

The Visual Vernacular of Climate Change on Instagram: How Modal Convergence Between Image and Text Is Changing the Representation of Climate Solutions

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Visual representations provide blueprints for defining and imagining climate change. We analyze the visual vernaculars of climate change on Instagram and their connection to wider issue dynamics, linking descriptions of what climate change *is* to normative statements about what *ought* to be done in response. Using quanti-quali digital methods, we identify themes and genres within high-engagement visuals, yielding new insights into communicative trends on Instagram and the representational politics of climate change. We find, first, that Instagram representations of climate change are shifting from aesthetically pleasing, less informational visuals towards didactic visuals containing both image and text, which we define as “modal convergence.” This maintains the visibility of textual messages within visuals as they travel around and beyond the platform. Second, these image-text combinations contain continuities and ambiguities between descriptive (is) and normative (ought) statements. We conclude with the implications of our research for climate communicators and social media researchers.

Keywords: climate communication, social media, modal convergence, visual vernaculars, platform vernaculars

To represent is to narrate, or to refuse to narrate. It is to perform, or to refuse to perform, a world of spatial assumptions populated by subjects and objects. To represent thus renders other possibilities impossible, unimaginable. It is, in other words, to perform a politics. (Law & Benschop, 1997, p. 158)

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A long-standing challenge in climate change communication is the need to shift from the abstract/scientific to the material/political (Pearce, Brown, Nerlich, & Koteyko, 2015), as knowledge of the issue has emerged primarily through scientific modelling rather than everyday experience (Jasanoff, 2010). While climate change is now entering lived experiences (Tschakert, Ellis, Anderson, Kelly, & Obeng, 2019), it is still perceived by many as a distant crisis. For example, a 2023 U.S. survey found that only 44% of respondents reported personally experiencing climate change effects (55% did not; Leiserowitz et al., 2023). This complicates people's ability to perceive and imagine climate change and hinders efforts to build effective responses.

The production and deployment of visuals provide a crucial means of addressing this problem, gaining control over a subject's representation (Sontag, 1978). Climate change visuals have been identified as "blueprints to imagine and shape reality" (Schneider, 2016, p. 13), yet remain relatively under-researched compared to textual representations. The representational politics of climate change have been further transformed by social media, through the unprecedented volume and accessibility of visuals, the ease with which visuals can be produced and reproduced, and the diluted power of established knowledge producers, such as scientific institutions and mainstream media organizations (Wang, Corner, Chapman, & Markowitz, 2018).

We investigate visual representations of climate change on Instagram, a crucial site for circulating and producing visual culture (Leaver, Highfield, & Abidin, 2020). Drawing upon previous research into climate visuals, we focus on one aspect of representational politics: the is-ought distinction between representing something that *is* happening and that which *ought* to happen (Walsh, 2010). We adopt an innovative methodology that analyzes the theme and genre of visuals (Vicari, Ditchfield, & Chuang, 2024) related to climate change and two "climate solutions," net zero and veganism. Specifically, we develop theoretical work on "visual vernaculars" (Pearce et al., 2020), distinctive visual communication styles co-produced by a social media platform's affordances and user practices. In contrast to previous research, we find commonplace usage of text within Instagram visuals. Building on research in multimodal communication (e.g., Kress, 2009; Pflaeging & Stöckl, 2021), we define this combination of image and text within Instagram visuals as *modal convergence*, designed to impart more complete information or argumentation in the context of broader digital communication practices that use various multimodal semiotic resources (e.g., images, videos, audios, captions, and emojis). This marks a novel development in Instagram climate change communication, contrasting with previous research that showed more aesthetically appealing visuals without overlaid text (Pearce et al., 2020). Our focus on vernacular, rather than specific social media users, foregrounds Instagram's changing aesthetics, which helps shape the representational politics of climate change. We examine the impact of this evolving vernacular on the communication of what climate change is and what ought to be done. In doing so, we highlight how visualization choices shape science and society relations in underappreciated ways (van Beek et al., 2020).

Background

Visual Representation of Climate Change

The visual representation of climate change has commanded increasing academic attention over the last two decades. Critical social science and communication researchers have examined how climate change has been *made visible* by those advocating for action (Mahony, 2016), understanding the reception of visuals as mediated by prior values, attitudes, and political orientation (Shao & Goidel, 2016). For example, within climate science, some visualizations have become controversial for perceived political implications that go beyond established norms of scientific objectivity (Mahony & Hulme, 2012). Within climate politics, visuals of protesters may resonate with those already supporting environmental action while alienating those who do not (Wang et al., 2018). This indicates how visual climate communication must negotiate a tension between, on the one hand, the desire to establish climate change as an observable fact above political controversy and, on the other, the urge to present transformational responses and solutions to climate change that are inherently political and controversial (Born, 2020).

Scholars have analyzed the visual representation of climate change in multiple domains; for example, as scientific models and charts (Schneider, 2016), extreme weather events (Nerlich & Jaspal, 2014), a source of risk (Mahony & Hulme, 2012), a misrepresentation of risk (O'Neill et al., 2023), and constitutive of arguments (Walsh, 2015). While climate impacts have featured prominently in the media, visuals of climate solutions remain under-represented (O'Neill, 2020). More broadly, Jasanoff (2001) shows how visuals of the Earth taken from space have fostered a global environmental consciousness that, while imagining the world as a single community in peril, also invites resistance from those rendered invisible by this detached, planetary view. Together, this scholarship reinforces the importance of visuals in representing climate futures and broader environmental politics.

Within digital media, an advanced review showed climate change represented by a relatively narrow repertoire of images, such as polar bears, melting ice, and politicians, with less attention paid to climate solutions (Wang et al., 2018). More recent research has found evidence of a greater variety of visuals, such as protests (Mooseder, Brantner, Zamith, & Pfeffer, 2023), animals as stakeholders (Koop-Monteiro, Stoddart, & Tindall, 2023), political events (Hopke & Hestres, 2018), and natural disasters (McGarry & Tréré, 2024). New groups of actors, such as social media influencers, are employing distinctive and novel visual strategies to foster user engagement across platforms (Qian, Lu, Peng, Shen, & Xu, 2024). However, there remains a gap in the literature about the visual representation of climate solutions. To adequately assess the co-production of social media visuals by platforms and users, we turn to the literature on visual vernaculars.

