

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository:<https://orca.cardiff.ac.uk/id/eprint/172673/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

McGarry, Aidan and Trere, Emiliano 2024. Impact and blame: visual climate change communication on twitter during the California wildfires. *International Journal of Communication*

Publishers page:

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



Impact and Blame: Visual Climate Change Communication on Twitter/X During the California Wildfires

AIDAN MCGARRY,
Loughborough University, UK

EMILIANO TRERÉ
Cardiff University, UK

Aidan McGarry: a.mcgarry@lboro.ac.uk

Emiliano Treré: trereE@cardiff.ac.uk

Date submitted: 2023-07-24

Visual images have played an important role in consciousness raising of the climate crisis in connection with environmental movements. This article explores the visual discourse on Twitter/X on the California wildfires in 2020 and 2021 and analyses the visual framing strategies used by environmental activists/NGOs on social media which attempt to shape knowledge, meanings, and narratives vis-à-vis climate change, and the challenges of doing this. Drawing on two visual data sets and interviews with key NGOs, we argue that impact and blame emerge as key themes on Twitter/X regarding the California wildfires. Visual culture helps to attribute blame to fossil fuel industry and politicians and presents the California wildfires as the result of anthropogenic climate change.

Keywords: visual, climate change, communication, Twitter/X, environmental activism

Climate change is an urgent issue that affects our environment, homes, lives, and resources. The decisions we make today on the environment will impact future generations, for better or worse. The Intergovernmental Panel on Climate Change (IPCC, 2013, 2021) has recognized that failure to limit temperature increase would exacerbate the already fragile conditions of the atmosphere marked by global warming.

Impact and Blame: Visual Climate Change Communication on Twitter/X During the California Wildfires

AIDAN MCGARRY,
Loughborough University, UK

EMILIANO TRERÉ
Cardiff University, UK

Aidan McGarry: a.mcgarry@lboro.ac.uk

Emiliano Treré: trereE@cardiff.ac.uk

Date submitted: 2023-07-24

Visual images have played an important role in consciousness raising of the climate crisis in connection with environmental movements. This article explores the visual discourse on Twitter/X on the California wildfires in 2020 and 2021 and analyses the visual framing strategies used by environmental activists/NGOs on social media which attempt to shape knowledge, meanings, and narratives vis-à-vis climate change, and the challenges of doing this. Drawing on two visual data sets and interviews with key NGOs, we argue that impact and blame emerge as key themes on Twitter/X regarding the California wildfires. Visual culture helps to attribute blame to fossil fuel industry and politicians and presents the California wildfires as the result of anthropogenic climate change.

Keywords: visual, climate change, communication, Twitter/X, environmental activism

Climate change is an urgent issue that affects our environment, homes, lives, and resources. The decisions we make today on the environment will impact future generations, for better or worse. The Intergovernmental Panel on Climate Change (IPCC, 2013, 2021) has recognized that failure to limit temperature increase would exacerbate the already fragile conditions of the atmosphere marked by global warming,

increased sea temperatures, extreme weather events (drought, forest fires) etc. In 2022, an IPCC report on impacts, adaptation and vulnerability included a chapter on North America which stated with “high confidence” that “anthropogenic climate change has led to warmer and drier conditions (i.e., fire weather) that favor wildland fires in North America” (IPCC, 2022, p. 1948). Significantly, Myers, Maibach, Roser-Renof, Akerlof, & Leiserowitz (2013) highlighted how first-hand encounters with widely publicized and extensively discussed events like extreme weather can influence individual beliefs concerning climate change. Hence, the challenge resides in the way we convey and conceptualize climate change.

In this context, images and visualizations acquire a particular relevance, as they are used to generate narratives, understandings, meanings, and knowledge of a range of events, phenomena, and practices (Rose, 2016). Further, visual images are “necessary for social literary and hold the capacity to stimulate conversation across the social and physical sciences” (Balkin, 2021, p. 232). This has been amplified in recent years by the proliferation of social media platforms which have dramatically increased the range and diversity of actors who attempt to shape understandings of climate change (Roxburgh et al., 2019). Environmental social movements exploit visual technology and social media platforms to meet communication goals, such as “grabbing attention, promoting comprehension, creating awareness, and changing beliefs, intentions, reasoning and behavior” (Maes, 2017, p. 231). Activists use the opportunities afforded by events such as forest fires to shape narratives, determine meaning and knowledge and raise awareness of the links between climate change and extreme weather (Vu et al., 2021).

Situated at the confluence between environmental studies, visual studies and social movement studies, this article explores the visual discourse on Twitter/X on the California wildfires in 2020 and 2021 and analyzes the visual framing strategies used by environmental activists/NGOs on social media to shape knowledge, meanings, and narratives vis-à-vis climate change. It shows that communicating climate change is a challenge for activists/NGOs who focus on attributing blame to those actors it holds responsible for climate change, namely fossil fuel industry and politicians.

We begin by discussing the key role of visual communication and framing in the climate crisis. Then, we explain the methodology adopted and introduce the case study of discourse around the California wildfires of 2020 and 2021. In the next section, we explore two different, but related, visual discourses shared on Twitter/X to assess the main debates and issues. We demonstrate that the visual discourse on the wildfires acted as a public information service where people could share updates on how the fires were spreading, and the impact they were making on people's lives. Then, we zoom in on the visual framing strategies used by environmental NGOs as they attempted to link the wildfires to climate change and attribute blame to specific actors (fossil fuel industry and complicit politicians who were failing to act). In addition to assigning blame, we show that NGOs developed a future-focused vision that recognized the power of protest and group action to affect change. In the discussion section, we underline the differences in the findings between the two data sets and reflect on the implications for environmental studies, visual studies, and framing. We conclude calling for more research to assess the visual strategies, repertoires, and meanings mobilized by the different social forces that constitute the climate crisis arena.

Research Context: Visual Communication, Framing, and the Climate Crisis

Visual Communication Research

The power of visual communication is well established in scientific research and health policy as a tool to communicate complex problems or act as “proof” to the lay public (Culloty et al., 2019). Manifestations of visual culture such as maps, graphs, tables, are important in health and science communication, and also increasingly important in environmental communication (van Beek et al., 2020). The “twenty-first century offers an unprecedented deluge of data, imagery and other materials” (Balkin, 2021, p. 233) relating to climate, the atmosphere, and future imaginaries of the planet. It has been pointed out that images do not just represent objective facts but signify a complex representation of social forces and political agendas (Luke, 2015). Thus, visual culture is not just a reflection of society but one which can shape society (Hansen & Machin, 2013). Visual culture “speak” to us as it communicates knowledge, meanings, values, and worldviews. As Hansen and Machin (2013) argue, the western world has

come to equate seeing with knowing and point to the central documentary role of the photograph as evidence or bearing witness.

