

Three Shades of Green(washing)

Content Analysis of Social Media Discourse by
European Oil, Car, and Airline Companies



Working Paper

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By **GEOFFREY SUPRAN** and **ALGORITHMIC TRANSPARENCY INSTITUTE**



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Cover image: Produced by DALL-E using the prompt “illustration of oil wells, cars, and planes spewing out pollution in the shape of social media posts in the style of a futuristic soviet propaganda poster”. Image edited by Cameron Hickey.

EXECUTIVE SUMMARY

We report the results of a pilot study as a first step towards establishing a major new research initiative that will monitor, analyze, and expose digital climate discourse and deception. This initiative will be directed by Dr. Geoffrey Supran at the University of Miami in collaboration with computer scientists at the Algorithmic Transparency Institute (ATI), a project of the National Conference on Citizenship.

We perform a textual and visual content analysis of 2,325 organic social media posts generated by 22 major European Union-based fossil fuel producers, car manufacturers, and airlines on Facebook, Instagram, TikTok, Twitter, and YouTube during the summer of 2022. This yields the following insights:

- **Climate silence:** During a summer of unprecedented European heat waves, droughts, and wildfires, only a negligible handful of posts made any explicit reference to climate change or global heating.
- **Greenwashing:** Two-thirds of oil and gas (72%), auto (60%), and airline (60%) companies' social media posts paint a 'Green Innovation' narrative sheen on their 'Business-as-usual' operations, which are given less air time. This ratio of 'green-to-dirty' in each industry's public communications (3-to-1, 4-to-1, and 1.2-to-1, respectively) misrepresents their contemporary commitments to decarbonization, implying that at least some of their social media content constitutes greenwashing. We interpret greenwashing by the fossil fuel industry to be most blatant, whereas that by airlines is notably subtle.
- **Misdirection:** One-in-five oil and gas (23%), auto (22%), and airline (15%) company posts feature sports, social causes, and/or fashion. The overarching theme of this narrative of 'Misdirection' is to focus the audience's attention on engaging topics unrelated to companies' core business operations. This can variously (1) legitimize fossil fuel interests' social license to operate; (2) distract attention away from firms' core business roles, responsibilities, and contributions to the climate crisis; and (3) market brands as exclusive, desirable, and relevant.
- **Nature-rinsing (formally termed 'executional greenwashing'):** Statistical analysis reveals fossil fuel interests' systematic use of nature-evoking imagery to enhance the 'greenness' of their brand image on social media. To our knowledge, this subtle intentionality to fossil fuel interests' 'green' messaging has never previously been quantified.
- **Demographic greening and misdirection:** Statistical tests show that companies (particularly car manufacturers) variously leverage not just the imagery of nature, but also of female-presenting people, non-binary-presenting people, non-Caucasian-presenting people, young people, experts, sportspeople, and celebrities to reinforce their messages of 'Green Innovation' and/or 'Misdirection'.

INTRODUCTION

Since the late 1980s, fossil fuel interests (including coal, oil, gas, utility, and car companies) and libertarian businessmen abetted by public relations firms have collectively waged a multi-decade, multi-billion dollar campaign of lobbying, disinformation, and propaganda to sabotage science, confuse the public, and undermine climate and clean energy policies¹⁻¹². Over time, their tactics and rhetoric have evolved and gone digital, from outright, blatant climate denial in newspapers and on television to more subtle talking points - sometimes referred to as 'discourses of delay' - on social media and in native advertising on news websites^{7,13-17}.

Indeed, climate propaganda and disinformation appear to have dramatically increased on social media¹⁸. In 2020, leaked documents revealed that British oil and gas giant BP had adopted a rebranding strategy explicitly intended to "reach influencers" and "younger people", and to use "digitally advanced" media partnerships and "social media & community management"¹⁹. Between 2018-20, in the run-up to the US presidential election, ExxonMobil spent more on political advertising on Facebook and Instagram than any other corporation²⁰.

Social media appears to be the "new frontier" of climate disinformation and deception. This is concerning because, as Wang *et al.* (2017) observe, "Digital media has caught up with (and in some cases surpassed) traditional media as the primary source of information about a range of topics, including climate change... One of the major changes to the digital landscape is the huge growth of social media as a way to access and share news..."²¹.

Today, there are also mounting efforts to hold fossil fuel interests accountable for their past and present climate damages, denial, and deceptive marketing. These include dozens of lawsuits filed by U.S. cities, counties, and states accusing fossil fuel producers and their trade associations of climate disinformation and greenwashing (one of the authors [GS] has provided expert input to some of these cases)²². In 2021, the U.S. House Committee on Oversight and Reform requested documents and testimony from oil and gas companies and trade associations as part of an ongoing investigation into the fossil fuel industry's "coordinated effort to spread disinformation" about climate change²³.

In parallel, and with the potential to inform these ongoing accountability efforts, there is a growing body of research — primarily white-paper reports by non-profits, investigative journalists, and advocates — seeking to monitor the online activities of fossil fuel interests and other sources of disinformation and delayism²⁴⁻⁴³. Because this is a nascent field, the majority of studies to date understandably face various limitations, for example concerning:

- Time windows of analysis.
- Number and diversity (by sector, geography, language, etc.) of actors investigated, sometimes with a focus mostly on fossil fuel producers.
- Diversity of social media platforms covered.
- Non-systematic and/or non-transparent methodologies of analysis of social media content.

To contribute to this burgeoning field, we are in the process of establishing a major new research initiative that will monitor, analyze, and expose digital climate discourse and deception. This initiative will be directed by Dr. Geoffrey Supran at the University of Miami in collaboration with computer scientists at the Algorithmic Transparency Institute (ATI), a project of the National Conference on Citizenship.

We here present a pilot study as a first step in this project. It does not yet address most of the limitations discussed above, but rather serves as a proof-of-concept scoping exercise to inform our future research directions and designs. The specific objectives of this preliminary project are to:

- Trial a manual content analysis coding scheme.
- Build some of the technical and analytical infrastructure needed to scale towards our long-term research objectives.
- Identify some of the key discourses contained in contemporary social media communications by a variety of fossil fuel interests.
- Explore visual as well as textual content analysis to get a feel for the role of imagery in fossil fuel interests' messaging.

Since our preliminary findings — to be updated, expanded, and published in a peer-reviewed journal in due course — may be of interest to some researchers and advocates investigating digital climate deception and marketing, we are releasing them here.

Specifically, this working paper reports the textual and visual content analysis of 2,325 organic posts by 22 European Union (EU)-based fossil fuel producers, car manufacturers, and airlines across five mainstream social media platforms over two months of summer 2022.

We observe that during a period of unprecedented European heat waves, droughts, and wildfires exacerbated by human-caused global warming, the 22 companies remained silent about climate change in the examined posts, with only a negligible handful (0.3%) making explicit reference to “climate change” or “global warming”. At the same time, we find that two-thirds (67%) of the 22 companies' posts communicate a narrative of ‘Green Innovation,’ while one-in-five (21%) of their posts offer a narrative of ‘Misdirection.’ The ‘Green Innovation’ narrative avoids directly addressing climate change while nonetheless presenting companies as environmentally-conscious, engaged in or committed to low-carbon technologies and/or technological innovation. The narrative of ‘Misdirection’ uses messaging about sports, fashion, and social causes to direct attention away from firms’ core business roles and responsibilities. We also show that a number of companies variously leverage imagery of nature, female-presenting people, non-binary-presenting people, non-Caucasian-presenting people, young people, experts, sportspeople, and celebrities to strengthen their messages of greenwashing and misdirection.

Overall, our findings provide evidence that at least some of the fossil fuel interests investigated variously engage in a number of corporate social responsibility washings, including 'claim greenwashing' (based on textual claims), 'executional greenwashing' or 'nature rinsing' (based on the subtle imagery of nature), sportswashing, and wokewashing, as well as the appropriation of select demographics such as women and racial minorities.

This pilot study was commissioned by Greenpeace Netherlands and additionally funded by the Algorithmic Transparency Institute. The authors maintain full research and editorial control, have no other relevant financial ties, and declare no conflicts of interest.



METHOD

SAMPLING PROCEDURE

Between 1 June and 31 July 2022, we collected 33,969 organic social media posts from 22 EU-based companies with fossil fuel interests, by way of 375 social media accounts across five platforms (Facebook, Instagram, TikTok, Twitter, and YouTube). The 22 companies comprised the:

5 largest EU-headquartered car companies by 2019 market capitalization, comprising a total of 12 brands⁴⁴:

- Volkswagen (Germany)
- Mercedes-Benz (Germany)
- Bayerische Motoren Werke, BMW (Germany)
- Stellantis (Netherlands) EU-headquartered subsidiaries:
 - Alfa Romeo (Italy)
 - Peugeot (France)
 - Citroën (France)
 - Fiat (Italy)
 - Maserati (Italy)
 - Opel (Germany)
 - Abarth (Italy)
 - Lancia (Italy)
- Ferrari (Italy)

5 largest EU-headquartered airlines by 2019 market capitalization⁴⁴:

- International Airlines Group (Spain/UK) EU-headquartered subsidiaries:
 - Aer Lingus (Ireland)
 - Iberia Líneas Aéreas de España (Spain)
- Lufthansa (Germany)
- Air France KLM (France)
- Wizz Air (Ireland)

5 largest EU-headquartered oil, gas, and coal (excluding cement) producers by cumulative historical greenhouse gas emissions (1965-2018)⁴⁵:

- Royal Dutch Shell (Netherlands)
- TotalEnergies (France)
- Eni (Italy)
- RWE (Germany)
- Repsol (Spain)

As part of our scoping exercise, we chose to investigate a variety of fossil fuel interests beyond just fossil fuel producers themselves. To our knowledge, this report is the first systematic snapshot of climate discourses by car companies and airlines on social media. For each industry, we limited our attention to five major companies in order to obtain a diverse yet manageable sample size for an initial pilot investigation. In the case of holding companies, all EU-based subsidiary brands were included.

We focused our attention on EU-based companies because (a) the public affairs strategies of European fossil fuel interests have generally received less attention than their US counterparts; (b) the public representations of climate change by European companies have historically been more nuanced than those of American companies, offering a useful testbed for the development of sensitive analytical methodologies robust to evolving climate discourses^{46,47}; and (c) the climate communications of European companies are of active interest to a variety of investigators and advocates, including the sponsors of this research.

Tracking the social media activities of the 22 companies of interest began by compiling their respective social media accounts across the world's four largest social media platforms (Facebook, Instagram, Youtube, and Twitter) excluding LinkedIn and the world's fastest growing social media platform (TikTok)⁴⁸. For each company, all available social media handles were collected from Google Knowledge Graph and the company's official website(s) combined with a manual search directly on each social media platform⁴⁹. This yielded a total of 375 corporate accounts. Each account was then categorized by Channel Type (General, Motor Sport, Cycling, Specialist) and by Region (country name or region when available, otherwise labeled as Unspecified). Channel Type and Region labels reflected any evident or self-identified topical focus and geographic targeting, respectively.