Visual Vernaculars of Climate Change

Social media platforms have distinct affordances that both facilitate and constrain user actions (e.g., Instagram's requirement for visual content or Twitter/X's character limits). The interplay between these platform affordances and user practices gives rise to distinctive visual communication styles, theorized by digital media scholars as visual vernaculars. On late-2010s Instagram, Leaver et al. (2020) identified the

importance of using photographic practices to create and share events, as part of a clean aesthetic that encourages users to make some textual elements less visible (pp. 57–64). While photographs initially dominated the platform, the introduction of type-post templates allowed users to embed text directly within Instagram visuals (Leaver et al., 2020, pp. 53–54).

The distinctiveness of Instagram’s visual vernacular was highlighted in previous cross-platform research on social media communication of climate change (Pearce et al., 2020). Table 1 shows how different platforms are associated with different aesthetics (e.g., Instagram’s travelogue aesthetic compared with Reddit’s staged photo-ops), different communication modes (e.g., Twitter’s image-text combinations compared to Tumblr’s cross-platform screenshotting), and different intentions (e.g., awareness raising on Instagram compared to political contestation on Twitter). More recent research has found stability in some visual vernaculars of climate change; for example, image-text combinations remain a key feature of climate change visuals posted on Twitter (Mooseder et al., 2023; Qian et al., 2024).

Table 1. Textual Descriptions of Visual Vernaculars Found in Climate Change Social Media Posts.

Platform	Description of vernacular
Instagram	Awareness traveling: aesthetically pleasing travelogue pictures. Experience-based, not informational
Tumblr	Environmental “screenshotting”: depicting noteworthy moments from other social media platforms, often showing “climate sceptics” being put in their place
Twitter	Controversy and contestation: includes combinations of image and text, sometimes in support of positions counter to mainstream opinion
Facebook	Memes and infographics: image and text combinations dominate, with the apparent aim of boosting shareability
Reddit	Staged photo ops: thumbnail images from mainstream media articles that appear on Reddit when users post the URL to an article

Source: Pearce et al. (2020, p. 175).

While visual vernacular has proved a productive concept for analyzing the emergence of visual representations on social media across various issues (Vicari & Ditchfield, 2024), its focus is generally limited to communicative styles within platforms (as seen in Table 1), with less attention being paid to “reconnect[ing] these dynamics to the world beyond the platform, that is, to anything happening independently of platforms’ affordances” (Vicari & Kirby, 2023, p. 1751). While we agree that this connection is currently neglected in the literature, we argue that visual vernaculars *can* be shaped by platform affordances *and* issue dynamics. For example, Greta Thunberg initially documented her school protests on Twitter (Olesen, 2022), reflecting the platform’s affinity with live events and current issues (Birkbak & Carlsen, 2016). As support grew, Instagram assumed greater importance as a platform where commenting enables audiences to express emotional attachment and contribute to the development of Thunberg’s *Fridays For Future* movement (Olesen, 2022). This shift was reflected in the visuals Thunberg used on Instagram, as group photos became more common than individual ones, aligning with Instagram culture of community-building and positivity (Molder, Lakind, Clemmons, & Chen, 2022). In this way, a combination of platform affordance (commenting), culture (positivity), and external issue dynamics (development of the

social movement) contributed to the development and dynamism of an Instagram visual vernacular focused on Thunberg, while also cleaving to Instagram's broader vernacular of experience-based visuals, typically without overlaid text (see Table 1).

We develop this connection between visual vernacular and issue dynamics, focusing on the tension between establishing climate change and its impacts as objective facts, and advocating specific responses that are inherently political and contestable. In the next section, we review the literature on this tension within visual climate change communication.

Visualizing the "Is" and "Ought" of Climate Change

Visual representations are powerful means of rendering public imaginations of possible futures (Law & Benschop, 1997). We present three ways climate visuals can shape these imaginations. First, global environmental visuals "always obscure as much as they reveal," as including some subjects inevitably excludes others (Mahony, 2016, p. 15). Second, visual relations between subjects are important, particularly for climate change, where cause, impact, and response are often temporally and geographically detached (Jasanoff, 2010). For example, visuals can link fossil fuel emissions with climate impacts, which would not normally appear side-by-side. Mahony (2016) identifies photomontage as one technique for addressing this challenge, enabling visual speculation about the impact of global climate change on specific locations. Third, climate change politics has been underpinned by concerns about the boundary between what climate change *is* and what *ought* to be done about it.

Within climate science, this is-ought² distinction has proved a vexed issue. Most notably, the IPCC's authority rests in part on remaining "policy neutral" (is) and not "policy prescriptive" (ought), a norm that is coming into question as calls for urgent social transformation intensify (Asayama et al., 2023). The IPCC's "burning embers" diagram provides an iconic example of the contested visual representation of is-ought. Mahony and Hulme (2012) demonstrate how attempts to color-code different levels of climate risk surfaced tensions between calls for scientific objectivity and cultural conventions in visual representation. Decisions about which levels of risk should be colored red, and thus connoting danger, lie on unstable ground of both "epistemic uncertainty and normative diversity," which render a perfectly "objective" assessment of risks impossible while still requiring communication (Mahony & Hulme, 2012, p. 86). Walsh (2010) argues more broadly that IPCC visuals display a continuity between is-ought, alternatively described by Schneider (2016) as a blurring, as opposed to the more careful is-ought distinction found in text. In graphical representations of climate model outputs, expertise in describing climate change (is) implies trustworthiness in advising responses (ought). Walsh (2010) shows that such visual argumentation is present not only in the IPCC but also in visualizations of arguments against mainstream climate science. This demonstrates how visuals have the potential to subtly bridge the is-ought boundary in the mobilization of climate change knowledge for a range of political actions.

While such analyses demonstrate the fragility of scientific norms of objectivity, the primary role of science in much climate change debate and activism (Evensen, 2019) has meant that the is-ought distinction

² Some formulate this relationship as an if-then programming logic (Mahony, 2016).

continues to occupy a critical position in the representational politics of climate change. How “is” and “ought” do or do not co-exist, often manifested as the relationship between scientific knowledge and political action, has been a persistent concern of climate researchers analyzing the extent to which climate change is accepted as an inherently political issue (Domingues, 2023; Swyngedouw, 2010). Pepermans and Maesele (2014) demonstrate how activists have sometimes adopted the IPCC’s depoliticizing is-ought distinction, critiquing how general calls for climate action become disassociated from “particular values, norms, and policy implications” (p. 226), a trend also observed in broader analyses of climate discourses (Domingues, 2023). Meyer, Peach, Guenther, Kedar, and Brüggemann (2023) argue that climate change in current public communication often appears as a “threat we should be concerned about” (is), not something “we know how to act on” (ought; p. 1). In their view, this approach forecloses opportunities for agency, as abstract calls for urgent action leave people without clear ways to respond, resulting in a constrained set of climate change narratives. They claim that “action-based” climate change communication is undervalued and that the transformative potential of public engagement could be unlocked through “place-based, localized action storytelling” (Meyer et al., 2023, p. 5).

