# Platitudes: The Carbon Weight of the Post-Platform Scholarly Web

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**Abstract:** This article interrogates the environmental consequences of our dependence on platforms, which increasingly includes higher education and the ways in which we share and disseminate scholarly research. We make a case for a minimal computing–inspired, back-to-basics approach to web design as a strategy to push back against the hegemony of big tech and adopt more reflexive, slow, and eco-conscious forms of knowledge production. At the same time, we are open about the trade-offs of deplatforming a scholarly project, using the authors' experience creating the University of Alberta SpokenWeb website as a case study.

The University of Alberta is part of the SpokenWeb Network, a Social Sciences and Humanities Research Council (SSHRC)–funded network that aims, among other things, to showcase local collections of literary sound. The University of Alberta's own archive, which dates back to 1957, features sound performances, interviews, lectures, and radio shows made by visiting authors and captured on reel-to-reel and cassette tape. When creating the project website, the team wanted to take a more hands-on approach, using a lightweight, static site design, which was inspired by the "needs-based" critical praxis of minimal computing (Risam and Gil 2022, 6). The challenge, as we found, was in how to negotiate sustainability in terms of carbon cost and the long-term maintenance and care of the archival materials, which for us meant finding ways to bridge between our digital project website and the existing University of Alberta library infrastructure. Along these lines, some of the key questions our article engages with are: How do you measure the carbon impact of a digital project? What practical steps can researchers take to design (or redesign) a website to minimize the energy cost? How might moving away from platforms to static sites change the labor distribution, in terms of how sites are maintained, updated, and preserved?

**Keywords:** digital humanities, platform studies, minimal computing, sustainability, research preservation

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How can online publishing be more sustainable, both in terms of energy consumption and labor? In this article we push back against the ideology of platform capitalism, exploring how more reflexive, slow, and eco-conscious forms of knowledge production can take inspiration from the "needs-based" critical praxis of minimal computing (Risam and Gil 2022, 6), with its origins in the do-it-yourself web design modalities of the early static web.

Since the advent of Web 2.0 in the mid-2000s, goods, services, and activities have increasingly become mediated through platforms (Poell et al. 2019). These include research outputs, so that one of the ways academic institutions participate in platform capitalism is by subscribing to suites of educational tools and applications, such as Google for Education and Microsoft for Education, as well as content management systems (CMSs), such as WordPress, Drupal, and Omeka. Website-building platforms such as Google Sites or Wix make it possible for researchers to manage and publish content online with little technical expertise. Though easier to get off the ground and easier to use to maintain content, CMS-based websites have stacks of dependencies that must be continually updated and patched. As Quinn Dombrowski (2022) puts it, the scholarly community's reliance on web-building platforms presents a "longevity" problem. What happens to the website when the funding runs out and the research project ends? Who will "maintain" it (Dombrowski 2022)?

As Alex Gil (2015) points out, one of the effects of academia's dependency on platforms to share and disseminate knowledge has been a growing disconnect between scholars and the "material conditions of their own knowledge production—digital and analog—with noxious effects for labor and ecological practices." Though platforms can offer academic institutions an efficiency of scale, the growth of platforms has caused a surge in online activity with negative consequences for the environment. Cloud computing recently overtook the airline industry in terms of the size of its carbon footprint, and its electricity consumption, now at 3% of the world supply, is set to quadruple by 2030 (Monserrate 2022).

Overproduction within academia is, in part, symptomatic of platformization, which increases the pressure on researchers to produce ever more *content*, not only in traditional publications but also as online tutorials, webinars, workshops, wikis, archives, and social media posts. In this article we therefore make the case for minimalist approaches to publishing on the web that are more sustainable, both in terms of labor and in terms of the carbon footprint of the publication. We will start by articulating how minimal computing can be situated within platform studies as a strategy to resist big tech's hegemony of information vis-à-vis proprietary platforms. Next, using the SpokenWeb UAlberta website as a case study, we will reflect honestly on the possibilities as well as challenges of minimal computing approaches to web publishing, particularly within the contexts of academia. We will explain the complexities of measuring the carbon impact of a digital project and the different factors at stake, and we will offer a few actionable steps that research teams can take to design (or redesign) their website to be more sustainable. Finally, we will touch on the tensions between open access, longevity, and sustainability and consider how minimal computing approaches, particularly static sites, can be used to archive a project, once the content needs to be retired and taken offline. Through our case study, we hope to invite a larger conversation around sustainable publishing and the environmental connotations and consequences of our media environments.

## Platforms

Though many of us can name a platform (or several), platforms are difficult to characterize. Indeed, as *Wired* journalist Leo Kim (2023) points out, the ubiquity of platforms is part of what makes them tricky to pin down: "platforms creat[ed] a new kind of object for us—one that doesn't even follow the thin logic of existing categories, instead inhabiting a unique sort of non-being that makes it notably difficult to understand." Platforms, in the computational sense, are defined as a "stage" or base that provides the tools and environment for other programs to run. But what does that mean, *really*?

Before computers, platforms were primarily understood as physical structures, a "raised, level surface or place," around which social and political activities were oriented. The political sense of the word, as a set of policies or plans, likely came from the "literal platform on which politicians gather, stand, and make their appeals."[1] The origins of the term offer insight into the social and economic function of platforms in the present day as well as point to the importance of metaphor in times of change to facilitate the adoption of new technologies.

