UMBRACOSPARK #SPARKQA

A Sustainable Approach to the web

Neil Clark and Thomas Morris











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Hello Umbraco Spark!







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Context













Organisational design & change

Umbraco

Technology and engineering

experience

Rock Solid

Enterprise

Data & artificial intelligence

Managed services





applications



People, Planet, Community

We're committed to building sustainable futures for our People, our Planet and our Communities.



People

Decreasing pay gaps, representation gaps and gaps in inclusivity. Employee wellbeing and satisfaction. Measuring, reducing and removing our carbon footprint. Removing barriers for our employees. Leading industry change.

Planet



Community

We are equipping our communities with future-proof skills, kickstarting 5,000 digital careers.











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Clients & Partners Employees Organisation Empower our employees Drive change in our industry Leave no trace **Collective action** Ways of working Measure, reduce and remove our footprint Behavioural change **Planet projects**

Rock Solid Knowledge **#SPARKQA**

The climate crisis doesn't happen in a vacuum

Climate change isn't solely an environmental issue. It's rooted in a web of ethical, political, and systemic issues. A lot of these issues overlap with tech, design, and how we do business.

- 🎧 Listen to <u>Introduction to climate justice</u>
- > Watch <u>A chat about climate justice</u>

This slide has been stolen with love from <u>Sandra Pallier</u> 🙏





Emissions Sources & Natural Sinks





It was COP27 🥳







It was COP27 😖













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It was COP27 🔬



Umbraco GIBE State GB Rock Solid Great State





It was COP27 🔛



WRONG DIRECTION: Change is heading in the wrong direction, and a U-turn is needed

G	Share of unabated fossil gas in electricity generation
G	Carbon intensity of global steel production
	Share of kilometers traveled by passenger cars
~	Mangrove loss
	Agricultural production GHG emissions

U-turn needed U-turn needed U-turn needed U-turn needed U-turn needed





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GIBE

Great State

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Rock Solid Knowledge

WELL OFF TRACK: Change is	heading in the right direction,	but well below the required pace

/	Deforestation	—→ 2.5x
G	Carbon intensity of electricity generation	<u> </u>
1	Ruminant meat consumption	> 5x
/	Total public financing for fossil fuels	> 5x
/	Energy intensity of building operations	5x Commerical 7x Residential
5	Share of unabated coal in electricity generation	——→ 6x
1	Number of kilometers of rapid transit per 1 million inhabitants	——————————————————————————————————————
1	Crop yields	———→ 6x
1	Median carbon price in jurisdictions with pricing systems	> 8x
L	Carbon intensity of global cement production	→ 10x
5	Green hydrogen production	> 10x
/	Number of kilometers of high-quality bike-lanes per 1,000 inhabitants	> 10x
5	Share of electric vehicles in the light-duty vehicle fleet	> 10x
L	Technological carbon removal	> 10x
/	Global total climate finance	> 10x
/	Global public climate finance	> 10x
/	Global private climate finance	> 10x
/	Share of global emissions under mandatory corporate climate risk disclosure	> 10x
5	Share of battery electric vehicles in medium- and heavy-duty vehicle sales*	Ins. data
5	Share of sustainable aviation fuels in global aviation fuel supply*	Ins. data
5	Share of zero-emission fuel in maritime shipping fuel supply*	Ins. data

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OFF TRACK: Change is heading in the right direction at a promising, but insufficient pace

1	Ruminant meat productivity	→ 1.3x
1	Reforestation	—→ 1.5x
5	Share of electricity in the industry sector's final energy demand	—→ 1.7x
5	Share of electric vehicles in light-duty vehicle sales*	 5x
5	Share of zero-carbon sources in electricity generation*	6x
5	Share of battery electric vehicles and fuel cell electric vehicles in bus sales*	









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ON TRACK: Change is occurring at or above the pace required to achieve the 2030 targets

NONE





Why does that matter to organisations?







The digital industry is responsible for around 4% of global emissions; above that of the aviation industry...







