How Advertising Matters: Outdoor Media Strategies for Increased Engagement with Creative Climate Change Messages

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Abstract

Amid many communication strategies in 2025, creative advertising approaches are clearly powerful tools. Yet, out-of-home (OOH) or outdoor media (OM) often receives little attention in advertising research, particularly when used in the context of climate change, sustainability and environmental issues. This research helps to bridge the gap with experimentation and analysis OOH or OM in the context of environmental messages by exploring how size, type (static versus mobile), placement, and content on advertisement engagement may shape engagement with climate change messages. We use data collected in a real-world field experiment (measured through QR codes) in 2022-2023, garnered through two waves of data collection using QR codes and clickthrough rates on mobile smartphones. We found that larger advertisements outperformed (in terms of engagement) smaller ones with the same message, yet that exterior bus advertisements garnered more engagement than interior advertisements, and static billboards were more engaging in terms of QR code scans than the transit or bus advertisements with the same messages. Furthermore, we found that general climate change advertisements and messaging gained more engagement than more specific sustainable fashion advertising and messages that linked to climate change. Overall, we found that creative advertising through OOH/OM can be very powerful and effective in raising awareness and garnering engagement or even persuading people to take action. This experimental research has been designed and executed in order to help provide insights for ongoing campaigns for enhanced climate, environment and sustainability awareness and action. In the context of ongoing research to understand the utility of advertising – by carbon-based industry, by groups seeking to inspire greater pro-environmental behavior – our experimental work provides insights and implications for academics and practitioners who seek to shape and influence pro-climate awareness and behavioral action.

Keywords

1   Introduction: creative advertising to raise awareness and inspire action in a changing climate

2   The year 2024 was the warmest year in nearly 150 years of recorded history (Copernicus Climate

3   Change Service, 2025) and the highest carbon dioxide concentrations in the atmosphere in the

4   last 14 million years (NOAA, 2024). Moreover, the ten hottest years since record-keeping began

5   have all occurred in the past decade (NASA, 2025) while humans have contributed to these

6   patterns through the burning of fossil fuels and through land use patterns (IPCC, 2023).

7   Carbon-based industries – coal, oil, natural gas companies, automobile manufacturers

8   among them – have fueled these patterns of practice, in part through their advertising, public

9   relations (PR), media and influence campaigns over decades (Aroncyk et al, 2025; Brulle, 2023;

10   Supran and Oreskes, 2021). For example, Edelman global communications firm has handled

11   public relations and advertising for several large fossil fuel companies – including ExxonMobil

12   and Shell (Hsu, 2021) – as well as their benefactor, investors and supporters – such as the

13   Charles Koch Foundation (Noor, 2024) and the Heartland Institute (Boykoff, 2024).

14   While heterogeneous in several ways, the collective of groups working together in these

15   spaces have earned them identification by the name 'climate change countermovement

16   organizations' (CCCMs). Examining these CCCMs, Justin Farrell linked together a complex web

17   of connections between industry board members, politicians, foundations, public relations firms,

18   trade associations, ad hoc groups and think tanks, and revealed how political actors and multi-

19   national oil and gas corporations have exerted influence over climate change policy (in)action in

20   the US over the past several decades. This mapping helped document ongoing channels – from

21   ExxonMobil to the Heartland Institute – through which misinformation and disinformation has

22   demobilized constructive policy action on climate change (Farrell, 2016).

1   Over the past decade, many scholars, groups and organizations have begun to pressure

2   advertising and public relations companies to stop producing carbon-based industry propaganda

3   in the face of anthropogenic climate change (Aronczyk and Espinosa, 2022). Yet, relationships

4   between carbon-based interests and AD/PR agencies persist despite public pressure from groups

5   like Climate Investigations, Clean Creatives and the Conscious Advertising Network. Of note,

6   Edelman themselves declared in 2014 that they "do not accept client assignments that aim to

7   deny climate change" (Goldenberg, 2014) but their connections to these contracts continue

8   (Meyer, 2024).

9   As such, assertions of 'greenwashing' continue to pervade analyses of rhetoric contrasted

10   with action in the face of contemporary climate change (Westervelt and Green, 2023). For

11   example, these ongoing connections and actions led United Nations (UN) Secretary General

12   Antonio Guterres to say to the UN Assembly in September 2023, "We need to hold fossil fuel

13   companies and their enablers to account. [This] includes the massive public relations machine

14   raking in billions to shield the fossil fuel industry from scrutiny" (Whelan and Jordan, 2024).

15   Yet, ongoing resistance to change is connected to several economic, societal, political

16   and cultural factors (Dunlap, 2013). In other words, power, profits and influence are at stake

17   (Boykoff, 2024). According to one World Bank estimate, carbon-based industries made US$3

18   billion a day in inflation-adjusted profits for last 50 years (Carrington, 2022). Meanwhile, global

19   advertising revenue has been reported to have grown 5.8% to $889 billion (excluding political

20   advertising) in 2023 (Yoo, 2023) as the advertising industry at a global level is anticipated to be

21   valued at US$1 trillion by 2025 (Fischer, 2021). Much like lucrative carbon-based industry

22   activities, the most lucrative advertising market is in the United States (US) (Rittenhouse, 2023).

1   Meanwhile, others have been harnessing the creative power of advertising in order to

2   promote climate-friendly engagement and action (Sheehan and Morrison, 2018). Researchers in

3   the area of environmental communication have called for advertising academia and industry to

4   focus their energy and resources to finding more effective ways to use the power of persuasion to

5   influence people to engage in more sustainable behaviors among other things (Gangadharbatla &

6   Morrison, 2022). One such under researched area that connects the advertising industry to the

7   environmental movement is the out-of-home (OOH) or outdoor media (OM). Increasingly,

8   practitioners, organizations and scholars involved in environmental movements have recognized

9   how messaging through OOH or OM has potential power to motivate and advance pro-

10   environmental awareness and engagement (e.g. Lustick et al, 2016; Wilson et al, 2021; Osnes

11   and Fahmy, 2022). Drawing on previous related research (e.g. Calder and Malthouse, 2012) the

12   current project bridges the gap in research on OOH or OM in the context of environmental

13   messages by exploring what roles size, type (static versus mobile), placement, and content on ad

14   engagement (measured through QR codes) matters when using data collected in a real world

15   field experiment.

16

17   **Literature Review: mobilizing advertising power for climate change (in)action**

18   Advertising is a powerful economic and social force that shapes individuals' beliefs, attitudes,

19   intentions and behavior. The creative engine that drives the advertising industry can also help

20   change beliefs, attitudes and intentions of people and even persuade them to engage in

21   sustainable behaviors. This represents new avenues – complementing often dominant scientific

22   ways of knowing with emotional and affective messages – through which climate change,

23   environment and sustainability themes can creatively be communicated in order to raise

4

1   awareness and inspire engagement and action (Boykoff, 2019). This approach also illustrates

2   movements beyond 'information deficit model' logics (e.g. Ehret et al, 2017) into science and

3   environmental communication efforts that are dynamic, non-linear and complex (e.g. Davies

4   2008). Before we delve into literature on the use and effectiveness of OOH advertising, let us

5   briefly examine some research in the broader area of advertising and climate change. We draw

6   from interactive advertising theory (Pavlou and Stewart, 2000; Sreejesh et al, 2020) that

7   highlights the dynamic role of consumption in contemporary society, that thereby shapes the

8   effectiveness of how messaging in interpreted in this age of earned attention, hyper-locality,

9   persuasiveness, interactivity and attribution (Hochman, 2017; Kerr and Richards, 2021).

