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8 News and Social Media Imagery of Climate Change

Analyzing the Role and Impact of Visuals in Public Communication

Mike S. Schäfer and Xiaoyue Yan

Why Media Imagery of Climate Change is Relevant

Public and media communication is crucial when it comes to climate change. Journalistic media – in print, radio, television, or online – are still important sources of news about climate change for many people. In addition, social media from social networks sites like Facebook, Instagram, and Twitter to video-sharing platforms like YouTube and TikTok have strongly risen in importance, particularly (but by no means exclusively) for younger generations. Even though a considerable proportion of the public say they perceive the impacts of climate change in their everyday life and immediate surroundings already, media sources still play an important role in shaping public perceptions and attitudes toward climate change.

In recent years, visualizations such as photos and infographics, but also memes, gifs, and short videos have become more important in news and social media. This applies to many topics, including communication about climate change. Imagery is used more widely in climate-related news. On social media, the importance of visuals has been heightened by the fact that several platforms are centered around visuals (like Instagram) or audio-visual content (like YouTube or TikTok). Visuals can serve as eye-catchers for audiences and users, generate and focus attention and engagement, and can be distributed easily across national, cultural, and linguistic boundaries (even though they have been shown to be interpreted differently in different sociocultural contexts). Ed Hawkins' "warming stripes" and "climate spirals" visuals, indicating average global temperatures and their changes over time (Figure 8.1), are well-known examples. They have gained prominence in news and social media and are used across the globe.

Researchers have responded. Studies of climate-related media imagery have gained importance in recent years. They have focused on stakeholders' use of climate change-related visuals (Wozniak, 2020), visual representations of climate change (Schäfer, 2020), and their uses and effects (Metag, 2020).

This chapter describes, first, how researchers have approached these questions, emphasizing the contributions of STS. It then summarizes the studies conducted on news media imagery of climate change, and social media imagery, respectively. Finally, it outlines future pathways for the field.

Analyses of Climate Change Imagery in STS and Beyond

Research into climate change communication started to grow in the 1990s and particularly in the mid-2000s. Soon afterward, studies on visual climate change communication appeared (see O'Neill and Smith, 2014 for an overview). Scholars analyzing climate-related visuals in news and social media come from different disciplines (such as sociology, geography,

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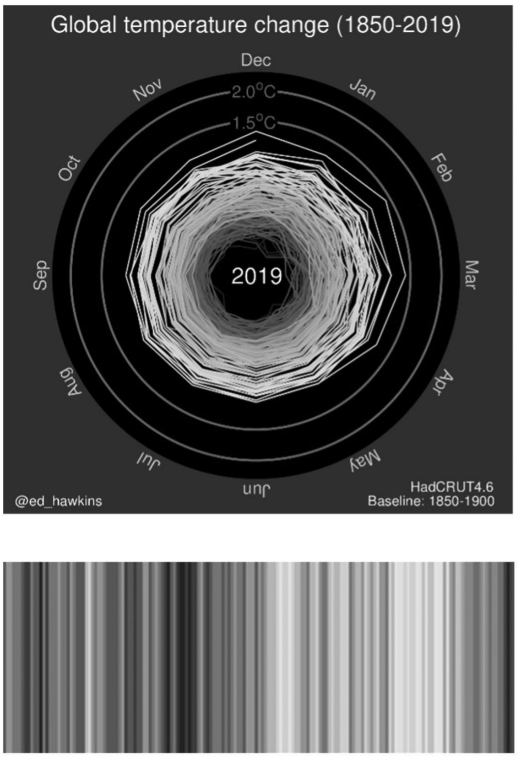

Figure 8.1 The "climate spiral" and the "warming stripes".

Source: Both developed by climate scientist Ed Hawkins (https://ed-hawkins.github.io/climate-visuals/).

communications, political science, or computer linguistics) and interdisciplinary fields like environmental studies. They mostly apply qualitative or quantitative variants of visual content analysis, visual framing analysis, or discourse analysis. Notably, they have mostly focused on print media imagery in English-speaking countries.

STS approaches play a role in this field, but not a prominent one yet. This may be due to STS's strong focus on communication *within* science rather than public communication, and its perspective on news and social media as socially shaped technologies rather than as places of public debate. The same is true for imagery: While STS scholars have turned to visual aspects more strongly in recent years, they have concentrated on images and the surrounding social practices within science. As a result, STS and studies on public communication have intersected and collaborated only selectively so far.