We extend this research agenda to focus on popular climate visuals on social media, addressing the following research question:

RQ1: How are “is” (descriptive) and “ought” (normative) elements of climate change and climate solutions visually represented on Instagram?

We investigate the extent to which “is” and “ought” are detached or attached in climate change communication on Instagram and whether this is shaped by a specific visual vernacular. In doing so, we explore the substantive impact on how climate change appears on Instagram and on its representational politics.

Data and Methods

Our research uses visual network analysis (Venturini & Munk, 2021) to study visuals—the primary component on Instagram—without the accompaniment of a caption (Figure 1; Colombo, Bounegru, & Gray, 2023). We focus on visuals for several reasons. First, visuals are more widely circulated on Instagram than their accompanying captions. For example, in the “image wall” used by Instagram to display search results and profile pages (Figure 2), the caption of a post is displayed only after clicking on a visual, making the caption less visible.³ Second, Instagram is associated with meticulously planned and composed visuals, suggesting a level of intentionality in the representation of climate change that contrasts with the impromptu “pointing, shooting and sharing” of some other platforms (Rogers, 2021, p. 4). Furthermore, we consider the volume of climate change visuals being circulated and their rapid shareability between users and across different platforms. Not only can the platform’s own affordances decontextualize a visual as it appears in Instagram timelines, profile pages, and search results with little or none of the original accompanying captions, but visuals can also be relocated in different platforms and/or contexts, again without their original caption.

³ In contrast, post captions are at least partly visible in user timeline views.



Figure 1. Instagram post details: visual and caption (personal communication, October 17, 2024).

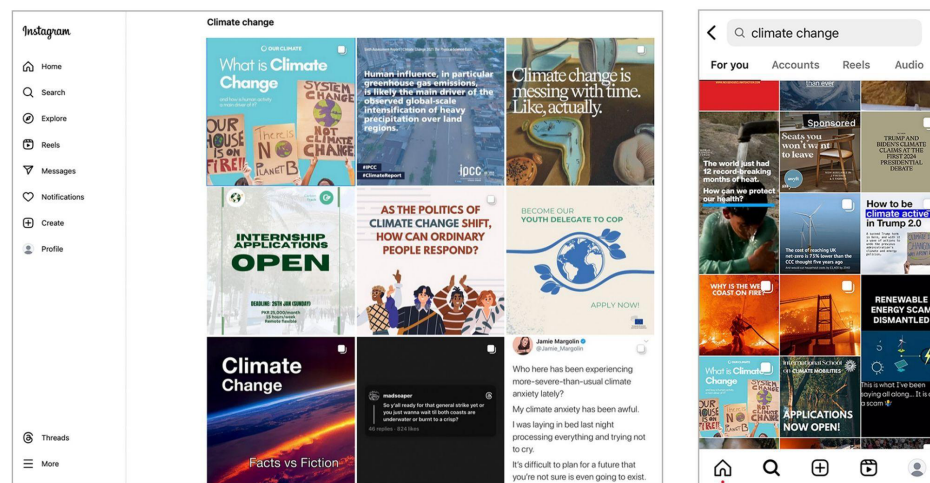


Figure 2. "Image wall" of search results: web view (left) and mobile app interface (right) (personal communication, multiple dates, collected on March 13, 2025).⁴

⁴ There are some differences between Instagram's web and mobile app versions, such as variations in the ordering of search results for the same account. These differences are minor and do not affect our analysis. Our data was collected via a web data scraping tool, Zeeschuimer (Peeters, 2022), via a laptop.

We select three search queries—[Climate Change], [Netzero], and [Veganism]—to build a novel dataset for relational analysis of the representations of climate change and climate solutions. While net zero and climate change are more closely related than veganism, recent years have seen veganism positioned by key scientific authorities as a pertinent response to the climate crisis, while also becoming more culturally mainstream (Sexton, Garnett, & Lorimer, 2022). Following the IPCC's (2019) *Climate Change and Land* report and the EAT-Lancet report (Willett et al., 2019), the link between meat consumption and climate change has gained extensive media attention (Mroz & Painter, 2023), boosting public debate (Sanford, Painter, Yasserli, & Lorimer, 2021) and cultural practices (Weik von Mossner, 2021). However, less is known about how information on veganism, animal agriculture, and climate change is "consumed, exchanged, and commented on via social media" (Kristiansen, Painter, & Shea, 2021, p. 156). Our query design thus addresses climate solutions along two key dimensions: policy (net zero) versus cultural (veganism), and established (net zero) versus emerging (veganism). All three are ambiguous queries, allowing for different and distinct hierarchies of concerns to emerge (Rogers, 2017). The visual representations of these concerns further provide a lens to explore the reasoning, mobilization, and struggle between them.

We used Zeeschuur and 4CAT (Peeters & Hagen, 2022) to collect data for 19 days during the COP28 negotiations in Dubai⁵ (between November 27, 2023 and December 15, 2023). The top 300 search results (i.e., visuals and captions) and their metadata (e.g., timestamp, engagement metrics, hashtags) were collected each day for each query, yielding a total of 17,100 posts. These represent the most prominent posts on Instagram, aligning with our broader research interest in how climate change is made visible. To build a manageable dataset for our analysis, we first eliminated duplicate posts from different days, retaining only unique posts. Second, we focused on the most engaged posts (in our case, the most "liked")⁶ due to their "success at gaining traction . . . on the platform" and being most likely to reach both intended and unintended audiences (Vicari et al., 2024, p. 7). The 50 most liked posts from each search query constitute the final sample (n = 150) for our analysis.⁷ We refer to each visual by its ranking in the top 50 (e.g., netzero #1 is the most-liked netzero visual).