Visual communication research has studied media images and the efficacy of images (i.e., people's perceptions of visual discourse; Smith & Joffe, 2009). O'Neill and Smith (2014) identify three prevalent themes on climate change imagery: time (past, present, future); truth (proof or witness, uncertainty, and perceptions); and power (who produces and chooses, who speaks, what frames are included) and articulate these themes across three "moments"—the production of images, the image itself, and the consumption of images. Research has shown that photographs tend to generate stronger risk perceptions compared to infographics like maps and graphs (Burgoon, Henderson, & Markman, 2013). There is a sense of validity that visual culture adds into public engagement with climate change risk and perception; meaning that visual culture bestows a stamp of authenticity which enables easier processing than text or verbal information (Smith & Joffe, 2009, p. 660). This does not apply exclusively to photographs, since infographic representations such as charts, maps, graphs are also data which "become an essential part of the epistemic process" (Heekeren, 2021, p. 73). They help to communicate or mediate scientific or expert knowledge to the lay public to make complex phenomena more legible. Visual culture tells us something meaningful about the accessibility, relevance, and attractiveness of information and knowledge (Susanka & Kramer, 2021).

Social Media Research

Social media platforms such as Twitter/X have emerged as powerful and important spaces where scientists, politicians, government officials, and citizens interpret and negotiate meanings, knowledge, and values, as well as determine mitigation and adaptive action (Hopke & Hestres, 2018). In the context of severe and potentially irreversible climate change, the question of who becomes authorized to speak, make sense of, translate and advocate acutely emerges. Those who have the power to determine the terms of the debate (i.e., the key issues and how these are understood) can significantly impact the outcomes. It has been shown that "the cultural politics of climate change are situated—power-laden, media-led and recursive- in an

ongoing battlefield of knowledge and interpretation” (Boykoff, 2011, p. 167). The scientific nature of climate change and the requisite authority to speak means that some voices are considered more legitimate than others (Manzo, 2010). Social media users themselves produce visual discourse on climate change as empowered and active participants meaning they engage in spaces through circulation, discussion, and debate (Vu et al., 2021). Social media platforms such as Twitter/X are useful spaces for the sharing and exchange of information, used to stimulate change at different socio-political and cultural levels (Kavada, 2015). Similarly, Shapiro and Park (2015) have explored how YouTube facilitates and encourages public engagement on climate related topics and fosters activism around climate change, whilst research on Instagram has focused on the power of prominent activists like Greta Thunberg to build collective identity (Molder, Lakind, & Chen, 2022).

Framing Climate Change

Research on frames highlights that framing refers to how an issue is portrayed or understood. Frames create meaning by highlighting specific elements of a perceived reality, making them more prominent. This influences how a problem is defined and understood, its moral significance, and the ways to address it (Entman, 1993). It is argued that “frames are interpretative storylines that set a particular train of thought in motion, communicating why an issue might be a problem, who or what might be responsible for it and what should be done about it” (Nisbet, 2009, p. 15). According to Nisbet (2009), frames are an inevitable consequence of communication because “there is no such thing as unframed information” (p. 15). Analyzing which frames are present and absent in public discourse helps to reveal how actors have tried to shape policy debates and public opinion by setting agendas and legitimating certain participants or responses whilst discouraging or undermining others (Supran & Oreskes, 2021). Frames are a key concept in social movement studies (Snow, Rochford, Worden, & Benford, 1986) including environmental movements. They are “imprints of power,” since highlighting certain aspects of a perceived reality is an expression of the frame sponsor’s views and interests (Gamson & Wolfsfeld, 1993). Actors such as journalists, politicians, businesses, scientists, and civil society all attempt to frame issues to communicate their demands to shape knowledge and understanding of a particular

topic. The importance of images and visual framing has also been addressed by studies on social movements and activism (McGarry, Erhart, Eslen-Ziya, Jenzen, Korkut, 2019a). At the same time, images have been used to help communities understand and communicate issues of climate justice in the context of resource extraction (Spiegel, 2020).

Over the past 50 years, environmental issues, and especially anthropogenic (man-made) global warming, has been one of the most contested terrains of framing activity. Actors use frames to influence public understanding of climate science and politics and its potential to trigger behavioral change towards more environmental thinking and activity (Wozniak, 2021). This has led to state interventions, the creation of international efforts to set standards on CO₂ emissions (such as the Paris Climate Agreement of 2015), and promotion of individual responsibility (e.g., recycling). These frames have been pushed by environmental advocates with other actors (industry, politicians, media, etc.) often responding to activist framing activity. Extreme weather events provide news organizations with concrete evidence strengthening the argument that climate change is caused by human activity (Hopke, 2020; Smith & Joffe, 2009, p. 649): Vivid images of suffering and devastation due to drought, flooding and forest fires are implicitly and explicitly linked to climate change. Yet, despite the evidence set out by the IPCC (2013, 2022) about the role of human activities contributing to global warming, social movements must walk a tightrope of discourse that can obfuscate scientific data and language, mired amid right-wing populist political and economic rhetoric designed to hide or minimize the role of humans in climate change (Pinto, Gutsche, & Prado, 2018, p. 3).

Most research on images and climate activism focuses on the role of photographs in news media (Hayes & O'Neill, 2021) which can distort the original frames elaborated by activists. This focus often fails to consider other visual culture (memes, maps, graphics, cartoons, stills) especially on social media (Davis, Love, & Killen, 2018). This article will illuminate the use of visual framing repertoires made by activists, whilst acknowledging the dominance of photographs. Additionally, we explore the visual frames elaborated by environmental activists and advocates to underline how visual communication helps raise awareness and advance key structural

goals, that is, attributing blame to politicians and advocating direct collective action. Our research contributes to integrating and advancing knowledge at the intersection between the power and challenges of the visual in environmental studies and the role of social movements in framing and raising awareness of the climate crisis on social media platforms.

Methodology and Case Study

The data collection and analysis combine digital data collection techniques with qualitative data analysis including visual coding and analysis as well as two semi structured interviews. We used social media scraping for the automated capture of online data. Scraping enables a form of “live” social research (Marres & Weltevrede, 2013) using a variety of tools such as hashtags, key word searches, and trending topics. In this research, scraping produced visual data (including photographs, GIFs, maps, video stills, and memes) from Twitter/X which was initially collected using the Twitter/X API and Mecodify software (Al Saqaf, 2016). Please note that the data was collected before Twitter/X began charging for its free API in February 2023. There are two data sets totaling 350 images: first, visual discourse of the California wildfires on Twitter/X during 2020–2021 (250 images); second, the visual data of environmental NGOs (100 images). We interviewed communications specialists in two of the NGOs (Greenpeace and Movement Generation) we collected data on in order to better understand their visual repertoires and digital communications strategies.