10

11   *Advertising about climate change and environmental topics*

12   Within the context of communication about climate change and other environmental issues, Joel

13   Smith and Helene Joffe (2009) found that images within print and television advertising further

14   prompted audiences to more readily identify dangers and threats as well as help define issues and

15   problems. Meanwhile, Anders Hansen and David Machin analyzed the use of Getty Images

16   Holdings, Inc – a visual media company that sells stock images – in environmental advertising

17   and found that generic green images have the ability to "promote discourses suitable for branding

18   and marketing" while warning that such use also has the potential "effect of promoting greater

19   consumption" (2008, 792). This caution was illustrated in a 'CO$_2$ is Green' advertising campaign

20   that ran more than a decade ago in several US major newspapers like the *Washington Post* and

21   was funded by groups associated with carbon-based industry (co2isgreen.org, 2010). A few years

22   later, the Heartland Institute rolled out a much-maligned billboard advertising campaign that

23   compared climate 'believers' with the notorious Ted Kaczynski (the 'Unabomber') (Boykoff,

5

1   2019). Over the past decade, ongoing and often-times more subtle narrative building through

2   greenwashed advertising has been detected in major news outlets like *Bloomberg*, *The*

3   *Economist*, *the Financial Times*, *the New York Times*, *Politico*, *Reuters*, and *the Washington Post*

4   in recent years (Westervelt and Green, 2023).

5

6   *Outdoor Advertising Media Effectiveness*

7   There has been a lot of research on measuring the effectiveness of advertising messages over the

8   last 75 years or so. As a starting point, from the Harold Lasswell's (1948) model of

9   communication, we know the five elements that make up the act of communication include who

10   (source) says what (message) in what channel (medium) to whom (audience) with what effect

11   (desired outcome). While all these elements play a role in the effectiveness of advertising

12   messages, in this study and literature review, we will focus on two factors that influence ad

13   effectiveness and the different ways in which effectiveness is measured. The two factors we

14   focus on that potentially impact the measurement of advertising effectiveness are: (1) the

15   advertising message itself and (2) the advertising media that carries the message (Lucas & Britt,

16   1963).

17   The role of message format in ad effectiveness has been extensively studied in various

18   media including but not limited to print advertising (Decrop, 2007), radio advertising (Janssens

19   & Pelsmacker, 2005; Martín-Santana et al., 2015; Riebe & Dawes, 2006; Sewall & Sarel, 1986),

20   television advertising (Bellman et al., 2009; Laskey et al., 1994), internet advertising (Baltas,

21   2003), in-game advertising (Herrewijin, 2015), and even outdoor advertising (Donthu et al.,

22   1993). However, there is limited research done in the area of outdoor (OOH/OM) advertising

23   effectiveness compared to other media and even fewer studies that examine outdoor in

6

1 combination with other media, specifically mobile phones. Outdoor (OOH/OM) when combined

2 with mobile phones (e.g., QR codes) offers unique measurements opportunities to test

3 empirically the effectiveness of various message formats and factors.

4   There have been several review and conceptual articles on the role of message formats

5 and other creative elements in outdoor advertising effectiveness, but one of the first empirical

6 studies to examine the role of such factors is by Bhargava et al., (1994). Using data from 282

7 campaigns, Bhargava et al., (1994) found that the factors that influence the effectiveness of

8 advertisements in the outdoor medium may be different from those of other media making

9 outdoor a unique medium. More specifically, in terms of executional factors, the use of

10 photography or artwork in outdoor advertising (positively), use of humor (positively), copy

11 length (negatively), and the type of the outdoor medium itself all are significantly related to

12 recall (Bhargava et al., 1994). Similarly, Donthu et al., (1993) found in a study of 142

13 respondents who commute on a daily basis on a stretch of highway with 10 billboards that

14 effectiveness of outdoor advertisements is influenced by their location, position, number of

15 words, color, respondent involvement, and attitudes. Unfortunately, Donthu et al., (1993) did not

16 examine the role of the size and type of the outdoor advertising in influencing advertising

17 effectiveness.

18   Exterior bus advertising is considered a type of a broader subset of outdoor (OOH/OM)

19 advertising often referred to as transit advertising. Transit advertising has a long history with the

20 first advertisement attached to a street car by its conductor in New York in 1831 (Prendergast &

21 Hang, 1999). In general, research suggests that for transit advertising to be effective, the

22 advertisements need to be simple, bold, catchy, and legible (Wells et al., 2008). However, there

23 are very few studies that examine the effectiveness of exterior bus advertising, particularly in the

1   context of environmental messages. Of the few studies that examined the effectiveness of

2   exterior bus advertising, Prendergast & Hang, (1999) found that the advertisements that drew

3   commuter attention and resulted in higher recall were colorful, interesting and have some feature

4   that make it noticeably different from other advertisements. Again, this study, which was done in

5   Hong Kong, used personal interviews for data collection relying on individuals' faulty memory

6   and the potential influence of demand effects. More specifically, bus advertising is known for its

7   potential for high visibility and frequency of exposure making it a cost-effective and powerful

8   way of increasing awareness (Hu et al., 2023).

9   One limitation of previous studies on outdoor (OOH/OM) advertising effectiveness is

10   that most of them employ audience responses of recall, attitudes and intentions, and/or traditional

11   measures of outdoor effectiveness GRPs etc., which are at best estimates rather than actual

12   measures of effectiveness. Using the power of QR codes and mobile phones, it is now possible to

13   measure the actual level of engagement with the outdoor advertisements, which is precisely what

14   the current study does. Furthermore, almost all previous studies have examined billboards as the

15   dominant form of outdoor advertising leaving room for inquiry into other outdoor formats such

16   as bus advertising. In addition, the use of outdoor (OOH/OM) for environmental messages is also

17   another under researched areas. Despite these limitations, previous studies do provide a direction

18   and scope for us to propose some research questions to guide our own exploratory study.

19   Based on the limited research in this area, particularly in the context of environmental

20   message, we developed the following research questions to carry out a systematic study on the

21   how size, type, placement, and ad content shaped engagement (Calder and Malthouse, 2012). To

22   answer our research questions, we developed a field experiment using data collected real time

23   through QR codes while the buses were in transit.

8

1   *RQ1:* What is the relationship between environmental ad size and ad engagement?
2   *RQ2:* What is the relationship between environmental ad placement (interior versus
3   exterior) and ad engagement?
4   *RQ3:* How does message content (general climate messaging versus sustainable fashion
5   messaging) impact ad engagement?
6   *RQ4:* For the same ad messages, how does mobility (static billboards versus bus
7   advertisements) impact ad engagement?
8   *RQ5:* How is ad engagement impacted by the presence of a human in advertisements
9   versus non-human content?

10

11   **Methods: context & study design**

12   The current study focuses on understanding the role of message and some content factors in the

13   outdoor medium for environmental communication. In other words, this project bridges tried and

14   tested advertising media strategies with tenets of environmental communication.

15   This study was based on a real world outdoor campaign in the Southwest region of the

16   United States and data was collected using QR codes and commuters' mobile phones. There

17   were two sets of public bus advertisements that began circulating November 1, 2022, (Figures 1-

18   3) and December 1, 2022, respectively (Figure 4). There were then two sets of billboard

19   advertisements that were posted at the same time as the December 1 set of bus advertisements

20   (Figures 5-6). Each were posted for 90 days. Each advertisement contained QR codes that linked

21   to Spanish-and English-language action webpages respectively. Potential confounds were

22   addressed by the regular circulation/routes of each bus through different locations in the area

23   each day and at randomized times of day, as determined by the Regional Transportation District

24   (RTD) without regard for the advertisements on the buses. Moreover, all QR codes were

25   designed to be large enough for phones to capture the link at any usual distance from the

26   roadways.