We reviewed the first 10 visuals of the posts from each search query to propose initial codes, then manually coded all 150 visuals, supplementing more codes during the process. Next, we constructed a matrix to quantify the co-occurrence of codes and transformed this matrix into a bipartite network graph for visualization in Gephi (Bastian, Heymann, & Jacomy, 2009). The graphs contain two types of nodes: visual nodes and code nodes. Links are made between two types of nodes, meaning that a visual node

⁵ This is a subset from a larger social media data collection for an interdisciplinary multimodal cross-platform analysis (Schwegler, Landschoff, & Rommel, 2024). We collected the data initially with five search queries (climate change, netzero, COP28, antinatalism, and veganism) across TikTok, Instagram, and Twitter.

⁶ We are cognizant that likes, comments, and reposts are engagement metrics with varying degrees of significance. Given the relatively low frequency of comments and reposts in the dataset, we use likes as the primary indicator of user engagement in this research.

⁷ Due to the increasing limitations in API-based data collection approaches, we are only able to use a real-time web scraping tool to collect the datasets, rather than directly collect posts with the most likes throughout a certain period of time (Özkula, Omena, & Gajjala, 2024).

connects to one or more code nodes, not other visual nodes. Visuals sharing more codes are positioned closer to each other, and codes that co-occur across numerous visuals are rendered in closer proximity. The bipartite networks facilitate the understanding of relationships between visuals based on shared codes and relationships between codes based on their presence in visuals, thus allowing us to read centers, peripherals, and clusters within the overall dataset.

Combining content analysis coding and cultural analytics techniques (Vicari et al., 2024), we developed a two-phase codebook to categorize the post visuals (Table 2). *Theme* codes are set for the topics involved in the visual, and *genre* codes address the dimensions of visual type and setting. The codes are not mutually exclusive, which means that one visual could be given multiple codes, if appropriate. We do this for two reasons. First, many studies adopt a “single-label approach” (codebooks with mutually exclusive codes), which help unsupervised machine-learning tools to label large datasets efficiently but unduly limits the ability to capture the “full meaning of an image” (Mooseder et al., 2023, p. 12). One exception is McGarry and Treré’s (2024) study of COP21 Twitter posts, wherein each visual is given multiple codes, and the most frequent codes are analyzed. Still, a relational approach to coding remains largely overlooked.⁸ Second, while some relational approaches—such as hashtag network analysis—can reveal patterns of topics being depicted, our focus on vernaculars demands an analysis of how visuals are connected thematically and aesthetically. Thus, we distinguish between codes of *theme* and *genre* to enable more granular analysis across multiple dimensions of the network’s relational structure. In doing so, we identify how theme and genre co-occur within climate change visuals and how these relate to representations of what climate change is and how societies ought to respond. In uncovering these co-occurrences, and their connection to wider issue dynamics, we are able to enrich the study of visual vernaculars.

⁸ Seelig and colleagues’ (2022) study on climate change solutions in legacy news and digital media (NOT social media) also uses non-mutually exclusive frames to code both texts and visuals. Similarly, they chose to follow a content analysis tradition, focusing on frequentist and proportional approaches rather than a relational one.

Table 2. Nonmutually Exclusive Codebook: Theme and Genre.

Code	Value	Description
Theme	Energy	Touch on topics related to energy production or consumption
	Justice	Touch on topics related to social justice
	Building	Mainly featuring buildings, construction, or architecture
	Food	Touch on topics related to food
	Technology	Touch on topics related to technology, innovations, or digital infrastructure
	Animal rights	Touch on topics related to animal rights, welfare, or the ethical treatment of animals
	Optimism	Touch on topics related to positivity or hope
	Crisis	Touch on topics related to survival of lives or places
	Politics/Policy	Touch on topics related to politics, policy or governments
	Environment/Climate	Touch on topics related to environment/climate
	Economy/Business	Touch on topics related to economic systems, business activities, or financial trends
	Behavior change	Touch on topics related to individual or social behaviour change
	(Mis)information	Touch on topics related to (mis)information
	Other themes	Other themes
Genre	Photo	Real-life scenarios, places, or objects captured through a camera
	Portrait	Showing a particular person, typically on face, expressions, or emotional state
	Illustration/Simulation	Artistic renditions such as cartoon, modelling, and computer-generated imagery (CGI)
	Infographic	Combining text, numbers, and graphics to convey information or knowledge
	Meme/Image macro	Captioned visuals with witty, humorous, or sarcastic text
	Message	Captioned visuals with text to communicate a message, thought, or idea
	Conference	Set in conference scenes, typically with people engaged in discussion, presentations, or panel sessions
	Protest	Set in protest scenes, typically feature crowds, banners, signs, or public displays of activism
	Nature	Set in natural environments, such as forests, parks, beaches, or mountains
	Industry	Set in industrial environments, such as factories, construction sites, warehouses, or production lines
	Other indoor	Set in other indoor spaces
	Other outdoor	Set in other outdoor spaces

Global/Earth	Containing a visual representation of the Earth or global elements, such as satellite images, globe visuals, and world maps
Other settings	Other settings

This project received ethical approval from the University of Sheffield in July 2023. All Instagram visuals shown below are publicly available at the time of writing and do not contain personal data or sensitive material. We take a precautionary approach to user expectations of privacy, paraphrasing some text, blurring faces, and removing account names (Vicari et al., 2024).

Findings and Discussion

Here, we present network visualizations of visual theme (Figure 3) and genre (Figure 7), rendered by the ForceAtlas2 algorithm on Gephi 0.9.7 (Jacomy, Venturini, & Heymann, 2014), and empirical findings emerging from the network structures. First, we examine the visual theme network, identifying how themes are connected or discrete within Instagram visuals. Second, we present the visual genre network, focusing on stylistic elements such as types (e.g., photo, infographic) and settings (e.g., conference, nature). We highlight key connections between these visual genres, building a more comprehensive picture of Instagram's climate change visual vernacular.

Concreteness and Ambiguity: Taking Actions, But for What?

Climate change and net zero posts are intermingled in the visual theme network (Figure 3), showing that the two issues share similar visual themes, such as environment/climate, economy/business, and politics/policy. In contrast, most of the visuals from the veganism issue are related to different themes, such as animal rights, food, and justice. The most significant theme across all three issues is crisis, located at the center of the network. This suggests that Instagram users make relatively few links between climate change and veganism, despite a consensus that a global shift to a vegan diet would significantly reduce greenhouse gas emissions (IPCC, 2019).