For the first data set, we collected tweets of the 2020 and 2021 California wildfires using hashtag searches of the most prominent hashtags including #CAwx, #calfire, and #californiawildfire as these produced tweets with images which were specific to California and wildfires (as opposed to #climatecrisis) and was used consistently across the time frame thus covering a range of wildfires. The timeframe of the data collection was 01/01/2020–12/31/2021 which covered the largest wildfires in California (especially in 2020). Mecodify was used to extract those tweets which had images and were not retweets or duplications which left 288 unique images, a random sample of these produced the first dataset (total 250 unique images). It should be noted that sometimes images captured wildfires in other parts of the country (such as the

Pacific coast, in Oregon) or in other states (such as Canada, which also experienced wildfires at the same time) but using the text in the tweet we could determine that there were only four such cases. The second data set drew on any environmental NGOs that were sub-tweeted (when an NGO's X handle is mentioned in the tweet) or mentioned (when an NGO name is written) in tweets of the first data set. It used Google searches and snowball sampling to identify prominent environmental NGOs in California and the United States, including national organizations with California-based and global chapters. The Twitter/X feeds for 20 environmental NGOs were scanned to ensure they tweeted about and during the California wildfires in 2020 and 2021, before 11 NGOs which tweeted about the wildfires with an image were selected for social media scraping. These are: Greenpeace USA; Sierra Club; Mighty Earth; Green Action for Health; Just Seeds; Movement Generation; 350.org; Sunrise Movement; Climate Youth versus Apocalypse; Earth First; and One Earth. The timeframe of the data collection was 01/01/2020–12/31/2021, which covered the largest wildfires in California. Mecomodify was used to extract those tweets which had images related to the forest fires (we did not collect tweets on other activities of these organization like intersectional justice or the green new deal) which was understandably much smaller than the first dataset. A random sample of these produced the second dataset (100 unique images). The images comprise photos, memes, video stills, images with text, graphic art, cartoons, visual data (graphs, charts etc.) and documentary images.

The two datasets were subsequently brought into NVivo individually for storage and coding purposes, employing a key visual discourse analysis technique to delve into the meanings conveyed through images (McGarry, Jenzen, Eslan-Ziya, Erhart, & Korkut, 2019b). It is important to note that images are extremely rich sources of data and are highly mutable (Rose, 2016) which is why coding is vital to categorize, organize and make sense of the data. The authors worked together on the codes for the first 50 images in the first data set and 20 images in the second data set. Both authors coded the rest of the images separately but to ensure reliability and consistency, select images (five in each data set) were coded by both authors. Coding helps to develop a typology of visual framing deployed by environmental NGOs to shape narratives and understandings relating to the wildfires as well as to climate change. The codes and categories of this study were developed inductively. Each image has 5–14 codes

attributed covering the following categories: object; actors; iconography (symbols and/or icons associated with wildfires); voice (the communication of demands/issues); affect (invocation of emotion/sentiment), and use of text. Coding of images is challenging. One drawback is that some codes overlap with others, including voice and affect, for example, when NGOs invoke danger (affect) to communicate their demands (voice). Voice is used to capture what is being communicated through an image whilst affect is when this invokes particular emotion(s). In these instances, images are coded in both categories. A related challenge is to accurately ascertain the reasons or motivations for the sharing of certain images, again this is not always so clear in voice and affect. For example, posting of a map of poor air quality can be read as an attempt to warn others of poor air quality in an area but it could also be simply information-sharing. With the interviews of NGOs, we are able to determine this to an extent but with the first dataset, we can only hypothesize. Overall, we understand coding of images to be an attempt to identify key themes and patterns in the content of the visual data and to attempt to uncover the meaning. Codes of both data sets are presented in Tables 1 and 2 below, with the frequency with which each code was used represented as a percentage.

Case Study: California Wildfires 2020 and 2021

California's Department of Forestry and Fire Protection (CalFire) confirms that 2020 was a record-breaking year in terms of fires. Five of the six largest fires ever in the state occurred in this calendar year, which killed 33 people and burned 4.3 million acres, destroying over 10,000 buildings (Anguiano, 2020). Every statistic about the scale and impact of the 2020 fires in California was unprecedented and extraordinary. The 2021 wildfires were also destructive but not quite on the same scale killing three people and destroying 2.6 million acres of land. The 2021 season reported more "megablazes" due to the devastation of the previous year. The fires destroyed natural ecosystems as well as flora and fauna on a scale not yet fully understood; it devastated the state's iconic Redwood and Sequoia trees and destroyed one million Joshua trees (Anguiano, 2020). California Governor Gavin Newsom regularly declared a "state of emergency" in pockets of California to focus resources towards areas particularly affected by the wildfires.

The wildfires in California and the west coast of the United States dominated news media (*The Guardian*, *Associated Press* and *BBC* each have dedicated “wildfire” sections to cover wildfires across the globe) and social media across 2020 and 2021 (CalFire’s Twitter/X account has just under half a million followers). It is widely acknowledged that the climate crisis is making the state hotter (Williams et al., 2019). Fire risk across the American West was exacerbated by historic conditions in 2020: a record-breaking drought and unprecedented heatwaves. Higher heat not only dries landscapes faster, making them prone to burn, it also reduces snow, reducing the water flow into rivers and reservoirs. It should be noted that there were some cases of arson, and cases where fires start due to accidents (e.g., agricultural machinery) or natural factors (e.g., lightning strikes).

Visual Discourse 1

Table 1. Visual Data 1 as % (Twitter/X Discourse From #californiawildfire).

Object	Cartoon/Drawin g	2	
	Graphic (not map)	14	
	Map	13	
	Meme	4	
	Newspaper	7	
	Other social media	3	
	Painting	0.4	
	Photograph	68	
	Split screen	4	
	Video still	2	
	Actor	Activists	0.4
		Corporations (not oil)	1

	Firefighters	24
	Media	2
	Oil/Coal	0
	Industry	
	Police	0.4
	Public	0.4
	Politicians	0.4
	Workers	1
	(agricultural)	
Iconography	Animal	4
	Fire	42
	Forest/Trees	46
	Home	19
	Lightning	0.4
	Smoke in the air/sky	48
Affect	Apocalyptic	12
	Beauty	5
	Courage	13
	Danger	39
	Death	2
	Destruction	27
	Gratitude	3
	Hope	3
	Hopelessness	2
	Humor	2
	Sadness	2
Voice	Accountability	1
	Advocacy	0.4
	Air Quality	22
	Appeal	12
	Blame	2

	Community/Solidarity	20
	Crisis	12
	Hypocrisy	0
	Intergenerational justice	0.4
	Link to climate change	0.4
	Responsibility	8
	Risk	38
	Urgency	17
Info sharing		30
Text	No text	61
	Text included	39

In the first data set (images shared on #californiawildfire) visual discourse tended to focus on the impact of the fires. Specifically, it demonstrates how fires affect people's home, everyday lives, businesses, mobility, health, and public workers (firefighters). The images do not lay the blame at the door of politicians or fossil fuel industry and almost no reference is made to climate change. Many images are information sharing (30%) in nature and focus on how people can either prevent further fires or help people to prepare for fires (e.g., what to pack for children and pets if one needs to flee one's home quickly). Across the data set, there is a shared sense of incredulity at the scale and power of the fires and gratitude at fire services for containing the fires and mitigating their impact.