DATA COLLECTION

Over a collection period of 1 June to 31 July 2022, we collected a total of 33,969 organic posts generated by these 375 accounts. This time period was used so as to provide a contemporary snapshot of the companies' online communications during a summer of record heat waves, droughts, and wildfires; and to generate a manageable sample for our scoping analysis.

For each social media account a combination of methods were used to extract each social media post, including text, image and video files, and social media engagement data. Data from Facebook and Instagram was collected using Meta's social listening tool CrowdTangle. Data from Twitter was collected using a combination of Twitter's public API and the PushShift Twitter API. Data from YouTube was collected using the YouTube public API, and data from TikTok was directly scraped from the platform and leveraged the use of a third-party data API.

CONTENT SELECTION AND SAMPLING

The posts analyzed in this report are generally referred to as "organic content" because each of them was posted by an official account controlled by a company, can be seen by the followers of that account, and can be included in recommendations produced by the social media platforms. "Organic content" is commonly distinguished from "advertisements" because advertisements are considered paid promotions, whereby an advertiser can target audiences based on demographics and other criteria. Advertisements are sometimes subject to stricter content rules and disclosure requirements. However, the distinction between advertisements and organic content can be misleading. All corporate communications content published on social media is, by definition, paid for by the company in question, regardless of whether the company paid the platform to promote it. In addition, a key objective of some social media advertising is to build a following, so that future organic posts reach audiences without additional paid promotion. In this sense, we consider

all posts from the companies included in this research to be a form of paid promotion, even if they are not strictly "advertisements."

We chose to limit the focus of this phase of research to organic posts because this is an area that has received less scrutiny than advertisements^{42,43,50}, faces limited restrictions and oversight, and yet, as explained above, represents a critical form of paid corporate speech that demands investigation. We note, however, that our organic content data collected from Twitter and YouTube likely also includes most or all paid advertisements. We recognize that this sample is not exhaustive, but for the sake of our scoping exercise, it offers a unique window and a model for future research that expands the scope of corporate climate discourse analysis.

Given the nature of our scoping exercise, we sampled *all* posts by the selected companies rather than applying pre-filtering for keywords or hashtags, as is commonly the case. To narrow our sample size to a more informative and manageable subset, we then filtered the posts according to the following criteria:

- Language: English language posts only, as determined by Google Chrome's Compact Language Detector (Ruby)⁵¹.
- Channel Type: General only.
- Region: 27 EU countries and Unspecified regions only⁵².
- Twitter replies (versus Tweets) excluded.

This yielded a final sample of 2,416 posts for analysis.*

**Note that the total number of posts analyzed throughout this report and quoted in the Introduction (2,325) is marginally smaller than the sample of 2,416 posts originally arrived at and stated here (and displayed in figure 2). The difference comprises posts that were coded as (1) Not English, (2) Problem with content, and (3) Content too long (even after a second round of coding of posts containing content lasting more than 5 minutes, during which coders were instructed to review content played at 2x speed).*

CODING SCHEME

We employed quantitative manual content analysis methods⁵³. Our unit of analysis was each individual social media post. Each post's manifest content was coded for the presence of any of 145 variables, which were aggregated into a hierarchy of 14 thematic categories (an additional 6 variables in our codebook allowed posts to be labeled as needing attention, for example due to problems viewing content). This taxonomy was developed deductively based on a literature review of more than three-dozen peer-reviewed, white paper, and journalistic content analyses of climate discourse, primarily on social media^{13,16,17,20,24–26,28,33–36,38,39,41,42,47,50,53–77}.

The taxonomy was further deductively informed by our (GS) own prior peer-reviewed assessments of climate change disinformation, rhetoric, and framing by fossil fuel interests (which themselves entailed complementary literature reviews)^{6,7}.

Finally, our codebook was inductively and iteratively refined and expanded through pre-testing with randomly selected samples of posts from May 2022 and through six rounds of coder training, as described below.

The resulting taxonomy is presented in table 1. While not exhaustive, it is designed to accommodate a wide spectrum of climate discourses, from outright climate denial, to discourses of delay, to narratives of misdirection. Whereas most⁷⁸ - though not all⁴² - investigations of fossil fuel interests' social media content have implicitly or explicitly focused on analyzing textual (or language-based) representations of climate change, our taxonomy also enables visual content analysis of human imagery, non-human imagery, and imagery of the so-called attributes (i.e. causes, consequences, and solutions) of global warming^{68,69}.

Table 1. Taxonomy used for manual content analysis. Each post's manifest content was coded for the presence of any of 145 variables, which were aggregated into a hierarchy of 14 thematic categories (Tier 1). Codes corresponding to the 'Green Innovation', 'Misdirection', and 'Business-as-Usual' master narratives identified in our analysis are highlighted in green, red, and black. All other codes are shown in gray.

TIER 1	TIER 2	TIER 3	TIER 4
Message Type(s)			
TYPE: General business	Responding to customers Business operations		
TYPE: Advertisement	General promo Specific ad		
Manifest Textual Content			
TEXT: Not real			
TEXT: Not human-caused			
TEXT: Misdirection	Conflation Charity Sports Other social goods Fashion and Design	Motor racing Other sports LGBTQIA+ issues Women's rights Racial justice Youth empowerment Additional social goods	
TEXT: Redirect responsibility	Whataboutism Individualism Free-Rider Excuse		
TEXT: Solutions	Technological optimism Green marketing Fossil fuel marketing	Clean Energy Marketing Sustainability/conservation Nascent technologies	Wind Solar Hydro Energy storage/distribution General/other EV product EV other Low-emission aircraft Other sustainable transport technologies Efficiency language Emissions data Clean' gas Hydrogen Carbon capture and storage (CCS) Bioenergy Nature-based solutions Clean coal'

TIER 1	TIER 2	TIER 3	TIER 4
		Fossil gas Conventional transport Drilling Nuclear	
	Free Market Solutionism Adaptation		
TEXT: Emphasize Downsides	Policy perfectionism Social justice Well-being Harms		
TEXT: Surrender	Too difficult	Human nature Capitalism Technology	Clean energy technology CCS
	Doomism	Bleak future Wasteful past Mitigation failed	
TEXT: Climate movement/science is unreliable	Science unreliable Movement unreliable Conspiracy		
Manifest: Visual Content			
VISUAL: HUMANS	Elites/Authorities	Politicians Experts Scientists Environmentalist Sportspeople Other celebrities Businessperson Other company employee Other elites/authorities	
	Ordinary people	Children Youth Elderly Fictional/cartoon characters Other ordinary people	
	Gender	Male-presenting only Female-presenting only Male- and female-presenting only Any non-binary-presenting	
	Race	Unclear gender All Caucasian-presenting All non-Caucasian-presenting Mixed-presenting Unclear Race	

TIER 1	TIER 2	TIER 3	TIER 4
Visual: Non-Human Imagery	Nature/Environment	Pastoral Green symbolism Clean air Clean water Eco-urbanism Animals/wildlife Ice/snow/glaciers	
	Industry/Technology	Smokestacks Oil and gas infrastructure Airplanes Cars/motorcycles/other internal combustion vehicles Factory Laboratory	
Visual: Global Warming Attributes	Iconography	Scientific iconography Futuristic lighting	Clean energy technology CCS
	Other non-human imagery		
	Causes	Chimneys Factories Carbon emissions Deforestation Vehicle emissions Airplane emissions Other causes	
	Consequences	Victims Impacts and threats Polar bears etc. Oil spills Other consequences	
	Solutions	Protests Civil society demands Political negotiations Clean energy solutions Lifestyle/consumption choices Innovation Corporate Leadership Conservation Other solutions	
Miscellaneous			
MISC: NOTES	Problem with content Content too long Noteworthy Not English Unsure	Content not displaying Private/hidden post	
MISC: NOTES			

CODER TRAINING AND INTERCODER RELIABILITY

AA team of seven coders comprising researchers at Harvard University and ATI, as well as research assistants from Harvard University and Princeton University, together coded the 2,416 posts. Coding was conducted on a custom-built integration to the Junkipedia social media investigation and research platform developed by the Algorithmic Transparency Institute⁷⁹. Each coder was presented with a randomly sorted sub-sample of the research set where each post could be reviewed and coded using a hierarchically nested set of labels (figure 1).

Prior to coding, coders were familiarized with the codebook and trained according to a standardized coding protocol. The codebook and coding protocol was refined through six rounds of development. After each round, coders discussed discrepancies and made modifications to the codebook and coding protocol to work toward agreement. We randomly generated a total training set of 229 social media posts. Posts were coded independently by each coder according to (a) all textual (i.e. language-based) content (including captions, audiovisual speech, etc.) and (b) all visual (i.e. image-based) content (including images, videos, etc.).

Intercoder reliability of the final round of coding was assessed using Krippendorff's alpha coefficient. Each variable/thematic category in the above coding scheme was tested separately for reliability, and all scored above 0.70. Having reached acceptable levels of intercoder reliability for exploratory research, the seven coders collectively coded all 2,416 posts.

The screenshot displays the Junkipedia platform interface. At the top, there is a search bar and various filters including Platform, 5 Lists, Post Type, date range (2022-06-15 - 2022-07-31), Engagement, Labels, 1 Languages, and 2 Excluded. Below the filters, it shows 2,033 Posts and options for View As, View Type, and Sort by. The main content area shows a post from Wizz Air with a list of coding labels on the right. The labels are organized into categories: TYPE (General business, Advertisement), TEXT (Not real, Not human-caused, Misdirection, Redirect responsibility, Solutions, Emphasize downsides, Surrender, Climate movement/science is unreliable), VISUAL (Humans, Non-human imagery), and a specific category for Nature/Environment (Pastoral, Green symbolism, Clean air, Clean water, Eco-urbanism, Animals/wildlife, Ice/snow/glaciers, Industry/Technology, Iconography). The post itself features an image of a Wizz Air plane and text about 4.34 million passengers.

Figure 1. Screenshot of customized Junkipedia platform, wherein each post was reviewed and coded as part of a continuous feed.

In the following subsections, we summarize the results of four types of analyses conducted in this pilot project. In the 'Overview,' we describe the broad 'shape' of our data sample based on its meta-data. In 'Climate Silence,' we report the results of a keyword frequency search. The following subsection, 'Three Master Narratives,' explains how our coding results can be aggregated into three overarching themes: 'Green Innovation,' 'Misdirection,' and 'Business-as-Usual.' Subsequently, 'Three Shades of Greenwashing' compares and contrasts fossil fuel interests' narratives of 'Green Innovation' and 'Business-as-Usual,' attributing different types and extents of greenwashing to each investigated industry. In 'Misdirection,' we discuss the third master narrative in detail. Finally, 'Greenwashing and Misdirection Weaponize Imagery of Nature and Demographics' uses statistical tests of variable independence to relate our textual and visual content analysis results.

OVERVIEW

In this subsection, we describe the broad 'shape' of our data sample based on its meta-data.