Platforms are not just technological but social structures. One of the defining features of platforms is their role in networking. Platforms may provide tools, storage space (as in cloud platforms), and rules and standards of conduct (Srnicek 2016, 29–31; Gorwa 2019).[2] However, they function first and foremost as "intermediaries" (Srnicek 2016, 24). Platforms in their purest sense do not actually produce goods, services, or information, only facilitate their exchange. Platforms are gathering places that connect sellers and buyers together in what is called a two-sided or multi-sided marketplace system (Rochet and Tirole 2003; cited in Poell et al. 2019, 7). As such, their success depends on the ability to attract and grow their user base.

1. Online Etymology Dictionary, "platform," accessed January 13, 2025, https://www.etymonline.com/word/platform.
2. For a definition of platform governance and how policies shape their politics, see Gorwa (2019); for an archived history of the policy changes of major social media platforms, see the Platform Governance Archive (PGA).

Platforms as we know them today took off in the middle of the first decade of the 21st century and were integral to the shift from a static, read-only web to a dynamic, interactive web. The new platform-driven internet, which was branded as "Web 2.0," was marketed as a more individualized, "democratized," and empowering space, where anyone could create and share content (Srnicek 2016, 27).[3] Indeed, platforms such as YouTube, through their very name, announced the arrival of a novel internet browsing experience, a web created *for you* (Gillespie 2010, 352–353). The term "platform," as a way of describing social networking services, was coined in reference to early "social gaming" applications like Friendster in 2002 (Ellison and Boyd 2013, 151, 158). Other platforms quickly followed: MySpace in 2003, Facebook in 2004, YouTube in 2005, Twitter in 2006, Instagram in 2010, and TikTok in 2016.[4]

Critics of platform studies, such as Dale Leorke (2012), argue that the notion of a "platform" is little more than a branding strategy. Josh Hands is similarly skeptical of how the rise of the "so-called platform" has been sold to users as a way to facilitate and normalize the "capture" and monetization of "digital life" (2013, 1). At the same time, Hands argues that "platforms" are "useful" as a way of conceptualizing not *things* in the consumerist sense, but rather a set of "distinct phenomenon" (1). As discussed, the term "platform" entered popular discourse just as the internet was being redefined, with the "singular" World Wide Web replaced by a world of platform-mediated interactions (1). As a consequence of platformization, the "operations" that "typify" online culture are increasingly hidden and made inaccessible to users; in a sense, as Hands put it, "the Internet is vanishing" (1). Anne Helmond (2015, 3) similarly describes the "platformization of the web" as a historically constituted process, which we are still undergoing. She observes how the growth of social media platforms had a transformative effect on the internet, with third parties adapting to accommodate the demand for "platform-ready data" (3).

Platforms have been defined as both a media environment and a mechanism of social, political, and economic change, with platform studies in recent years focusing on how the logics of platform capitalism have transformed the internet and society at large (Poell et al. 2019, 4). Along these lines, platforms can also be understood as a metaphor and means for negotiating and sublimating the anxieties around these changes. Even as platforms proliferate, their workings and governance have become obfuscated. Case in point, there are manifold types: from operating system platforms, such as Windows, Mac, and Android, to marketplace platforms, such as Uber, Skip, and Etsy, to media streaming platforms, such as YouTube, Spotify, and Netflix. Though we are surrounded by platforms, they are, as Kim puts it, "conceptually slippery" (2023). He uses the example of the mega-platform Google, which encompasses an ever-increasing suite of tools and

3. See also O'Reilly (2005) and Mayo and Newcomb (2008).
4. For a fuller history of the rise of social media and "platformed sociality," see Dijck (2013, 4–7).

applications: "It is undoubtedly real . . . yet it is also incredibly difficult to perceive directly. It is phantomlike, fleeting, observable only via the periphery, always sitting just beyond any specific products, apps, codebases, or websites you might encounter, while remaining constantly present. If I asked you to point at Google the platform, it's unclear what you could point to, though anything you did point to would almost certainly be part of it." As Kim muses, "If everything is a platform, does that mean nothing is a platform?"

The ambiguity of platforms is integral to their logic, in that it has allowed corporations to skirt regulations and facilitated their enormous growth (Gillespie 2010, 352–53).[5] Kate Crawford writes, similarly, of how the metaphor of the cloud functions to forward the agenda of the AI industry by "imply[ing] something floating and delicate, within a natural green industry" and obscuring the human and environmental costs (2021, 50).[6]

As Nick Srnicek explains, the "network effect" of platforms also creates a "natural tendency towards monopolisation," which favors those who enter the market early on (2016, 25). The significant advantage of having a large user base (and supply of data) inhibits smaller players from "breaking in," ultimately frustrating competition (Poell et al. 2019, 25). That the platform economy has become concentrated in the hands of a few large tech giants is part of the reason why platforms themselves defy easy categorization. Once a platform has monopolized a marketplace, the lack of alternative options makes it difficult for users to leave. This creates the conditions for a phenomenon that Cory Doctorow (2023) terms "enshittification." Having created a dependency on their service, the initial perks will disappear; users and business customers alike will find the cost of using the service increases, while the quality declines, in order to maximize profit for the corporations (Doctorow 2023).

