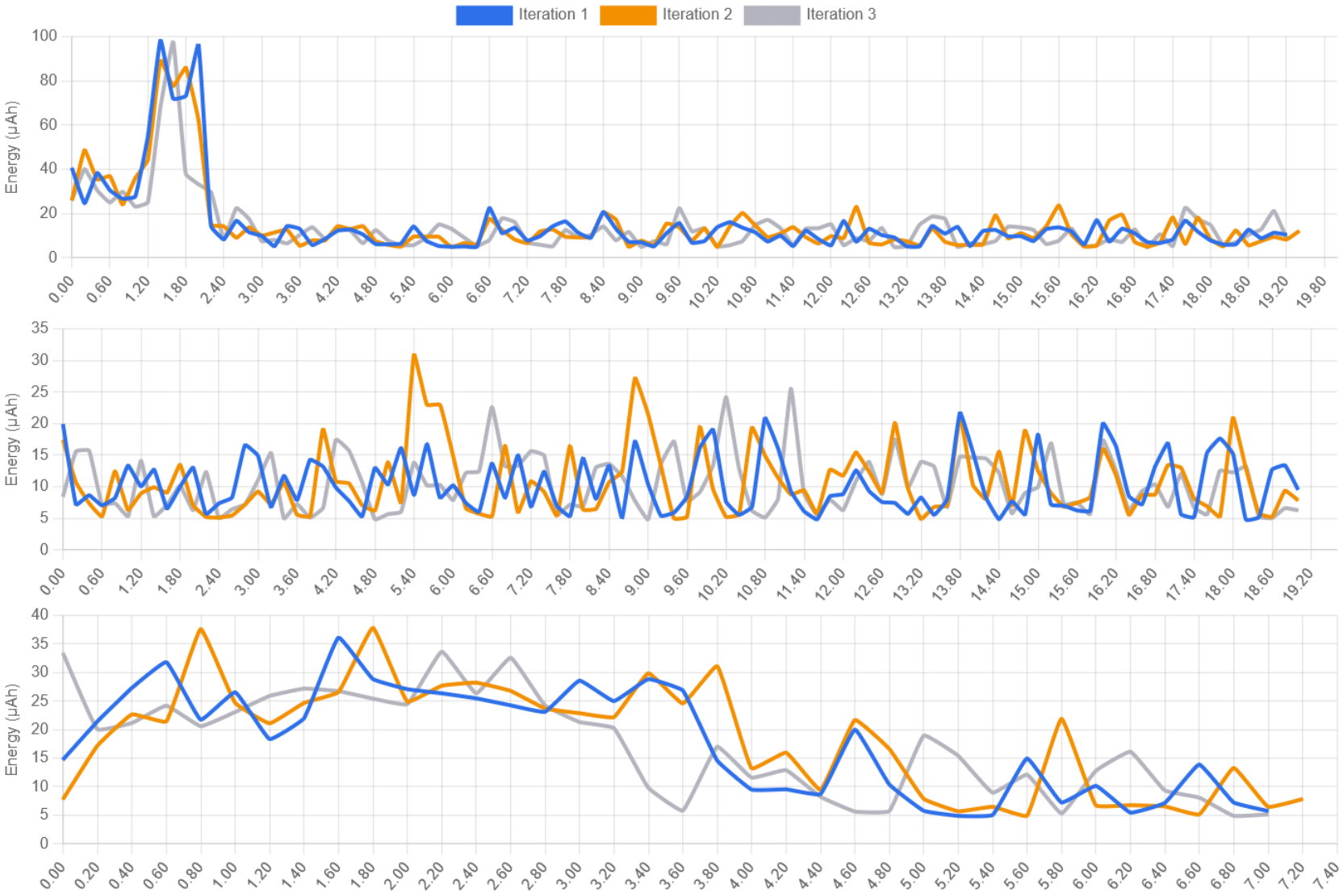




Greenspector Studio – Analysis



Greenspector Studio – Measurement Details



Loading

Idle

Scrolling

Overview of results for eco-compute.io

Methodology	Tool	Incl. server estimation	CO_2e (mg)	Energy (mWh)	Notes
Data transfer as main proxy metric	WebsiteCarbon.com	✅	120		
	Kastor	✅	353		
	Beacon	✅	444		
	Ecograder	✅	460		
	ecoIndex	✅	2160		own methodology, not SWDM
Hardware utilization as proxy metric	GreenFrame CLI	❌	17	37.7	
	Cardamon Web (client)	❌	80	92	only client
	Cardamon Web (network)	❌	40	82	only network (impacts are estimated)
Energy measurement	WebNRG (client)	❌	2.9	6.7	only CPU + DRAM
	WebNRG (network)	❌	81	285	only network (impacts are estimated)
	Greenspector Studio	✅	590	18	low carbon intensity of France is used

Agenda

- Introduction
- Methodologies & Tools
- **User Interactions**
- Good & Bad Websites
- Conclusion

From Page Loads to Real Interactions

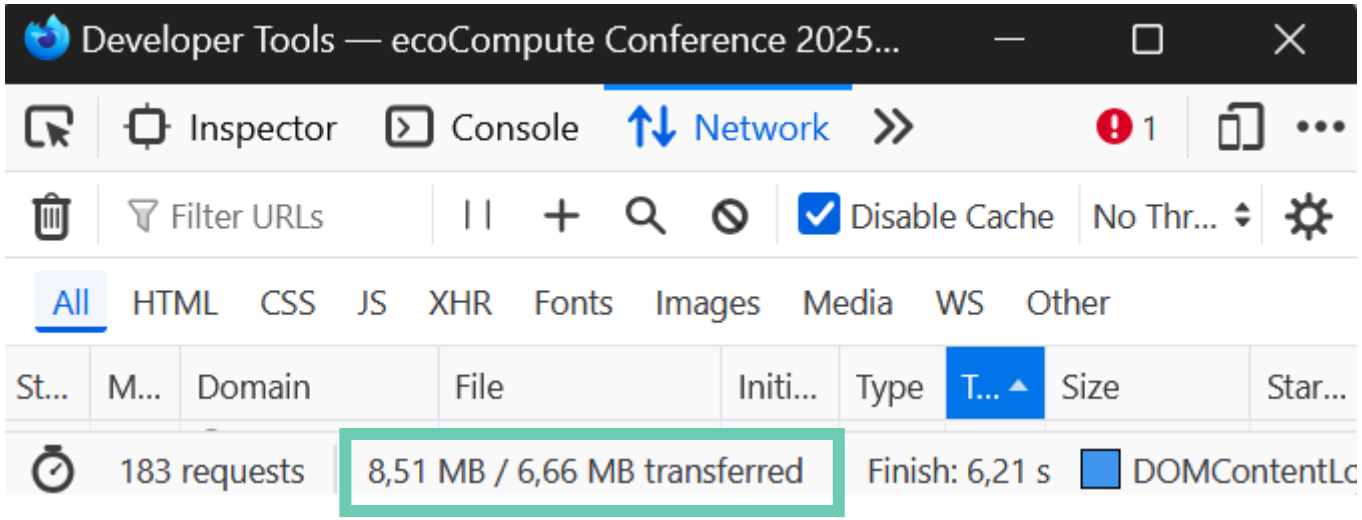
- In reality, users interact with the website
  - Scrolling, clicking, navigating…

First step: Scrolling down

- The simplest and most common page interaction
- Only a few tools are including scrolling in their measurements by default
  - Greenspector Studio: scrolling for ~3s
  - Cardamon: scrolling for 10s
  - ecoIndex: scrolling to bottom

Scrolling on websites: eco-compute.io

Tool	Data (MB)
Greenspector Studio	1.14
ecoIndex	1.17
Cardamon Web	1.32



→ Automatic scrolling with the tools did not work as expected!

Scrolling on websites: eco-compute.io

- Tools are typically using `window.scrollTo()`
- This does not work on the eco-compute.io website, due to:

```
body, html {
  height: 100%;
}
```

- "`height: 100%`" makes the body the scroll container
- Possible workaround: `document.body.scrollTo()`

Scrolling on websites: developer-week.de

Tool	Data (MB)	Scrolling?	Notes
Ecograder	1.3	❌	
WebNRG	5.3	❌	
Greenspector Studio	8.2	✅	scrolling for 3 seconds
Cardamon Web	22.4	✅	scrolling for 10s
ecoIndex	31.5	✅	scrolling to bottom of the page

Big differences (web page contains a video that is lazy loaded during scrolling)

User Journeys

- Automated execution of a typical usage scenario in a (headless) browser
- Advantages:
  - Environmental impact of frequently used or resource-intensive use cases
    - Helpful for reporting
    - Good starting point for optimizations
  - Recording of potentially resource-intensive aspects:
    - Accepting cookies
    - Lazy loading of resources
    - Background activities
    - Animations
    - …
  - Applying the Software Carbon Intensity (SCI) standard

SCI for Web

- root & branch (makers of Cardamon) are currently working on this topic: https://cardamon.io/sci