Figure 2 shows the total number of social media posts per industry and per company in our final sample. We see that over the study period, car manufacturers dominated by volume, generating 78% (1,875 out of 2,416) of posts. By contrast, airlines produced 15% (361 out of 2,416) and fossil fuel producers output 7% (180 out of 2,416). Part of the reason for this difference in volume, of course, is that our sample contains twice as many brands in the auto industry as in the other industries. However, even on a per-brand basis, the posting rate of car

brands (156 posts per brand over the study period) is roughly double that of airlines (72 per brand) and quadruple that of fossil fuel producers (36 per brand).

This dichotomy in volume has two implications. First, it illuminates an interesting distinction in the relative initiative taken by different industries to engage the public, at least through organic content. Presumably car manufacturers, as the most public-facing brands in our sample (in that their products and services interface most directly with consumers), are particularly incentivised to distinguish themselves by crafting strong public images. The auto industry's outsized public outreach (and online following) in turn speaks to its significant role in shaping contemporary climate discourse, which has arguably not yet received sufficient scrutiny. Second, given the difference in sample sizes between industries, and the relatively small sample sizes for individual airlines and fossil fuel producers, in this report we analyze each industry in aggregate rather than at the level of individual brands. We also focus on fractional rather than absolute statistics. This approach permits direct, statistically significant comparisons to be made between industries. A limitation of this simplification is that it yields industry-level insights that are likely to be more applicable to some companies than others.

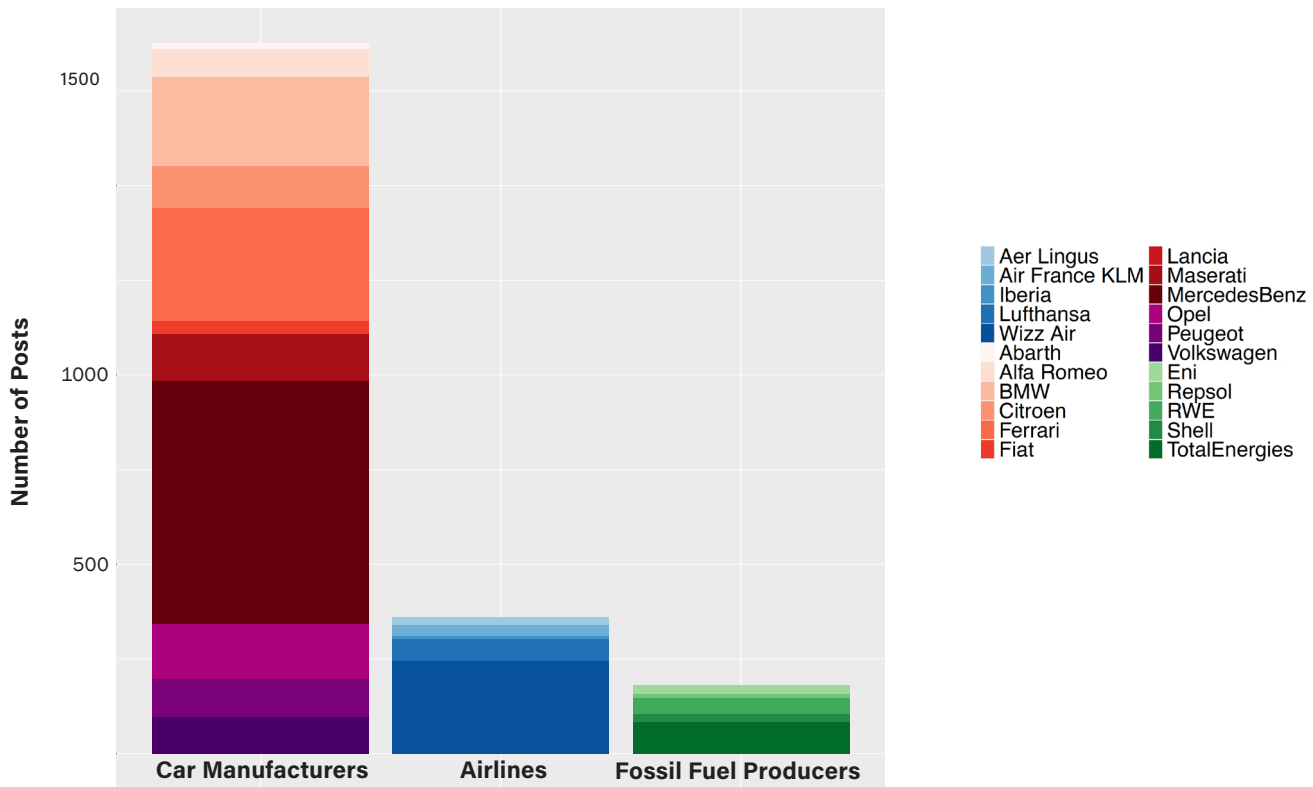


Figure 2. Number of social media posts per industry and per company.

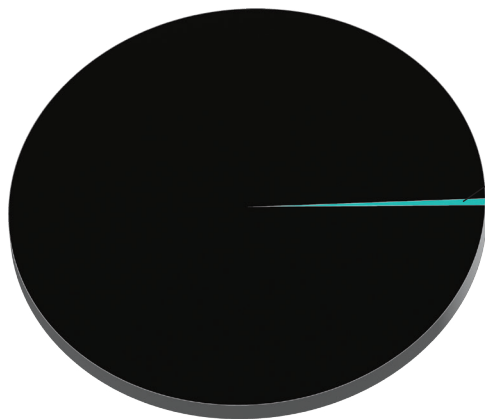
CLIMATE SILENCE

Throughout our study period (1 June to 31 July 2022), Europe experienced the hottest summer ever recorded, featuring unprecedented heatwaves, droughts, and wildfires.⁸⁰ In June, hundreds of daily, monthly, and all-time record-high temperatures were recorded across the continent.⁸¹ Seven of 28 European capital cities, including London, Rome, and Dublin, saw temperatures reach 40-year highs for June, July, or both.⁸² In mid-July, UK temperatures exceeded 40°C for the first time in recorded history - an extreme made 10 times more likely by human-caused global warming, according to analysis by World Weather Attribution.⁸³ These soaring temperatures mean that Europe likely suffered its worst drought in 500 years, preliminary analysis by the EU's Joint Research Center shows.⁸⁴ Initial estimates suggest that these conditions led to more than 10,000 heat-related deaths, as well as evacuations, ruined harvests, and disrupted supply chains.⁸⁵⁻⁸⁹ Meanwhile, wildfires across France, Spain, Portugal, and Romania burned an area the equivalent of one-fifth of Belgium, 56% higher than the previous record in 2017.⁹⁰

Amidst this summer of climate emergencies, our analysis reveals a systemic 'climate silence' among the social media posts examined from the 22 fossil fuel interests⁹¹. A keyword search of all printed textual content identified a negligible handful (6 out of 2,325, or 0.3%) of posts making explicit reference to "climate (change)" or "global warming" (figure 3). In other words, despite the catastrophic climate impacts playing out in Europe this summer, the 22 major European fossil fuel producers, car manufacturers, and airlines that we examined — all major contributors to global warming — avoided explicitly acknowledging the climate crisis almost entirely in their organic social media posts. The companies that did acknowledge climate change were Lufthansa (3 times), TotalEnergies (twice), and BMW (once); none referenced the European heatwaves (figure 4).

Likewise, imagery in the examined posts rarely illustrated the *Causes* and *Consequences* of global warming (here and throughout, we italicize the names of discourses in order to signify that they are coded variables). *Causes* were visually communicated in 6%, <1%, and 3% of posts by fossil fuel producers, car manufacturers, and airlines, respectively. *Consequences* were never communicated (0%) by any industry.

Consistent with this climate silence, our content analysis also confirmed the absence of rhetoric directly attacking or undermining climate science or policy in the sample posts. Posts that claim global warming is *Not real* or *Not human-caused*, *Emphasize downsides* of climate mitigation, profess the inevitability of catastrophic climate change (*Surrender*), or suggest the *Climate movement/science is unreliable* were all coded as absent (0%). This is consistent with the evolution of climate discourse by fossil fuel interests away from outright climate denial previously demonstrated by us (GS) and others.⁷¹³ In its place, our analysis below shows, have emerged the more subtle practices of greenwashing and misdirection.



0.3% of posts refer to "climate (change)" or "global warming" during Europe's 2022 heatwaves

Figure 3. A negligible handful (6 out of 2,325, or 0.3%) of posts by 21 fossil fuel interests made explicit reference to "climate (change)" or "global warming" during Europe's 2022 heatwaves.

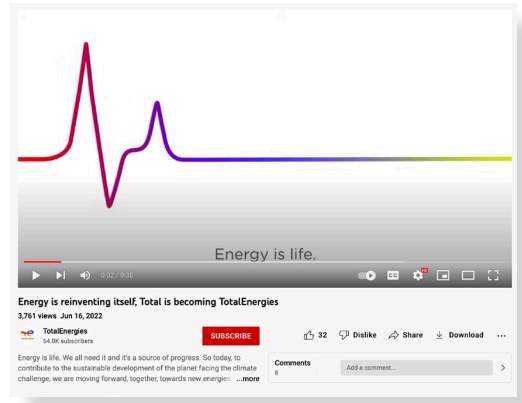
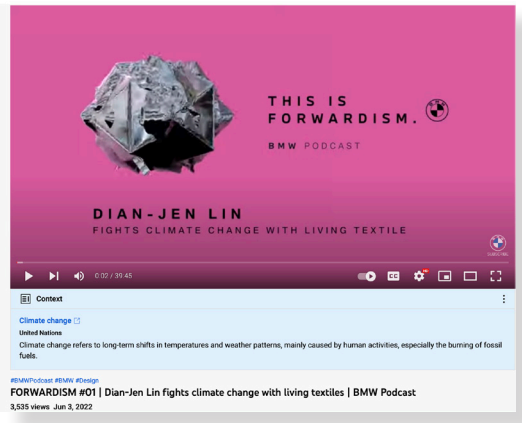


Figure 4. Four of the six (out of 2,325, or 0.3%) posts making explicit reference to "climate (change)" or "global warming"⁹²⁻⁹⁵.

THREE MASTER NARRATIVES -

'GREEN INNOVATION', 'MISDIRECTION', 'BUSINESS-AS-USUAL'

This subsection explores how our coding results can be aggregated into three overarching themes.

Beyond the five thematic categories of outright claims by climate contrarians discussed above (*Not real, Not human-caused, Emphasize downsides, Surrender, and Climate movement/science is unreliable*), our codebook contains an additional 122 variables. Of these, 28 variables characterize any Humans visibly featured in posts, six characterize the fundamental functions of posts (*General Business* and *Advertisement*), and eight flag posts as *Needs attention*. As illustrated below, codes for *Humans* help identify how fossil fuel interests use people to communicate their messaging. Yet they, along with the other sets of six and eight variables, do not directly characterize the discourses contained in social media posts, which was our initial objective in this scoping exercise.