The ramifications of platform capitalism for the environment include, among other things, the spread of mis/disinformation. In November 2024, the United Nations and UNESCO launched a Global Initiative for Information Integrity on Climate Change in order to combat "disinformation campaigns that are delaying and derailing climate action" (United Nations 2024).[7] UN Secretary-General António Guterres stated that "We must fight the coordinated disinformation campaigns impeding global progress on climate change, ranging from outright denial to greenwashing to harassment of climate scientists" (cited in United Nations 2024). Bram Büscher in the *The Truth About Nature* argues that attempts to utilize social media to galvanize support for a "online green movement" have been largely unsuccessful, because these platforms are predicated on

5. See also Huws (2020); Edelman and Geradin (2016).
6. See also J. R. Carpenter's *The Gathering Cloud* (2016), a multimedia work that uses the materiality of clouds in the sky to trouble the "cultural fantasy of cloud storage."
7. See also European Commission (n.d.); Local Governments for Sustainability (n.d.).

an algorithmic system that is indifferent to truth: "new media make it more difficult to see—because of the density of the digital natureglut—that the workings of platform capitalism might rather undermine any long-term effective conservation movement or 'green army.' Speaking truth to power, therefore, necessitates confronting capitalism" (Büscher 2021, 147).

Higher education might be faced with a similar reckoning. As pointed out by Martin Grandjean (2015), given how digital humanists are often "at the forefront in the use of digital tools," it is perhaps no surprise that the community embraced social media. The uptake of Twitter (now X) was driven, in large part, by gatherings like the Digital Humanities Summer Institute (DHSI), with participants live-tweeting sessions since at least 2009 and even earning prizes for "top tweets." Grandjean's 2015 blog post—"Digital Humanities on Twitter, a small-world?"—which features a network visualization of 1,400 digital humanities-connected Twitter users, is indicative of the degree to which the platform was utilized by the field's leading researchers and organizations. That said, after peaking in 2015, there has been a noticeable fall off of DHSI-related Twitter activity, which some took as a sign that the reign of the DHSI Twittersphere had come to an end. Jessica Ottis, writing in 2020, called these predictions premature, attributing the decline in DHSI-hashtagged tweets to a welcome influx of new voices and the end, not of the platform itself, but of the dominance of a core group of influencers, the "DHSI Twitterati." These anxieties around the "death of DHSI-Twitter" are indicative of a deeper discomfort with the discursive power wielded by platforms. Academics utilize social media in various ways including networking, sharing work, and building a research profile. Yet how do academics reconcile the usefulness of platforms in communicating research to the public with their role in the spread of mis/disinformation? Even before the acquisition of Twitter by Elon Musk in 2022, the platform was known to have a problem with promoting falsehoods and conspiracy theories, with one 2020 study showing that the more false a claim was, the faster it circulated (Shahi et al. 2021). When it comes to climate-related disinformation, a study by Climate Action Against Disinformation Coalition (2023) ranked Twitter/X the worst of five social media companies, the others being Meta, Pinterest, YouTube, and TikTok.

Although DHSI, ADHO, and *Digital Humanities Quarterly* still maintain X feeds, the activity has significantly quieted. If X is no longer the "it place" for digital humanists, where next? Discord? Bluesky? The solution is not as simple as convincing those in the field to "move house," since platforms make it notoriously difficult for users to export their networks and rebuild those same connections and presence in a different online space (Doctorow 2023). The mass exodus from Twitter/X, which has only accelerated since Trump's election in November 2024 (Boyd 2024), demonstrates the risks of relying on a proprietary platform to build a research community and presence: mainly, the question of what happens to that community and its data when the platform's rules and policies change, so that they no longer align with a community's values, or when the platform itself folds.

Higher education is also bound up with platform capitalism in another sense, through the rise of EdTech. Academic institutes increasingly depend on platforms for teaching and learning. Tanner Mirrlees and Shahid Alvi argue that these digital technologies are "not neutral" and have facilitated the commodification of education: "public knowledge is fast becoming the site of private accumulation for the EdTech industry. . . . Capitalism is reducing higher education to a market, to a digital factory and to a commodity: too often, its role and goal is to train students to consume, to produce and to sell themselves" (2020, 10–11). In this way, higher education has become an extension of the platform economy (23). The pandemic accelerated the adoption of EdTech and, in turn, the platformization of education. Roopika Risam and Lee Skallerup Bessette observe how in the rush to "solve" a problem that did not necessarily need solving, there was little thought as to the ethical connotations and consequences, not just for privacy and security but for the environment: "none of us had the opportunity to reflect on the very real question of 'what do we actually need?'" (2024, 749).

Another way in which academic culture has become platformized is through its reliance on CMSs, or platforms for publishing content online. Researchers have many uses for public-facing websites: an organization, a research project, a collection or exhibit, a conference or symposium, a workshop, a course website, a journal, a digital portfolio or CV, or a personal blog. CMS platforms, such as WordPress, Wix, and Drupal, have a lower technical barrier to entry, allowing users with no prior web development or design knowledge to easily create and publish online content. That said, users have less control over their content. As with social media platforms, making use of CMS services presents similar concerns around platform governance and the need for users to navigate changing rules and regulations. CMS platforms rely on stacks of dependencies and must be continually updated to remain functional and secure, which has consequences for the long-term security and longevity of research data.