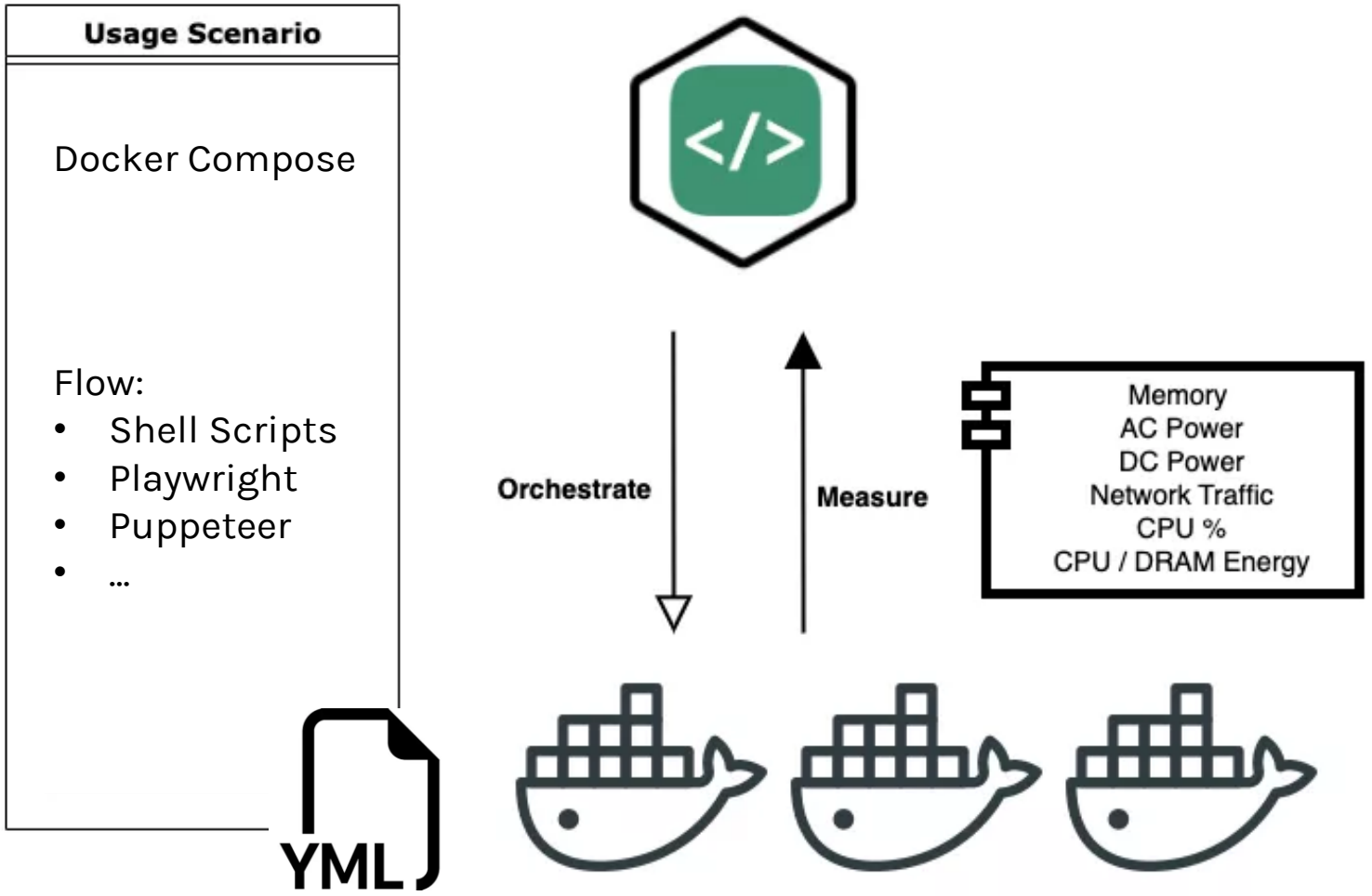
Oliver Winks @ Green IO London (2025)
Source: LinkedIn

- Green Metrics Tool supports SCI within a single usage scenario

Measuring the environmental impacts of automated user journeys – Tools

- **GreenFrame**
  - Energy measurement: Conversion of utilization data into energy consumption
  - Automation: Playwright with headless browser
- **Cardamon**
  - Energy measurement: Conversion of utilization data into energy consumption
  - Automation: Any tool (e.g., Playwright) with headless browser
- **Green Metrics Tool**
  - Energy measurement: Energy measurement on reference device (server)
  - Automation: Any tool (e.g., Playwright) with headless browser
- **Greenspector Studio**
  - Energy recording: Energy measurement on real end device (smartphone/tablet)
  - Automation: Part of the tool; own DSL

Energy Measurement with the Green Metrics Tool



https://docs.green-coding.io/docs/prologue/measurement-process/

Energy Measurement with the Green Metrics Tool

usage_scenario.yml (excerpt):

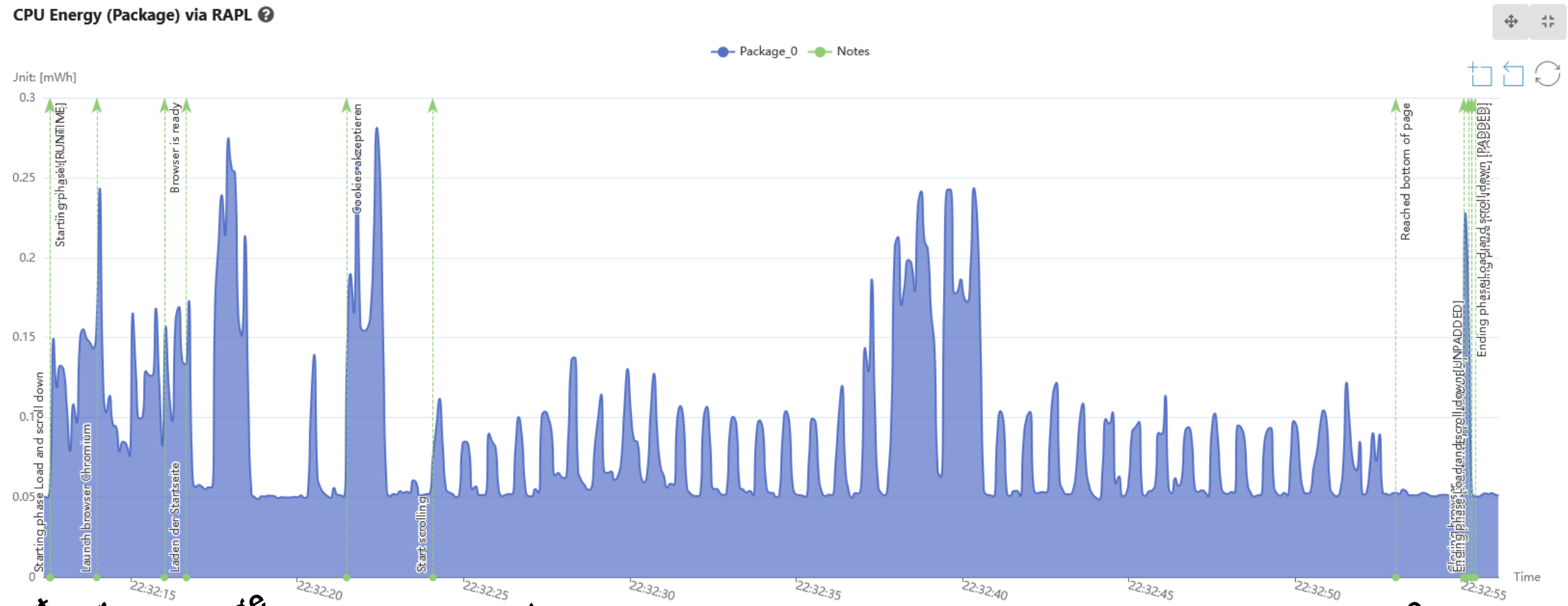
```yaml
name: "Website User Journey"

services:
  playwright:
    image: greencoding/gcb_playwright:v21

flow:
  - name: Execute user journey
    container: playwright
    commands:
      - type: console
        command: python3 /repo/playwright-flow.py
```

Energy Measurement with the Green Metrics Tool

playwright-flow.py:

```
browser = await playwright.chromium.launch(headless=False, args=["--headless=new"], slow_mo=2500)
context = await browser.new_context(viewport={"width": 1280, "height": 720})
page = await context.new_page()
# Load Home Page
await page.goto(website_url)
# Wait, until the cookie banner is visible
await page.locator('#uc-main-dialog').wait_for(state='visible')
# Accept cookies
await page.get_by_role('button', name='Accept all').click()
# Wait until the cookie banner disappears
await page.locator('#uc-main-dialog').wait_for(state='hidden')
# Go to page "Program"
await page.get_by_text('→Program').scroll_into_view_if_needed()
await page.get_by_role('link', name='→Program').click()
# ...
```

Scenario: Load the home page, accept cookies, scroll to the bottom of the page

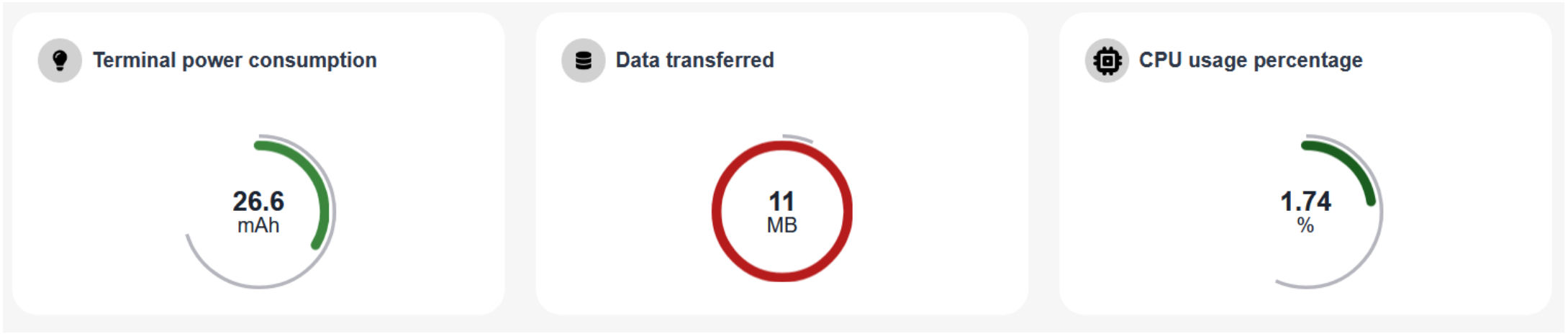


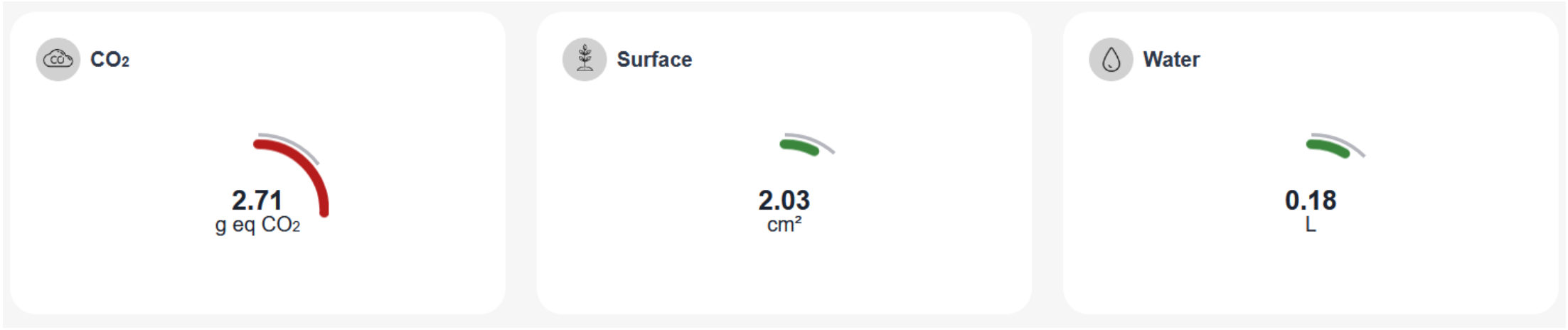
Greenspector Measurement Script

```
launchBrowser
browserGoToUrl,$WEBSITE_URL

# Load home page
assertNotExistsId,uc-main-dialog
measureStart,CHRGT_home_no_cookies
pressEnter
pause,${PAUSEAFTERACTION}
waitUntilId,uc-main-dialog
pause,${PAUSEAFTERLOAD}
measureStop

# Measure background activities
measureStart,PAUSE_home_no_cookies
pause,${PAUSEDURATION}
measureStop
```

```
# Accept cookies
measureStart,CHRGT_home_accept_cookies
clickById,accept
pause,${PAUSEAFTERLOAD}
measureStop

# Measure background activities
measureStart,PAUSE_home_accept_cookies
pause,${PAUSEDURATION}
measureStop

# Go to the button “→Program”
measureStart,SCROLL_to_button_to_pogramm
scrollToText,→Program
pause,${PAUSEAFTERACTION}
measureStop
```