27   There were two types of messages created and then tested: (1) general messaging about

28   climate change, and (2) messaging relating to climate change and sustainable fashion. In round

1   one (beginning November 1), the messages were repeated on bus installations in two sizes

2   ('King' and 'Queen' exterior, and interior). The project was a collaboration with several entities,

3   and therefore, the messaging was co-produced, discussed, revised and ultimately agreed upon

4   before final publication in each of the two rounds or 'waves' of advertisements.

5   Using the nomenclature of the advertising industry Figure 1 and Figure 4 show 'King

6   Size' advertisements (30 inches by 144 inches each) that appeared on the outside of buses.

7   Figure 2 shows 'Queen Size' advertisements (30 inches by 88 inches each) that also appeared on

8   the outside of buses. Figure 3 shows 'Interior' advertisements (11 inches by 28 inches each) that

9   appeared inside buses.

10   Figures 5 and 6 show billboard advertisements that appeared in two locations in both

11   Spanish and English. The billboards in Figure 5 (10 feet 6 inches by 22 feet 9 inches each)

12   appeared along two highways near the city in the Southwest region. The billboards in Figure 6

13   (10 feet 6 inches by 22 feet 9 inches each) appeared along another set of highways near another

14   city in the region.

15   For additional background, pilot work for this project began in early 2022 with climate

16   change advertising placed in three newspapers in the US South: *the Selma Times-Journal* in

17   Selma, Alabama (appearing March 9), *the Brunswick News* in New Brunswick, Georgia

18   (appearing March 19) and *the Harrison Daily Times* in Boone County, Arkansas (appearing July

19   23) (Figure 10). *Green Suits Your Fashion* was enacted in the Spring of 2021 with an upper-

20   division undergraduate Creative Climate Communication course taught at a large Southwest

21   university. For this assignment, students were asked to (1) sustainably source an aspirational

22   outfit (thrifting, gifting, clothing swap, and beyond), (2) photograph themselves in the outfit

23   while wearing a full green morph suit underneath, and (3) add an environmental message about

1   the importance of sustainable or "slow fashion" (the opposite to fast fashion), and (4) share all of

2   this with at least ten people within your circle of community. Instead of the hopeful outcome of

3   40 students reaching 400 people with this environmental message, when we tallied up all the

4   "hits" and "reaches," we reached over 5000 people. Beyond that, two students took the initiative

5   to apply for external funding to create bus advertisements with these images and accompanying

6   messages and plastered these images through the interior spaces of the buses, which are

7   frequently used by the university students. The use of green suits has evolved as a mode of

8   embodied climate communication that has had several iterations, all "green lighting" various

9   resilience and sustainability issues. The use of the human body in visual climate communication

10   attracts the eye, as research demonstrates that we are more attracted to people than pie charts

11   (Center for Research on Environmental Decisions, 2014, p. 42).

12   This helped build coordination among the design teams (that included nine students as

13   co-creators at various stages) and organizational partners to establish protocols for assessment

14   and to explore further text and images messaging and answer research questions for this

15   OOH/OM bus and billboard research study. The following figures show all the images used in

16   the OOH/OM advertisements. These advertisements represent the different sizes (KING v.

17   QUEEN), types (static billboards v. transit advertising), placements (exterior v. interior), and

18   some content aspects (e.g., presence of humans v. non-humans) that our research questions are

19   based on and, for all the advertisements, the number of QR code scans serves as a measure of ad

20   engagement.

21

1 *Figure 1:* 'King Size' advertisements that appeared outside buses for 90 days beginning
2 November 1, 2022.
3

4
5
6 *Figure 2:* 'Queen Size' advertisements that appeared outside buses for 90 days beginning
7 November 1, 2022.
8

9
10
11
12

1   *Figure 3:* 'Interior' advertisements that appeared inside buses for 90 days beginning November
2   1, 2022.

column A, row 1-5   column B, row 1-5

3
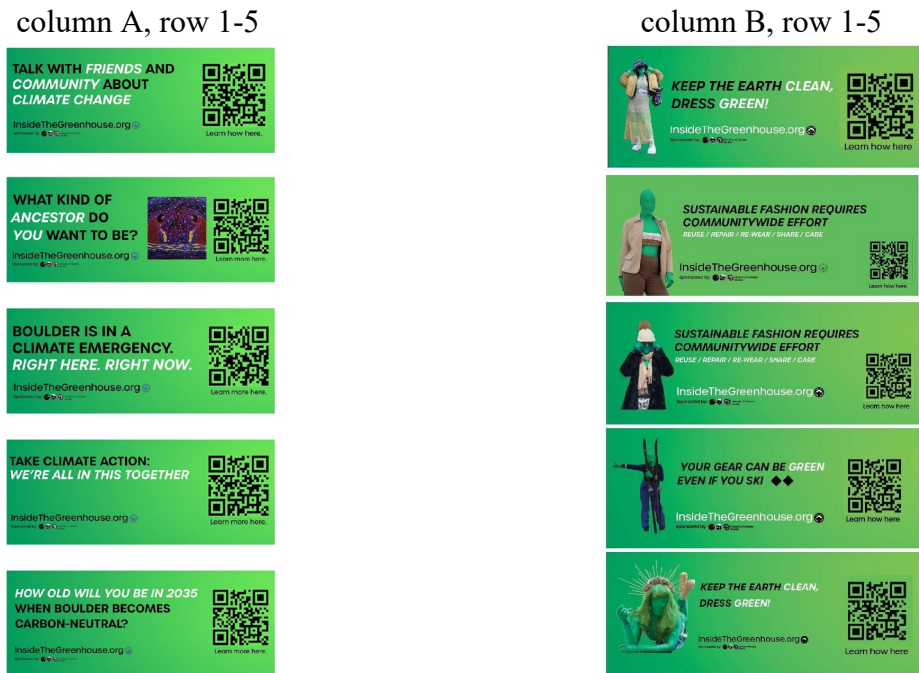
4   *Figure 4:* 'King Size' advertisements that appeared outside buses for 90 days beginning
5   December 1, 2022, (second phase of data collection).