Figure 1. Firefighters (Xavy 2020).

Photographs are the dominant object (68%) which is not surprising given how powerful photographs are as a mode of bearing witness and of “seeing” the reality of the fires on the ground. Of all the actors included easily the most popular are firefighters (24%) with many images capturing their perceived courage and bravery as they worked to either put out the fires (or to mitigate their impact) and protect people and homes. Firefighters are presented as working in close proximity to the flames (see Figure 1), putting themselves in danger to protect communities. In Figure 1, we see two firefighters in conversation with their backs to us; their fire engine sits in front of them whilst a huge fire scorches a near hillside. The fire is large with smoke pluming into the air. Of relevance for this article is the complexity of “localizing” climate images with research showing that deploying images to help reduce the supposed psychological and geographic distance of climate change as a strategy for engagement is unclear (Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015). Here, the fires are very real and very present. Figure 1 presents an apocalyptic vision, one which is out of control and full of danger. The suggestion being that the only protection we, the viewers, have is the efforts of heroic fire fighters at the frontline. Interestingly, this image leads us to believe that human intervention is the solution, but fails to attribute blame to anthropogenic causes, just anthropogenic solutions. O’Neill, Boykoff, Niemeyer, & Day (2013) show that images which ostensibly pictured climate change impacts (such as bushfire) were not considered particularly salient for audiences in influencing people’s behavior regarding climate change, even if these images generated significant attention and attracted visibility on news media and social media.



Figure 2. Home on fire (Tehran Times 2020)

In terms of iconography, fire (42%), forest/trees (46%) and smoke in sky/air (48%) are the most prevalent. Visual discourse on Twitter/X shows the proximity and scale of the fires, to people's homes, their livelihoods, and their ability to move around the state. Homes are present in 19% of this data and sometimes the home is on fire (or homes are shown close to fires/flames). Figure 2 shows a house engulfed by flames with only the frame still standing, though the intensity of the fire suggests that soon the frame itself will be gone. The image is composed of fire and flames with a strong and intense orange/red hue, communicating to the viewer the raw power of fire and its potential to destroy everything in its path, including someone's home as well as a tree (this sends the message that both natural flora and man-made structures are vulnerable to fire, nothing is safe). Home is considered a stable and permanent place, strong and sturdy in its build, however fire shatters that illusion and suggests that all could be lost if fire tears through. The photographs in Figures 1 and 2 are taken by a professional photographer working with CalFire which ensures that the photographer has access to spaces where the fires rage most intensely and thus tend to create the most dramatic shots, particularly those which demonstrate the scale, intensity, and impact of the fire.



Figure 3. Smoke in sky/air (Chin 2020).

Figure 3 shows smoke in the sky and the resultant poor visibility. The vehicles on this freeway move towards a hazy horizon, suggesting uncertainty. The image is taken from the center of a freeway, presumably by a passenger in a moving vehicle. While forest fires certainly damage property and land across the state, most residents' first-hand experience of the fires is smoke which stretched across the state and country. The fires also impacted on the capacity of Californian residents to move freely with roads often being closed off for safety reasons (Pao, 2020). There were many images like this one in the data set. Such citizen journalism enables ordinary people to document knowledge and understanding of the impacts of the fire in real time. Whilst perhaps not as eye-catching as the previous images, Figure 3 helps to contribute to discussions about the scale of the fires and their impact. It also helps to reinforce the idea that the effects of the fires are in the present, not something remote or future-oriented. These images do not make any explicit link to climate change, indeed, reference to climate change as a cause of wildfires is surprisingly low in this data set (0.4%). Instead, the visual discourse tends to document and record what is happening rather than communicate a particular argument through the images.

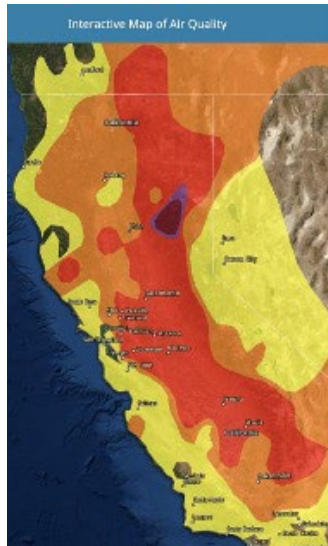


Figure 4. Air quality map of California (CLCA Insider 2020).

Visual discourse on Twitter/X takes a variety of forms. In addition to photographs, the objects include maps, infographics, memes, video stills, and newspaper front pages. Media reporting on events like wildfires also produces a variety of visual discourse to help communicate information and knowledge on the wildfires. In Figure 4, we see a map of (part of) California. It shows the air quality index across the state, roughly corresponding to where the wildfires are most intense; where there are fires, there is smoke, and this creates poor air quality. Whilst there is no legend to the map, we can infer that yellow is the best quality air (and is mainly along the coast where fresh ocean air is strongest) then orange and red until purple represents the poorest quality air. The sharing of this graphical information acts as a warning to others about where to avoid when planning to travel across the state. It also alerts us to take air quality seriously, air quality appearing in 22% of the visual data. Graphical information is used in data journalism to communicate “facts,” with such information being regarded as reliable and authoritative. This kind of images are often taken from news media or metrological sources; they are not created by ordinary users as they require significant technical skills to create. This image is an example of information sharing (30%) and community/solidarity (30%) which are relatively prominent in the visual discourse. Information sharing imparts facts in a seemingly objective manner allowing the viewer to interpret and (not) take appropriate action. We can hypothesize

that by sharing this information, users display a sense of community towards fellow residents in flagging the potential danger of poor air quality.

Having considered the main themes and issues emanating from visual discourse on Twitter/X, we will now turn our attention to the visual discourse produced by environmental NGOs as they attempted to shape knowledge, meaning and narratives during the California wildfires.

Visual Discourse 2 (NGOs)

Table 2. Visual Data 2 as % (Environmental NGOs).