All remaining variables, however, speak directly to the discourses communicated. Four of these variables are designed to code posts that *Redirect responsibility*, though only a handful (7 out of 2,325, or 0.3%) were found to do so. These posts tend to redirect responsibility by giving primacy to *Individualism*, as illustrated by the examples in figure 5.

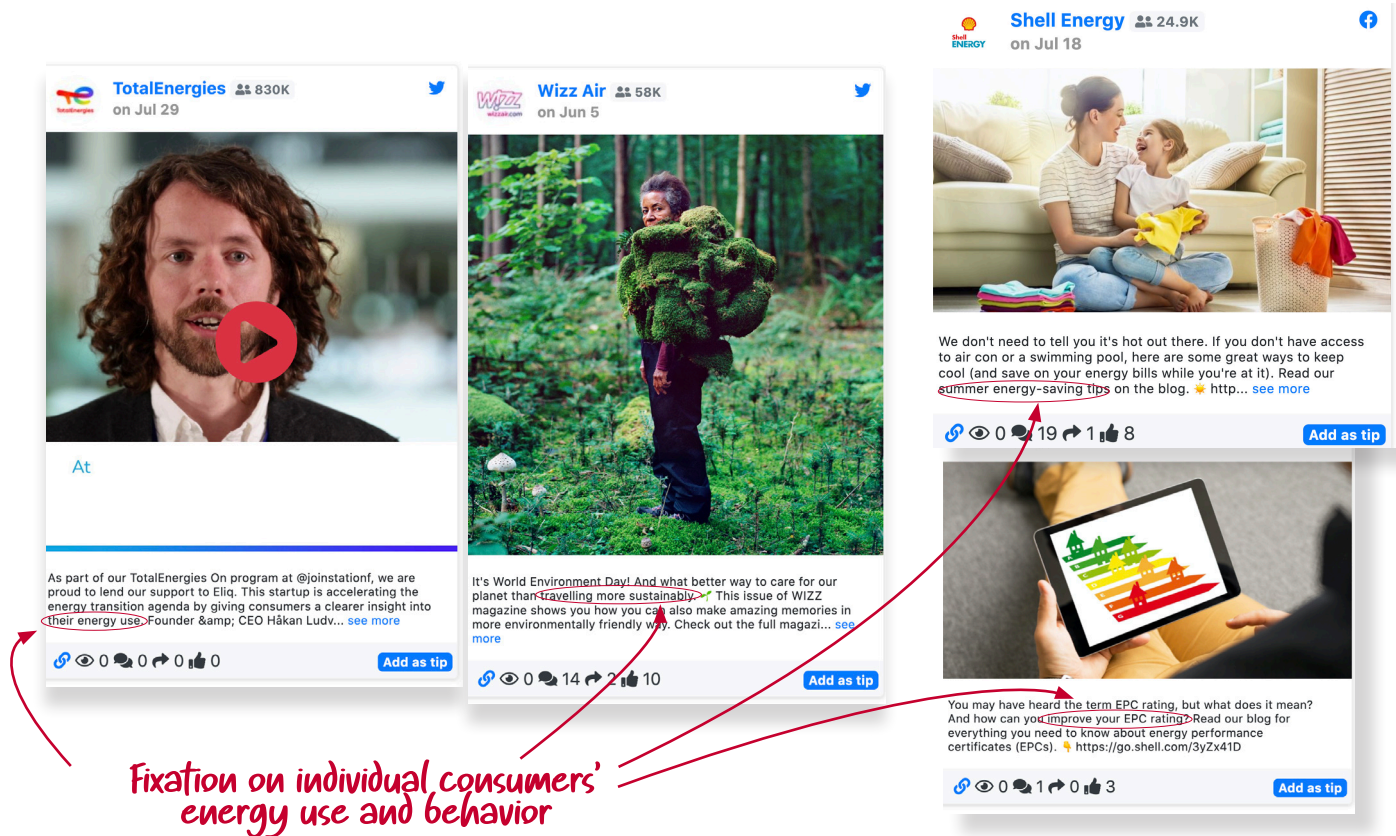


Figure 5. Four of the seven (out of 2,325, or 0.3%) posts that redirect responsibility for climate mitigation onto individuals⁹⁶⁻⁹⁹.

We aggregate all of the other variables that describe discourses into three overarching master narratives, which we term 'Green Innovation', 'Misdirection', and 'Business-as-Usual'. These narratives are respectively made up of the textual and/or visual discourses shown in green, red, and black in table 1. They are also summarized in figures 10, 11, and 16, respectively. We aggregate textual and visual discourses because, as Hopke and Hestres (2015) have observed, "the visuals found in social media do not function independently of the textual material they often accompany" — they are experienced holistically by audiences.⁴²

We define the 'Green Innovation' narrative as a combination of textual and/or visual discourses that present a company as environmentally-conscious, engaged in or committed to low-carbon technologies and/or technological innovation. We use the term 'Misdirection', by contrast, to characterize messaging about sports, fashion, and social causes unrelated to the firms' core business operations. Finally, we use 'Business-as-Usual' to refer to narratives describing and/or depicting those core business operations and any outcomes associated with them.

Figure 6a is a Venn diagram of all 2,325 posts in our sample, categorized according to the three master narratives. We see that 82% of all posts are captured by these categorizations: 67% of posts communicate 'Green Innovation' (green circle), 21% communicate 'Misdirection' (red circle), and 22% communicate 'Business-as-Usual' (gray circle). The portions of posts containing combinations of these narratives are shown by the overlaps in the Venn diagram. The 'Other' 18.5% of posts do not contain these narratives, and are shown by the white circle.

We immediately observe that 'Green Innovation' is the dominant master narrative in our sample, and that 'Misdirection' occurs as frequently as 'Business-as-Usual' discussions. In the following sections, we address each of these narratives in detail.

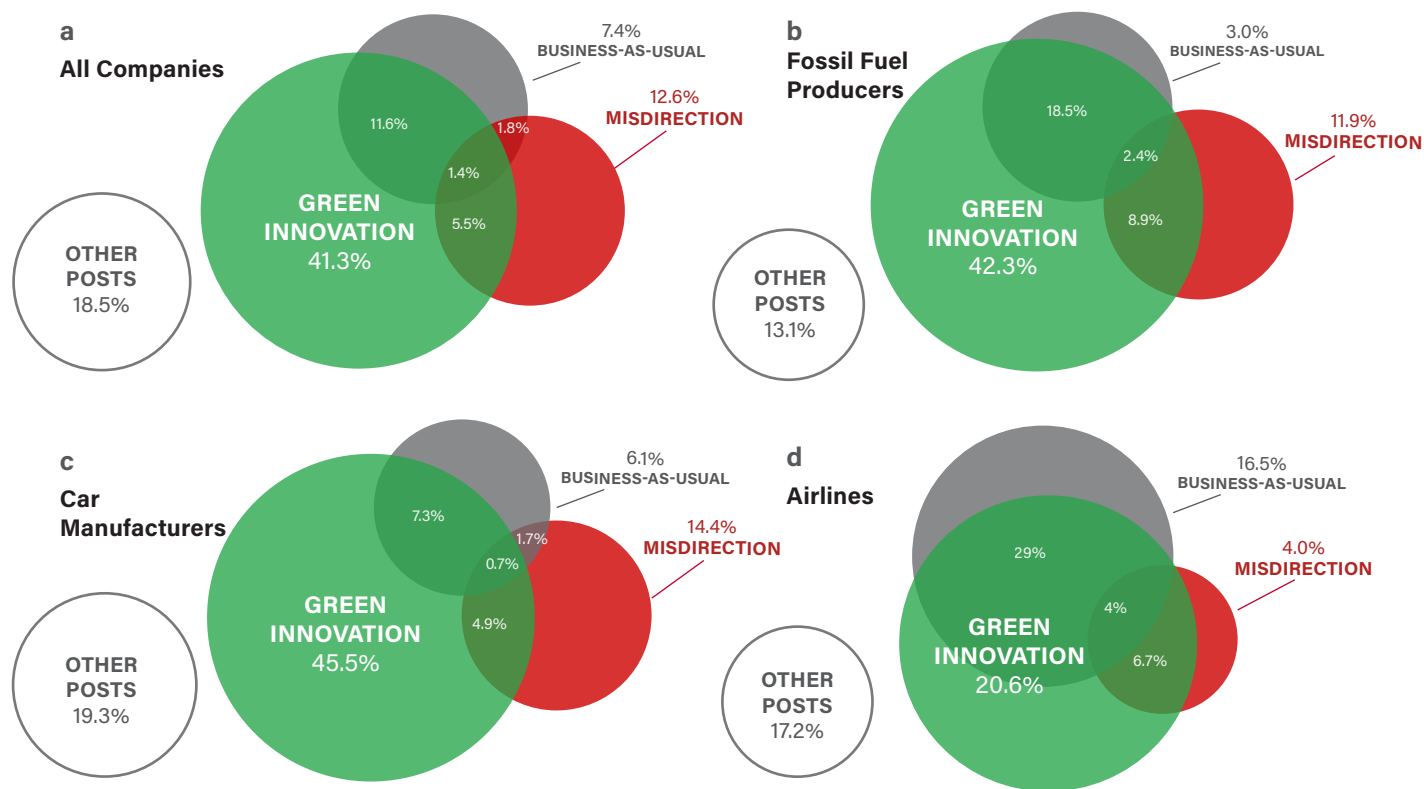


Figure 6. Venn diagrams of the fraction of posts communicating three master narratives in (a) all 2,325 posts in our sample, (b) posts from fossil fuel producers, (c) posts from car manufacturers, and (d) posts from airlines. The three master narratives are 'Green Innovation' (green circles), 'Misdirection' (red circles), and 'Business-as-Usual' (gray circles). The portions of posts containing combinations of these narratives are shown by the overlaps in the Venn diagram. 'Other' posts (white circles) do not contain these master narratives. Percentages may not add up to precisely 100% due to rounding.

THREE SHADES OF GREEN(WASHING)

In this subsection, we examine fossil fuel interests' master narrative of 'Green Innovation' in detail. In the subsequent three subsections, we compare and contrast 'Green Innovation' against each industry's other master narrative about their operations, 'Business-as-Usual'. This leads us to attribute different types and extents of greenwashing to each industry.

As previously discussed, 67% of all 2,325 posts in our sample communicate 'Green Innovation' (figure 6a, green circle). Figures 6b-d illustrate equivalent distributions of master narratives among fossil fuel producers, car manufacturers, and airlines, respectively. We observe that in all three industries, 'Green Innovation' predominates, constituting 72% (121 out of 168) of all posts by fossil fuel producers and 60% of posts by car manufacturers (1,043 out of 1,784) and airlines (225 out of 373).

Figure 10 (left hand side) summarizes the discourses aggregated to construct the 'Green Innovation' narrative. The relative prominence of each coded discourse among all posts by airlines (left, blue bars), car manufacturers (middle, red bars), and fossil fuel producers (right, green bars) are shown as a fraction of posts categorized as 'Green Innovation'.