6

13

1
2 *Figure 5:* English- and Spanish-language advertisements that appeared on billboards for 90 days
3 beginning December 1, 2022, on highways.
4

Billboard 5.a   Billboard 5.b

5 *Figure 6:* English- and Spanish-language advertisements that appeared on billboards for 90 days
6 beginning December 1, 2022, on highways.
7

Billboard 6.a   Billboard 6.b

8
9 *Figure 7*: An example of a bus with sustainable fashion and climate change messaging on a bus
10 running within the city area for 90 days in late 2022 and early 2023.
11

12
13
14

1 *Figure 8*: Examples of interior bus advertising with general climate change messaging on a bus
2 running in the City area for 90 days in late 2022 and early 2023.
3
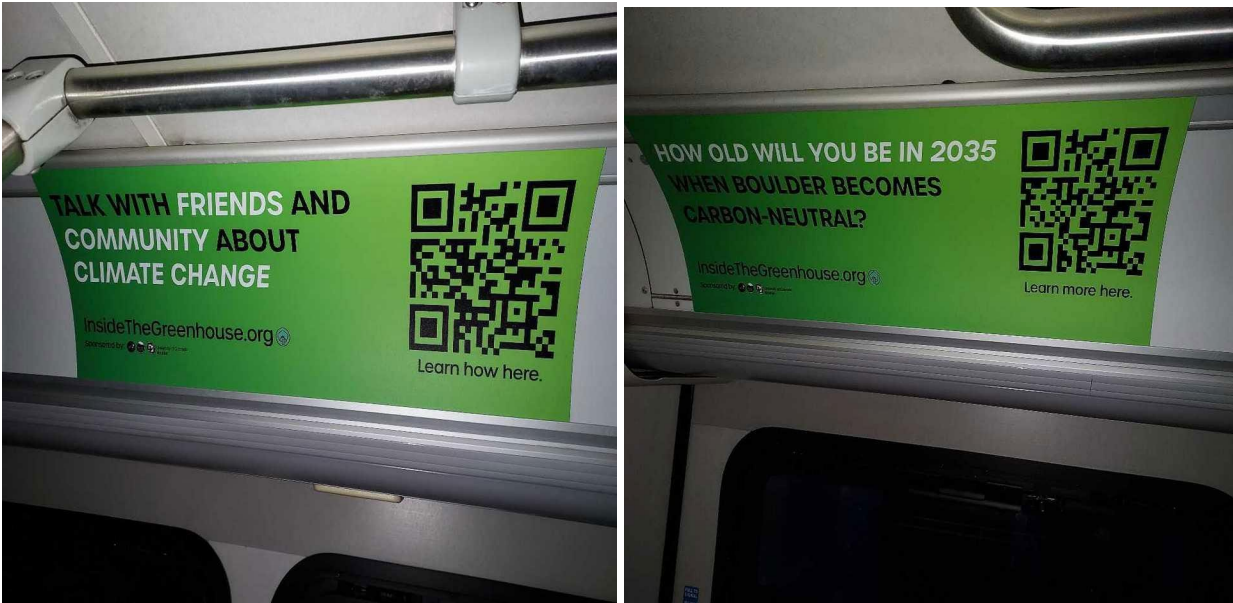
4
5
6 *Figure 9*: Examples of pilot work: Advertising in *the Harrison Daily Times* in Boone County,
7 Arkansas in the July 23, 2022, print edition [left], and advertising at an Indoor Soccer facility in
8 Southwest region beginning September 21, 2022 [center and right].
9

10
11

12 **Analysis and Results**

13 The study first assembled descriptive statistics and measured ad engagement through QR codes,

14 which was captured in raw numbers (column B of Table 1 below) as well as by the percentage of

15 overall QR code engagement (column C). Overall, there were 527 engagements through the QR

1 codes (King (round one): N = 382; King (round two): N = 35; Queen: N = 45; Interior: N = 22;

2 Billboards: N = 43). A breakdown of ad engagement for each individual ad can also be found in

3 Table 1.

4

5 Table 1 – QR Code Scans by Ad

Categories & Advertisements/Messages	QR-code scans (counts)	QR-code scans (% of total in category)	QR-code scans (% of total overall)
KING (round one)			
1.a.1 Talk with friends and community about climate change	55	14.4	10.4
1.a.2 What kind of ancestor do you want to be?	62	16.2	11.7
1.a.3 Boulder is in a climate emergency. Right here, right now.	61	16.0	11.5
1.a.4 Take climate action: we're all in this together.	58	15.2	11
1.a.5 How old will you be in 2035 when Boulder becomes carbon-neutral?	54	14.1	10.2
1.b.1 Keep the Earth clean, dress green! (version 1)	23	6.0	4.3
1.b.2 Sustainable fashion requires communitywide effort (version 1)	21	5.5	3.9
1.b.3 Sustainable fashion requires communitywide effort (version 2)	20	5.2	3.7
1.b.4 Your gear can be green even if you ski	7	1.8	1.3
1.b.5 Keep the Earth clean, dress green! (version 2)	21	5.5	3.9
KING (round two)			
5.a Six key facts about global warming…	4	11.4	.7
5.b Seis puntos claves del calentamiento global…	3	8.5	.5
5.c 76% of Boulder area adults think corporations…	3	8.5	.5
5.d What legacy do you want to leave on this planet?	6	17.1	1.1
5.e ¿Qué legado deseas dejarle al planeta?	6	17.1	1.1
5.f Climate change is about opportunity	3	8.5	.5
5.g We're building back better…	5	14.2	.9
5.f We're making progress!...	5	14.2	.9
QUEEN			
2.a.1 Talk with friends and community about climate change	2	4.4	.3
2.a.2 What kind of ancestor do you want to be?	7	15.5	1.3

16

Categories & Advertisements/Messages	QR-code scans (counts)	QR-code scans (% of total in category)	QR-code scans (% of total overall)
2.a.3 Boulder is in a climate emergency. Right here, right now.	15	33.3	2.8
2.a.4 Take climate action: we're all in this together.	6	13.3	1.1
2.a.5 How old will you be in 2035 when Boulder becomes carbon-neutral?	0	0	0
2.b.1 Keep the Earth clean, dress green! (version 1)	6	13.3	1.1
2.b.2 Sustainable fashion requires communitywide effort (version 1)	1	2.2	.18
2.b.3 Sustainable fashion requires communitywide effort (version 2)	6	13.3	1.1
2.b.4 Your gear can be green even if you ski	0	0	0
2.b.5 Keep the Earth clean, dress green! (version 2)	2	4.4	.3
INTERIOR			
3.a.1 Talk with friends and community about climate change	4	22.2	.7
3.a.2 What kind of ancestor do you want to be?	1	5.5	.18
3.a.3 Boulder is in a climate emergency. Right here, right now.	2	11.1	.3
3.a.4 Take climate action: we're all in this together.	2	11.1	.3
3.a.5 How old will you be in 2035 when Boulder becomes carbon-neutral?	3	16.6	.5
3.b.1 Keep the Earth clean, dress green! (version 1)	1	5.5	.18
3.b.2 Sustainable fashion requires communitywide effort (version 1)	0	0	0
3.b.3 Sustainable fashion requires communitywide effort (version 2)	2	11.1	.3
3.b.4 Your gear can be green even if you ski	3	16.6	.5
3.b.5 Keep the Earth clean, dress green! (version 2)	0	0	0
BILLBOARDS			
6.a Six key facts about global warming…	2	4.6	.3
6.b Seis puntos claves del calentamiento global…	13	30.2	2.4
7.a What legacy do you want to leave on this planet?	12	27.9	2.2
7.b ¿Qué legado deseas dejarle al planeta?	16	37.2	3.0

1

2   Then, to answer our research questions, we conducted a series of independent samples t-

3   tests with QR-code scans, which measured the ad engagement, as the test variable. RQ1 relates

1   to the role of ad size on ad engagement. As noted earlier, there were two different exterior ad

2   sizes (KING and QUEEN) and data was collected in two different waves. In order to answer the

3   first research question, we needed the ad messages to be the same across different sizes, which

4   resulted in a comparison of QR code responses for KING and QUEEN sized advertisements. As

5   noted in table 1, the messages across KING and QUEEN messages were not only the same, but

6   the data was also collected during the same time period. Table 2 below summarizes the results of

7   the t-test with QR-code scans as the test variable and the ad size as the grouping variable (KING

8   *versus* QUEEN).