Object	Graphic (not map)	24
	Map	4
	Meme	14
	Other media	4
	Photograph	70
	Split screen	8
	Video still	1
Actor	Activist	19
	Firefighter	2
	Indigenous	3
	Oil/Coal Industry	22
	Politician	20
	Public	11
	Workers (agri)	8
Iconography	Animal	5
	Fire	28
	Forest/Trees	29
	Home	14
	Landscape	11

	Oil drill/pump	4
	Rainforest	8
	Smoke in air/sky	30
	Smokestacks	2
Affect	Anger	23
	Apocalyptic	18
	Beauty	11
	Danger	17
	Death	2
	Disdain	9
	Fear	6
	Hope	2
	Humor	11
	Love	1
Voice	Advocacy	24
	Blame	39
	Community/Solidarity	25
	Hypocrisy	10
	Link to climate change	25
Text	No text	40
	Text included	60

The data examined 11 different environmental NGOs and the visual images they shared during the 2020/2021 California wildfires. As social movement actors, environmental NGOs attempt to shape knowledge, understanding and meaning of the wildfires. Partly due to their dramatic imagery, wildfires are themselves media and political events thus attracting a significant amount of attention around the world. Therefore, they are excellent opportunities to attract visibility to the work of environmental NGOs and to shape meanings and understandings. It is in the NGOs'

interest to demonstrate a causal relationship between the wildfires and climate change, which is not a straightforward intervention.

Blame regulates behavior by criticizing or devaluing the blamed agent, it is thus a strong and potentially damaging intervention which undermines or seeks to apportion fault for an event, action, or outcome (Malle, Guglielmo, & Monroe, 2014). Blaming is an act which is itself subject to social norms and carries a burden of proof: The blamer must be able to offer grounds for why an agent deserves the attributed blame (McKenna, 2012). Environmental NGOs attempt to attribute blame to various actors and actions (oil companies, politicians, fracking, oil drilling) for the California wildfires, and attempt to show that these events were not unfortunate and inevitable natural disasters but caused by human activity and greed. Blame has a significant presence in 39% of the NGO images.



Figure 5. Last Chance Alliance coalition blames Newsom and fossil fuels (Sunrise 2020).

As Governor of California since 2019, Gavin Newsom (D), draws particular ire from environmental NGOs who are quick to point out the hypocrisy of his actions. One of the visual repertoires deployed by activists is to use a split screen to make the visual link between wildfires and drilling for oil more explicit, and calls for concrete action from Newsom, that is, to phase out fossil fuels. Figure 5 relies on text to make the link between the two explicit though the message would have been also clear without it. Interestingly, text is used in 60% of images shared by NGOs whilst it was used in 39%

in the first data set. It could be that making the connection between climate change and wildfires and apportioning blame requires text to reinforce an argument or to shape meaning and understanding. However, other images do not rely on text and communicate a clear connection between fossil fuel industry and forest fires (Figure 6). In this split screen image, the orange smoke plumes upwards to create or feed a forest fire. The orange flames in the top screen burn brightly amongst verdant trees which will not last long due to the engulfing flames. The argument is clear: man-made industry is fueling the fires, and we, humans, are to blame. The aesthetic choices made by diverse actors such as NGOs reveal the pivotal role of visual culture in shaping understandings and ascribing meaning to the unfolding climate crisis.

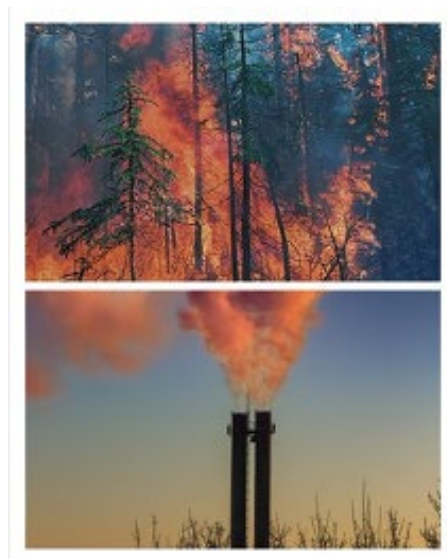


Figure 6. Split screen of cause and effect (Greenpeace 2020).

As objects, photographs are as common in the NGO data (70%) as is the case in the first data set (68%) showing the enduring power of a photograph to bear witness. In terms of actors, whilst firefighters dominated the previous data set (24%), they did not appear so much in the NGO visual data (2%). Instead, politicians (20%), oil/coal industry (22%) and protestors/activists (19%) are similarly represented in the NGO visual data. Whilst activists are keen to make the link between forest fires and climate change, they also point to meaningful collective action. They try to embody and communicate agency showing that ordinary people can make a difference by engaging

in protest action. Figures 7 and 8 document protestors taking to the streets with banners, signs, and slogans to raise awareness of the climate crisis, its impact as well as to draw the link between climate change and fossil fuel reliance, with one banner in Figure 7 reading “for the air we breathe”. The question of who to blame or who bears responsibility is pertinent: “The impact of personal environmental wrongs loses political traction as soon as ‘everyone’ is tagged as being responsible” (Luke, 2015, p. 290). It is more expedient and effective to attribute blame to a specific actor or cause. So, NGOs carefully target politicians (in Figures 7 and 8, activists gather outside the LA office of Democrat Dianne Feinstein) and oil industry through their visual framing, leaving no doubt about who they regard as to blame for the wildfires and for the failure to act. This is reinforced through the images of protest shared by NGOs who tend to place young activists front and center of the imagery, which also highlights the flip side of blame, that is, responsibility. The theme of intergenerational justice is strong across environmental activism today with media reports focusing on youth activism and the role of Greta Thunberg (and others) as the figurehead of the climate movement (Alter, Haynes, & Worland, 2019). As a corollary, in the visual discourse we analyzed, politicians and fossil fuel industry are presented as old relics from a polluting past who have failed to adapt to modern times and the necessity of breaking free from fossil fuel dependency. Moreover, they emphasize the need to protect the earth for future generations who will, inevitably, have to deal with the mistakes and actions of politicians and the oil industry today.



Figure 7. Young protestors mobilize (Sunrise Movement 2021a).



Figure 8. Activists target Dianne Feinstein (Sunrise Movement 2021b).

Discussion

In this discussion section, we illustrate the differences in the findings between the two data sets and reflect on the implications for environmental studies, visual studies, and framing. We enrich our discussion drawing on interviews with Katie Nelson, Communications Director from Greenpeace USA and Tré Vasquez, Co-

Director of the environmental justice collective Movement Generation. We conclude by outlining the shortcomings of our study.

It is notable that the two visual discourses are different in terms of their focus. The visual discourse on the wildfires acted as a public information service where people could share updates on the fires, how they were spreading, and the impact they were making on people's lives. The discourse expressed danger but at the same time there was a clear sense of community and solidarity communicated through visual imagery as users documented and shared the impact of the fires on their lives. It is significant that digital technology and media are designed to be used in particular way, meaning that photographs (which dominated the data sets) were taken by freelance photographers but also lay people, contributing to a reactive, real time citizen journalism (e.g., Figure 3). Our results demonstrate that users were interested in sharing the impact of the wildfires on their lives and communicate how fires impacted their capacity to live, work and travel. In an interview with Katie Nelson, Communications Director from Greenpeace USA, she acknowledges that impact is key:

these human centric catastrophes are, they have real life implications... first and foremost, before we switch into that policy ask or that accountability or responsibility etc., we are prioritizing making sure that people are on the ground doing that mutual aid or rescue work are amplified and people know who to get resources and people know how to get these things because the human impact is most important.