Resource consumption & environmental impacts

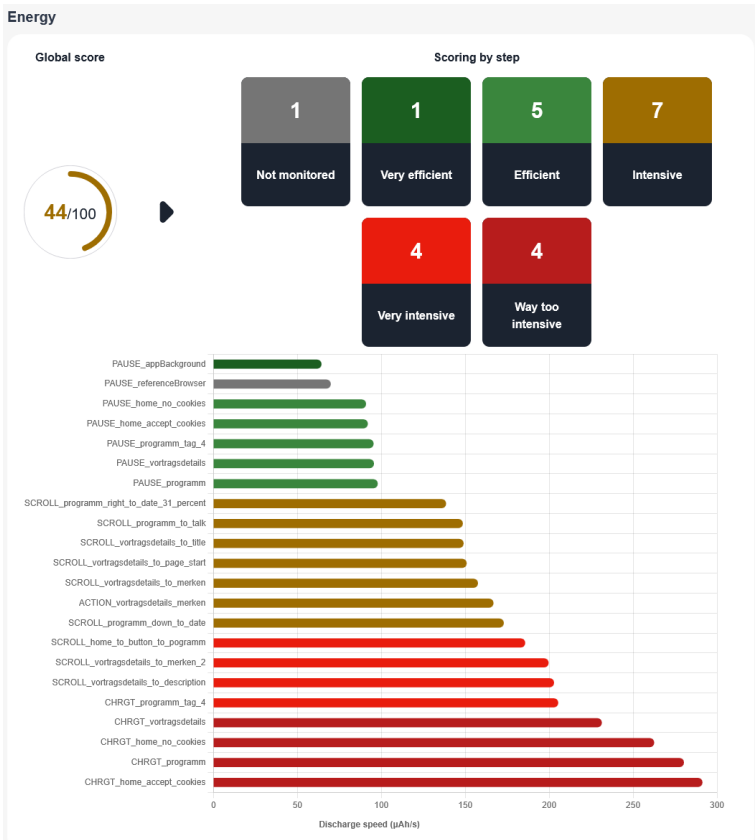




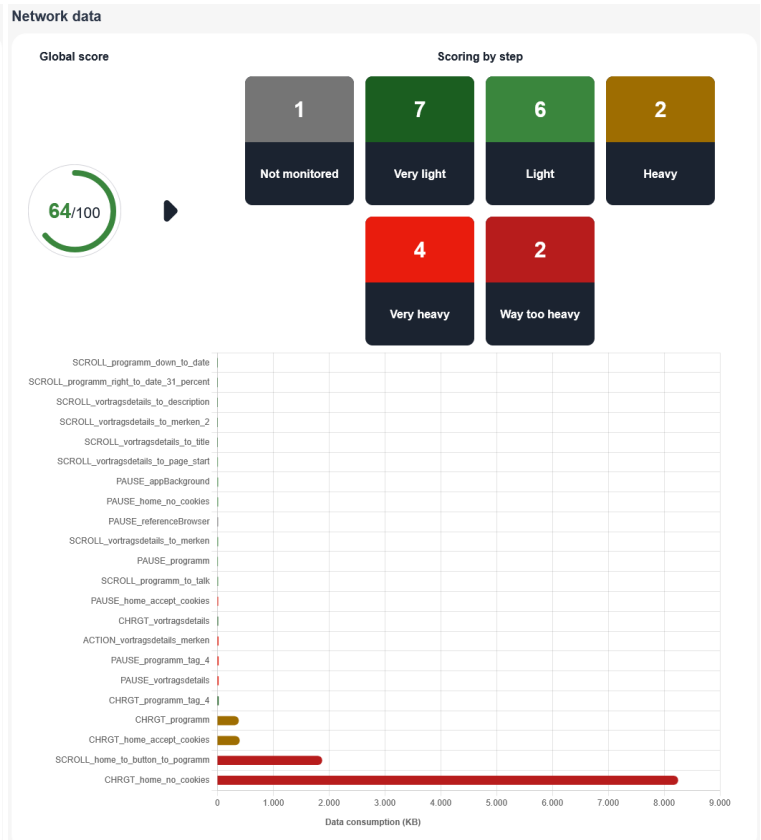
Results per Step

Time

Energy



Network



Tool Overview: Our Recommendations

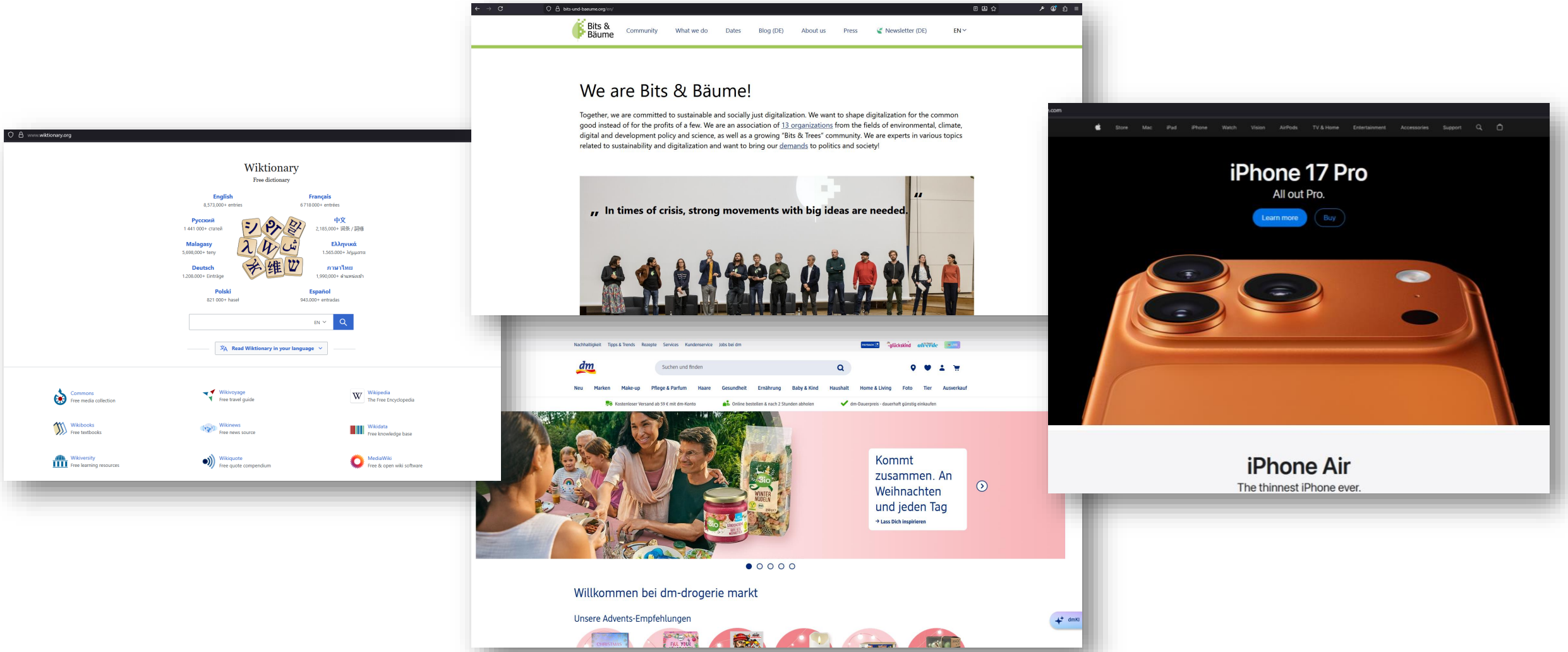
	Measurement			Assessment	
Methodology	Data transfer as the main proxy metric	Hardware utilization as the main proxy metric	Energy measurement	Analysis of best practices	Manual profiling in the browser
Tools	• CO2.js • Website Carbon Calculator • Ecograder • Kastor • EcoIndex.fr • Klimatest • Beacon • …	• GreenFrame(€) • Cardamon Web	• WebNRG / Green Metrics Tool • Greenspector Studio(€)	• GreenIT-Analysis • Ecograder • Kastor	• Firefox Profiler • Chrome DevTools • Safari Web Inspector

(€) Only really useful in the paid version

Agenda

- Introduction
- Methodologies & Tools
- User Interactions
- **Good & Bad Websites**
- Conclusion

What makes websites good or bad?