9   Table 2. Result of Independent Samples T-test (test variable = QR-code Scans) for Ad Sizes
10 (KING *versus* QUEEN)

11

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	KING	10	38.20	21.441	6.780
	QUEEN	10	4.50	4.577	1.447
*mean differences sig at p < .001					

12
13   As noted in the table, there were significant differences in the scanned QR-codes for ad

14 size KING (M=38.2, SD=21.4) and QUEEN (M=4.5, SD=4.5); t (18) =4.8, p < .001. This

15 answers our research question that ad engagement is a function of the ad size with the larger

16 KING size resulting in almost 8.4 times more the engagement than smaller size QUEEN for the

17 same set of environmental advertisements.

18   Our second research question, RQ2, asks if the ad placement (interior versus exterior) has

19 an impact on the ad engagement as measured through the QR-code scans. All the interior

20 advertisements are listed under figure 3 above with the exterior advertisements with same

21 message listed in figures 1 and 2. In order to test whether the placement of the ad had any effect

22 on ad engagement, we first ran an independent samples t-test between interior advertisements

23 and KING size exterior advertisements. And then ran a similar t-test with QUEEN size exterior

18

1 advertisements and interior advertisements as grouping sizes. Results are outlined in the table 3a

2 and b below.

3

4 Table 3a. Result of Independent Samples T-test (test variable = QR-code Scans) for Ad
5 Placement (exterior KING *versus* INTERIOR).
6

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	KING	10	38.20	21.441	6.780
	INTERIOR	10	1.80	1.317	.416
*mean differences sig at p < .001					

7
8 Table 3b. Result of Independent Samples T-test (test variable = QR-code Scans) for Ad
9 Placement (exterior QUEEN *versus* INTERIOR).
10

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	QUEEN	10	4.50	4.577	1.447
	INTERIOR	10	1.80	1.317	.416
*mean differences sig at p < .001					

11
12 Comparing both exterior and interior advertisements with the exact same message, it

13 appears that exterior advertisements, both KING and QUEEN sizes, outperformed the interior

14 advertisements with the exact same message in terms of QR-code scans. However, differences in

15 ad engagement were significantly higher for the larger sized exterior KING advertisements

16 (M=38.2, SD=21.4) in comparison to interior advertisements (M=1.8, SD=1.3); $t(18) = 5.3$, p <

17 .001 than for the QUEEN sized exterior advertisements (M=4.5, SD=4.5) in comparison to

18 interior advertisements (M=1.8, SD=1.3); $t(18) = 1.7$, p < .001. In other words, exterior KING

19 size advertisements outperformed interior advertisements with the exact same messages by 21.2

20 times while QUEEN size exterior advertisements outperformed interior advertisements with the

21 exact same message by only 2.5 times. This indicates that more than the placement of the ad

22 (exterior *v.* interior), the ad size plays a significant role in generating more engagement through

23 QR-codes.

19

1　　　　RQ3 deals with the impact of the message content itself on ad engagement. More

2　　precisely, it asks whether general climate change messages are more or less engaging than

3　　specific sustainable fashion messages. Given that people interested in sustainable fashion may be

4　　a subset of the larger population of people interested in climate change action itself, it can be

5　　expected than general climate message will be more engaging than sustainable fashion ones.

6　　Within the KING and QUEEN ad sizes, the first five messages relate to general climate change

7　　action and the second set of five advertisements relate to sustainable fashion (please refer to table

8　　1). To answer RQ3, another series of independent samples t-tests were run with QR-code scans

9　　as the test variable and general versus sustainable fashion as the grouping variable within both

10　KING and QUEEN ad size categories. Results are summarized in table 4a and b below.

11
12　Table 4a. Result of Independent Samples T-test (test variable = QR-code Scans) for Message
13　Content (general climate change action *versus* sustainable fashion) within KING size
14　advertisements.
15

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	KING-general climate change action	5	58.00	3.536	1.581
	KING-sustainable fashion messages	5	18.40	6.465	2.891
*mean differences sig at p < .001					

16
17　Table 4a. Result of Independent Samples T-test (test variable = QR-code Scans) for Message
18　Content (general climate change action *versus* sustainable fashion) within QUEEN size
19　advertisements.
20

	CAT	N	Mean	Std. Deviation	Std. Error Mean
scans (counts)	QUEEN-general climate change action	5	6	5.788	2.588
	QUEEN-sustainable fashion messages	5	3	2.828	1.265
mean differences NOT SIG.					

21

20

1   From tables 4 a and b, we can see that ad engagement was higher for general climate

2   change action messages than for sustainable fashion messages. However, the results were

3   statistically significant for only the KING size advertisements. More precisely, within the KING

4   size advertisements category, general climate change action advertisements (M=58, SD=3.5)

5   were more engaging than sustainable fashion messages (M=18.4, SD=6.4); $t(8) = 12.01$, $p <$

6   .001. Or in other words, the general climate change action messages were 3.1 times more

7   engaging than the sustainable messages within the same ad size category of KING. This result

8   needs to be further investigated as within the QUEEN size ad category even though the general

9   climate change action advertisements were twice as engaging as sustainable fashion messages,

10   this finding was not statistically significant at $p < .001$ level.

11   RQ4 asks about the difference in ad engagement between static billboards and mobile bus

12   advertisements for the same ad messages. From table 1, you will see that the ad messages on the

13   billboards and KING size bus advertisements that ran during our second phase of data collection

14   are identical. Since there were only four billboards, the four KING size advertisements that ran

15   during second phase with identical messages were chosen for running an independent samples t-

16   test with these two—billboards and phase two KING advertisements—as the grouping variable

17   and QR-code scans as the test variable was conducted. Results are summarized in table 5 below.

18   Table 5. Result of Independent Samples T-test (test variable = QR-code Scans) for static
19   (billboards) *versus* bus advertisements with identical messages.
20

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	Bus Advertisements	4	4.75	1.5	.750
	Billboards	4	10.75	6.076	3.038
*Mean differences significant at p=.052 level					

21

1   For identical messages, billboards (M=10.75, SD=6.06) generated more ad engagement

2   in terms of QR-code scans than bus advertisements (M=4.75, SD=1.5); t(8) = -1.917, p=0.052.

3   This suggests that static advertisements (billboards) are almost 2.5 times more effective in

4   generating engagement than bus advertisements, which are constantly on the move.

5   Lastly, within all of the ad size categories and interior advertisements, half the

6   advertisements featured a human and the other half non-human content. Our last research

7   question asks whether the presence of a human increases or decreases engagement with the ad in

8   terms of the QR-code scans generated. For this, we collapsed all advertisements across

9   categories into human and non-human messages and ran an independent samples t-test with QR-

10   code scans as the test variable. Table 6 below presents the result of this analysis.

11   Table 5. Result of Independent Samples T-test (test variable = QR-code Scans) for
12   advertisements with humans *versus* advertisements with non-human messages.
13

	CAT	N	Mean*	Std. Deviation	Std. Error Mean
scans (counts)	Human in Advertisements	27	15.19	21.2	4.08
	No human in Advertisements	15	7.53	8.86	2.28
*Mean differences significant at p=.09					

14
15   In all, 27 advertisements featured a human and 15 advertisements featured non-human

16   content. Although there were differences in the level of engagement with advertisements with

17   humans (M=15.19, SD=21.2) and advertisements without humans (M=7.53, SC = 8.86), these

18   differences were not statistically significant at p<0.05; t(40) = 1.32, p=0.096.