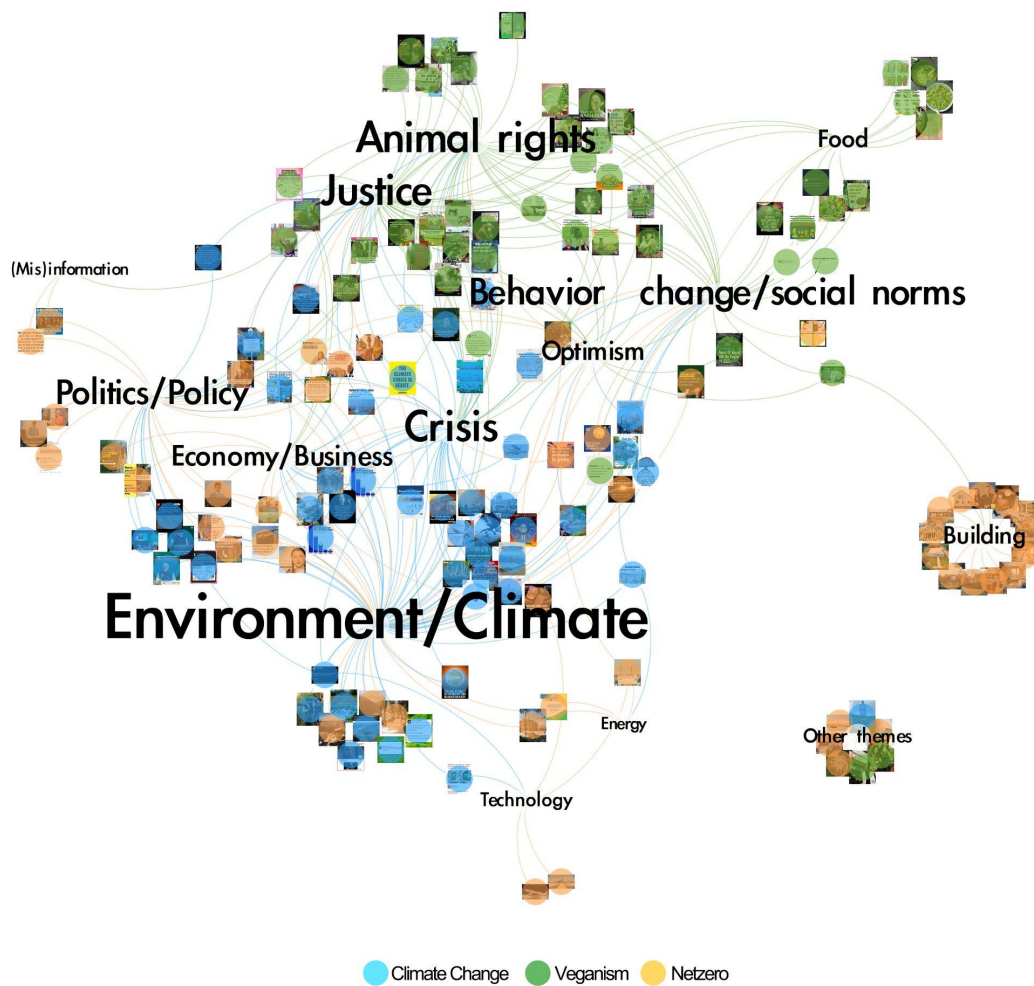


Figure 3. Network showing connections of 50 most liked Instagram visuals for each of climate change, veganism, and net zero with visual themes.

We focus on two well-populated parts of the network around material, rather than conceptual, themes: buildings and food. In line with our research question, these themes could be either value-neutral and descriptive (is) of current states and practices or value-based and normative (ought) ones. Notably, the buildings and food themes are connected to more visuals than two themes more typically associated with climate change: technology and energy. Our focus on buildings and food is also supported by scholarship from visual network analysis that identifies network peripheries as related to emerging or boundary-spanning ideas (Omena, 2021; Venturini & Munk, 2021).

In the building cluster, visuals predominantly feature timber houses and rustic-style interior designs set against a natural landscape, representing a distinctive type of net zero-related visual on Instagram (Figure

4). These visuals convey a desire to relocate to “natural” surroundings for a simpler, more sustainable way of life, albeit one that does not show the humans living there. This reflects trends seen in previous social media research on climate change visuals that include natural scenes with no human presence (Mooseder et al., 2023; Pearce & De Gaetano, 2021). These visuals are also notable for being aesthetically pleasing without overlaid text, similar to the Instagram climate vernacular reported in Table 1 above. Within the food cluster (Figure 5), visuals relate either to recipes for plant-based food that often also have no or minimal texts (Figure 5, top-right), or rationales for veganism driven by concerns for animal welfare (Figure 5, bottom-right).



Figure 4. Zoomed-in building cluster with examples (personal communication, #3, November 3, 2023; #19, January 19, 2019; #34, August 10, 2019; #41, August 10, 2020).

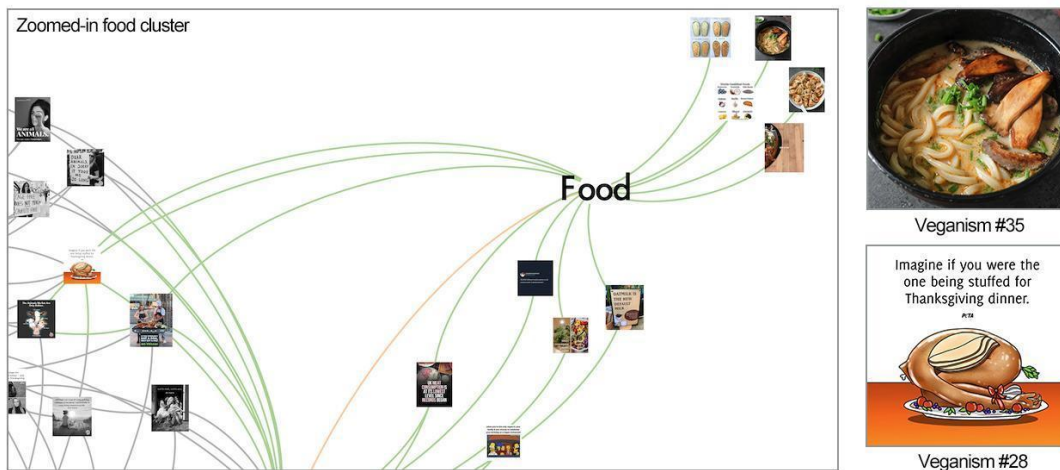


Figure 5. Zoomed-in food cluster with examples (personal communication, #35, November 30, 2023; #28, November 20, 2023).