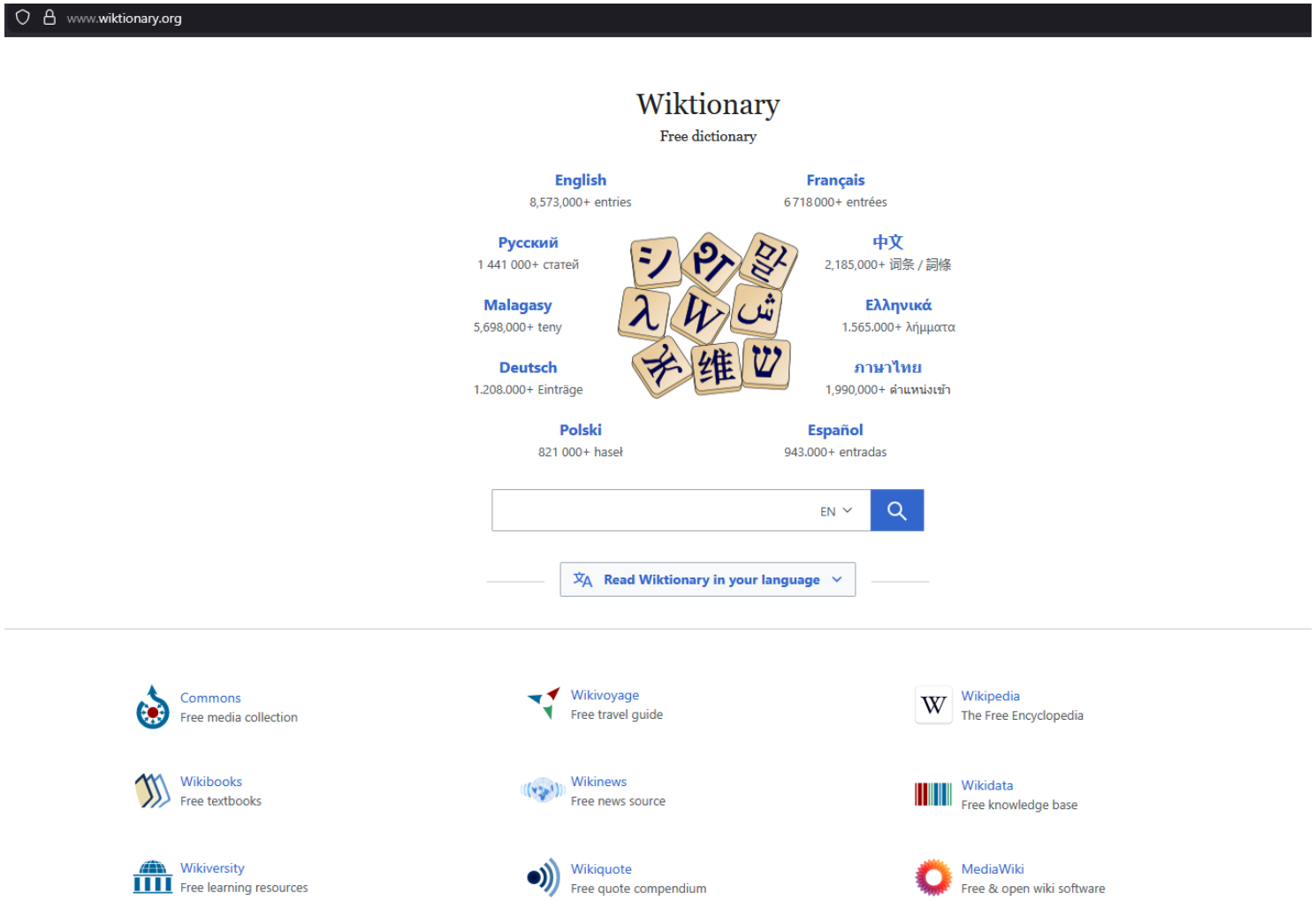


What makes websites good or bad?

WebNRG

	Rendering Energy Score	Network Data Score
wiktionary.org		
bits-und-baeume.org		
apple.com		
dm.de		

wiktionary.org



wiktionary.org

Rendering Energy

The CPU power consumption for rendering was **3.16 W**

With a visit time of **5.45 s** this equates to **4.79 mWh**

If you have 10.000 people visiting your page per month this would consume **0.05 kWh** of energy

Network Data

The network data transfer the website was **114.99 kB** for loading and staying on the page for **5.45 s**

Assuming you have 10,000 visitors per month this website would produce about **0.49 kg**

https://website-tester.green-coding.io/details.html?page=https://www.wiktionary.org

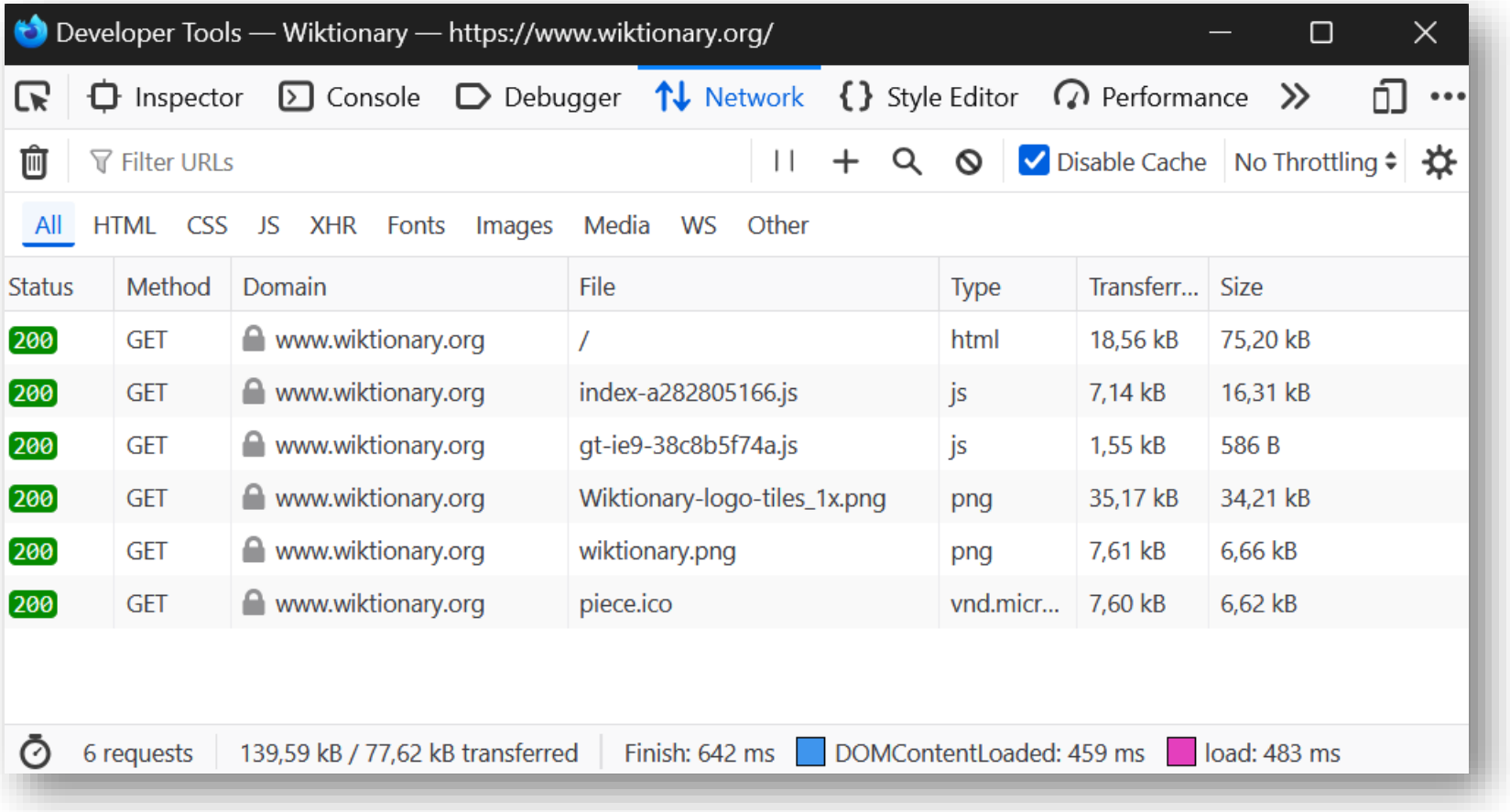
wiktionary.org

https://www.websitecarbon.com/website/wiktionary-org/

wiktionary.org

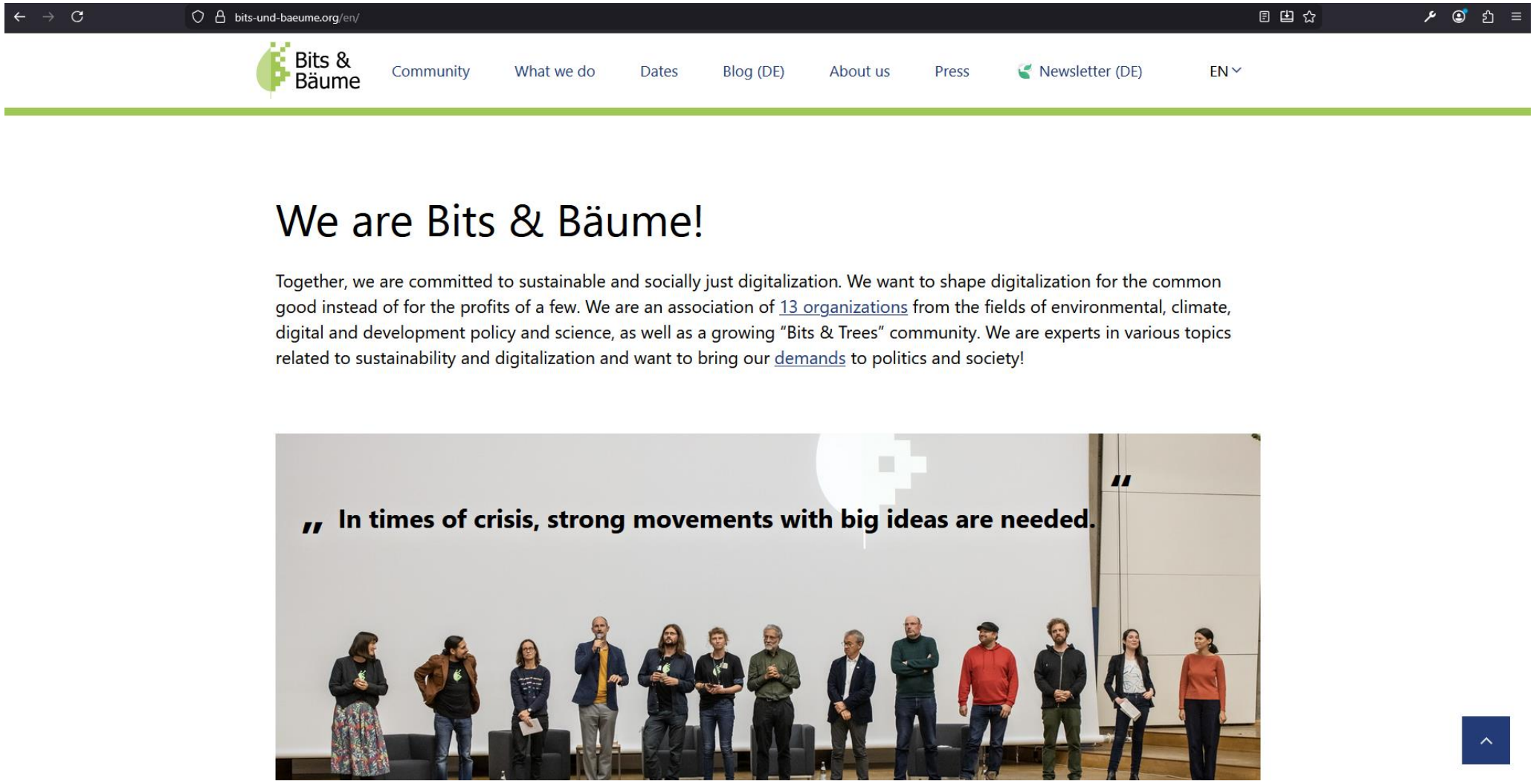
https://web.cardamon.io/reports/H6KcS

wiktionary.org



- Only 6 requests
- Only 139 kB

bits-und-baeume.org



bits-und-baeume.org

WebNRG

Rendering Energy

The CPU power consumption for rendering was **3.29 W**

With a visit time of **5.52 s** this equates to **5.03 mWh**

If you have 10.000 people visiting your page per month this would consume **0.05 kWh** of energy