19

20   **Discussion: harnessing advertising power for pro-environmental engagement and action**

21   In 2023, the New Zealand-based conservation organization 'Forest & Bird' held an online

22   contest to vote for the New Zealand 'bird of the century' (Hernandez, 2023). On the other side of

1   the world, US-based comedian John Oliver learned of the contest, and began an environmentally

2   tinged OOH/OM advertising campaign in support of a water bird called the pūteketeke. With the

3   power of his celebrity influence and with the creative OOH/OM advertising campaign in many

4   cities around New Zealand as well as the US, Japan and India, the Australasian crested grebe

5   with black, brown and white feathers took the prize in a landslide contest (Forest & Bird, 2024).

6   Through creativity and humor, John Oliver and his team demonstrated the power of OOH/OM

7   advertising for engagement and action. This episode also drew attention to the fact that over 80%

8   of native New Zealand birds are on the country's threatened species list: that was a reality that

9   the group Forest & Bird sought to raise awareness about and this OOH/OM advertising

10   campaign illustrated how this became possible (Paul, 2023).

11   *Figure 12*: Out of home/outside media (OOH/OM) images associated with John Oliver's New Zealand
12   'Bird of the Century' campaign in 2023. credit: Nick Perry/*Associated Press* [left], Lillie
13   Beliveau/*Associated Press* [right].

16   Similarly, this research sought to more understand and harness the power of creative

17   advertising done in the often ignored medium of OOH/OM, particularly to raise awareness and

18   inspire engagement and action. The current study, using real world data collected from an

19   OOH/OM campaign, works to advance our understanding of OOH advertising effectiveness

20   within the context of environmental movements (e.g. Goldberg et al, 2021). It also works to

21   combat the ubiquity and influence of fossil fuel company and internal combustion engine

22   advertising in contemporary society (Brulle et al, 2020) as it creatively communicates through a

23

1   combination of text and imagery that swirls and competes for attention in public life (e.g.

2   O'Neill and Smith, 2014).

3   These creative actions are happening in many places by different approaches from

4   practitioners such as Futerra, Creatives for Climate, the Dutch Green Health Alliance, Media

5   Bounty, and Brandalism as examples. While these approaches vary considerably – from

6   pressuring large PR firms to creating subversive and clandestine street art – the research

7   community must still work to help understand their influence and efficacy in the public sphere.

8   This experimental research has been designed and executed in order to help provide insights for

9   ongoing campaigns for enhanced climate, environment and sustainability awareness and action.

10   Research has already established the importance of location and size in OOH/OM

11   advertising (e.g. Calder and Malthouse, 2012). Our study's findings further provide insights into

12   how size matters when it comes to OOH/OM advertising in general, as well as in relation to

13   climate, sustainability and environmental topics. The larger advertisements in our study received

14   over 8 times the engagement that smaller sized advertisements for environmental advertisements

15   with the exact same message. When it comes to placement, exterior advertisements garnered

16   more engagement than interior advertisements, again, for the exact same content in the

17   advertisements. In terms of mobility, static billboards were much more engaging in terms of QR

18   code scans than the mobile transit or bus advertisements with the exact same message. This

19   could be explained by the fact that maybe getting a QR code scan on a moving bus is more

20   difficult than from a static billboard. Lastly, in terms of message content factors, general climate

21   change advertisements gained more engagement than specific sustainable fashion messages. The

22   results were inconclusive when it comes to the use of human in environmental advertisements.

The study presents numerous implications for academics, practitioners, and climate change activists. First, OOH/OM deserves more attention from researchers in our field, particular with the advent and proliferation of technologies like QR codes that combine the use of mobile devices as a way of measuring OOH advertising effectiveness. For practitioners, the study provides empirical evidence for media planning strategies such as opting for larger size static advertisements instead of, say, smaller interior bus advertisements for similar CPM rates. The biggest implications are for climate change communicators who often employ shocking or unconventional strategies to raise awareness (e.g., throwing fake blood on fur coats or throwing paint at famous artworks). Our study suggests that creative advertising through OOH/OM can be very effective in raising awareness or garnering engagement or even persuading people to take action. Perhaps a better strategy for activists is to raise funds or enlist celebrities for creative OOH/OM campaigns like in the "Forest and Bird" example above.

While our study is unique in combining OOH with mobile devices as a way of collecting real world data (QR codes) from an actual OOH/OM campaign, it does present some limitations worth noting here. For instance, the data collection and our OOH/OM campaign is restricted to one small geographic area in the Southwest region, so the results present some issues of external validity. Although experimentation was limited to the advertisements in this campaign, these results provide insights for other markets going forward. Generalizing these findings, in other contexts the engagement numbers will differ from market to market, but we posit that the trends found here as a function of size, placement and content will be similarly evident in other contexts. Our study was designed to further our understanding of the role and effectiveness of OOH/OM advertising in the environmental communication, as well as to inspire further research and practitioner activity and consequent insights for ongoing considerations of how to harness

25

1   the power of advertising for climate change, sustainability and environment action. We look

2   forward to seeing how others build on our findings as pro-environmental advertising

3   communications experimentation continues.

Acknowledgments

References

Aronczyk M, Boykoff M, Coan T, Lahsen M, Morris H, Russill C. Steering the discourse: legacy news, social media, advertising and public relations. In: Roberts JT, Milani C, Jacquet J, Downie C, editors. *First Global Assessment of Climate Obstruction*. Oxford: Oxford University Press; 2025. Chapter 6.

Aronczyk M, Espinosa MI. A strategic nature: Public relations and the politics of American environmentalism. Oxford University Press; 2022. 320 p.

Baltas G. Determinants of internet advertising effectiveness: an empirical study. Int J Market Res. 2003;45(4):1-9. doi: 10.1177/147078530304500403.

Bellman S, Schweda A, Varan D. A comparison of three interactive television ad formats. J Interact Advert. 2009;10(1):14-34. doi: 10.1080/15252019.2009.10722160.

Bhargava M, Donthu N, Caron R. Improving the effectiveness of outdoor advertising: lessons from a study of 282 campaigns. J Advert Res. 1994;34(2):46-56.

Boykoff MT. Climate change countermovements & adaptive strategies: insights from the Heartland Institute annual conferences a decade apart. Clim Change. 2024;177(5). doi: 10.1007/s10584-023-03655-5.

Boykoff M. Creative (climate) communications: productive pathways for science, policy, and society. Cambridge University Press; 2019. ISBN: 9781316646823.

Brulle RJ. Advocating inaction: a historical analysis of the Global Climate Coalition. Environ Politics. 2023;32(2):185-206.

Brulle RJ, Aronczyk M, Carmichael J. Corporate promotion and climate change: an analysis of key variables affecting advertising spending by major oil corporations, 1986–2015. Clim Change. 2020;159:87-101.

Calder BJ, Malthouse EC. Media engagement and advertising effectiveness. In: Kellogg on Advertising & Media: The Kellogg School of Management. 2012. p. 1-36.

Carrington D. Revealed: oil sector's 'staggering' $3bn-a-day profits for last 50 years. The Guardian. July 21, 2022.

Center for Research on Environmental Decisions, ecoAmerica. Connecting on Climate: A Guide to Effective Climate Change Communication. 2014.