Nonetheless, STS has a lot to contribute to the analysis of climate-related visuals, starting with some of its fundamental tenets. Its basic assumption that science and scientific developments are socially embedded and constructed and must be studied accordingly also applies to climate science. STS's emphasis on news and social media's sociotechnological characteristics and their impact on communicators and audiences as relevant means for enabling societal debate and creating social meaning is important to keep in mind when analyzing any form of mediated communication.

STS also approaches imagery from a fundamentally constructivist point of view. It underlines that "seeing and recognition are historically and culturally shaped" (Burri and Dumit, 2008, p. 299), and that "scientific images and visualizations are exceptionally persuasive because they partake in the objective authority of science and technology" because they may "appear universal and neutral while selectively privileging certain points of view and overlooking others" (Burri and Dumit, 2008, p. 299). STS emphasizes that this persuasiveness also applies to mediated, public communication, for example when scientific images are used and distributed beyond science among stakeholders or the broader public.

In addition to these general points, specific concepts from STS lend themselves well to analyses of climate-related visuals and have partly been employed in analyses of mediated communication already. Examples are:

- **Boundary work** (Gieryn, 1999), which refers to practices through which different fields of knowledge and the boundaries between them are negotiated, often repeatedly and continuously. This can be the fundamental boundaries between science and its surroundings, or negotiations about expertise and about the question of who is an expert in a given field. Related concepts are **boundary objects** (Star and Griesemer, 1989) or **boundary organizations** (Guston, 2001), which bridge different knowledge communities. The concept of boundary organizations has been employed to analyze public communication of scientific institutions and Science Media Centers, for example, and images have repeatedly been interpreted as important boundary objects.
- **Science-related controversies**, in which knowledge communities exchange and negotiate different perceptions of scientific knowledge or technological applications, are another focus of STS that has been taken up by scholars analyzing mediated communication. The latter have analyzed, for example, how advocates and opponents of stem cell research or human cloning hold clashing viewpoints, how different communities debated fracking, or how discussions about applications of artificial intelligence develop. Sometimes using methods developed in STS such as "controversy analysis" (e.g., Marres and Moats, 2015), they have aimed to reconstruct how stakeholders engage in public, how they try to make their views and positions prominent in news and social media, and how successful they are in doing so.
- A third focus of STS studies that lends itself well to analyses of mediated communication is the concept of **imaginaries**, understood as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures" (Jasanoff and Kim, 2015, p. 4) that can manifest themselves in various ways and influence how people think and act toward issues such as climate change. Imaginaries can manifest in imagery as well. Such imaginaries, and their visual representations in news media or social media, can influence how members of the public envision the future development of scientific fields and certain technologies.

Prevalence and Characteristics of Climate Change Imagery: Findings from Research

Analyzing News Media Visuals of Climate Change

In recent years, more scholars have analyzed climate change visuals in news media. They have mostly focused on print media outlets and their online equivalents, including tabloids and broadsheet publications, and occasionally also television news. Most of them analyzed Western countries, particularly Anglophone countries such as Australia, the UK, and the US, but recently research has diversified to include some countries from the Global South.

Scholars found, first, that the *use of imagery in news media has been increasing*. News media utilize more images and position them more prominently – which is true for many topics and also applies to climate change.

Second, *news outlets throughout the world adopt relatively similar visual representations of climate change*. Images depicting polar bears on (too) small ice shelves, national landmarks submerged under water due to rising sea levels, or the joyous pose of world leaders after signing the Paris Agreement at the Conference of the Parties (COP) climate summit in 2015 have been used in news coverage around the world. Quantitative analyses have shown that in many countries, the most widely used images are those showing large-scale, harmful effects of climate change such as melting polar ice, floods, droughts, or mudslides. The second most prominent category is visualizations of politicians, celebrities, or stakeholders, which are often shown speaking at international summits or conversing with each other. Less common but still prevalent in news coverage are infographics that show temperature curves and other climate developments, images reflecting the causes of climate change such as greenhouse gas emissions, visualizations of impacts on citizens' everyday lives, pictures of unspoiled nature, visualizations of activists and their actions, and images of solutions.

Third, studies on the effects of news media imagery have shown that *this selection of visualizations may be problematic*. They have shown, for example, that the most widely used images of large-scale, harmful effects of climate change draw audience attention, but also give them a feeling of powerlessness and hopelessness, diminishing people's perceived self-efficacy and their intentions to act. In turn, visuals that may be more potent in motivating action are utilized less frequently in news media, such as pictures of solutions or the everyday consequences of climate change.