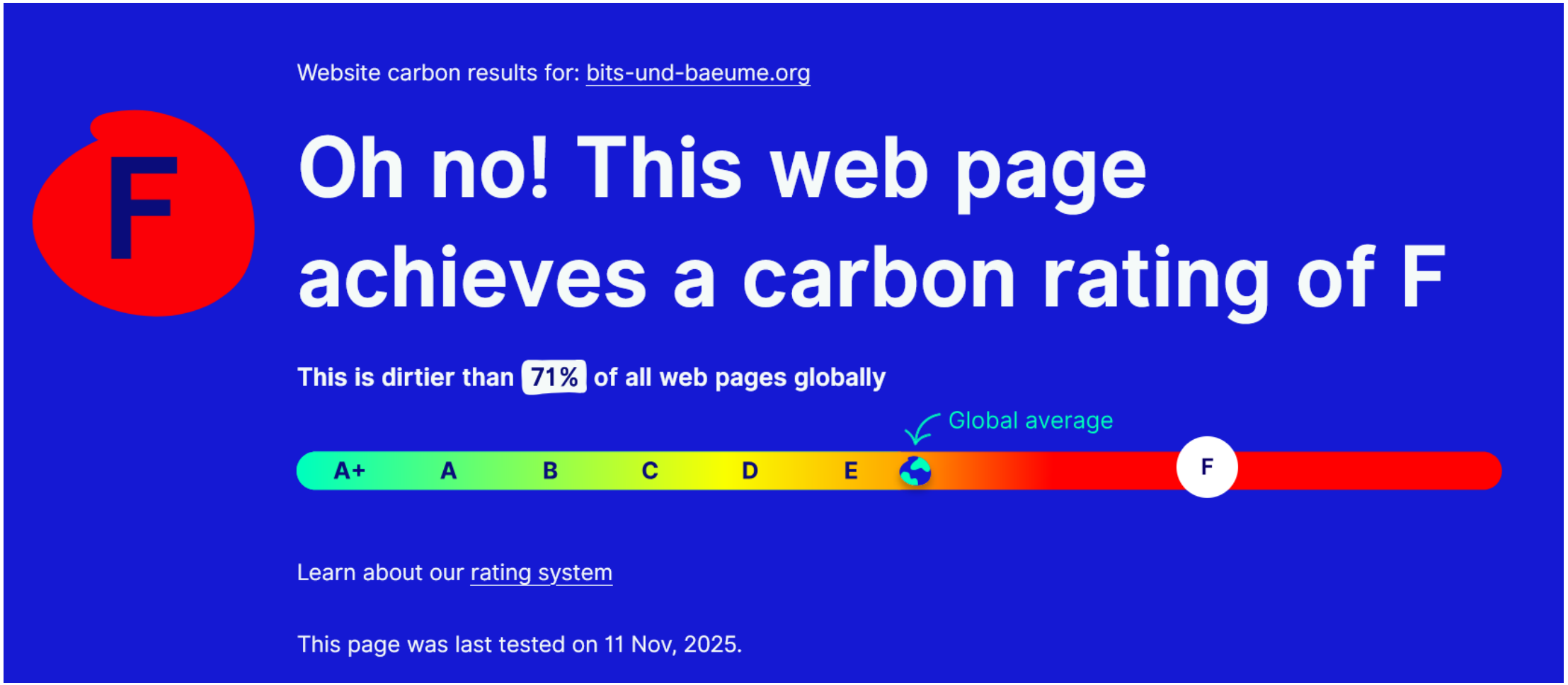
Network Data

The network data transfer the website was **5512.85 kB** for loading and staying on the page for **5.52 s**

Assuming you have 10,000 visitors per month this website would produce about **23.69 kg**

https://website-tester.green-coding.io/details.html?page=https://bits-und-baeume.org

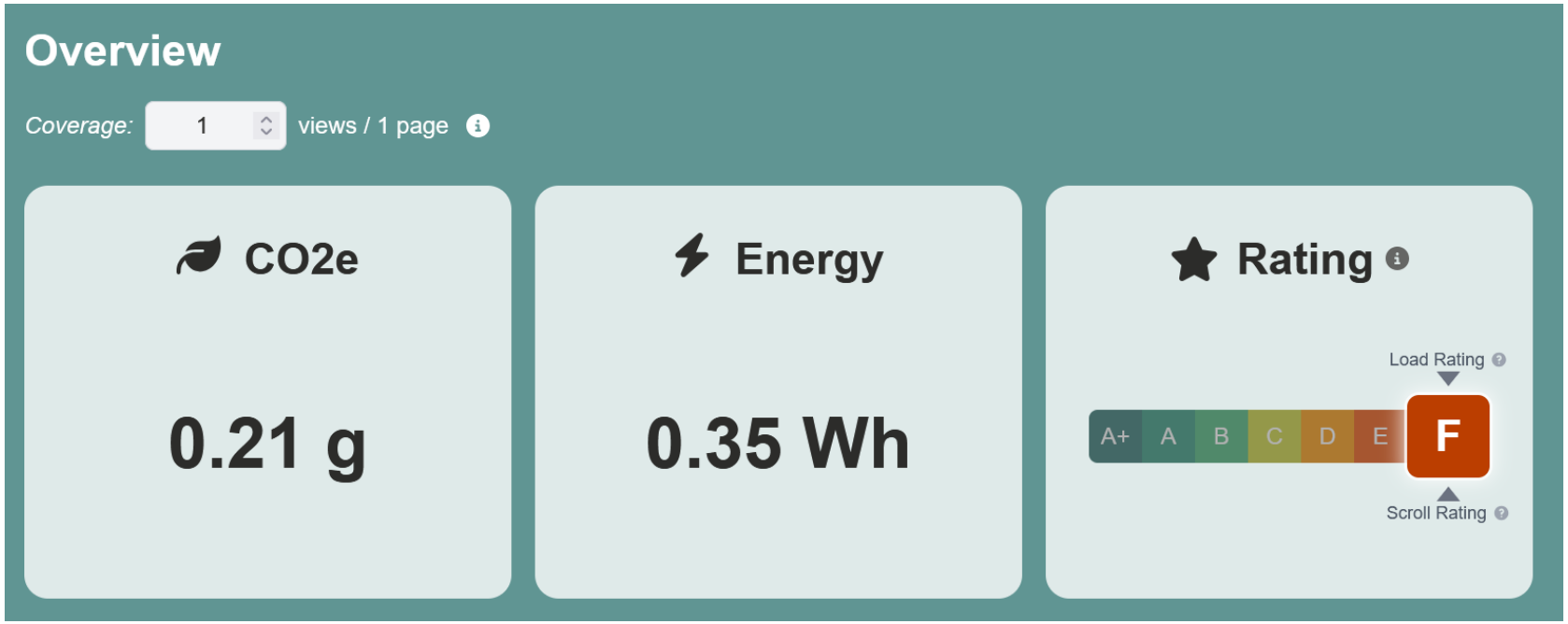
bits-und-baeume.org



https://www.websitecarbon.com/website/bits-und-baeume-org/

bits-und-baeume.org

cardamon



Frontend

CO2e	Energy
0.08 g	0.09 Wh

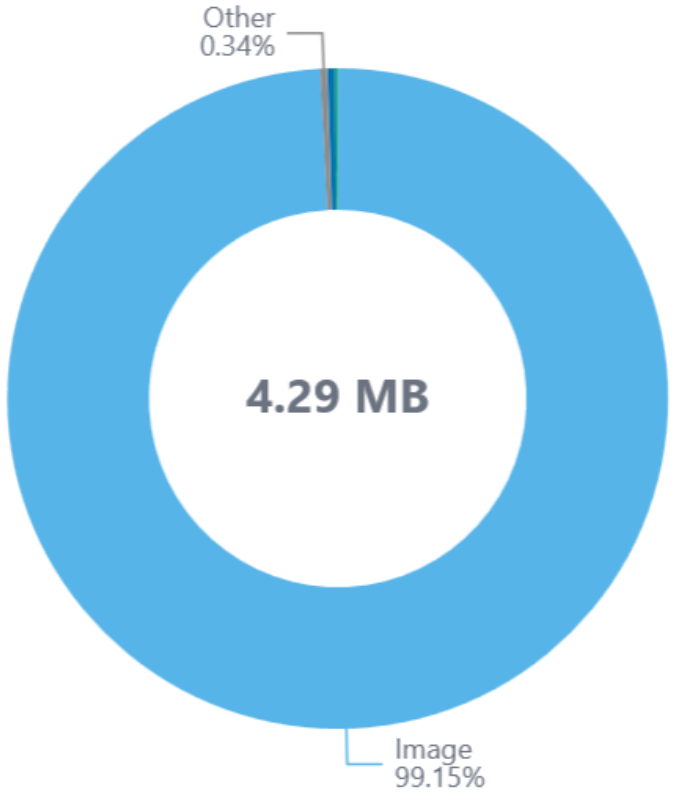
Network

CO2e	Energy
0.13 g	0.27 Wh

https://web.cardamon.io/reports/vqHrK

bits-und-baeume.org

cardamon



All Resources

Resource	Size
Image	4.25 MB
Document	15.78 KB
Other	15.04 KB
Stylesheet	5.56 KB
Manifest	707 B

https://web.cardamon.io/reports/vqHrK

bits-und-baeume.org

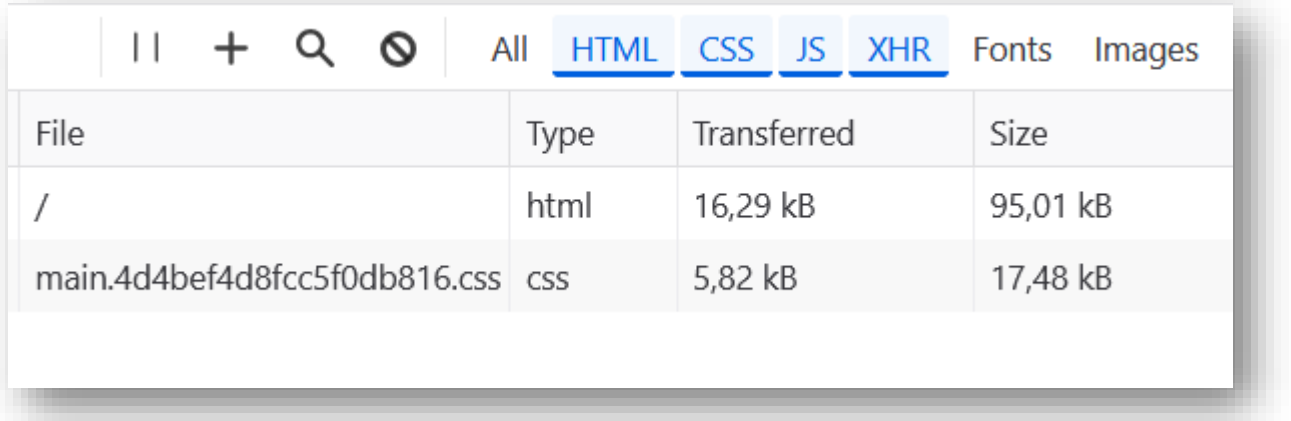
- Bad: a lot of data transferred over the network
  - 4.25 MB unoptimized images
- But: Rendering is highly efficient
  - WebNRG: Rendering Energy Score of A

→ Using data transfer only is here a bad proxy for the environmental impacts of the web page

→ Why is the rendering so efficient?