Whilst most Californians were not in direct harms' way of the fires, many experienced poor air quality and so photographs documenting smoke in the sky or graphical representations of air quality and maps are common. The images focused on the devastation wrought by fire which reinforced the conviction that wildfires are powerful, with the potential to destroy homes and communities. Many of the images were those covered by mainstream media showing apocalyptic imagery with landscapes ablaze, dwarfing efforts by firefighters to control the flames, or of skies turned a freakish orange tone. These iconic images often dominated news media coverage of the

fires, as dramatic and unusual visuals made for compelling stories. Interestingly, this discourse did not attempt to apportion blame (2%), and actors such as politicians (0.4%) and oil industry (0%) did not figure significantly, if at all.

Environmental activists try to shape narratives to their perceived reality and influence how different publics (and Twitter/X users around the world) think about wildfires not just as dramatic events but come to understand the link between climate change and human action or inaction (in the case of politicians failing to ban fracking and oil industry). According to Tré Vasquez, whilst Movement Generation focused its immediate efforts on providing mutual aid, food, shelter and “a place to breathe” for vulnerable communities, social media was useful for information sharing and informing people where they could come to access support and services. He says: “Our messaging was first and foremost about care and support because when people are in a state of crisis and trauma and needing to flee their homes, it’s not an appropriate time to call people to action.” However, Vasquez argues that Movement Generation developed a utility justice campaign which focuses on “the connection between PG&E (Pacific Gas and Electricity) who is our utility company being largely responsible for many fires across the state of California.”

Framing can be used to pare down information or to emphasize certain elements or considerations over others; it helps audiences to make sense of information and drives how they interpret or use that information. As Katie Nelson from Greenpeace USA maintains: “Some of the best storytelling is by showing them what that looks like... through images you can show people what it looks like on the ground and what is happening now.” Thus, visuality is understood “as representation, symbolization and agitation... in their respective capacities to envision, attribute meaning, and act” (Balkin, 2021, p. 239). Smith and Joffe (2013) argue that “visual information is particularly salient for global warming” as it can render an often remote or abstract issue concrete (p. 18). The very real and present danger posed by wildfires helps communicate the urgency of the climate crisis and demonstrates that climate change is not a distant and remote issue but impacts communities in the Global North.

There are a number of shortcomings with the research, one being that visual framing interpretation is much more heterogenous and unpredictable than meaning construction based on textual information. Coding has attempted to make sense of the data, but images are highly mutable and open to interpretation (Rose, 2016). This study does not focus on how audiences interpret climate change visuals (O'Neill & Smith, 2014), meaning it advances our understanding of intention, but cannot add to our understanding of message reception and comprehension. Although it is recognized that visual images on social media campaigns can make citizens aware of climate change (León, Negrodo, & Carmen Erviti, 2022), this article demonstrates how visual frames express specific narratives and attempt to shape particular understandings.

Conclusion

Climate change communication is about raising awareness to influence societal understandings and generate meaningful action. Using the case of the California wildfires of 2020 and 2021, this article has first explored the visual discourse shared on Twitter/X to foreground the key debates and issues and examined what was being shared through visual discourse. Second, we have analyzed the visual framing strategies used by environmental NGOs as they attempted to link the wildfires to climate change and attribute blame to specific actors (e.g., fossil fuel industry and complicit politicians who were failing to act). Our research has found that environmental NGOs harness visual culture in order to make an explicit connection between climate change and wildfires.

Climate crisis communication is fraught with difficulties because it represents a challenge to “prove” the causes and impact of climate change. In the context of the California wildfires, our findings show that visual discourse was focused on impact, information sharing and mutual aid. Environmental problems are not always visible; despite the lack of clarity on the causes of forest fires, environmental NGOs attempted to make the link between (a) climate change and (b) its impact by stitching together a narrative which attributed blame to fossil fuel industry and complicit politicians encouraging users to see the link between a and b. Visual culture helps to attribute blame and present the California wildfires as the result of anthropogenic climate

change. As a further step, visual images of environmental activism helped to show that there is a path of resistance to prevent devastating wildfires by targeting politicians and fossil fuel industry through collective action.

While our study focuses on Twitter/X as an environment for investigating communication dynamics in digital spaces, we acknowledge the inherent limitations of exploring only one digital platform and the need to critically combine the unique affordances of different online spaces as part of broader media ecologies (Pearce et al., 2020; Treré, 2018). Yet, we believe that what we may lose in extension by not adopting a multi-platform approach, we can gain in depth by scrutinizing the specific affordances of X. Furthermore, the recent closure of Twitter/X's API raises important considerations for future research on this topic and is part of the broader conversation around how platforms policy and codes shape the work of critical scholars around the world (Bruns, 2019).

California is an interesting case study as it has experienced catastrophic wildfires in recent years. The single case focus allows us to explore the socio-political context and the role of local actors such as NGOs and politicians. It also reveals the deeply embedded relationship between politicians (notably Democrat Governor Gavin Newsom) and the state's reliance on fossil fuels. California has been at the vanguard of environmental activism since the 1960s (with counter-culture movements growing from San Francisco) and today it shows a strong focus on the role of youth activism and the importance of intergenerational justice. Whilst a democratic "blue" state (since 1992), large sections of the Californian population, especially in more rural areas, vote Republican. Further research could explore how visual frames align with both Democrat and Republican voting preferences to determine whether visual framing strategies by environmental advocates resonate across ideological boundaries.

As the connection between visual culture and social media platforms intensifies, more research is needed to assess the visual strategies, repertoires and meanings deployed by the different social forces that make up the contested terrain of climate crisis communication. In particular, more research is needed on (a) examining the differences and similarities between multiple digital platforms' affordances and how

they contribute to shape diverse opportunities to raise awareness and build collective action through visual cultures (b) investigating how platforms like X, YouTube, TikTok and Instagram can be harnessed in variable combinations to build transnational networks of solidarity and alliances on environmental activism and protest, including mobilization to draw attention to the relationship between climate change and wildfires in different geographic contexts such as Australia and Europe.