... And since the Paris Agreement, average <u>web page size has increased</u> almost 60% on desktop and over 125% on mobile







Global trends in digital and energy indicators, 2015-2021

	2015	2021	Change
Internet users	3 billion	4.9 billion	+60%
Internet traffic	0.6 ZB	3.4 ZB	+440%
Data centre workloads	180 million	650 million	+260%
Data centre energy use (excluding crypto)	200 TWh	220-320 TWh	+10-60%
Crypto mining energy use	4 TWh	100-140 TWh	+2 300-3 300%
Data transmission network energy use	220 TWh	260-340 TWh	+20-60%













Why isn't the planet a stakeholder in digital projects?







But this isn't just a developer or engineering problem



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What needs to be done?

Energy efficiency

Actions taken to make software consume less electricity when performing its functions

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Hardware efficiency

Actions taken to make software need fewer physical resources when performing its functions

Carbon awareness

Actions taken to understand how much carbon is on the electricity grid and react accordingly, to use renewable energy

Inform and educate

Raises awareness of why digital things cause emissions and how that is being addressed



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Technical tips







We have standards and checklists for other aspects of the web. You can test and get a **score**.



What do we have for sustainability?





There is no accepted checklist for sustainability, but there is progress.

- > W3C working group
- Green Software Foundation
- BIMA sustainability council

We will show you some of the approaches you can take and would be a good starting point for consideration.









How do we measure all this?







Set up a regular ping for your website's carbon emissions

- > Where do my website's resources come from?
- How green are they?
- Understand your monthly impact
- Diagnose issues
- Track changes over time







gCO2e over time

Last 3 days

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This is what your website's CO2e looks like over time.



 Over a year, with 5,000 monthly page views, TPXimpact produces.
 Change this monthly value e
 5000

 kg of CO2e 1
 Cup of tea 1
 Farts 1
 Trees 1

 14.80
 208.45
 740,000.00
 0.59







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53.5% EcoScore	1_r 0.3	<u>1 page</u> of your site produced <u>0.35 gCO2e</u> per page view.		
Site Stats Looking at 1 pages of your w EcoScore • 0.53 Page Load Time • 2s	vebsite, here are your l CO2 gra 0.35 Perform 0.98	key stats.	Grid Intensity 378.00 SEO 1	Transfer size 1.8 MiB
0.067g	0.053g	0.050g		0.185g
Hardware production	Data center use	Network use	Consumer device use	







We will look at this from 3 main areas of interest.

Combined this can have a substantial impact on your footprint.









02.1 Infrastructure









What does it mean to be green?






Data centres require a lot of energy to run.

How efficient are they?
Do they use renewable energy?
How is electrical waste handled?

Green Web Foundation publishes a directory of green hosts: https://www.thegreenwebfoundation.org/directory/







For Umbraco, we typically use Azure for hosting. Umbraco Cloud is also running on Azure for all it's services.



But what does this mean from a sustainability perspective?







Azure, as a part of Microsoft, has been 100 percent **carbon neutral** since 2012. This means they are removing as much carbon each year as they emit, either by carbon removal (carbon offsetting) or reducing carbon emissions.

By 2025, Azure will shift to 100 percent supply of **renewable energy**.







Is it really green?

Whilst you may be hosted with a green provider, websites typically utilise resources that come from all across the world.

...and not all countries produce green energy.

Iceland - 100% renewable and low-carbon **United Kingdom** - mostly renewable, but also reliant on imports







Found bugs or have ideas? Report them here.

Anything unclear? Check out our frequently asked questions.









Electricity production by source







Carbon aware development







Consider when the grid is filled with renewable energy sources.

If the grid is in high use, it may be using a high amount of fossil fuels.

Let's revisit our **electricity map**...











Electricity production by source





In development terms...

- > Send form submissions at a later time
- Batch up newsletter campaigns
- > Apply patches outside of peak times
- Deploy when the grid is low intensity









Let's deliver content close to our users













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By utilising a Content Delivery Network, we can deliver content efficiently.

- Less travel time
- Less bandwidth
- Less effort from origin servers
- Greater performance
- More secure







CDN usage vs hosted resources



Percent of requests









How can we be efficient with data?