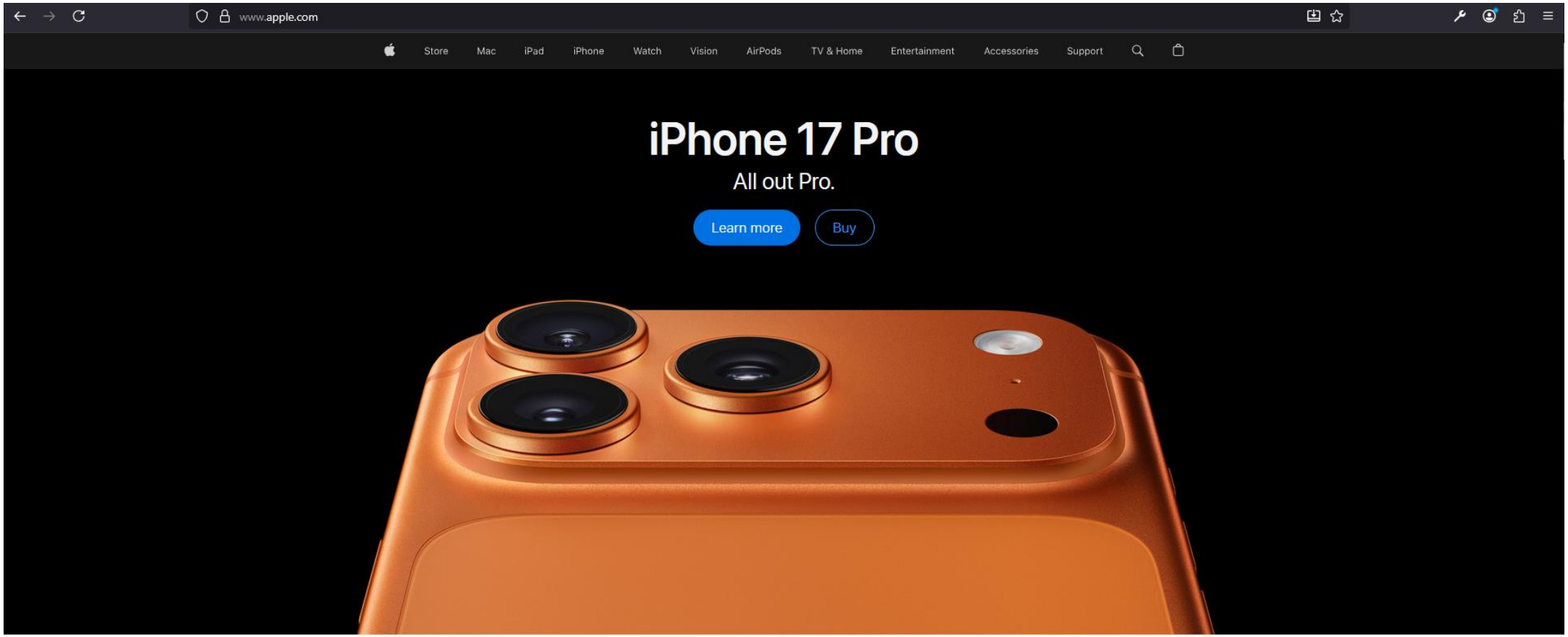
bits-und-baeume.org

HTML & CSS & no JavaScript:



- Server-side rendering is used
- No JavaScript at all!

apple.com


www.apple.com
Store
Mac
iPad
iPhone
Watch
Vision
AirPods
TV & Home
Entertainment
Accessories
Support
iPhone 17 Pro
All out Pro.
Learn more
Buy
iPhone Air
The thinnest iPhone ever.

apple.com

WebNRG

Rendering Energy

The CPU power consumption for rendering was **3.67 W**

With a visit time of **5.73 s** this equates to **5.85 mWh**

If you have 10.000 people visiting your page per month this would consume **0.06 kWh** of energy

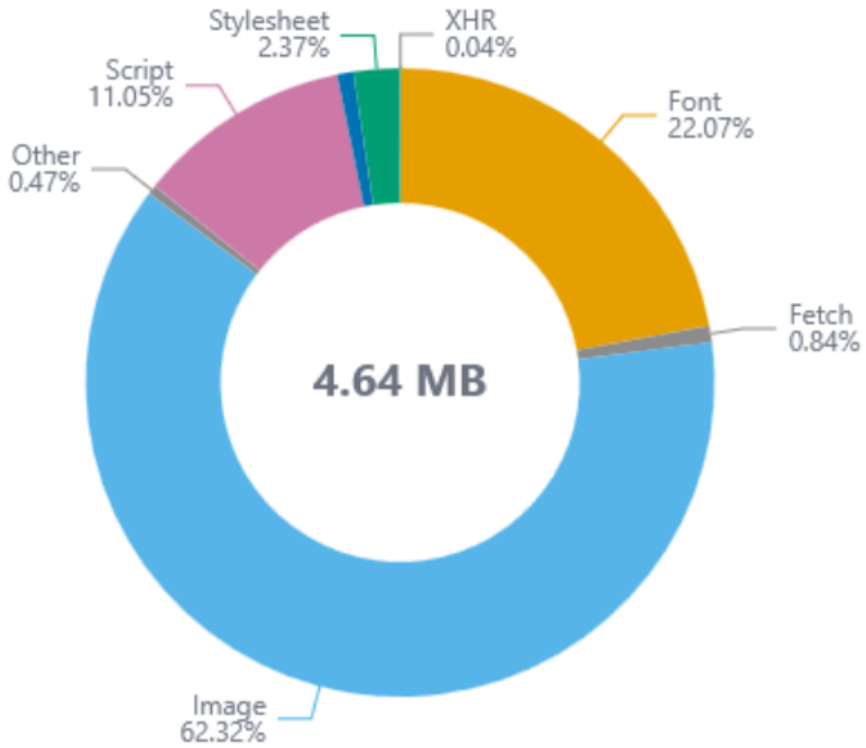
Network Data

The network data transfer the website was **3510.41 kB** for loading and staying on the page for **5.73 s**

Assuming you have 10,000 visitors per month this website would produce about **15.09 kg**

https://website-tester.green-coding.io/details.html?page=https://www.apple.com

apple.com



All Resources

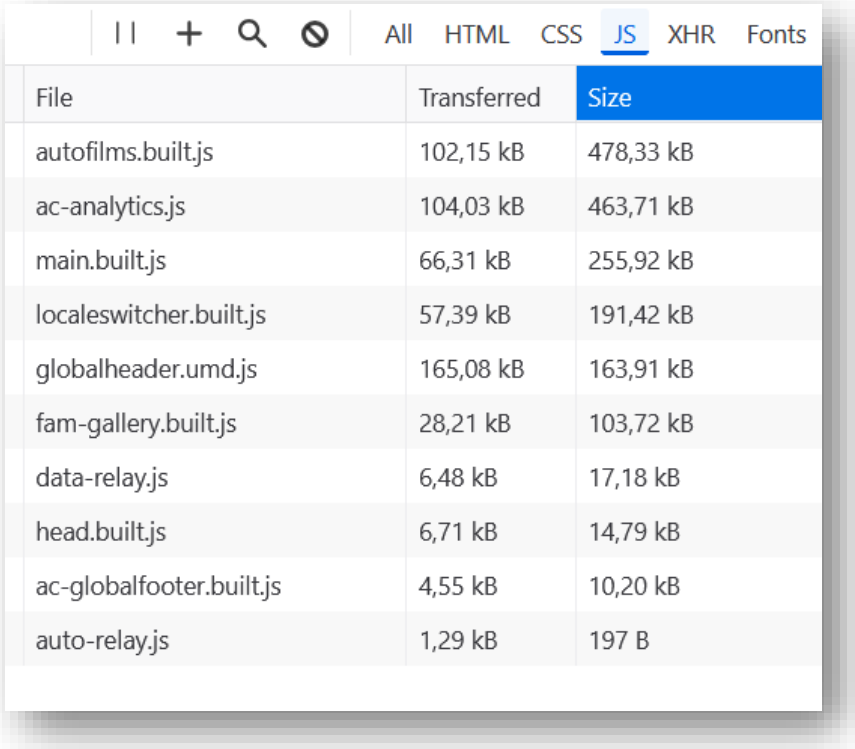
Resource	Size
Image	2.89 MB
Font	1.02 MB
Script	525.42 KB
Stylesheet	112.45 KB
Fetch	39.95 KB
Document	39.76 KB
Other	22.6 KB