What of the environmental impacts? There are multiple factors to consider when weighing the carbon cost of a research project. A 2024 study published in *Nature* looked at how the growing demand for internet services contributes to carbon emissions and puts additional strain on the global community's "capacity" to keep within the 1.5°C-warming threshold. The researchers found that the consumption of online content, which includes "web surfing, social media, video and music streaming, and video conferencing," could constitute a whopping 40% of the average individual's carbon share in order for this target to be met (Istrate et al. 2024). The carbon impacts of online activity can be exacerbated or mitigated, depending on how the content has been formatted, stored, and ultimately delivered to the user. These design-level decisions, which unlike user-end costs are, to an extent, within the control of the researcher, are the focus of our article.

Because content is dynamically generated, with data processed on the server side typically in response to user interactions (such as clicks or scrolls), websites created with CMSs have a higher computational load. The nature of dynamic websites, which are generated on the fly, makes it more difficult to archive and preserve the sites offline. In order to keep users "locked in" and dependent on their services, platforms also tend to make it difficult for users to export their data (Doctorow 2023). As such, the tendency is for online content to accumulate, and this, too, has a carbon cost. One of our aims here, as detailed in the next section, is to reflect on what the process of *deplatformizing* a scholarly publication might entail, using minimal computing approaches that make visible the steps in the web design and development process and their potential carbon cost that CMS platforms typically automate and render invisible.

## Minimal Computing

Minimal computing is not a fixed set of tools or techniques, but rather a critical praxis, with roots in the digital humanities (Risam and Gil 2022, 3). Minimal computing is deeply concerned with issues of access, particularly in exploring research practices that can be utilized by communities with limited resources, including those in "low bandwidth" areas (17). Though not a strictly "green" movement, minimal computing has been described as "akin to environmentalism" in that it draws inspiration from concepts like "de-manufacturing and reuse" (Minimal Computing, n.d.). Minimal computing pushes back against the "fetishization" of "newness" and instead focuses on recognizing and utilizing the "assets" and resources at hand (Risam and Gil 2022, 3, 6–7).

The minimal computing movement, though not often framed in relation to platform studies, parallels a growing skepticism of and resistance to the ideology of platforms. As detailed in the previous section, proponents of platform capitalism promise users greater connectivity, greater freedom and creativity, and a more individualized experience.[8] The reality is that platforms are sites of accumulation, which in turn constrain their users in myriad ways. The early optimism and utopian dreams of an internet that was simultaneously for all and for "you" has been replaced by general feelings of anxiety, alienation, and mistrust. Indeed, as the headline for Kaitlyn Tiffany's 2021 *The Atlantic* article declares, "the internet 'died' five years ago" (2021). That said, for Büscher, the solution is not necessarily to "abandon algorithms and social media platforms altogether" (2021,

8. For a discussion of the ideologies of Web 2.0, see Lialina (2024).

147). At the conclusion of *The Truth About Nature*, he suggests that platforms could be "meaning-rich" if they were divested from the logic of capitalism (147).

As Tiffany (2021) observes, the increasing dissatisfaction of users has fed a wave of nostalgia for the early days of the web, before platforms: "People talk about longing for the days of weird web design and personal sites and listservs all the time. Even Facebook employees say they miss the 'old' internet." There has been a corresponding resurgence of interest in the do-it-yourself practices and methodologies of Web1 and a revival of lightweight, static web design, which relies on open access tools and web standards. These include static site generators such as Jekyll (Maroli 2024), Hugo (Pedersen 2024), VuePress (Liu 2024), and Pelican (Mayer 2024) and non-proprietary social networking services such as SpaceHey (Röhm 2020), NINA (Showoff 2024), and Escargot(Showoff 2017), which are modeled after MySpace, AOL, Yahoo Messenger, ICQ, and MSN Messenger. Within the digital humanities, notable Jekyll-based minimal computing projects include Ed (Torrent et al. 2019), Wax (Nyrop and Gil 2019), and AVAnnotate (Clement and Brumfield Labs 2025).

Risam and Gil, drawing upon Matt Kirschenbaum's (2009) concept of coding as "worldmaking," suggest that minimal computing is a way to "create new worlds in which we model human knowledge and culture" (Risam and Gil 2022, 16). Minimal computing aligns with Büscher's concept of a "post-capitalism platform" (2021, 147) in that it similarly invites researchers to imagine how technologies (and platforms) could be repurposed "for justice," as opposed to for profit, with the goal of remedying the "catastrophic and slow hurt that result from the manic pursuit of techno-utopias and unscrupulous profit" (Gil 2022).

That said, building a minimalist, eco-conscious scholarly website presents unique practical challenges, particularly as academics work within a higher education system that is becoming increasingly platformized, as discussed in the following case study of the SpokenWeb UAlberta website.