Immediately evident are the different levels of diversity of 'Green Innovation' messaging between the three industries. Airlines 'green' their image primarily with *Nature/Environment* visuals (97% of all 'Green Innovation' posts from airlines, including *Clean Air* (68%), *Clean Water* (37%), and *Pastoral scenes* (36%)). They also sometimes discuss their *Plans/initiatives* (8%) and *Low-emission aircraft* (9%). Examples are shown in figure 7. Wizz Air's post is a noteworthy exception because it satirically acknowledges airlines' frequent use of nature-evoking imagery to 'green' their images: "A magnificent shoreline and soothing planet music... doesn't prove that we care about the planet."

limited or nascent solutions

Wizz Air 485K on Jul 25

Aaaand pencils down! 🎒 School's over, holiday's in session! 🌴 Get 20% OFF on 500,000 seats on selected flights to or from the UK today and go on that family holiday you've been waiting for! 🌊 Grab your ticket now and travel until 30 September 2... see more

0 8 0 335 Add as tip

Lufthansa News 51.3K on Jun 28

Ready for take-off! Today we fly to the #ConnectingEurope Days by @Transport_EU in Lyon, showcasing what's possible for #SustainableAviation. LH1076 from @Airport_FRA to @lyonaerports will make use of a modern aircraft, #SAFs, #SESAR approach pro... see more

Lufthansa Group 69K on Jun 13

You thought sharks only swim in the ocean? Look at this! Applied in patches on the surface of an aircraft, AeroSHARK is a film that replicates the skin of sharks to optimize the airflow around the aircraft and consequently reduces fuel consumption... see more

0 8 0 1.48K Add as tip

Ambiguous buzzwords

Appropriating the beauty of nature

limited or nascent solutions

Wizz Air acknowledges greenwashing by airlines

Aer Lingus 290K on Jun 24

- 186 economy seats means lower fuel burn per seat
- Nearly 50% reduction in noise (compared to A320ceo)
- Up to 20% less fuel burn and CO2 emissions (compared to A320ceo)

Say hello to the newest member of the family 🌟 Next month we'll welcome two shiny new A320neo aircraft to our shorthaul fleet ➔ These fuel-efficient aircraft will operate on our routes between Ireland and London Heathrow 🌱

0 30 19 139 Add as tip

June 29, 2022 at 5:00am PDT **Wizz Air** 58K on Jun 29

Actions speak louder than a bunch of stock footage. That's why at WIZZ, we don't have business class seating, a source of unnecessary pollution. Check out this video to find out why WIZZ is your greenest choice of air travel. #flythegreenest 🌱 http... see more

0 0 0 0 Add as tip

Figure 7. Examples of 'Green Innovation' posts by airlines¹⁰⁰⁻¹⁰⁴.

Car manufacturers do the same (64% of their 'Green Innovation' posts show *Nature/Environment* visuals*), but in similar measure also communicate about *Sustainable Transport* (60%), primarily by highlighting *Electric Vehicle product(s)* (36%) and vehicle *Emissions* data (32%) and by making *Efficiency* language claims (7%). For examples, see figure 8.

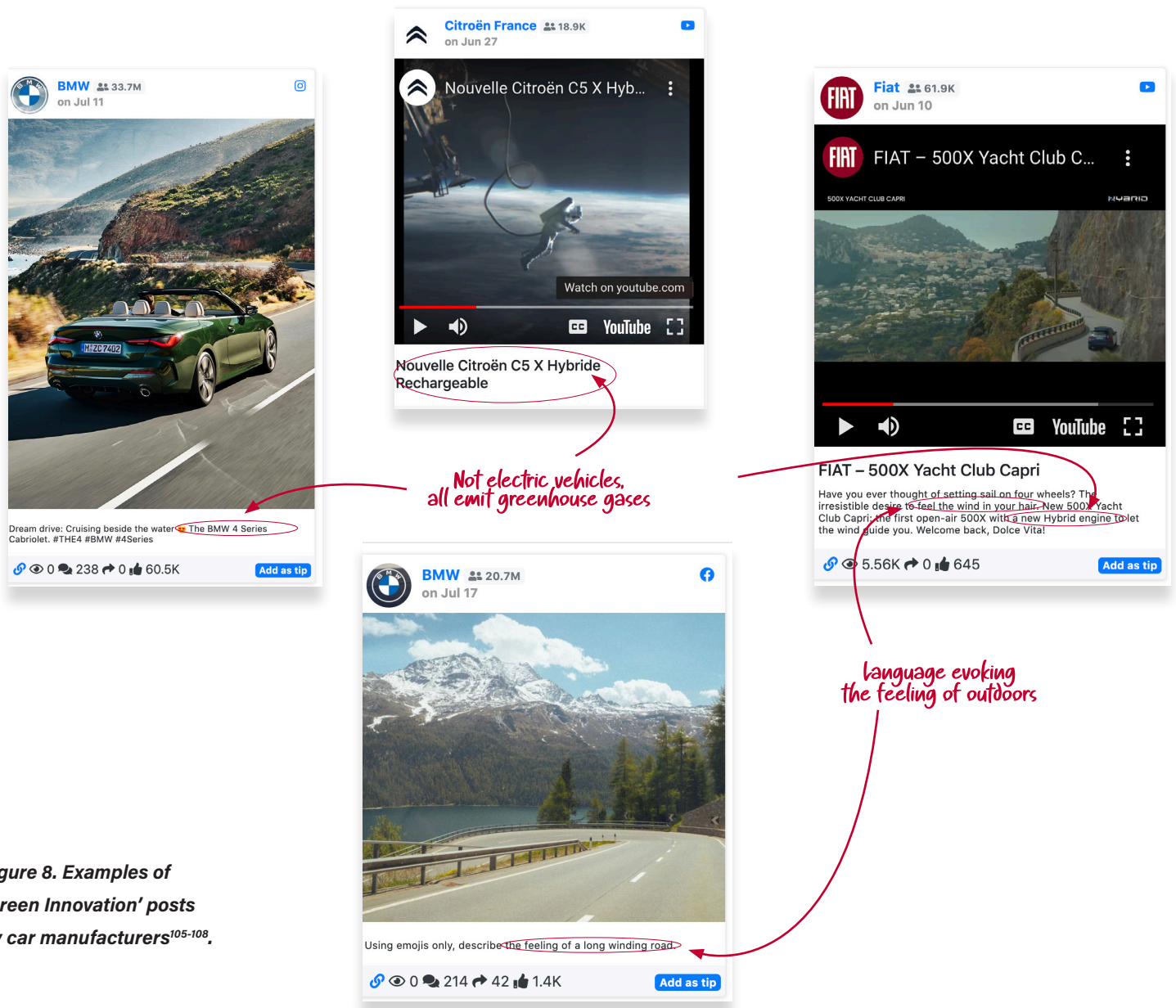


Figure 8. Examples of 'Green Innovation' posts by car manufacturers¹⁰⁵⁻¹⁰⁸.

Fossil fuel producers have a broader spread of 'green' discourses than the other industries, the most common textual discourses being *Plans/Initiatives* (42% of 'Green Innovation' posts), *Wind* (30%), *Technological Optimism* (20%), *Solar* (17%), *Sustainability/Conservation* (16%), *Nascent technologies* (23%) (notably *Bioenergy* (11%), *Hydrogen* (9%), and *Clean Fossil Gas* (5%)), and *Sustainable Transport* (12%). The most common imagery contains *Clean Energy Solutions* (42%), *Nature/Environment* (56%), and *Innovation/Laboratories/Scientific Iconography* (10%/7%/9%, respectively). Examples include those shown in figure 9.

* Our analysis does not assume that visuals of cars, in of themselves, evoke a 'green' or 'dirty' impression: for the most part, low- and high-carbon emitting vehicles are not visually distinguishable by mainstream audiences. A sensitivity analysis confirms that categorizing car visuals as 'Green Innovation' when they are accompanied by textual discussions of sustainable transportation, and likewise categorizing car visuals as 'Business-as-Usual' if they come with textual discussions of conventional internal combustion engine vehicles, yields negligible difference in overall results because the 'Green Innovation' and 'Business-as-Usual' categories aggregate textual and visual codes.

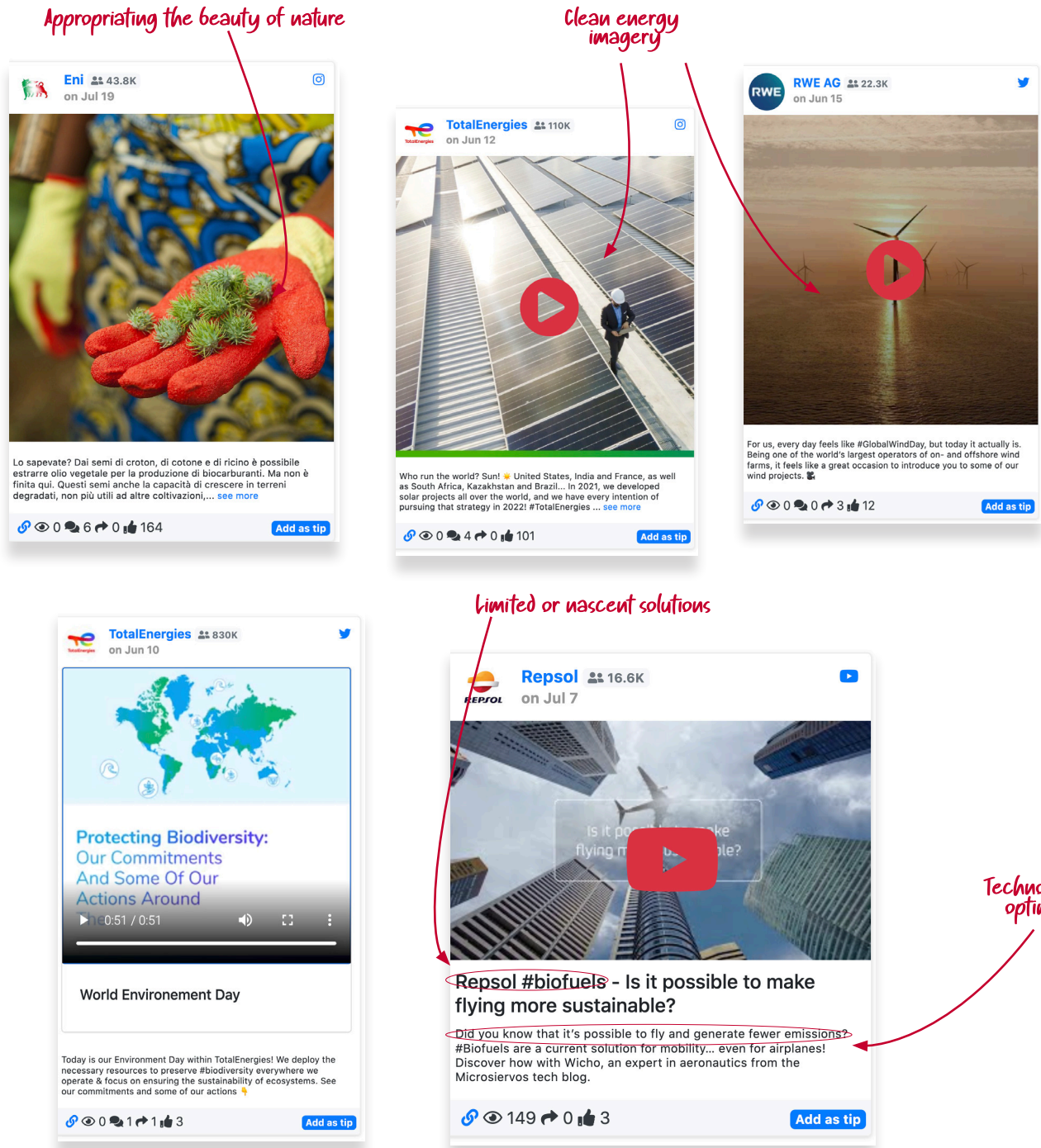


Figure 9. Examples of 'Green Innovation' posts by fossil fuel producers¹⁰⁹⁻¹¹³.