https://web.cardamon.io/reports/wLCu9

apple.com

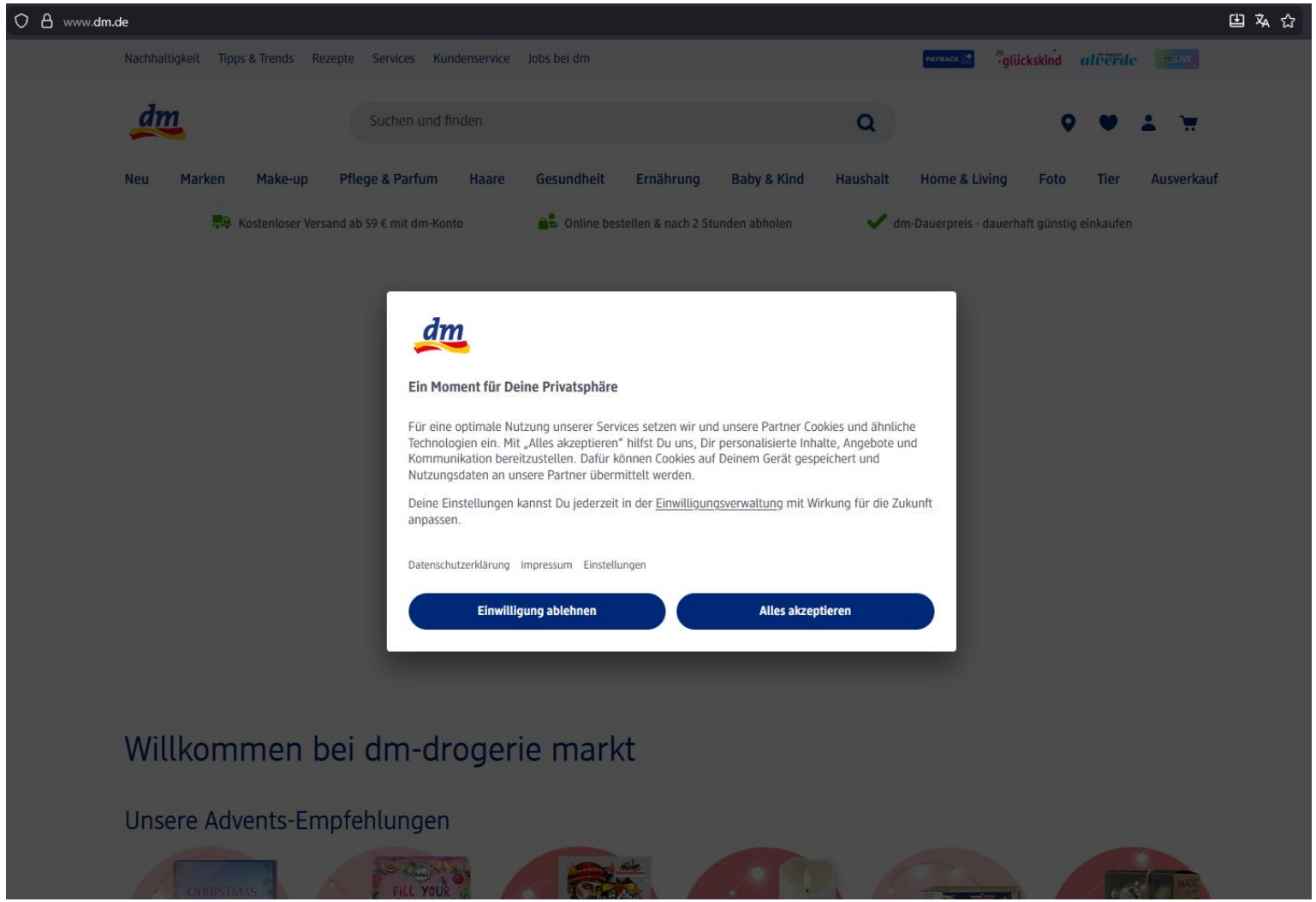
- Bad: a lot of data transferred over the network (4.6 MB)
  - 1 MB of custom fonts!
  - Unoptimized Images (JPEG, 2.8 MB)
- Good:
  - Server-side rendering is used
  - Only a few “nice-to-have” JS scripts (web page works with JS disabled)

JavaScript:

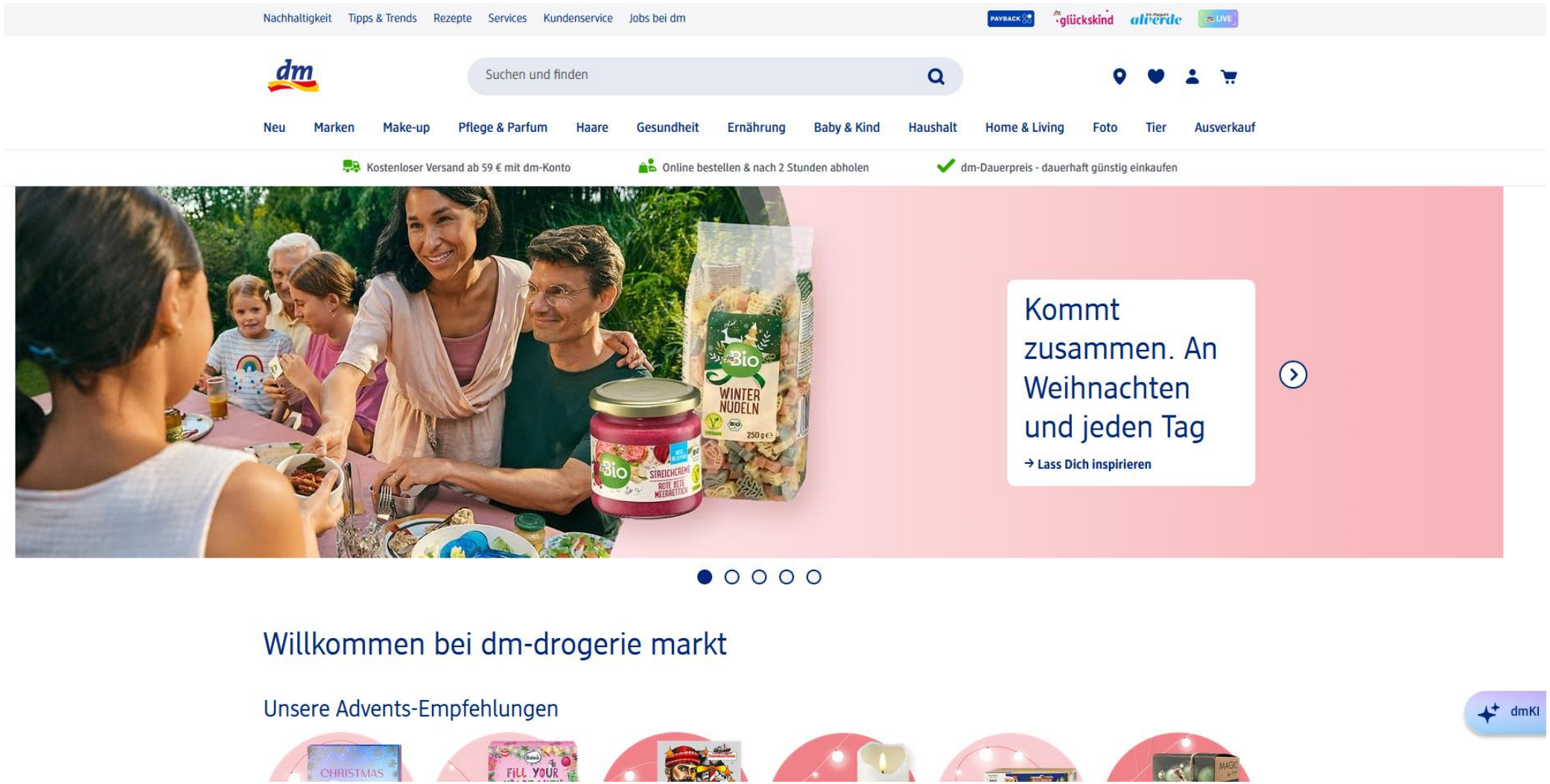


File	Transferred	Size
autofilms.built.js	102,15 kB	478,33 kB
ac-analytics.js	104,03 kB	463,71 kB
main.built.js	66,31 kB	255,92 kB
localeswitcher.built.js	57,39 kB	191,42 kB
globalheader.umd.js	165,08 kB	163,91 kB
fam-gallery.built.js	28,21 kB	103,72 kB
data-relay.js	6,48 kB	17,18 kB
head.built.js	6,71 kB	14,79 kB
ac-globalfooter.built.js	4,55 kB	10,20 kB
auto-relay.js	1,29 kB	197 B

dm.de


www.dm.de
Nachhaltigkeit
Tipps & Trends
Rezepte
Services
Kundenservice
Jobs bei dm
Suchen und finden
Neu
Marken
Make-up
Pflege & Parfum
Haare
Gesundheit
Ernährung
Baby & Kind
Haushalt
Home & Living
Foto
Tier
Ausverkauf
Kostenloser Versand ab 59 € mit dm-Konto
Online bestellen & nach 2 Stunden abholen
dm-Dauerpreis - dauerhaft günstig einkaufen
Ein Moment für Deine Privatsphäre
Für eine optimale Nutzung unserer Services setzen wir und unsere Partner Cookies und ähnliche Technologien ein. Mit „Alles akzeptieren“ hilfst Du uns, Dir personalisierte Inhalte, Angebote und Kommunikation bereitzustellen. Dafür können Cookies auf Deinem Gerät gespeichert und Nutzungsdaten an unsere Partner übermittelt werden.
Deine Einstellungen kannst Du jederzeit in der Einwilligungsverwaltung mit Wirkung für die Zukunft anpassen.
Datenschutzerklärung
Impressum
Einstellungen
Einwilligung ablehnen
Alles akzeptieren
Willkommen bei dm-drogerie markt
Unsere Advents-Empfehlungen

dm.de


Nachhaltigkeit
Tipps & Trends
Rezepte
Services
Kundenservice
Jobs bei dm
Suchen und finden
Neu
Marken
Make-up
Pflege & Parfum
Haare
Gesundheit
Ernährung
Baby & Kind
Haushalt
Home & Living
Foto
Tier
Ausverkauf
Kostenloser Versand ab 59 € mit dm-Konto
Online bestellen & nach 2 Stunden abholen
dm-Dauerpreis - dauerhaft günstig einkaufen
Kommt zusammen. An Weihnachten und jeden Tag
→ Lass Dich inspirieren
Willkommen bei dm-drogerie markt
Unsere Advents-Empfehlungen
dmKI

dm.de

Rendering Energy

The CPU power consumption for rendering was **7.89 W**

With a visit time of **5.72 s** this equates to **12.58 mWh**

If you have 10.000 people visiting your page per month this would consume **0.13 kWh** of energy

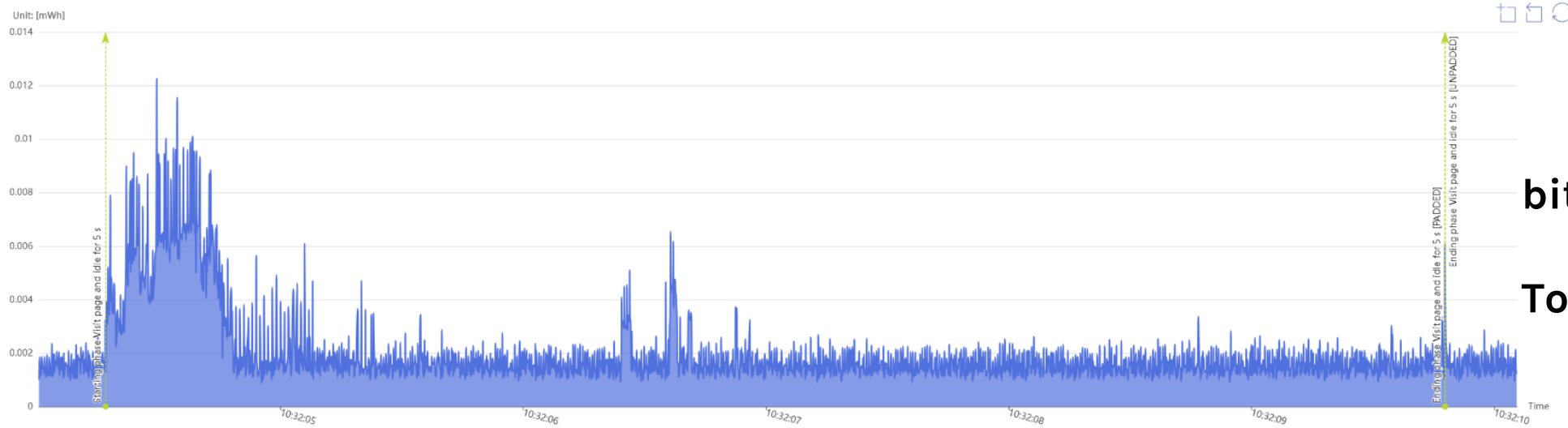
Network Data

The network data transfer the website was **3177.30 kB** for loading and staying on the page for **5.72 s**