Both visual clusters represent specific actions at a human, local level, providing concrete examples of what people *ought* to do: veganism manifested as making plant-based cuisine, and net zero embodied in moving to bucolic timber houses. However, in the image-only visuals, it is less clear what these “ought” actions respond to; in other words, the “is” is ambiguous in both clusters. For the building visuals, it is unclear whether they are being hailed for their energy efficiency, as an artistic celebration of rural living, or as part of a reactionary movement that adopts a more ecologically mindful and enjoyable lifestyle in times of climate crisis (akin to the 19th-century retreat to the countryside responding to the Industrial Revolution; Bracke, 2017). Likewise, it is unclear whether plant-based diets are promoted for health benefits, to avoid animal cruelty, to reduce carbon emissions, for taste, or for other reasons. In other words, these visuals promote alternative ways of living (ought) independent of any overt stimulus (is), which is reflected in the peripheral positioning of food and buildings in Figure 3.

Unlike these image-only visuals, some image-text visuals clearly articulate a rationale for veganism (e.g., Figure 5, bottom-right). These visuals explicitly convey *what* they advocate (stance) and *for what reason* (rationale). Here, the actions are situated within the broader context of the issue, becoming *solutions in practice*; the “ought” of veganism is driven by the “is” of animal welfare and food justice (Giraud, 2023). This contrast also helps to explain the structure of the visual theme network (Figure 3), where the image-only visuals are mostly at the periphery, so invocations of what ought to be done are detached from descriptions of what is. Climate change (being one of the many “is”s for adopting veganism) and veganism (being one of many “ought”s to address climate change) thus remain detached.

Only two visuals (Figure 6) from the veganism issue, both of which are text-only, mention climate change or the environment. The first explicitly emphasizes that framing veganism as a reaction to the environment is “incorrect,” implying an affinity with the dominant themes of animal welfare and food justice identified above. The other, a screenshot from a tweet, satirically suggests that the same ignorance applied to climate change should be extended to vegan practices to put an end to “vegaphobia” (Cole & Morgan, 2011).

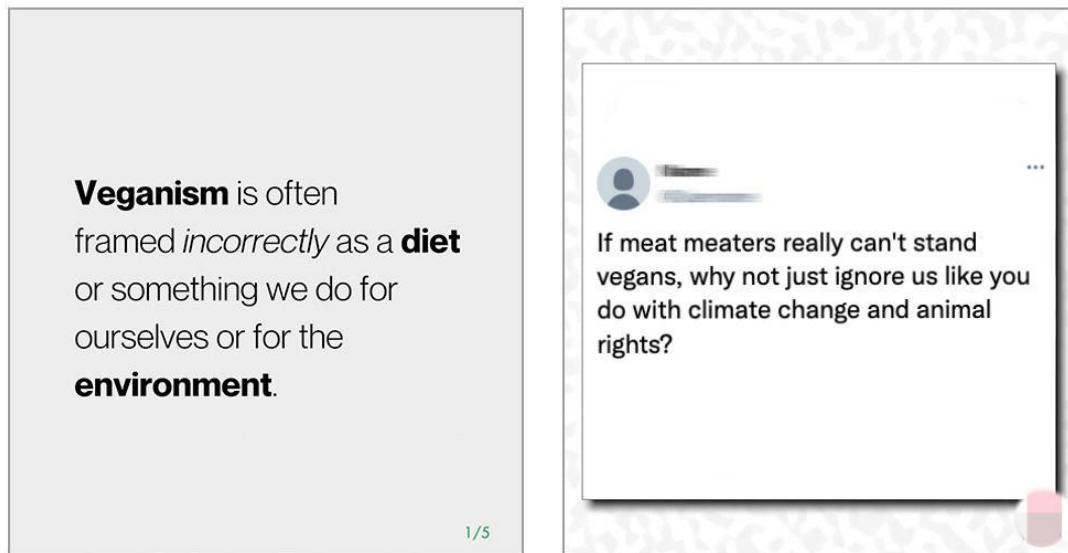


Figure 6. Veganism #7 and #16 (personal communication, #7, July 26, 2023; #16, September 13, 2023).⁹

In short, the issues of climate change and veganism remain largely detached from each other in our dataset of Instagram posts. This is particularly notable given that data collection took place during COP 28, when climate change had a higher public profile and was more likely to be invoked in connection with issues described elsewhere as climate solutions, such as veganism. The positioning of veganism in relation to animal rights and climate change should be contextualized within recent debates about veganism. Giraud (2023) identifies a tension between, on the one hand, veganism as a holistic philosophy that confronts structural violence and seeks to promote animal, human, and environmental justice, and on the other, a more recent depoliticization of veganism through a narrowed focus on vegan eating practices. We find both these “faces” of veganism on Instagram, with posts making strong justice-based arguments for veganism—albeit focused on animal welfare rather than climate change and the environment—as well as aesthetically pleasing but more ambiguous food lifestyle visuals.

Modal Convergence in Visual Vernacular: The Turn to Image-Text Combinations

In the previous section, we identified distinctive roles for both image-only and image-text visuals in thematically articulating the descriptive and normative elements of climate change. Next, we build on this observation to develop a more comprehensive picture of the climate change visual vernacular on Instagram. Figure 7 provides an overview of a network showing the relationship between key elements of the visual genre across the three issues. Notably, posts from all three image spaces, unlike the clear differentiation between veganism and the other issues seen in the visual theme network (Figure 3). This suggests that the three different issues share a visual vernacular. The image-only visuals corresponding to buildings and food

⁹ User information has been removed, and original text of #16 paraphrased, to protect user privacy.

discussed in the previous section are mostly found on the left edge of the network (to the left of the dashed line in Figure 7). These are detached from the dominant central node of “message” related to visuals including text that communicate a message (see Table 2). This indicates that text is a dominant feature within all three issues and that the image-only visuals related to food and buildings, although important examples of communicative styles, do not represent the wider visual vernacular. This constitutes a significant turn away from aesthetically pleasing, image-only Instagram visuals towards a *modal convergence* between image and text, mimicking previous trends on Facebook and Twitter (Mooseder et al., 2023; Pearce et al., 2020; Qian et al., 2024). Unlike platform functionality that enables or requires users to engage with multimodal semiotic resources—such as images, videos, audios, captions, and emojis—in parallel, modal convergence reveals users’ deliberate intention to integrate these sources cohesively within a single visual unit. While explaining the reasons for this turn is beyond the scope of this article, we argue that this modal convergence aligns with the platform affordances shown in Figure 2, where Instagram’s recurrent image wall display facilitates the circulation of images detached from their accompanying text captions. Using image-text combinations allows key textual information to be retained, even as a visual is circulated in search results and timelines. If this text was contained only in the caption of an Instagram post, this information would be rendered invisible as the visual travels. We now examine in greater depth the impact of modal convergence on the representation of descriptive and normative elements of climate change and net zero (Figures 8 and 9).