Turn on HTTP/2

Allow for more requests, by loading them concurrently. Easy enable on most servers. Minify assets

Minify static files to keep the file sizes low

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S Compression

Reduce file size even further using compression with Gzip/Brotli Caching

Cache responses effectively so that the server doesn't have to work too hard





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A serverless function could provide the experience we need

- > On demand resources
- Resources are allocated when needed
- Execute as individual functions
- Low impact







Can we utilise a different approach?

JavaScript, APIs and Markup
 Serve static content
 Composable architecture
 Shift for developers
 Lots of hosting options











MACH is an industry tech standard describing modern technology.

Microservices
APIs first
Cloud native
Headless









What about bad bots?







Not all bots are bad, but unfortunately 25% of traffic is from bad bots.

Submit junk data
Hijack accounts
Scrape content
DDoS attacks

Let's look at some options we have...







> Robots.txt

- Rate limiting
- **Block IPs**
- >
- Super Bot Fight Mode!

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Configure Super Bot Fight Mode



Likely automated traffic can include bad bots, along with other traffic. Select an action for this traffic.

Allow

• Off

On 🕂

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Verified bots

Verified bots are unique good bot identities validated by Cloudflare. Select an action for verified bots for this traffic.

Static resource protection

Enable if static resources on your application need bot protection. **Note**: Static resource protection can also result in legitimate traffic being blocked.

JavaScript Detections

Use lightweight, invisible JavaScript detections to improve Bot Management. Learn more.









Let's turn off what we don't need







These websites are typically not needed that often

> Extra resources

- Low usage
- Ramp up when needed
- Consider impact







	TDVimpact website		Done take me back
	Tr Ampact website		Done, take me buck
	You are unable to remove the Developme before Ye	ent environment as you have a Staging environr removing this environment s, delete this environment	nent, remove it,
	 Staging - Remove the 	View page	to backoffice Environment history
	If you don't need the Staging environment changes on the environment a	: you can remove it. Make sure that you don't h as they'll be lost and this operation can't be und s, delete this environment	ave any pending ione
	• Live -	View page — Go	to backoffice Environment history
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Set up Azure runbooks to amend resources when not in use

- > Use the Azure cli
- Schedule for regular times
- Switch off or scale down after work
- Automated quick win







02.2 Front end









Images are the most popular resource type on the web









Combined they consistently add the most to page weight







Image size distribution

Web Almanac 2022: Page Weight



Percentile







Optimise upload

Optimise images for storage, these can then be handled effectively

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Better formats

Use newer formats such as Webp and AVIF in favour of JPEG or PNG

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Suitable sizes

Adjust images to the viewport of the user

Caching

Cache images so the user doesn't download multiple times





Ensure the image stored is optimised in size

> Use a tool to optimise
> Optimise during upload
> Show warnings within the CMS
> Upload the max size required











Serve the best format possible







Distribution of image sizes by format

Web Almanac 2022: Page Weight





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- > The most common format.
- > Standard from the late 1980s.
- > Supported in all major browsers.
- Lossy compression

Our image is 1.01 MB as a JPEG file. 664 kB with some optimisation.






- > Widely used for high quality images
- > Allows for transparency
- Launched in 1995
- Supported in all major browsers.
- Lossless compression

Our image is 7.46 MB as a PNG file.







- > Designed to supersede JPEG and PNG
- > Allows for transparency
- Launched in 2011
- > Supported in all major browsers.
- Lossy and lossless compression

Our image is 363 kB as a WEBP file.







- > Up to 10x smaller than JPEG
- **>** Generally offers the best results
- Supported in some browsers.
- Introduced in Chrome August 2020.
- Lossy and lossless compression

Our image is 294 kB as a AVIF file.





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- > Allows us to support the best possible formats today.
- > Can still support legacy browsers if we need to
- Browser will load the most relevant image

<picture>

<source srcset="**photo.avif**" type="image/avif"> <source srcset="**photo.webp**" type="image/webp"> </picture>

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- Default behaviour for assets is eager loading
- Images are being loaded regardless of placement on the page
- Images only load when they come into view.







- > Turn off autoplay for videos
- > Set preload to none to prevent browsers from loading data.
- > Use a poster image to showcase where a video is used.









Can we use an SVG instead?









How about the use of fonts?







Optimise for use

Optimise fonts for the device, and use custom styles sparingly

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Better formats

Use only WOFF2 and forget about everything else.