Fourth, research has shown that the *visual portrayal of climate change in news media is not only influenced by journalists and news producers, but also by stakeholders from politics, civil society, business, and science*. Throughout the past few decades, a wide range of visual arguments and assertions regarding climate change have been generated strategically by environmental groups and activists. For instance, the environmental non-governmental organization (NGO) Greenpeace first used visuals to reflect the potential dangers and destructions coming from the rising temperature in the 1980s and 1990s, then shifted its visual messaging to identifying the causes, responsible parties, and potential solutions to the issue in the late 1990s and 2000s, and finally, it turned to pressuring policymakers. These climate visuals were widely adopted by journalists to explain the rather complex issue and engage the public. Another active group of stakeholders are climate scientists, who often employ infographics and photographs to visualize research findings for decision-makers and the public. A typical, influential example is the Intergovernmental Panel on Climate Change (IPCC) assessment reports that widely, and influentially, use imagery as heuristic cues to convey scientific messages. In recent years, stakeholders' use of visuals has evolved, with many turning to more audience- and impact-focused visualizations that sometimes move beyond the realms of environmental activism and climate research and into spheres like arts and advertising.

Fifth, *visual content has been shown to have considerable influence on viewers*, potentially more so than textual information. Scholars have analyzed the effects of climate visuals on audiences' awareness, emotions, and behaviors toward climate change. Regarding awareness, findings show that images depicting the consequences of climate change are better comprehended by audiences and lead to a feeling that climate change is significant. It has been found that climate visuals – including audio-visual content like climate-related films and documentaries – can heighten audiences' concerns about climate change, elicit positive or negative emotions, and influence audiences' behavioral intentions. Studies exploring the affective and emotional

Table 8.1 Core findings from the research field

	Analyses of News Media Imagery	*Analyses of Social Media Imagery*
Typical research approach	Mostly quantitative or qualitative content analyses of print media imagery from Western countries.	Mostly manual variants of content analysis of small samples, usually from one social media platform.
Core findings	The use of imagery in news media has increased.	Visuals on social media differ from news imagery.
	News outlets around the world adopt relatively similar imagery of climate change.	Number of videos supporting consensus views about climate change and skeptical videos differ considerably from platform to platform.
	The selection of news imagery can be problematic.	Activists and activist groups have been shown to use social media visuals extensively.
	News imagery of climate change is influenced by journalists, news producers, but also many stakeholders.	Different types of visuals receive different levels of engagements on social media.
	Visual content has considerable influence on audiences.	
Limitations	Lack of multimodal analysis that is taking imagery as well as written text, sound, or video into account.	Mostly single platform studies, often analyzing Twitter.
	Focus often on case studies and lack of large-scale (e.g. computational) analyses.	Lack of quantitative and computational analyses.
	Focus largely on English-language data and Western countries.	Focused largely on English materials and Western countries.

impacts of visuals have shown that fear appeals (messages aiming to elicit fear by highlighting dangers and suffering), which often appear in climate change communication, can elicit negative emotions and stifle action – while other, less commonly used visuals (like depictions of solutions) evoke positive emotions and can improve people's belief that they can take action to address climate change.

Analyzing Social Media Visualizations of Climate Change

The emergence and rise of social media have changed how issues like climate change are publicly communicated, perceived, and engaged with. Social media have become important sources of climate-related content for many. They have changed the fundamental logic of public communication by allowing for many-to-many communication, bypassing established gatekeepers like journalists, and enabling members of the public to author, distribute, share, or comment upon content and take an active part in the public discussion of climate change.

So far, however, only very few studies have analyzed climate change imagery on social media. They mostly employ discourse analysis, qualitative or quantitative content analysis that rely on manual coding and modest sample sizes (from one to 200 visuals). Often, they are case studies focusing on single well-known organizations or persons, like Greenpeace and Greta Thunberg, or prominent events like the COP summits. They frequently employ multimodal

approaches, taking visual and textual attributes of posts into account. Several findings can be distilled from the field:

First, even though few studies have compared this systematically, *visuals on social media seem to differ from news media imagery*. On Twitter, memes, motivational quotes, and screenshots have been shown to be the most common visualizations of climate change, followed by portrayals of individuals like politicians and celebrities. Visualizations of climate change consequences, the most popular visual category in the news, are less important on social media. When focusing only on "top tweets" (defined by Twitter as "the most relevant" tweets for a search query based on the platform's "popularity" measure that contains interactions, shares, and other factors), the use of visuals changes. While the imagery in top tweets often portrays individuals, these are more often citizens rather than politicians and celebrities who are prominent in news media. Images of climate consequences and solutions are the second most prevalent category among top tweets, followed by images depicting protests and scientific imagery. Memes on Instagram and Facebook have been shown to call mostly for awareness and action against climate change, followed by memes attacking liberal and conservative political views and politicians.