In principle at least, there is nothing inherently problematic about a company promoting its engagement in or commitment to the environment and technological innovation. They have the right to do so, and in itself, 'Green Innovation' is a worthy endeavor. However, this does not discount the possibility that such messaging may also serve strategic public affairs purposes and/or misrepresent the overall activities and impacts of a company. We scrutinize this possibility by now turning to each industry's other master narrative about their operations, 'Business-as-Usual.'

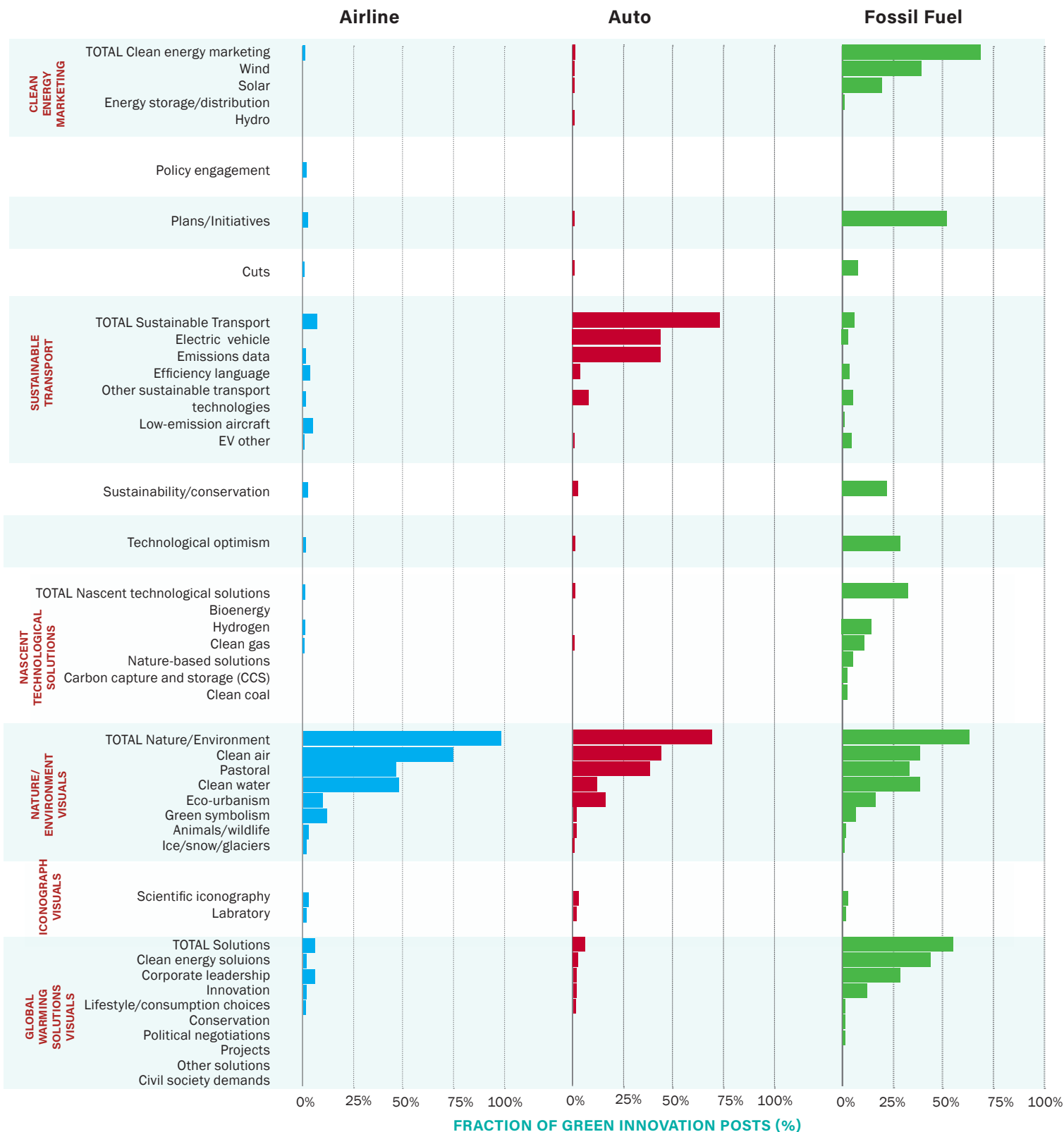


Figure 10. Relative prominence of each coded discourse in the 'Green Innovation' narrative, as a fraction of 'Green Innovation' posts from airlines (left, blue bars), car manufacturers (middle, red bars), and fossil fuel producers (right, green bars)

HEAVY GREENWASHING BY FOSSIL FUEL PRODUCERS

Analogous to figure 10, figure 11 shows the breakdown, per industry, of textual and visual discourses as a fraction of total posts containing the 'Business-as-Usual' narrative. In the case of fossil fuel producers (right, green bars), the 'Business-as-Usual' narrative is evenly represented by textual discourses concerning *Oil & gas* (38% of all 'Business-as-Usual' posts) and visuals of *Oil and gas infrastructure* (33%), *Factories* (30%), *Airplanes* (20%), and *Carbon emissions* (25%). See figure 12 for examples.

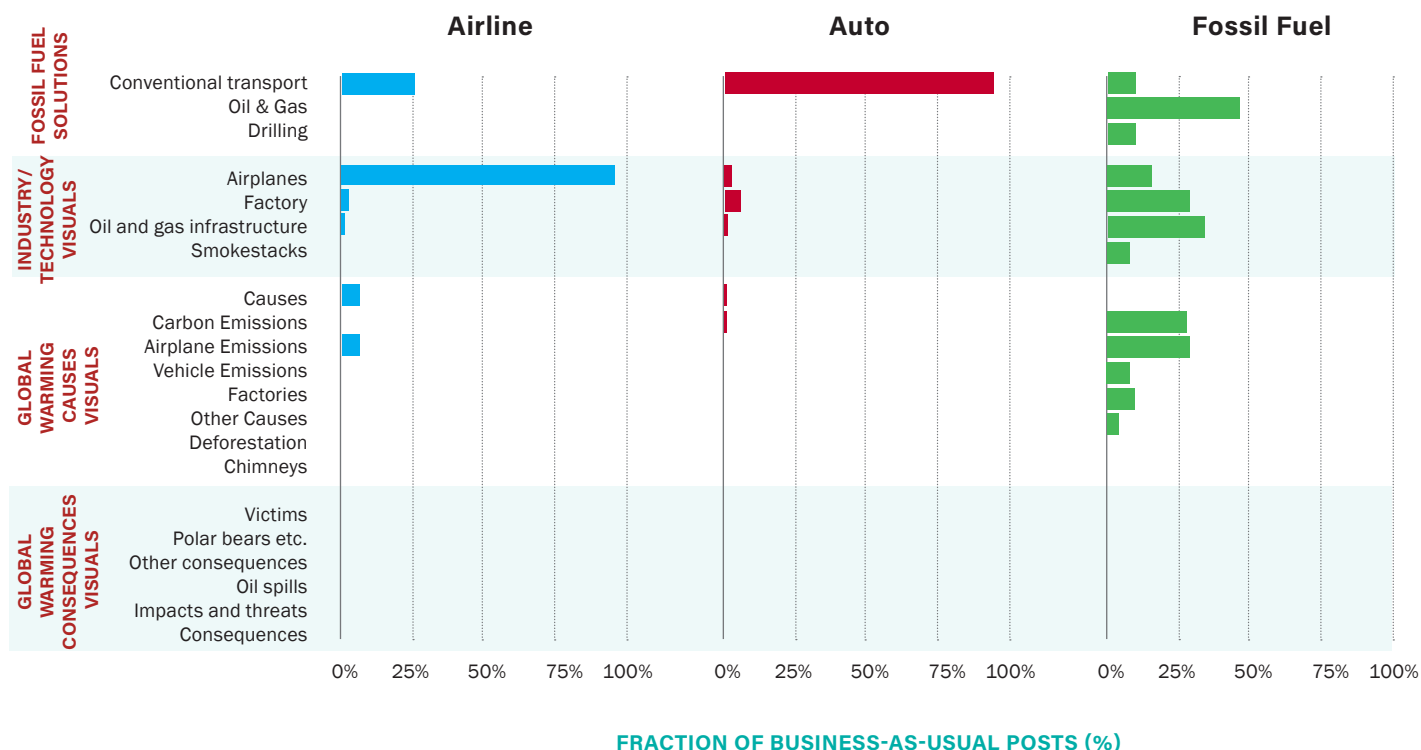
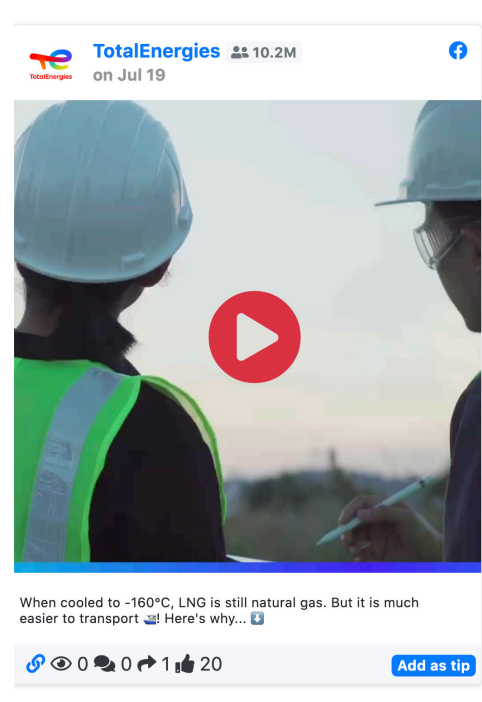


Figure 11. Relative prominence of each coded discourse in the 'Business-as-Usual' narrative, as a fraction of 'Business-as-Usual' posts from airlines (left, blue bars), car manufacturers (middle, red bars), and fossil fuel producers (right, green bars).