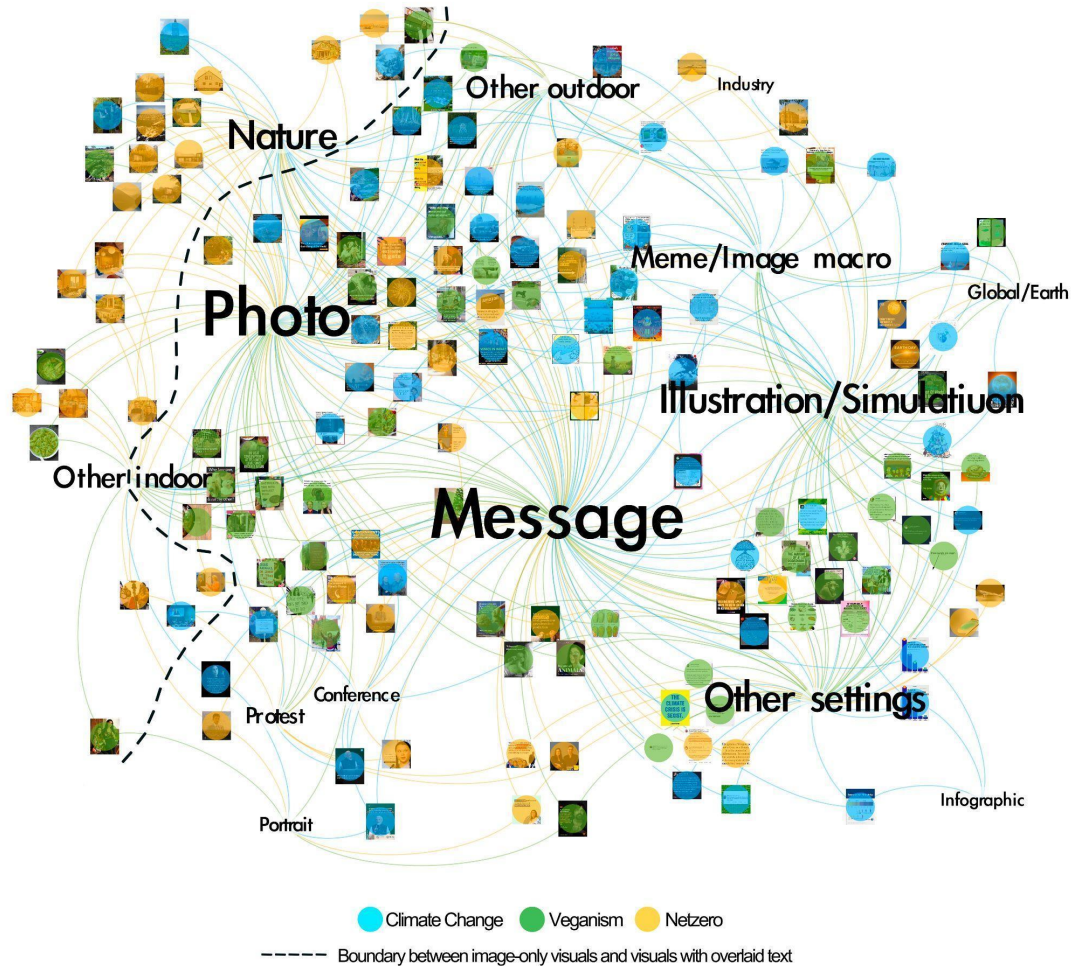


Figure 7. Network showing connections of 50 most liked Instagram visuals for each of climate change, veganism, and net zero with visual genres.

Figure 8 comes from the net zero dataset. Shrouded in a red filter suggesting danger, the image alone depicts a clear “is,” an environmental disaster that already exists, while the overlaid text provides a warning about the consequences of delaying what ought to happen in response. However, the text does not *specify* what ought to happen, only that there should be no delay in this unspecified action. While the modal convergence of image and text provides an opportunity for climate visuals to provide more complete, politicized arguments that span both “is” and “ought,” Figure 8 instead continues climate communication approaches that avoid advocating for specific political responses (Pepermans & Maesele, 2014).



Figure 8. Netzero #14 (personal communication, August 9, 2021).

Figure 9 is also characterized by ambiguity, both in the image and text. Unlike in Figure 8, the image requires the text to be given a clear meaning, the significance of the coastal location being contextualized by the textual message about sea level rise. An antithesis emerges from the image and the text (Tseronis, 2021): The text provides a statement about what is happening, or about to happen, supported by a visual depiction of what stands to be lost. As with Figure 8, what ought to be done in response to this threat is left unsaid. Indeed, the need for action is even less specific than in Figure 8, being implied only by the statement of danger. The "12 Indian cities" that are going to be submerged (note that there are no hedges such as "predicted" but straightforwardly "on the verge") are not some abstract ice floes in the far Antarctic, but mega urban centers that millions call home. The text, thus, helps construct an argument that moves from an image of "what a coastal cityscape is" to a post visual of "what a coastal cityscape ought to remain." This marks the point where the continuity from "is" to "ought" occurs, as one can start to "feel the policy-level implication of such a statement" (Walsh, 2010, p. 42) and consider preventive actions. Therefore, the "is" in the photo is not only anchored but also becomes an "ought": a coastal city that ought to stay as is. In this way, Figure 9 starts to answer the call by Meyer et al. (2023) for place-based action storytelling, identifying specific places for responses to climate change (as opposed to Figure 8). However, Figure 9 also demonstrates another of Meyer et al.'s points, that climate change remains represented as something we do not know how to act upon.