## Case Study: The SpokenWeb UAlberta Website

The SpokenWeb UAlberta (SWA) site is the University of Alberta satellite website of a larger multi-institutional SSHRC-funded project, the SpokenWeb Network project. SpokenWeb UAlberta, led by Michael O'Driscoll, has been digitizing spoken word performances that were on reel-to-reel and cassette recordings kept for decades in boxes in and around the campus. Like many universities, the University of Alberta had an active center of literary activity in the English and film studies department. Invited authors and writers-in-residence were often recorded using analog technologies, and then those recordings were stored and forgotten in cardboard boxes under desks. The SpokenWeb

Network therefore has been recovering, digitizing, documenting, and studying this recent history of literary audio performance.

The SWA site thus provides a window into one university's history as part of a larger project. The web publication explains the project, provides access to the collection, features exhibits, and provides news of events. This website was developed by the authors (and others) following minimal computing principles to ensure sustainability, which is why we return to it to illustrate the possibilities and tensions of the post-platform academic web.

The actual digitized audio recordings, however, are not hosted on the site; they are stored on the University of Alberta's Aviary repository, a platform service chosen by the University of Alberta Library (SpokenWeb UAlberta, n.d.-b). Browsers can play selected streaming audio performances off the Aviary platform without knowing the audio is there. The SWA site provides controls for playing the relevant audio in the context of exhibits, where we have the appropriate permissions. To access the rest of the digitized performances, one needs to go to the Aviary repository and sign in, which requires appropriate permission. Thus, there is a tension between the sustainability principles of the SWA site and the use of a platform such as Aviary. Before delving into these tensions in more detail, we will first grapple with the problem of carbon calculations.

## Carbon Calculations

Measuring the carbon impact of human activities is a complex and fraught process. On the one hand, some have criticized the notion of a carbon footprint, arguing that the idea that environmental harm is quantifiable and can be "offset" and negated through other actions normalizes continued environmental destruction.[9] On the other hand, Crawford (2021, 50) points out the power of metaphor, both in minimizing the material and environmental demands of digital technology and in making these costs visible. One way to counteract and deconstruct the illusion of the digital "cloud" is to walk through and trace the energy demands of our online activities and how these costs accumulate. Artist-researcher Joanna Moll (2014, 2019) uses self-tracking as a form of eco-activism and through her multimedia works documents the carbon footprint of everyday activities such as purchasing a book from Amazon. In a project with a similar ethos, Crawford working with Vladan Joler (2018) has created an online infographic and essay detailing the labor and resources that go into the Amazon Echo.

When it comes to online scholarship, what practical steps can scholars take to calculate and reduce the carbon footprint of a research website? Following Moll's

9. See, for example, Abela (2021).

example, let's start by looking at the home page of the SWA site (SpokenWeb UAlberta, n.d.-a).

The footprint of a web page is typically due to a combination of the following:

1. The **size of the network payload** sent from the server to the browser. The payload, which refers to the data transmitted or received, is essentially compiled of the HTML file and all the associated files, such as logos, images, fonts, linked JavaScript files, and so on. The larger the payload, the more energy is consumed serving, routing, and rendering the page.
2. The **cost of rendering the page on the user's computer**. This will depend on both the size of the payload and the processing that has to take place for it to render. A web page with a lot of JavaScript that has to be run on your computer will consume more energy locally. The more client-side processing that has to run, the less energy efficient. Moll (2019) points out how, in this way, companies like Amazon "unload" the environmental cost of tracking our data onto the user; in her test case, a single purchase on the Amazon platform required the customer to navigate a dozen different interfaces that total over 1,300 separate requests.
3. The **cost of the network route** the payload has to travel. A long route from a server further away will consume more energy. This is something you probably cannot control unless you know where most of your users are located and have a choice of server. Note that distance here does not necessarily correlate with geographic distance. Data from an academic server in the same city as a user on a commercial network may have to travel far to switch networks.
4. The **cost of serving up the page** from the server. This is more than just a matter of the size of the payload; it includes the cost of the server-side processing that has to take place. CMS-generated sites will have higher carbon costs as they have to generate a page from a database. This is where static sites that are generated once (every time the content is updated) are more efficient. (See the previous section on minimal computing.)
5. The **energy efficiency of the server** (or data center) and the **carbon cost of the energy used by the server**. Different servers will be more or less energy efficient, and the energy they use will be more or less green. There is also the option to run your own local server. Though self-hosted servers are not necessarily more sustainable, there are notable examples of recent experiments in solar-powered media. *Low-Tech Magazine*, for instance, is a static website, which is supplied with power from an "off-grid solar PV system on the balcony of the author's home" (De Decker 2024). Anne Pasek has also written extensively about low-carbon research methods, and, in 2021, she and Benedetta Piantella published a zine with instructions on how to build and install your very own DIY solar-powered server.

Some private companies have developed online tools such as the Website Carbon Calculator and Ecograder, which they claim can estimate these costs.[10] However, these calculations are based on a number of assumptions (Sustainable Web Design, n.d.). For most academics who have to use university servers it is probably more useful to focus on the things you can control, such as the size of the payload (1), the processing that takes place on the client side (2), and the cost of serving the page (4), and this will be the focus of the next section.[11]

### *How to Optimize Your Page*

There are a number of useful tools out there to help you improve the performance of a web page, though it should be noted that not all performance issues have to do with energy efficiency. A good rule of thumb is to follow advice for Search Engine Optimization (SEO). For this reason, you can use tools designed to help you speed up the loading of a web page in order to improve the user's experience.