Oil and gas infrastructure/worker imagery



Trumpeting fossil gas (in favor of renewables and storage/transmission)

Deceptive: fossil gas is a greenhouse gas causing global heating

Figure 12. Examples of 'Business-as-Usual' posts by fossil fuel producers¹¹⁴⁻¹¹⁶.

As we have seen (figure 6b), 72% of all fossil fuel producers' posts communicate 'Green Innovation'. By contrast, figure 6b also shows that only 24% of their posts reflect 'Business-as-Usual'. This narrative imbalance implies a publicly communicated 'green-to-dirty' ratio of 3-to-1 (figure 13a). If we limit our calculation to posts exclusively featuring one narrative or the other, the 'green-to-dirty' ratio is larger still: 47% 'Green Innovation' to 9% 'Business-as-Usual', or 5-to-1.

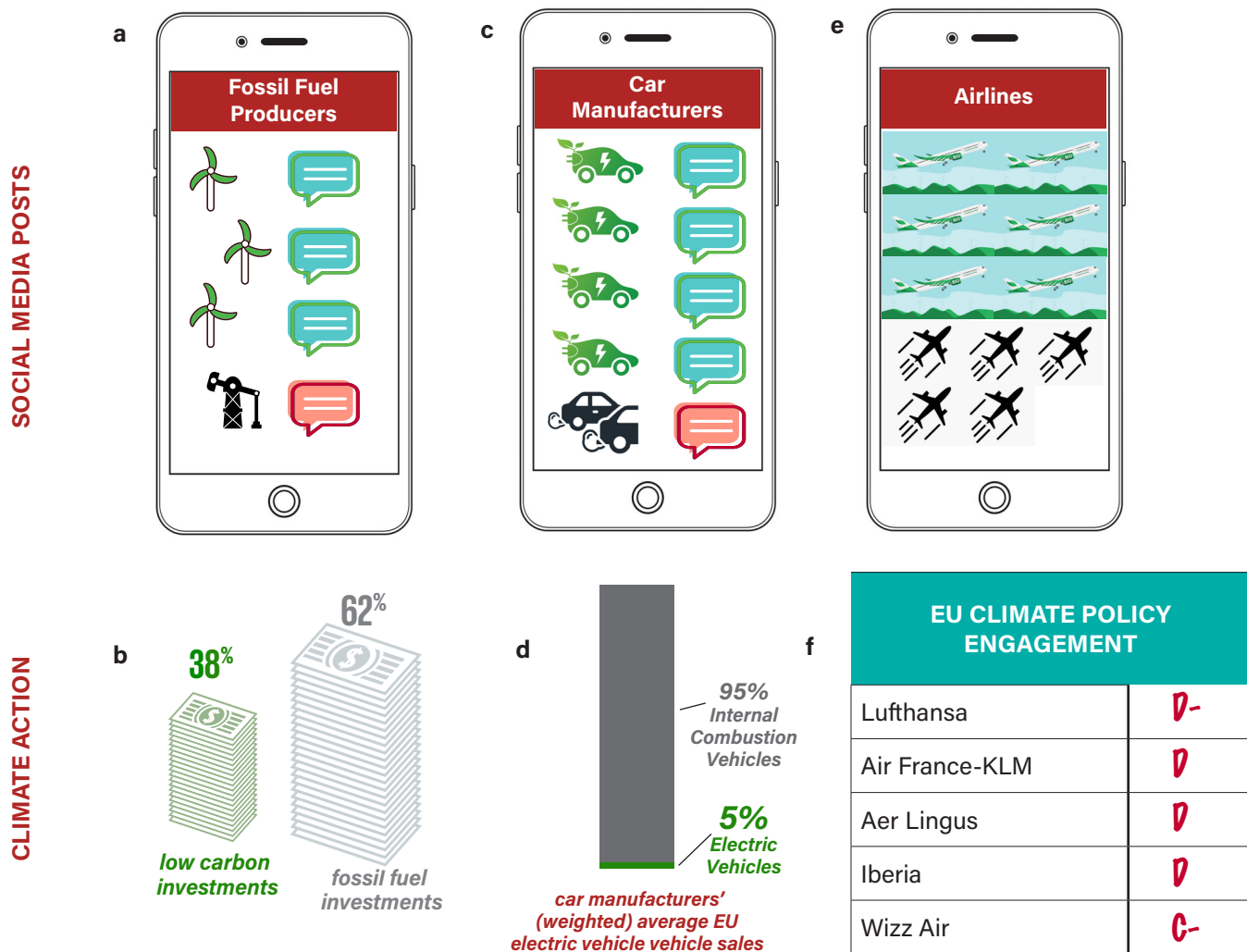


Figure 13 .Social media posts from (a) fossil fuel producers, (c) car manufacturers, and (e) airlines exhibit ‘green-to-dirty’ ratios of at least 3-to-1, 4-to-1, and 1.2-to-1, respectively. These ‘green’ public images respectively contrast against (b) fossil fuel producers’ 38% (weighted) average investments in low-carbon technologies in the first half of 2022; (d) car manufacturers’ 5% (weighted) average EU electric vehicle sales; and (f) airlines’ D- to C- ratings for EU climate policy engagement.

This imbalance between ‘green’ and ‘dirty’ narratives has the effect of portraying fossil fuel companies as primarily focused on the environment and technological innovation. Yet on average, the fossil fuel companies investigated (excluding RWE, for which we do not have data) invested just 1.7% of their annual capital expenditures in low-carbon technologies between 2010-18.¹¹⁷ Based on each company’s quarterly financial reports, we estimate that even their most recent reported expenditures, for the first half of 2022, average only 32% (or 38% when weighted by the relative number of social media posts from each company in our sample) (figure 13b and table 2).^{*,+}

** Note that these figures likely overestimate true low-carbon investments. TotalEnergies and Shell disclose only aggregated expenditures in “Integrated gas, Renewables & Power” and “Renewables and energy solutions” (which includes hydrogen, renewables, and marketing, sale, and trading of gas & power), respectively²⁷. Repsol likewise only report aggregate investments in “Commercial and Renewables”, which is defined as “corresponding, mainly, to (i) low carbon power generation and renewable sources, (ii) gas and power commercialization, (iii) mobility and commercialization of oil products and (iv) liquefied petroleum gas(LPG)”¹¹⁸. Shell also reports capital and operational expenditures for “low- and zero-carbon products and services,” which amount to roughly one third of total expenditures. These products and services include electric vehicle charging, chemicals, lubricants, and convenience retail. This is in line with Shell’s previous pledge to spend 35% of 2022 capital expenditures on low-carbon energy and “non-energy products.” The conflation of energy and non-energy products, and of low-carbon products and services with products and services indirectly supporting business-as-usual operations, makes parsing these values intractable. For consistency with figures reported by other companies, we do not include this group of capital and operational expenditures. Sensitivity analysis shows that were we to revise Shell’s low-carbon investment fraction from 11% to 35%, this would shift the overall weighted average low-carbon expenditure by all investigated companies by only two percentage points, from 38% to 40%.*

+ Eni: ref. 119; Repsol: ref. 118; RWE: ref. 120; Royal Dutch Shell: ref. 121; and TotalEnergies: ref. 122. General: ref. 123. Excluding RWE, the average drops to 16% (or weighted, 20%).

Table 2. Fraction of capital expenditures invested in low-carbon technologies during the first half of 2022 by each fossil fuel company in our sample. Weighted average reflects mean fraction weighted by the relative number of social media posts from each company in our sample.

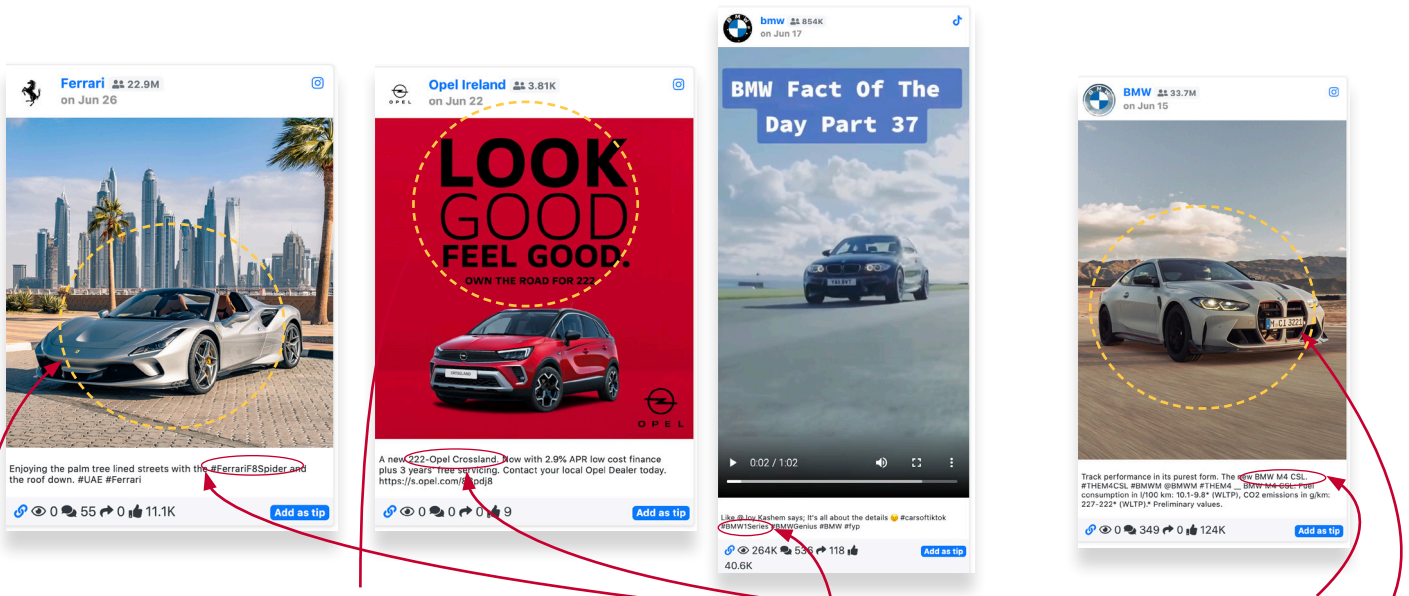
Company	Fraction of capital expenditures in low-carbon technologies (Jan - June 2022)
Royal Dutch Shell	11%
TotalEnergies	25%
Eni	8%
RWE	95%
Repsol	19%
AVERAGE	32%
WEIGHTED AVERAGE	38%

The fossil fuel companies' 'Green Innovation' social media content is therefore a prototypical example of greenwashing - of talking 'green' but acting dirty - because it almost doubles the implied extent of the companies' low-carbon portfolios compared to reality (72% versus 38%). Nemes *et al.* (2021) define greenwashing as "an umbrella term for a variety of misleading communications and practices that "intentionally, or not, induce false positive perceptions of an organization's environmental performance"¹²⁴. Fossil fuel producers' posts commit both so-called 'claim greenwashing' (wherein textual claims exaggerate a company's greenness) and 'executional greenwashing' (which does not make specific claims, but uses nature-evoking imagery to induce false perceptions of a company's greenness)¹²⁵.