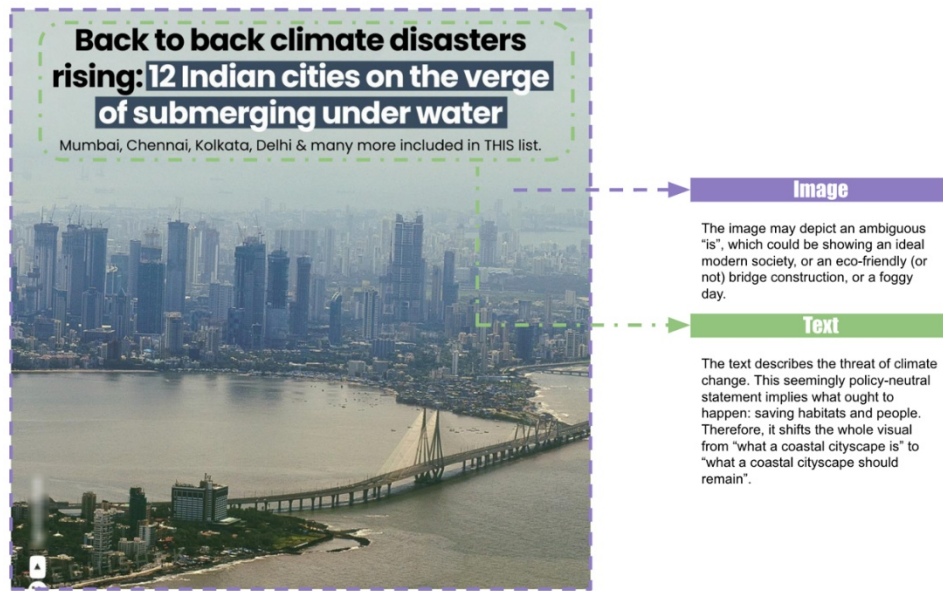


Figure 9. Climate change #5 (personal communication, December 7, 2023).

The modal convergence identified in Figures 8 and 9 opens up opportunities for more didactic, politicized communication of what climate change is, and what ought to be done about it, in comparison with the image-only building and food visuals in Figures 5 and 6. However, as Figures 8 and 9 demonstrate, these opportunities are not necessarily being taken. In Figures 8 and 9, the text reiterates the message of fear sent by the photo, a long-standing and arguably depoliticizing trope in climate communication (Swyngedouw, 2010). Images and texts can have consistent or conflicting meanings if seen separately, but their combination enables an intermingling of objective realities and normative judgments. However, this is-ought continuity does not necessarily implicate specific climate actions, as the ambiguous "oughts" remain detached from the specifics of values-based political choices.

Conclusion

Our research analyzes current trends in climate change representation on Instagram, with a platform-level focus on visual vernacular. Coding visuals related to climate change, net zero, and veganism, we used network visualizations to identify visual themes and genres within posts made visible within Instagram search results. Thematically, we found that posts related to veganism were most likely linked to animal rights and justice, while being detached from environmental concerns. This marks a divergence between the scientific literature proffering veganism as a response to climate change. For genre, we identify a dominant role for modal convergence: the inclusion of text within Instagram visuals. Our findings show how image-text combinations in Instagram visuals contain continuities and ambiguities between is-ought, echoing previous research on IPCC visuals (Walsh, 2010). These continuities were found in visuals of landscapes, either damaged or threatened by climate impacts overlaid with text, where the image and text could fulfil different roles in providing information or calls for action.

Based on these results, we argue that climate change representation on Instagram has evolved in recent years, with modal convergence marking a decisive turn away from the aesthetically pleasing visuals found in earlier research on Instagram climate change visuals. However, while modal convergence allows more information to be shared within visuals, this did not lead to clearer advocacy of responses to climate change. Instead, “climate actions” remained curiously undefined even within apparently hard-hitting calls for action. We do not claim to analyze the totality of climate change communication on Instagram because different search queries and/or hashtags may be associated with different visual vernaculars (Leaver et al., 2020). However, our focus on the posts made most prominent within search results provides important insights into how the platform as a whole represents climate change to its users through a visual vernacular.

Our results contribute new insights into the visual representation of climate change, demonstrating how longstanding tensions between *is-ought* play out on social media platforms such as Instagram. The rising prevalence of modal convergence constitutes an important new research focus, drawing attention to how platform affordances and the practices of its users are reconfiguring the visual representation of climate change. Recent research also demonstrates the importance of image-text combinations within other issues; for example, how the use of text and images in health communication varies between different platforms (Vicari et al., 2024). Our research highlights the importance of analyzing images and texts together in science and health communication.

This matters because much-existing research into social media science communication, whether in climate change or elsewhere, focuses on textual and visual concepts such as narratives, frames, and misinformation. While important, we argue that our research demonstrates the value of analytical approaches that foreground political agency and aesthetics, which should play a larger role in future research into climate change social media communication.

Modal convergence provides new opportunities for more mobile, politicized climate change communication, which makes sharper arguments about potential “solutions” to climate change. We do not argue that climate communicators should try to restrict themselves to “*is*” statements merely describing climate change. Rather, we have shown that there are continuities between “*is*” and “*ought*” in social media climate change communication, and that this is something to be harnessed by anyone wanting to make more political calls for action. Communicators should also be aware of the danger of the ambiguous *ought*, which echoes norms within climate science and some climate activism of avoiding calls for explicit actions. Second, we show that the reasons provided for climate solutions such as veganism and timber buildings, oftentimes do not include climate change. Neither vegan recipes nor timber buildings are climate solutions alone, or can be neatly categorized as either mitigation or adaptation strategies, a binary often used to distinguish climate solutions (Seelig, Deng, & Liang, 2022). An “*ought*” without an “*is*” can broaden engagement by reaching more individuals with different preconceptions about climate change, but it also risks the ambiguity noted above. These images, while resonating with Instagram audiences, are symptomatic of a lifestyle aesthetic that erases the political rationale for action (Giraud, 2023).

The political tension between “*is*” and “*ought*” can both guide and constrain the meaningful visual articulation of climate futures. Our study provides granular examples of how climate change is being made visible on Instagram, a key site of digital visual culture. Further research is required into important aspects

of digital platforms that remain beyond the scope of this research, for example, the role of expert and nonexpert actors, cross-platform comparisons, how visuals circulate within, across, and beyond platforms, and how visual representations change over time. Such a research agenda is required to examine how digital platforms, expertise, and visual cultures interact to produce new practices in climate change communication.

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