Assuming you have 10,000 visitors per month this website would produce about **14.27 kg**

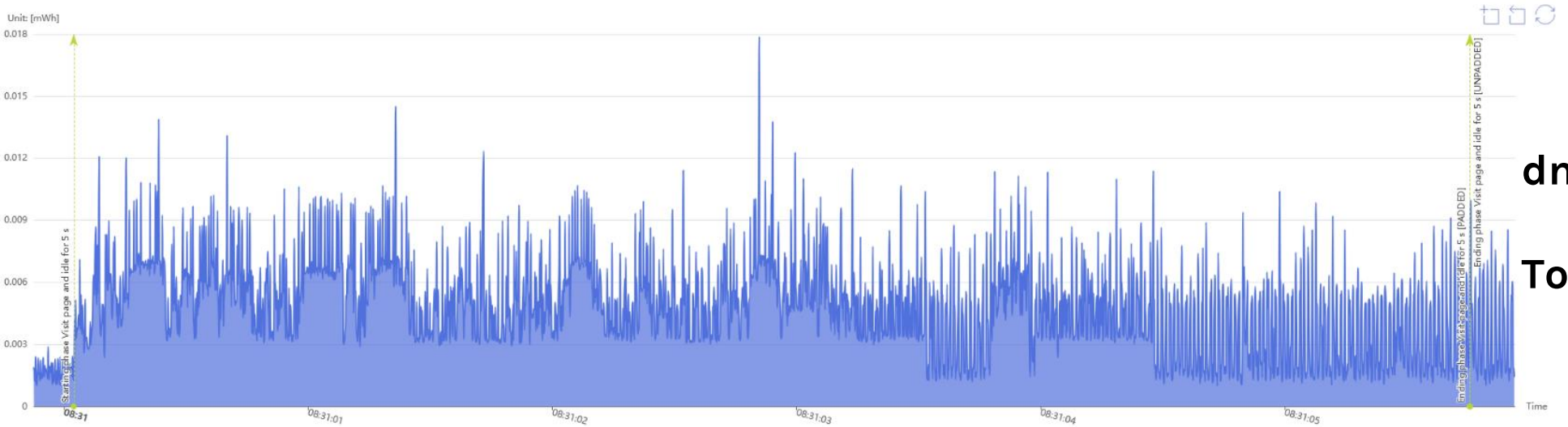
https://website-tester.green-coding.io/details.html?page=https://www.dm.de

dm.de – Comparison Energy Consumption



bits-und-baeume.org

Total: 5.03 mWh



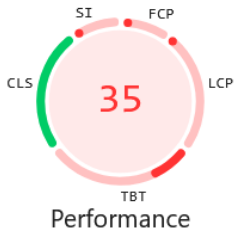
dm.de

Total: 12.58 mWh

dm.de

Mobile | Desktop

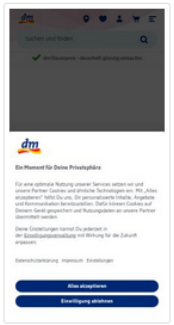
35 Performance | 100 Accessibility | 96 Best Practices | 100 SEO



Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. See calculator.

▲ 0–49 ■ 50–89 ● 90–100



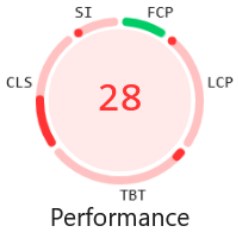
METRICS Expand view

▲ First Contentful Paint 7.2 s	▲ Largest Contentful Paint 26.1 s
▲ Total Blocking Time 930 ms	● Cumulative Layout Shift 0.035
▲ Speed Index 11.3 s	

Captured at Nov 11, 2025, 11:55 AM GMT+1 | Emulated Moto G Power with Lighthouse 13.0.1 | Single page session
Initial page load | Slow 4G throttling | Using HeadlessChromium 137.0.7151.119 with lr

Mobile | Desktop

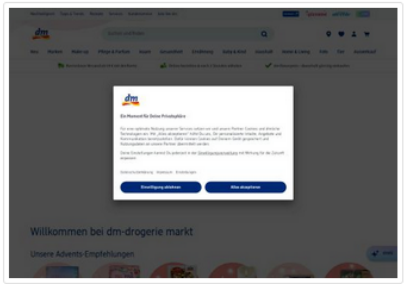
28 Performance | 95 Accessibility | 96 Best Practices | 100 SEO



Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. See calculator.

▲ 0–49 ■ 50–89 ● 90–100



METRICS Expand view

● First Contentful Paint 0.7 s	▲ Largest Contentful Paint 4.7 s
▲ Total Blocking Time 740 ms	▲ Cumulative Layout Shift 0.265
▲ Speed Index 4.3 s	

Captured at Nov 11, 2025, 11:55 AM GMT+1 | Emulated Desktop with Lighthouse 13.0.1 | Single page session
Initial page load | Custom throttling | Using HeadlessChromium 137.0.7151.119 with lr

https://pagespeed.web.dev/analysis/https-www-dm-de/mt8gqozxeo

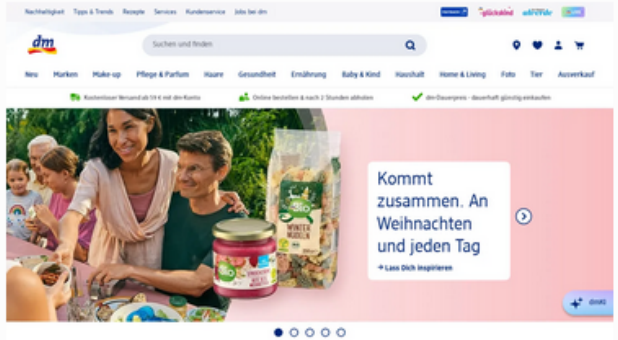
dm.de

eco Index

G

Ouch.

Score: 8 / 100



Let's not hide it: it hurts. Time to act!

max. 100 min. 0

A B C D E F G

Page rank:	**534083 / 546563**
Too heavy	3.529 Mb
Too complex	3324 elements
Too many requests	239 requests

Too heavy

Page weight

3.529 Mb

min median: 2.41 max

Target: 1.024 Unit: megabyte (Mb)

Too complex

Complexity

3324 elements

min median: 693 max

Target: 600 Unit: Number of DOM elements

Too many requests

Requests

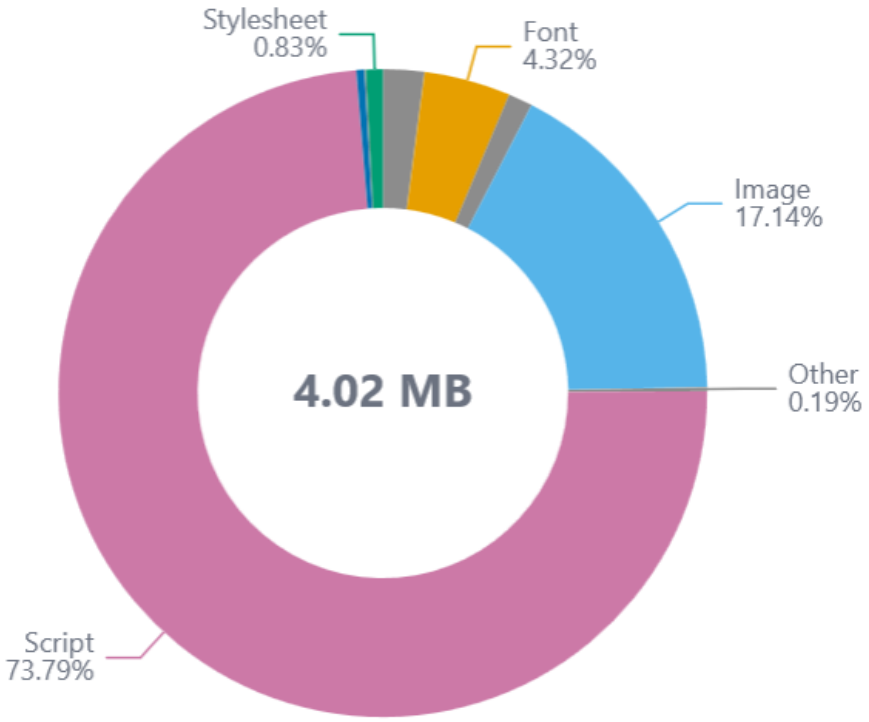
239 requests

min median: 78 max

Target: 40 Unit: Number of server requests

https://www.ecoindex.fr/en/result/?id=844ac0b4-3382-4b67-8f67-09a9e409c470

dm.de



All Resources

Resource	Size
Script	2.96 MB
Image	704.8 KB
Font	177.58 KB
XHR	84.13 KB
Fetch	49.94 KB
Stylesheet	34.1 KB
Document	16.16 KB

https://web.cardamon.io/reports/sTVww

dm.de

- Good:
  - images are optimized! (webp, biggest image has only 80 kB)
  - no videos!
  - caching is used!
  - …
- Bad:
  - >200 requests!
  - ~3 MB of JavaScript!
    - a lot of duplicated and unused scripts
    - login.js >300 kB transferred size

Agenda

- Introduction
- Methodologies & Tools
- User Interactions
- Good & Bad Websites
- **Conclusion**

Conclusion

- **Tools & Methodologies**
  - Understand the scope and limitations of each tool
  - Results may vary significantly between different approaches
  - Measure beyond just data transfer
  - Select the right methodology & tool for your goals
- **User Interactions**
  - The more your tests reflect actual user behavior, the more valuable your insights
- **Act on Results**
  - Leverage recommendations as a starting point
  - Transform insights into concrete actions

Questions?

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