#### Developer Tools

Firefox, Chrome, and Safari all have developer tools that can be used to see how efficiently a page loads.[12] For example, in Figure 1, you can see the SWA home page in Safari on a Mac with the Web Inspector showing and the Network tab chosen. When you reload the page (with the Disable Cache checkbox checked) you can see all the file details: the file Name, the Type, the Transfer Size, and the Time to load.

In examining our home page, it is clear that some of the images are taking most of the time (and energy) to transfer and load. Thus, the simplest way to reduce energy consumption is to reduce the file size of the images we use by choosing the appropriate file format (e.g., Scalable Vector Graphics [SVG] are best suited for logos and illustrations and often

10. Wholegrain Digital, a WordPress website design and developer agency, runs Website Carbon Calculator, while the Mightybytes marketing agency runs Ecograder.
11. If you have the freedom to pick your data center, see the Green Web Foundation, https://www.thegreenwebfoundation.org.
12. Netscape Navigator, which was officially discontinued in 2008, was one of the first browsers to include built-in developer tools (Chenska 2024). For more insight into this history and a comparison of the functionality of devtools across different browsers, see Chenska (2024), Hoffmann (2021), and MDN Web Docs "What are browser developer tools?", https://developer.mozilla.org/en-US/docs/Learn_web_development/Howto/Tools_and_setup/What_are_browser_developer_tools. Chenska, Tina. "One Tool, Many Faces: Why and How DevTools Vary Between Browsers?" Medium, June 30, 2024. https://medium.com/@tinachenska/one-tool-many-faces-why-and-how-devtools-vary-between-browsers-cf0bd36ecce7. Hoffmann, Jay. "Checking "Under the Hood" of Code." The History of the Web (blog), May 2, 2021. https://thehistoryoftheweb.com/checking-under-the-hood-of-code/.

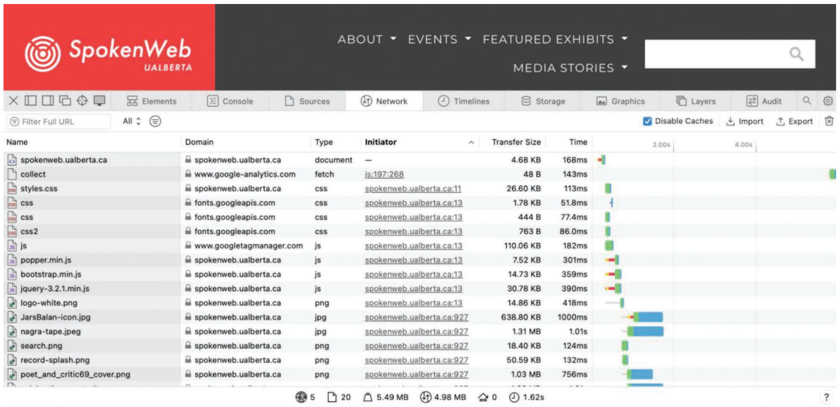


**Figure 1**. SpokenWeb UAlberta in Safari with Developer Network tab

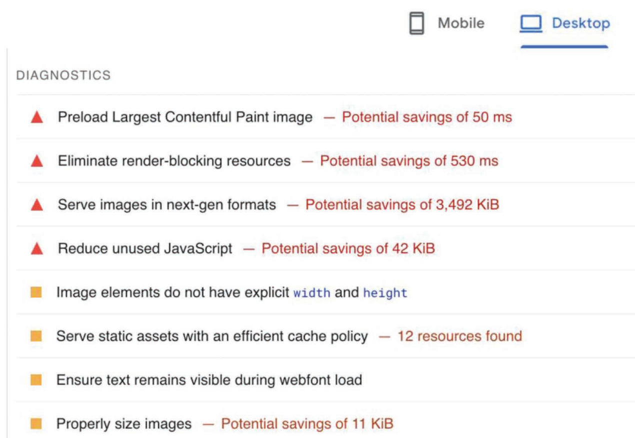


**Figure 2**. Diagnostics of SpokenWeb UAlberta home page from PageSpeed

smaller in size than JPEGs), resizing the image to the appropriate dimensions for the device, or even eliminating some images entirely. There are also tools and services that can convert your images to newer, more efficient formats, such as WebP (web picture).[13]

## Lighthouse and PageSpeed Insights

An alternative to using the developer tools in your browser is to use a web optimization tool such as Lighthouse from Google (Chrome for Developers, n.d.). This open-source tool is available for use in different forms. Google also has a free service, PageSpeed Insights, which is powered by Lighthouse data; the tool takes a web page URL as an input, runs a series of tests, and then generates a report with recommendations for how

13. For more on image formats for the web, see Duò (2023).

to improve things like efficiency, accessibility, and SEO (PageSpeed Insights, n.d.). We entered the home page for the SWA page and received a number of diagnostic recommendations that could speed up loading.

For instance, one of the recommendations was to "serve images in next-gen formats." When we expand this, PageSpeed suggests that "image formats like WebP and AVIF often provide better compression than PNG or JPEG, which means faster downloads and less data consumption." This then links to documentation for Lighthouse on why we should "serve images in modern formats" (Chrome for Developers 2019).