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D Limit variations

Reduce the number of font variations required to be efficient with usage Self host

Self host and use a CDN for

caching of requests





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Usage of CSS generic font family names



Percent of pages

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- > Custom fonts need to download
- > We can make use of fonts that are pre-installed on a device.
- > Extra benefit in that they match the look and feel of the OS.

:root { --system-ui: system-ui, "Segoe UI", Roboto, Helvetica, Arial, sans-serif, •••







- > Subset could be latin chars only
- > Provide a hint for the unicode range
- Browser will download if it finds a match

@font-face {
 font-family: LatoSubset;
 src: url('path-to-optimized-lato.woff2') format('woff2'),
 url('path-to-optimized-lato.woff') format('woff');
 unicode-range: U+65-90, U+97-122;

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If you do use custom fonts, then self host should be preferred.

Using Google Fonts results in extra round trips (and tracking)

Remove a reliance on a 3rd party

google webf	onto holpor											
Get eot, ttf, svg, v	woff and woff2 file	+ CSS snippets										
Doppi	o One											
sans-seri	f											
1 style regular								Rank	734 in popul	larity of 14	38 fonts i	in tot
2 charsets latin, la	tin-ext							Last r	modified 20)22-09-2	2 (v13)	
1. Select cha	rsets: (default i	latin)										
🖉 latin 🗌 latin	-ext											
2. OCICOL Styl		aulan)										
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Can we make sustainable design choices?







Colour choice

Use a more sustainable colour palette as certain colours use more energy

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Image use

Use smaller images and in less places, say no to stock images and prefer illustrations. Low carbon

Adjust the design based on low grid intensity

Inform

Be visible about your design choices and the impact we can have

























More data means more carbon emissions.

While the median page weight of websites is increasing every year, we are collecting websites that go in the opposite direction without compromising design quality.









02.3 Content









Redundant, out of date or trivial content?







Redundant

Duplicate content, confusing to users and bad to the planet.

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Out of date

It's possible for content to go out of date as things change and don't get audited. 3

Trivial

Content for content sake. Understand the value of the content being added. No longer used

Review content that is no longer required and has no purpose.







How to reduce redundant content.

Content audits
Card sorting
Consider the page UX
Editor warnings







How to reduce out of date content.

- > Content audits
- Show last updated
- > Flag stale content in Umbraco
- Notify users







How to reduce trivial content.

> Content audits

- If in doubt, leave it out
- Readability score, e.g. Preflight
- > Editor warnings







Images

Is it just decoration? What impact does it have? Can it be done with colour? Is it actually in use?

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Integrations

Evaluate purpose and which sources are in use. Are they duplicated? Are they worth it?

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Data

Ask only what is necessary. Define why it's important. Keep data for as long as it's needed.

Downloads

Review content that could be made available as HTML first content, e.g. instead of PDFs

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Let's be HTML first

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Use web pages instead of PDFs

- > Avoids large downloads
- Web pages load upon request
- > Provide suitable navigation
- Allow for search
- > More accessible







What we can do





As an organisations/agency

Adopt low carbon practices

Formalise the why, how and what

Make it everyone's problem

But make sure someone is really pushing it

Challenge your client's brief

It's easy at first but stick with it

Open source your ideas

The successes and the failures; add to the bank of knowledge













Umbraco functionality changes

Hosting and infrastructure

Community







Umbraco functionality changes

- AVIF support
- Aggressive defaults for backups, versions and other data storage
- Carbon aware defaults for backups, deployments, patches, resource allocation, versioning etc
- > Device power consumption of rendering a page
- CO2e/page weight budgets and alerts







Hosting and infrastructure

- CDNs and caching
- Bot blocking
 - Plugin management
 - Payload compression
 - Hosting transparency
 - Make the planet a stakeholder of future hosting decisions, e.g. data centre locations

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Community

- Can we set up a planet or low carbon focused community group?
- How do we maintain a dual focus on best practice when developing with Umbraco and changing the core of Umbraco?
- Could we publish a "What would a sustainable Umbraco community look like" as per Wordpress?
- How might the marketplace reflect the need for low carbon websites?







Questions?







Thank You

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