References

- Al Saqaf, W. (2016) Mecodify user manual. *Github.com*. Retrieved from <https://github.com/wsaqaf/mecodify/blob/master/manual.md> (June 5, 2024).
- Alter, C., Haynes, S., & Worland, J. (2019, December 30). Greta Thunberg: Time's person of the year. *TIME*. Retrieved from <https://time.com/person-of-the-year-2019-greta-thunberg/>
- Anguiano, D. (2020, December 30). California wildfire hell: How 2020 became the state's worst ever fire season. *The Guardian*. Retrieved from <https://www.theguardian.com/us-news/2020/dec/30/california-wildfires-north-complex-record>
- Balkin, A. (2021). Visualizing atmospheric politics. In T. J. Demos, E. E. Scott, & S. Banerjee (Eds.), *The Routledge companion to contemporary art, visual culture, and climate change*. (pp. 230–241). London, UK: Routledge.
- Boykoff, M. (2011). *Who speaks for the climate? Making sense of media reporting on climate change*. Cambridge, U.K.: Cambridge University Press.
- Brügger, A., Dessai, S., Devine-Wright, P., Morton, T., & Pidgeon, N. (2015). Psychological responses to the proximity of climate change. *Nature Climate Change*, 5(12), 1031–1037. doi:10.1038/nclimate2760

- Bruns, A. (2019) After the ‘APIcalypse’: social media platforms and their fight against critical scholarly research. *Information, Communication & Society*, 22(11), 1544–1566. doi:10.1080/1369118X.2019.1637447
- Burgoon, E., Henderson, M., & Markman, A. (2013). There are many ways to see the forests for the trees: A tour guide for abstraction. *Perspectives on Psychological Science* 8(5), 501–520. doi:10.1177/1745691613497964
- Chin, J. (@jadachin). (2020, August 23). In Vacaville a blanket of smoke takes over 80 west #Californiawildfire [tweet]. Retrieved from <https://x.com/jadachin/status/1297649280245592070>. August 26, 2024.
- CLCA Insider. (@CLCAInside). (2020, August 25). As the air quality goes down & the number of wildfires goes up, CLCA encourages all green industry professionals to monitor unhealthy air quality [tweet]. Retrieved from <https://x.com/CLCAInside/status/1298043623812902914>. August 26, 2024.
- Culloty, E., Murphy, P., Brereton, P., Suiter, J., Smeaton, A. F., & Zhang, D. (2019). Researching visual representations of climate change. *Environmental Communication*, 13(2), 179–191. doi:10.1080/17524032.2018.1533877
- [Davis, J.L., Love, T. P., & Killen, G. \(2018\). Seriously funny: The political work of humor on social media. *New Media & Society*, 20\(10\), 2898-3916. doi:10.1177/1461444818762602](#)
- Entman, R. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 51–58. doi:10.1111/j.1460-2466.1993.tb01304.x
- Gamson, W., & Wolfsfeld, G. (1993). Movements and media as interacting systems. *The Annals of the American Academy of Political and Social Science*, 528(1), 114–125. doi:10.1177/0002716293528001009

Greenpeace. (@Greenpeace). (2020, February 4). Our forests are burning. Our air is worsening. Our planet is suffering. [tweet]. Retrieved from <https://x.com/Greenpeace/status/1224580870109106177>. August 26, 2024.

Hansen, A., & Machin, D. (2008). Visually branding the environment: Climate change as a marketing opportunity. *Discourse Studies*, 10(6), 777–794. Doi:10.1177/1461445608098200

Hansen, A., & Machin, D. (2013). Researching visual environmental communication. *Environmental Communication*, 7(2), 151–168. doi:10.1080/17524032.2013.785441

Hayes, S., & O'Neill, S. (2021, November). Visualizing climate protest in UK media and the Getty image collections. *Global Environmental Change*, 72, Article 102392. doi:10.1016/j.gloenvcha.2021.102392

Heekeren, S. (2021). Popular science images: Reflections on visual practices in science communication. *Design Issues*, 37(4), 72–85. doi:10.1162/desi_a_00659

Hopke, J. E., & Hestres, L. E. (2018). Visualizing the Paris climate talks on Twitter: Media and climate stakeholder visual social media during COP21. *Social Media + Society*, 4(3). doi:10.1177/2056305118782687

Hopke, J. E. (2020). Connecting extreme heat events to climate change: Media coverage of heat waves and wildfires. *Environmental Communication*, 14(4), 492–508. doi:10.1080/17524032.2019.1687537

Intergovernmental Panel on Climate Change. (2013). Summary for policymakers. In Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (Eds.) *Climate change 2013: The physical science basis. Contribution of working group I to the fifth assessment*

report of the intergovernmental panel on climate change (pp. 3–29).
Cambridge, UK: Cambridge University Press.

Intergovernmental Panel on Climate Change. (2021). Summary for policymakers. In Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (Eds.) *Climate change 2021: The physical science basis. Contribution of working group I to the sixth assessment report of the intergovernmental panel on climate change*. (pp. 3–32). Cambridge, UK: Cambridge University Press.

Intergovernmental Panel on Climate Change. (2002). *North America*. In H. -O. Pörtner, D. c. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, . . . B. Rama (Eds.), *Climate change 2022: Impacts, adaptations and vulnerability. Contribution of working group II to the sixth assessment reports of the intergovernmental panel on climate change* (pp. 1929–2042). Cambridge, UK: Cambridge University Press.

Kavada, A. (2015). Social movements and political agency in the digital age: A communication approach. *Media and Communication*, 4(4), 8–12.
doi:10.17645/mac.v4i4.691

León, B., Negredo, S., & Carmen Erviti, M. (2022). Social engagement with climate change: Principles for effective visual representation on social media. *Climate Policy*, 22(8), 976–992. doi:10.1080/14693062.2022.2077292

Luke, T. (2015). The climate imaginary. *Current Sociology*, 63(2), 280–296.
Doi:10.1177/0011392114556593

Maes, A. (2017). The visual divide. *Nature Climate Change*, 7(4), 231–233.
doi:10.1038/nclimate3251

- Malle, B., Guglielmo, S., & Monroe, A. (2014). A theory of blame. *Psychological Inquiry*, 25(2), 147–186. doi:10.1080/1047840X.2014.877340
- Manzo, K. (2010). Imaging vulnerability: The iconography of climate change. *Area*, 42(1), 96–107. doi:10.1111/j.1475-4762.2009.00887.x
- Marres, N., & Weltevrede, E. (2013). Scraping the social? Issues in live social research. *Journal of Cultural Economy*, 6(3), 313–335. doi:10.1080/17530350.2013.772070
- McGarry, A., Erhart, I., Eslen-Ziya, H., Jenzen, O., & Korkut, U. (Eds.). (2019a). *The aesthetics of global protest: Visual culture and communication*. Amsterdam, The Netherlands: Amsterdam University Press.
- McGarry, A., Jenzen, O., Eslen-Ziya, H., Erhart, I., & Korkut, U. (2019b). Beyond the iconic protest images: The performance of ‘everyday life’ on social media during Gezi Park. *Social Movement Studies*, 18(3), 284–304. doi:10.1080/14742837.2018.1561259
- McKenna, M. (2012). Directed blame and conversation. In D. J. Coates & N. A. Tognazzini (Eds.), *Blame: Its nature and norms* (pp. 119–140). New York, NY: Oxford University Press.
- Molder, A. M., Lakind, A., & Chen, K. (2022). Framing the global youth climate movement: A qualitative content analysis of Greta Thunberg’s moral, hopeful, and motivational framing on Instagram. *The International Journal of Press/Politics*, 27(3), 668–695. doi:10.1177/194016122110556
- Myers, T., Maibach, E., Roser-Renof, C., Akerlof, K., & Leiserowitz, A. (2013). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, 3(4), 343–347. doi:10.1038/NCLIMATE1754