While website diagnostic tools such as PageSpeed can be useful for assessing carbon footprint, it is worth noting that corporations have a proprietary interest in their own technology. As such, Google might promote their own file formats like WebP while minimizing alternative initiatives like Mozilla's MozJPEG.

### *General Advice*

A number of sites, starting with the Lighthouse documentation, have good advice on how to reduce the loading time of pages. We have already discussed the importance of reducing image size, but there are other ways to reduce the energy consumed serving, transferring, and then rendering your website.

- Adopt a **clean design** that uses minimal graphics. Eliminate any graphics that do not convey something important. Design for mobile devices—they are now the norm.
- **Copy edit your text** to make it clear, concise, and efficient. Do not waste users' time; that also consumes energy.
- **User experience** (UX) is important too. Design for users and their anticipated needs, not your administration's vanity. Reduce the number of pages users have to navigate through to get to what they want. Avoid fancy animations. Do not use academic jargon.
- **Minimize font variations**. Where possible, use default system fonts rather than custom fonts, such as Google Fonts, that users need to download. Try to limit the number of font types as well as the variations in style and weight, such as italic and bold, since this increases the load time (Gardner 2025).
- **Minimize code and CSS** so that it takes less time to run the JavaScript included. Try to avoid loading libraries that are not used. Keep the CSS simple.
- **Build Static Sites.** Use minimal computing tools to avoid platforms. (See previous section.)

Our advice is adapted from the more detailed advice available at Wholegrain Digital in their post "20 Ways to Make Your Website More Energy Efficient" (Greenwood 2019) as well as the Lighthouse documentation, especially in the sections on Opportunities and Metrics (Chrome for Developers 2016).

## Trade-Offs

Within academia, various factors—from labor constraints to local technological infrastructure—make it hard to avoid platforms for publishing. While we might aspire to develop only the most sustainable web publications, the reality is we are part of networks of support and obligation that force us to make trade-offs. What are the give-and-takes we should be aware of or beware of? An online project can be sustainable—or unsustainable—in more than one sense; some of these key tensions have been identified in the table below.

| | |
|---|---|
| *Energy Sustainability*<br>Static sites consume less energy to serve and view. | *Labor Sustainability*<br>Some content management systems (CMSs) such as WordPress can be easier for authors and editors to add and edit content. |
| *Green Content Delivery*<br>To reduce energy consumption, one can use green content delivery services including content delivery networks, but these have ongoing costs. | *Organizational Servers*<br>Using your own organization's servers may not be as "green," but it does reduce costs and you can get local support. |
| *Minimal Upkeep*<br>Static sites are less likely to need to be updated, making long-term maintenance easier. | *Ongoing Support*<br>However, you may have institutionally maintained platforms where the CMS is upgraded by computing staff or by a service. |
| *Long-Term Preservation*<br>Static sites can be easily deposited for long-term preservation and archiving. | *Short-Term Access and Ease of Use*<br>CMSs often have design templates with built-in functionality, such as SEO and accessibility tools, which can help your content reach a wider audience. |

### *Using a Green Content Delivery Platform*

Ideally, we could all choose to use data centers with the best green ratings, including content delivery networks (CDNs) that distribute frequently accessed content geographically to minimize network costs. Examples would be services such as Cloudflare, Akamai, AWS CloudFront, and Google Cloud CDN. These, however, have an ongoing cost. The reality is that most of us work in institutions that have set up web servers for institutional use that are free to use. That is not to say that universities necessarily run inefficient servers, but it is also likely that CDNs can achieve efficiencies of scale and geographic distribution of popular content. That said, using a university-run server usually means you can get support on demand and that you can ensure that the content is not misappropriated. With a university server you also have some say in the management of the server. There is answerability in using servers from the institution one works for, and it is in the institution's interest to promote the content.

### *To Use a Platform or Not*

As we found when developing the SpokenWeb UAlberta site, it is often difficult to avoid using platforms for some services. In our case, the Library had chosen to stop running a University of Alberta–specific streaming media server and moved to Aviary, a service. This was more cost-effective for the Library; in fact, it is almost always more cost-effective to use a service than to roll your own specialized media server.

Should we have switched to hosting the audio ourselves? In the end we decided not to, for a number of reasons that will probably parallel situations readers are in. First, there was the question of support. The Library offered excellent support through and with the Aviary service. Second, there is trust and division of labor. The Library is organized to maintain academic content, like our audio, over time. They should be trusted to make decisions about the stack of technology and to then support it over time. The SpokenWeb project, like most grant-funded projects, had funding mostly for graduate research assistants who do not have the technological experience to set up and maintain a streaming media server. We also only had funding for the seven years of the project.

Conversely, Aviary had limited facilities for curating and contextualizing the collection objects, in ways that add new layers of meaning and nuance and invite further critical engagement—this is where the website comes into play. The Featured Exhibits, which are central to our electronic publication, are curated experiences that combine text (in the form of authored essays), archival images, and playlists of archival recordings with audio controls that play sound clips off Aviary.[14] The Exhibits are the result of close and attentive listening and research, which often inspired further engagement with and re-activation of the archive, through oral history interviews, podcasts, and live listening events, material that is also showcased on the website.[15] In this way, the SWA website complements and extends the functionality of the Library catalog while making the research outcomes of the project more visible/audible and accessible to the public.