1 Co2isgreen.org. More CO2 results in a greener earth: about us. Last accessed May 1, 2025.
2   Available from: http://co2isgreen.org/default.aspx/MenuItemID/138/MenuGroup/Home.htm
3 Copernicus Climate Change Service. Global Climate Report 2024 confirms last year as the
4   warmest on record, first ever above 1.5°C annual average temperature. Last accessed May
5   12, 2025. Available from: https://www.copernicus.eu/en/news/news/copernicus-global-
6   climate-report-2024-confirms-last-year-warmest-record-first-ever-above
7 Davies SR. Constructing communication: talking to scientists about talking to the public. Sci
8   Commun. 2008;29(4):413-434.
9 Decrop A. The influence of message format on the effectiveness of print advertisements for
10   tourism destinations. Int J Advert. 2007;26(4):505-525. doi:
11   10.1080/02650487.2007.11073030.
12 Donthu N, Cherian J, Bhargava M. Factors influencing recall of outdoor advertising. J Advert
13   Res. 1993;33(3):64-73.
14 Dunlap RE. Climate change skepticism and denial: an introduction. Am Behav Sci.
15   2013;57(6):691-698.
16 Ehret PJ, Sparks AC, Sherman DK. Support for environmental protection: an integration of
17   ideological-consistency and information-deficit models. Environ Politics. 2017;26(2):253-
18   277.
19 Farrell J. Corporate funding and ideological polarization about climate change. Proc Natl Acad
20   Sci. 2016;113(1):92-97.
21 Fischer S. Ad industry growing at record pace. Axios. December 7, 2021. Last accessed
22   February 15, 2025. Available from: https://www.axios.com/2021/12/07/advertising-industry-
23   revenue
24 Forest & Bird. Bird of the century: Pūteketeke Pandemonium Prevails! Last accessed May 7,
25   2025. Available from: https://www.birdoftheyear.org.nz/
26 Gangadharbatla H, Morrison D. A playbook for engaging in social and environmental activism
27   in advertising. Advert Soc Quart. 2022;23(1). Available from:
28   https://muse.jhu.edu/pub/21/article/853006
29 Goldberg MH, Gustafson A, Rosenthal SA, Leiserowitz A. Shifting Republican views on climate
30   change through targeted advertising. Nat Clim Chang. 2021;11(7):573-577.
31 Goldenberg S. Edelman formally declares it will not accept climate denial campaigns. The
32   Guardian. August 7, 2014. Last accessed April 25, 2025. Available from:
33   https://www.theguardian.com/environment/2014/aug/07/edelman-pr-climate-change-denial-
34   campaigns
35 Hansen A, Machin D. Visually branding the environment: climate change as a marketing
36   opportunity. Discourse Stud. 2008;10:777-794.
37 Hernandez J. With a boost from John Oliver, Pūteketeke soars to first in New Zealand bird
38   contest. NPR. November 15, 2023. Last accessed April 28, 2025. Available from:
39   https://www.npr.org/2023/11/15/1213228757/john-oliver-new-zealand-bird-century-contest-
40   puteketeke
41 Herrewijin L. The effectiveness of in-game advertising: the role of ad format, game context, and
42   player involvement. ProQuest; 2015. Available from:
43   https://www.proquest.com/docview/1695814456?pq-origsite=gscholar&fromopenview=true
44 Hochman N. From site-specificity to hyper-locality: performances of place in social media. In:
45   The SAGE Handbook of Social Media Research Methods. 2017. p. 367.

1 Hsu T. A PR giant is caught between climate pledges and fossil fuel clients. The New York
   Times. December 10, 2021. Last accessed May 3, 2025. Available from:
   https://www.nytimes.com/2021/12/10/business/media/a-p-r-giant-is-caught-between-climate-
   pledges-and-fossil-fuel-clients.html

Hu Z, Huang D, Wang S. Joint optimization of bus scheduling and targeted bus exterior
   advertising. J Transp Eng Part A Syst. 2023;149(5):04023022. doi:
   10.1061/JTEPBS.TEENG-7812.

Kerr G, Richards J. Redefining advertising in research and practice. Int J Advert.
   2021;40(2):175-198.

Janssens W, Pelsmacker PD. Emotional or informative? Creative or boring? Int J Advert.
   2005;24(3):373-394. doi: 10.1080/02650487.2005.11072930.

IPCC. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II, and III to
   the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Lee H,
   Romero J, editors. IPCC; 2023. doi: 10.59327/IPCC/AR6-9789291691647.

Laskey HA, Fox RJ, Crask MR. Investigating the impact of executional style on television
   commercial effectiveness. J Advert Res. 1994;34(6):9-17.

Lasswell HD. The structure and function of communication in society. 1948.

Lucas DB, Britt SH. Measuring advertising effectiveness. New York: McGraw-Hill Book
   Company; 1963. p. xi, 399. doi: 10.1037/13112-000.

Lustick DS, Lohmeier J, Chen RF, Wilson R, Rabkin D, Thompson SR. ScienceToGo.org: The
   strengths and weaknesses of communicating climate change through mass transit advertising
   spaces. American Geophysical Union; 2016. ED33A-07.

Martín-Santana JD, Reinares-Lara E, Muela-Molina C. Music in radio advertising: effects on
   radio spokesperson credibility and advertising effectiveness. Psychol Music. 2015;43(6):763-
   778. doi: 10.1177/0305735614567701.

Meyer C. Lululemon relying on fossil fuel-linked PR firm as it faces greenwashing allegations.
   The Narwhal. February 27, 2024. Last accessed May 5, 2025. Available from:
   https://thenarwhal.ca/lululemon-greenwashing-allegations-edelman/

NASA, Global temperature. Last accessed May 12, 2025. Available from
   https://climate.nasa.gov/vital-signs/global-temperature

NOAA. Global Monitoring Laboratory: Trends in Carbon Dioxide. Last accessed January 10,
   2025. Available from: https://gml.noaa.gov/ccgg/trends/monthly.html

Noor D. PR giant Edelman worked with Koch network, despite climate pledges. The Guardian.
   January 14, 2024. Last accessed May 4, 2025. Available from:
   https://www.theguardian.com/us-news/2024/jan/14/edelman-charles-koch-foundation-
   climate

O'Neill SJ, Smith N. Climate change and visual imagery. Wiley Interdiscip Rev Clim Chang.
   2014;5(1):73-87.

Osnes B, Fahmy S. Keeping the fun in staying with the trouble: Green suits and environmental
   activist pleasure. Theatr Top. 2022;32(2):49-60.

Paul L. John Oliver-backed puking Pūteketeke wins New Zealand bird of the century poll.
   Rolling Stone. November 15, 2023.

Pavlou PA, Stewart DW. Measuring the effects and effectiveness of interactive advertising: A
   research agenda. J Interact Advert. 2000;1(1):61-77.

Prendergast G, Hang CC. The effectiveness of exterior bus advertising in Hong Kong. J Int
   Consum Market. 1999;11(3):33-50. doi: 10.1300/J046v11n03_03.

Riebe E, Dawes J. Recall of radio advertising in low and high advertising clutter formats. Int J Advert. 2006;25(1):71-86. doi: 10.1080/02650487.2006.11072952.

Rittenhouse L. US ad industry predicted to grow 5% in 2023 and get a political boost in 2024. Ad Age. September 6, 2023. Last accessed February 17, 2025. Available from: https://adage.com/article/agency-news/us-ad-industry-grow-5-2023-43-2024-brian-wieser-predicts/2514506

Sewall MA, Sarel D. Characteristics of radio commercials and their recall effectiveness. J Mark. 1986;50(1):52-60. doi: 10.1177/002224298605000105.

Sheehan K, Morrison D. Advertising leadership and climate change: The efficacy of industry professionals to address climate issues. Advert Soc Quart. 2018;19(1).

Smith N, Joffe H. Climate change in the British press: the role of the visual. J Risk Res. 2009;12(5):647-663.