- Nisbet, M. (2009). Communicating climate change: Why frames matter for public engagement. *Environmental: Science and Policy for Sustainable Development*, 51(2), 12–23. doi:10.3200/ENV.51.2.12-23
- O’Neill, S., Boykoff, M., Niemeyer, S., & Day, S. (2013). On the use of imagery for climate change engagement. *Global Environmental Change*, 23(2), 413–421. doi:10.1016/j.gloenvcha.2012.11.006
- O’Neill, S., & Smith, N. (2014). Climate change and visual imagery. *Wiley Interdisciplinary Review Climate Change* 5(1), 73–87. doi:10.1002/wcc.249
- Pao, M. (2020, August 14). Wildfire season is off to a roaring start in California and Colorado. *NPR*. Retrieved from <https://www.npr.org/2020/08/14/902581715/wildfire-season-is-off-to-a-roaring-start-in-california-and-colorado>
- Pearce, W., Özkula, S. M., Greene, A. K., Teeling, L., Bansard, J. S., Omena, J. J., . . . Rabello, E. T. (2020). Visual cross-platform analysis: Digital methods to research social media images. *Information, Communication & Society*, 23(2), 161–180. doi: 10.1080/1369118X.2018.1486871
- Pinto, J., Gutsche, R. E., & Prado, P. (2018). Introduction: Critical challenges in communicating climate change. In J. Pinto, R. E. Gutsche, & P. Prado (Eds.), *Critical issues in global environmental communication* (pp. 1–12). Leeds, UK: Emerald.
- Roxburgh, N., Guan, D., Shin, K. J., Rand, W., Managi, S., Lovelace, R., & Meng, J. (2019). Characterizing climate change discourse on social media during extreme weather events. *Global Environmental Change*, 54, 50–60. doi.org/10.1016/j.gloenvcha.2018.11.004
- Rose, G. (2016). *Visual methodologies: An introduction to researching with materials*. London, UK: Sage.

- Shapiro, M., & Park, H. W. (2015). More than entertainment: YouTube and public responses to the science of global warming and climate change. *Social Science Information, 54*(1), 115–145. doi:10.1177/0539018414554730
- Smith, N., & Joffe, H. (2009). Climate change in the British press: The role of the visual. *Journal of Risk Research, 12*(5), 647–663. doi:10.1080/13669870802586512
- Smith, N., & Joffe, H. (2013). How the public engages with global warming: A social representations approach. *Public Understanding of Science, 22*(1), 16–32. doi:[10.1177/0963662512440913](https://doi.org/10.1177/0963662512440913)
- Spiegel, S. (2020). Visual storytelling and socioenvironmental change: Images, photographic encounters, and knowledge construction in resource frontiers. *Annals of the American Association of Geography, 110*(1), 120–144. doi.org/10.1080/24694452.2019.1613953
- Snow, D., Rochford, E. B., Worden, S. K., & Benford, R. (1986). Frame alignment processes, micromobilization, and movement participation. *American Sociological Review, 51*(4), 464–481. doi:10.2307/2095581
- Sunrise Movement. (@sunrisebayarea). (2020, August 21). Hey, did you know that @Gavin Newsom is quietly approving fracking across California during a respiratory pandemic? [tweet]. Retrieved from <https://x.com/sunrisebayarea/status/1296590831944515584>. August 26, 2024.
- Sunrise Movement. (@sunrisemvmtLA). (2021a, July 14). It's been 24 hours and we're still here. [tweet]. Retrieved from <https://x.com/SunriseLAYouth/status/1415376213762211844/photo/1>. August 26, 2024.

Sunrise Movement. (@sunrisemvmtLA). (2021b, July 14). Update. A dozen youth climate organizers are staying overnight at @SenFeinstein 's LA office until she meets their demands. [tweet]. Retrieved at <https://x.com/SunriseMvmtLA/status/1415110715967348736>. August 26, 2024.

Supran, G., & Oreskes, N. (2021). Rhetoric and frame analysis of ExxonMobil's climate change communications. *One Earth*, 4(5), 696–719. doi:10.1016/j.oneear.2021.04.014

Susanka, T., & Kramer, O. (2021). Introduction: Knowledge design- visual rhetoric in science communication. *Design Issues*, 37(4), 4–8. doi:10.1162/desi_a_00684

Tehran Times. (@tehrantimes79). (2020, August 25). #California still struggles with wildfires [tweet]. Retrieved from <https://x.com/TehranTimes79/status/1298213534090764288>. August 26, 2024.

Treré, E. (2018). *Hybrid media activism: Ecologies, imaginaries, algorithms*. London, UK: Routledge.

van Beek, L., Metze, T., Kunseler, E., Huitzing, H., de Blois, F., & Wardekker, A. (2020). Environmental visualizations: Framing and reframing between science, policy and society. *Environmental Science & Policy*, 117, 497–505. doi:10.1016/j.envsci.2020.09.021

Vu, H. T., Blomberg, M., Seo, H., Liu, Y., Shayesteh, F., & Do, H. V. (2021). Social media and environmental activism: Framing climate change on Facebook by global NGOs. *Science Communication*, 43(1), 91–115. doi:10.1177/1075547020971649

Williams, A. P., Abatzoglou, J. T., Gershunov, A., Guzman-Morales, J., Bishop, D. A., Balch, J. K., & Lettenmaier, D. P. (2019). Observed impacts of anthropogenic climate change on wildfire in California. *Earth's Future*, 7(8), 892–910. doi:10.1029/2019EF001210

Wozniak, A. (2021). Just “performance nonsense”?: How recipients process news photos of activists’ symbolic actions about climate change politics. *Nordic Journal of Media Studies*, 3(1), 61–78. doi:10.2478/njms-2021-0005

Xavy. (@_xavy_). (2020, August 24). Los #IncendiosForestales del norte de #California ya son el Segundo más grande de la historia tras arrasarse 400.000 hectáreas #Californiawildfire [tweet] Retrieved from https://x.com/_xavy_/status/129787067293328999126. August, 2024