14. See, for example, Freeman and Wu's (2024) audio exhibit on the Poet & Critic Conference, which took place at the University of Alberta in 1969.
15. For a fuller discussion of the ways that archival power can be unsettled and challenged through critical and creative practice, see Camlot and McLeod (2019) and Miya and Kroon (2024).

In the end we compromised and built a static site for SpokenWeb UAlberta that was designed for content like the Featured Exhibits while keeping the audio on Aviary. We then hired a programmer to develop custom audio controls that could be added to the static site and play the appropriate audio. This hybrid model allows us to concentrate on the research publication of the SWA site and trust the Library to manage the deposited audio. It also allows us to propose future projects that might develop alternative static interfaces to the audio. We could, for example, develop a pedagogical site for courses interested in allowing teachers to develop custom playlists for students. The separation may prove a boon in the long run.

### *Preservation*

When it comes to long-term preservation, our team had two considerations: how to archive the digitized audio collections and how to preserve the website itself with the Featured Exhibits.

Had we rolled our own system from scratch, we would have had to maintain it over the long term. This is a matter of labor sustainability. By depositing the audio files in the Library's Aviary platform, we were able to turn the responsibility of maintaining the collection over to the Library, which has the long-term staffing, the commitment, and expertise to do just that.

The website content, however, had different preservation needs, which could be better served by a minimal, static site approach, which was conducive to deplatforming. Because static site generators, such as Jekyll and Hugo, allow you to build and store the entire website as individual flat HTML pages, they are much easier to archive than dynamic, CMS-driven sites. The files are lightweight, requiring minimal storage; in our case, the SpokenWeb UAlberta website, minus the audio files, was a mere 13.7 MB. As our developer Ryan Chartier quipped, "we could host it on a potato." Since static sites rely primarily on HTML, one of the building blocks of the web, they also need little to no maintenance. The files can be saved and served locally so that the website is viewable even offline. As long as HTML files can be read by a browser, the web pages will continue to be readable.

Because static sites are self-contained, they are already in a format that is amenable to archiving. In our case, the SpokenWeb UAlberta static site can readily be bundled up and deposited in the University of Alberta's Education and Research Archive (ERA), which is set up so that researchers and projects can easily deposit content with basic documentation for long-term preservation. It is worth mentioning that proprietary services such as Aviary are not the only option for archiving your website, and scholars can also make use of free, open-access repositories such as Knowledge Commons and the

Internet Archive. The Internet Archive's Wayback Machine is set up to automatically crawl static sites, and we found multiple iterations of the SpokenWeb UAlberta website had been archived, dating back to January 2024. Though there is no way to "submit" an entire website to the Wayback Machine, the Internet Archive offers tips for helping ensure that your website is included (e.g., making sure your website's robot.txt file does not ban web crawlers), and you can request individual web pages be added by using the "Save Page Now" feature (Internet Archive, n.d.).

For these reasons, when it comes to long-term preservation, static websites are often more durable, lightweight, and easy to archive than their CMS counterparts. In fact, CMS-driven sites are likely to be inaccessible in the future when the stack of technologies needed to generate pages is hard to reconstruct (Rockwell et al. 2014).

## Conclusions

To conclude, it is time to rethink the use of platforms in electronic publishing. We need to consider the sustainability of electronic works, both the ecological and the labor sustainability. It is no longer enough to roll out a neat new electronic journal or multimedia work. We need to ask how sustainable the shiny new things are.

One approach to more energy-efficient publications is to reduce the size of the files that need to be transmitted. Using newer image formats and even eliminating graphic design features that do not contribute to the content is one way to reduce the computational load and energy requirements. Reviewing the JavaScript code to eliminate code that is not used is another. Along these lines, there are open tools built into modern browsers that can help you review the size and time it takes to load a page.

Minimal computing approaches that do away with server-side platforms, be they WordPress or a custom stack of technologies, are another way to create website publications that are technologically sustainable. Rendering static sites that do not need a server-side CMS to deliver to browsers is a great way to ensure that you do not need to constantly maintain the publishing technology. It decreases the labor costs over time if you do not have to constantly upgrade software and then update the code that renders the site pages. It also reduces the energy used to serve up the publication.

There are, however, trade-offs to "deplatforming" your scholarly project. A CMS can cut down on the immediate cost, in time and labor, of authoring and editing any particular publication. It can be easier to get a web publication off the ground if you use a well-supported CMS or commercial platform. You are more likely to be able to train people to use the system to author content. Your institution may already run systems that you should use to ensure compatibility with policies and support. In the case of SpokenWeb UAlberta, we built a hybrid solution where the website was built following a minimal computing approach, but the streaming media (the digitized audio) is preserved and served by the University of Alberta Library's choice of service.

Finally, we note that an important aspect of sustainability is planning for the end of a project or electronic publication (Carlin 2018; Rockwell et al. 2014). Appropriately documenting, ending, and depositing a project for preservation can be seen as a way of providing further sustainability. Even if and when the minimal computing site fails, a project deposited for preservation could still be reanimated by a sufficiently capable browser. Planning for the end is part of sustainability.

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