Sreejesh S, Paul J, Strong C, Pius J. Consumer response towards social media advertising: Effect of media interactivity, its conditions, and the underlying mechanism. Int J Inf Manage. 2020;54:102155.

Supran G, Oreskes N. Rhetoric and frame analysis of ExxonMobil's climate change communications. One Earth. 2021;4(5):696-719.

Wells W, Spence-Stone R, Moriarty S, Burnett J. Australian Advertising Principles and Practice. Pearson Education Australia; 2008. Available from: https://opus.lib.uts.edu.au/handle/10453/12249

Westervelt A, Green M. How the media greenwashes the fossil fuel industry. The Nation. December 5, 2023. Last accessed March 12, 2025. Available from: https://www.thenation.com/article/environment/media-greenwashing-climate-change/

Whelan H, Jordan TJ. Investors challenge 'blind spots' in climate-friendly ratings for ad and PR giants. Last accessed April 22, 2025. Available from: https://www.desmog.com/2024/02/25/wpp-omnicom-esg-investing-climate-ratings-financial-risks-publicis-ipg-dentsu-fossil-fuel-clients-advertising-pr-agencies/

Wilson RT, Lohmeier JH, Lustick DS, Chen RF. Using transit advertising to improve public engagement with social issues. Int J Advert. 2021;40(5):783-809.

Yoo H. In global ad spend forecasts, CTV is poised to overtake linear. AdExchanger. December 7, 2023. Last accessed March 9, 2025. Available from: https://www.adexchanger.com/online-advertising/in-global-ad-spend-forecasts-ctv-is-poised-to-overtake-linear/

Figure 1.1

Figure 1.2

Figure 2.1

Figure 2.2

Figure 3.1

Figure 3.2

Figure 4.1

Figure 4.2

Six key facts about global warming:
It's real. It's us. Experts agree.
It's bad. Others care. There's hope.

Figure 6.1

Figure 6.2

Figure 7.1

What *legacy* do you want to leave on this planet?

InsideTheGreenhouse.org
Sponsored by:

Figure 7.2

save the planet. scan the code.

InsideTheGreenhouse.org

Figure 8

Figure 9

Figure 10.1

Figure 10.2

Figure 11.1

Figure 11.2

Investigation: Boston train fire caused by loose metal panel

SOMERVILLE, Mass. (AP) — A fire on a Boston-area public transit train that prompted one passenger to jump into a river and others to scramble out of windows appears to have been caused by a metal panel on the train's base that came loose and touched the electrified third rail, the system's general manager said.

No one was hurt Thursday morning when the Massachusetts Bay Transportation Authority's inbound Orange Line train caught fire while on a bridge crossing the Mystic River just north of Boston on approach to the Assembly station in Somerville.

MBTA General Manager Steve Poftak said at a news conference late Thursday that the preliminary indication is that a 1-by-6-foot (30-centimeter-by-1.8-meter) panel that he called a "sill" that runs along the base of the train came loose, touched the high-voltage rail and caused sparks that ignited other materials.

It appears passengers removed four windows during the escape, and most of the roughly 200 passengers on board were walked to safety by MBTA personnel, Poftak said. The woman who jumped into the river declined medical attention.

The power to the third rail was turned off in less than two minutes, he said.

The 43-year-old train car in question had been inspected less than a month ago, which included an inspection of the panel that came loose, he said. After the fire, the same panel on every other in-service Orange Line car was inspected, and no issues were found, Poftak said.

The investigation is ongoing, he said.

The fire is the latest in a string of dangerous problems with the troubled system.

The Federal Transit Administration launched a review of the subway system in April following several accidents in the past year that led to injuries or death. The federal agency last month issued a series of directives to immediately address "longstanding issues" with the system's "overall safety program and safety culture."

Jan. 6 hearing dominates top TV networks — except one

NEW YORK (AP) — America's top television networks on Thursday turned prime time over to a gripping account of former President Donald Trump's actions during the Jan. 6, ... tol — with one prominent exception.

The top-rated news network, Fox News Channel, stuck with its own lineup of commentators. Sean Hannity denounced the "show trial" elsewhere on TV just as he was featured in it, with the House's Jan. 6 committee examining his tweets to Trump administration figures.

Hannity aired a soundless snippet of committee members entering the hearing room as part of a lengthy monologue condemning the proceedings.

That was all Fox News Channel viewers saw of the hearing.

"It's really just a cheap, selectively edited political ad," Hannity told his viewers.

Meanwhile, ABC, CBS, NBC, PBS, CNN and MSNBC aired the second prime-time hearing, focusing on Trump's real-time response to the riot. The committee said it was the last hearing until September.

"This very much sounded like a closing argument, certainly of this chapter of their investigation, and it was profound," ABC News anchor David Muir said.

About 20 million people watched the first prime-time hearing on June 9, the Nielsen Company said. Generally, reaching that would be a long shot, as it is the least-watched television month of the year.

Yet the seven daytime hearings have proven something of an oddity. Buoyed by strong word-of-mouth, the hearings grew in audience as they went along. CNN, for example, reached 1.5 million people for the second daytime hearing on June 16, and 2.6 million for the last one on July 12, Nielsen said.

Fox's broadcast station in New York, which did not air last month's prime-time hearing, showed the Thursday night session. The 17 other Fox-owned stations elsewhere in the country aired both hearings.

There's little interest at Fox News Channel, which televised the daytime hearings, although only up until the demarcation line of the network's popular show "The Five." Ratings show that roughly half the network's audience flees when the hearings start, and return when they're over.

That would be a much more serious problem in prime time, where Fox's audience is more than double what it is during the day. Fox News Channel's decision not to air the prime-time hearings is almost certainly a function of the demands of their audience and prime-time hosts, said one expert on conservative media and author of the upcoming book "Partisans: The Conservative Revolutionaries Who Remade American Politics in the 1990s."

"It creates an awkward situation when a host like Tucker Carlson tells his audience that the hearings are a debacle not worth their time, and then the network preempts his show to air them," Hemmer said.

Carlson found plenty of things to talk about besides the hearing Thursday, including President Joe Biden's COVID-19 diagnosis, a "meltdown" by liberals over the U.S. Supreme Court's abortion decision, the failure of drug legalization, "climate crazies" and "trans-affirming" lessons in Los Angeles schools.

Hannity's lead story was the "grand finale" of the Jan. 6 committee, although he didn't show it — at least with the sound on.

He brought on guests like GOP Rep. Jim Banks of Indiana, who said that if the hearings have done anything, "they've exonerated President Trump and the people supporting him."

Talk show host Mark Levin told Hannity the U.S. Justice Department is corrupt because "the Colbert 9 are roaming free." That's a reference to federal prosecutors' decision not to bring charges against nine people associated with CBS' "Late Show with Stephen Colbert" who were arrested in a U.S. Capitol complex building last month.

While Hannity was on the air, the Jan. 6 committee showed tweets that Hannity and other Fox News personalities had sent to Trump administration officials, warning that the Capitol riot was making the president look bad.

In a closing statement, Rep. Liz Cheney, the committee's vice chair, noted that most of its case against Trump has been made by Republicans. She ridiculed the notion that the committee's findings would be much different if Republicans other than she and Rep. Adam Kinzinger were members.

"Do you really think that Bill Barr is such a delicate flower that he would wilt under cross-examination?" she said.

The Republicans watching Fox News Channel on Thursday night didn't hear her.

Figure 11.3

Figure 12.1

Figure 12.2

Figure 5