Second, studies analyzing audio-visual content have shown that the *number of videos supporting consensus views about climate change versus climate-skeptical videos differs considerably from platform to platform*. A YouTube analysis in 2018 showed that among 200 randomly selected videos on climate change, the majority opposed the scientific consensus (Allgaier, 2019). On TikTok, the science of climate change is rarely a topic, but a large majority of videos on the platform support the scientific consensus, often coupling sincere appeals with humorous text or visuals when mentioning the issue. It is notable, however, that some widely viewed videos exist on TikTok as well that refute anthropogenic climate change, and that a substantial proportion of TikTok videos with climate-related hashtags are irrelevant to the issue. They just "hijack" the buzz generated by the hashtags to draw attention to themselves.

Third, *activists and activist groups use social media visuals extensively* to broadcast their views, mobilize their audiences, and illuminate the absence of news media coverage. This was especially true for young activists, who are more accustomed to social media logics. The prime example is activist Greta Thunberg who communicated her weekly climate strikes on social media and has become a global icon and an important communicator of the issue. She has been shown to frame climate change as a moral and ethical issue on Instagram and to use visuals to motivate collective action, for example, by depicting protest signs and smiling peers while engaging in activism. Activists sometimes come together and protest during important climate events like COP meetings. In their protest videos on YouTube during COP15, activists visually portrayed themselves as soldiers or freedom fighters. The visual discourse focuses on the nodes of war, injustice, and resistance. Among activist groups, Greenpeace uses three main visual themes on Instagram to communicate a "climate crisis" in Indonesia: climate crisis threats, an urgent need to switch to renewable energy, and calls for more environmentally friendly political regulations. Environmental NGOs also post advertisements about climate change on Facebook, in which they frequently combine texts on pollution and efficacy with visuals of climate impacts and texts about protest with visuals of collective action.

Fourth, *different visuals receive different levels of engagement on social media*. Social media allow individuals to become both content producers and reproducers by sharing, liking, and commenting on specific content. Therefore, understanding the drivers of social media engagement is important for analyses of (visual) communication of climate change. Several scholars have focused on this question. They have shown that despite their infrequent occurrence, protest visuals regularly received the highest engagement on Twitter, followed by people-related visuals. In contrast, memes, motivational quotes, and screenshots generated limited amounts of

engagement despite their prevalence. On YouTube, videos in favor of the scientific mainstream perspective barely outnumbered those against it in terms of views. On TikTok, videos of natural disasters and the environmental effects of climate change typically get more views, likes, and comments than other videos. Although making up only a small portion of climate videos on TikTok, videos that spread misinformation about climate change earned many views as well.

Limitations and the Way Forward

Generally, researchers have paid less attention to climate change images than merited by their importance. Consequently, several of the findings above are less definitive than they should be. Since the amount of climate change visuals is clearly rising in news and social media and their effects on audiences are significant, more research is urgently needed in this field. In addition, this research needs to be more diverse – in the cases it analyses, the contexts and countries it draws them from, and the news and social media it focuses on. With their unique conceptual and methodological approaches, more STS research would be particularly helpful in providing an additional conceptual grounding.

In addition, current research on climate change communication in news and social media has clear gaps and limitations. Most research analyses print media and often focuses on single news media or social media (mostly Twitter) within each study. Even though visuals are disseminated across borders and socio-political contexts, and can travel across language barriers, research continues to concentrate almost entirely on English-language materials and Western nations. Often media within cultures and nations more vulnerable to climate change are ignored such as coastal countries in south and southeast Asia. Despite the importance of understanding how climate visuals affect audiences, existing research frequently does not investigate impacts.

A significant gap in news media studies is their lack of multimodality. Studies usually concentrate only on visuals such as still images and photographs. But visuals function in concert with other modalities, such as texts, and can have varying effects on audiences accordingly. More studies examining news visuals in conjunction with other modalities should be conducted.

Social media analyses should go beyond Twitter and expand their view to include social media platforms with large user bases like Facebook and centered around visuals like Instagram. In addition, studies across platforms are required since different social media platforms have unique logic and affordances. Scholars should also pay attention to specific online visuals like memes, screenshots, and gifs and consider their potential for use by climate change skeptics. In general, the role of visuals for the dissemination of dis- and misinformation and climate-related conspiracy theories needs questioning.

Finally, the role of generative artificial intelligence, which provides original responses to user prompts based on supervised and reinforcement machine learning techniques, for the visualization of climate change should be analyzed (Schäfer, 2023). Tools like DALL.E, Midjourney, or Stable Diffusion can already produce photo-like visualizations that could change visual communication about climate change (among other issues) considerably.

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