MODERATE GREENWASHING BY CAR MANUFACTURERS

Car manufacturers' 'Business-as-Usual' narrative is mostly conveyed by way of textual discourse about *Conventional transport* (i.e. conventional internal combustion engine vehicles) (90% of all 'Business-as-Usual' posts), and to a lesser extent by visuals of *Factories* (7%) (see figure 11: middle, red bars). Figure 14 displays four examples.

Again, whereas 60% of all car manufacturers' posts communicate 'Green Innovation', only 16% reflect 'Business-as-Usual' (figure 6c), equivalent to a publicly communicated 'green-to-dirty' ratio of almost 4-to-1 (figure 13c). Excluding posts with overlapping narratives in figure 6c, the 'green-to-dirty' ratio increases to 50% 'Green Innovation' versus 8% 'Business-as-Usual', or 6.5-to-1.



Visuals and language fetishizing luxury and performance, with no consideration of sustainability

All greenhouse-gas-emitting conventional internal combustion engine vehicles

Figure 14. Examples of ‘Business-as-Usual’ posts by car manufacturers 126-129.

As with fossil fuel producers’ posts, the imbalance between ‘green’ and ‘dirty’ narratives in car companies’ posts gives the overall impression that the center of mass of their business is ‘green innovation.’ We estimate that, on average, electric vehicle sales by the investigated car brands constituted only 6% of their total EU vehicle sales in 2021 (or 5% when weighted by the relative number of social media posts from each company in our sample) (figure 13d and table 3). An alternative, high-end proxy for the low-carbon orientation of car manufacturers is obtained by estimating the fractions of their annual capital expenditures on electric vehicles and/or low-carbon initiatives. These do not appear to be consistently disclosed by the sample companies*, except for Volkswagen and Mercedes-Benz, which have average low-carbon expenditures of 24% (or 22% when weighted by social media posts). Based on these estimates, the car companies’ social media messaging is on the order of 3 to 12 times ‘greener’ than the companies’ average sales portfolios (60% versus 5% or 22%).

Table 3. Fraction of capital expenditures invested in low-carbon technologies during the first half of 2022 by each fossil fuel company in our sample. Weighted average reflects mean fraction weighted by the relative number of social media posts from each company in our sample.

Company	Fraction of capital expenditures in low-carbon technologies (Jan - June 2022)	Fraction of capital expenditures in low-carbon technologies (2021)
Volkswagen	13%	26%
Mercedes-Benz	6%	21%
Bayerische Motoren Werke, BMW	7%	NA
Stellantis	3%	NA
Ferrari	0%	NA
AVERAGE	6%	24%
WEIGHTED AVERAGE	5%	22%

* Based on a keyword search of each company’s quarterly and sustainability reports for “capex”; “capital (expenditure)”; “invest(ment)”; “research”; “electric”; “(low) carbon”; “sustainable (aviation fuel)”; “renewables”; environment”; and “climate”. In 2021, BMW and Stellantis each pledged to invest “more than €30 billion through 2025” in “research and development” of electric vehicles and autonomous driving technology and in “electrification and software,” respectively^{130,131}. However, real capital expenditures on these activities to-date were not retrievable, and we do not consider pledges of future spending to be a reliable measure of investment at the time our sample data were collected. A sensitivity analysis assuming that one quarter of each of those €30 billion investments was made in 2022 by BMW and Stellantis increases the weighted average low-carbon expenditure fraction to 52%, which still does not match the 60% of car manufacturers’ posts communicating ‘Green Innovation.’

It could be argued that car manufacturers' 'green' public messaging is a signal of their legitimate intentions to decarbonize their vehicle fleets and sales. Indeed, many of the companies in question have publicly committed to 100% electric vehicle sales by 2050 or sooner. However, this does not change the fact that in the meantime, car manufacturers' social media activities are likely serving to 'green' their public images to extents that are not necessarily matched by their levels of commitment to and investment in sustainable transportation technologies. Indeed, we note that only 34% of 'Green Innovation' posts from car companies advertised a specific *Electric vehicle product*. The remainder function, at least directly, to sell a 'green' image rather than a 'green' car. Moreover, those advertisements of an *Electric vehicle product* constitute just 20% of all car manufacturers' posts. In other words, one-in-five of all car companies' posts is advertising an electric car; less than twice as many as posts advertising conventional internal combustion engine vehicles (11%). This 1.8-to-1 'green-to-dirty' advertising ratio is dwarfed by the same companies' 4-to-1 'green-to-dirty' narrative ratio, suggestive of at least moderate levels of greenwashing*.

SUBTLE GREENWASHING BY AIRLINES USING NATURE IMAGERY

As with their 'Green Innovation' messaging, airlines allude to 'Business-as-Usual' primarily through visuals; unsurprisingly, their 'Business-as-Usual' posts feature *Airplanes* 87% of the time (figure 11: left, blue bars)⁺. 19% of 'Business-as-Usual' posts also textually refer to *Conventional transport*. For instance, figure 15 displays four cases of 'Business-as-Usual' from airlines.

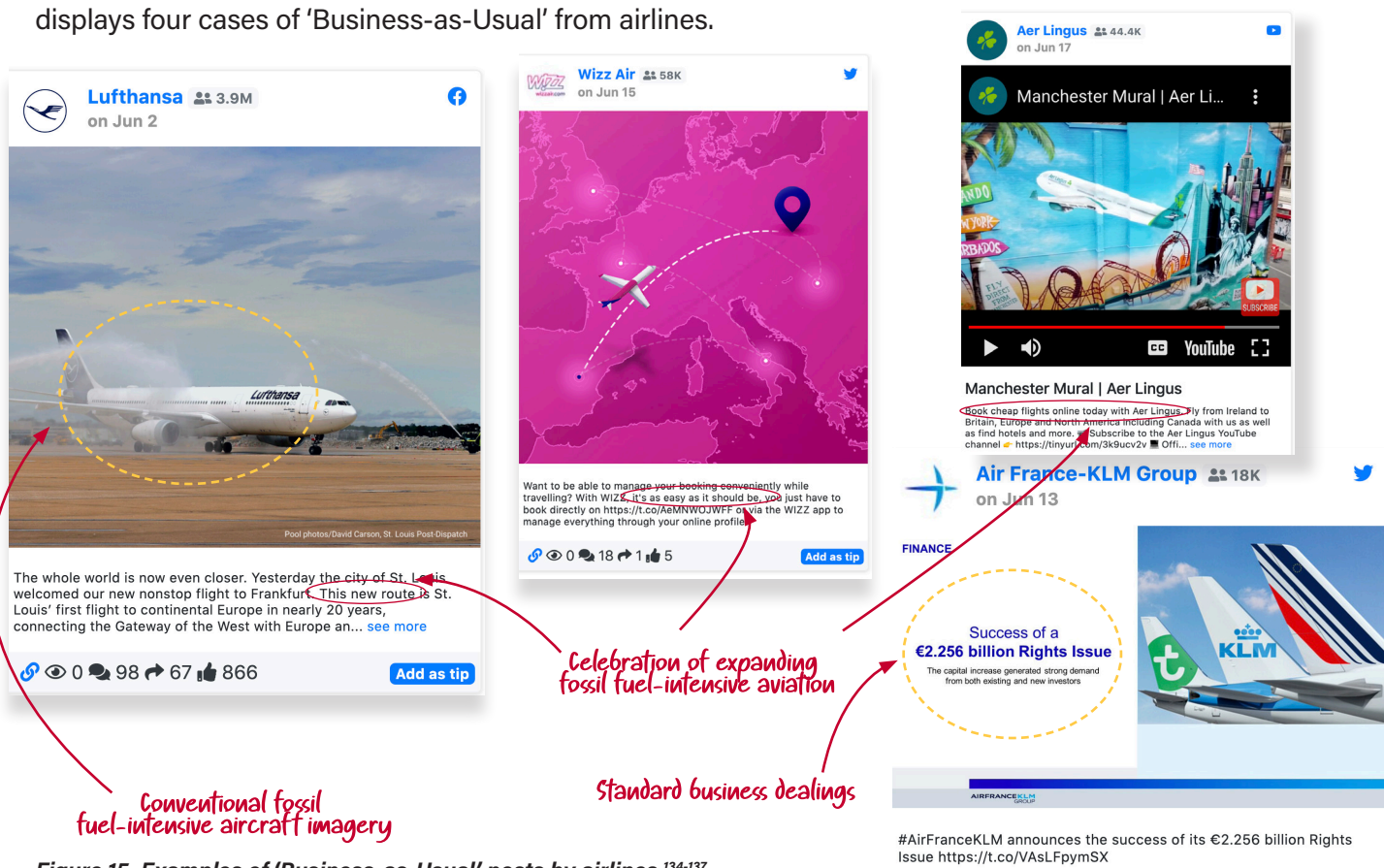


Figure 15. Examples of 'Business-as-Usual' posts by airlines¹³⁴⁻¹³⁷.

*While our sample posts primarily consist of organic content and so do not include all paid promotions, our analysis here concerns the ratio of advertisements in the sample posts, and so holds regardless of the sample's composition.

+ Unlike visuals of cars, whose interpretation is ambiguous because low- and high-carbon emitting vehicles are generally not visually distinguishable by mainstream audiences, visuals of airplanes are assumed to invariably reinforce a 'Business-as-Usual' narrative because the European aviation industry is entirely fossil fuel-dependent: the European Environment Agency estimates that oil-derived jet fuel accounts for over 97% of airline greenhouse gas emissions^{132,133}.

In contrast to fossil fuel producers and car manufacturers, figure 6d shows that airlines' narratives of 'Green Innovation' and 'Business-as-Usual' overlap far more and are of comparable magnitude: 60% 'Green Innovation' versus 49% 'Business-as-Usual', or a 'green-to-dirty' ratio of 1.2-to-1. Given the greater overlap, even the mutually exclusive portions of the two narratives are more comparable: 27% 'Green Innovation' and 16% 'Business-as-Usual', equivalent to a 'green-to-dirty' ratio of 1.8-to-1.

In contrast to fossil fuel producers and car manufacturers, figure 6d shows that airlines' narratives of 'Green Innovation' and 'Business-as-Usual' overlap far more and are of comparable magnitude: 60% 'Green Innovation' versus 49% 'Business-as-Usual', or a 'green-to-dirty' ratio of 1.2-to-1. Given the greater overlap, even the mutually exclusive portions of the two narratives are more comparable: 27% 'Green Innovation' and 16% 'Business-as-Usual', equivalent to a 'green-to-dirty' ratio of 1.8-to-1.

What is the significance of these smaller 'green-to-dirty' ratios, greater overlaps between opposing narratives, and less diversity of discourses within airlines' 'Green Innovation' narrative (figure 10, left bars)? One interpretation is that the aviation industry currently has few viable technological alternatives compared to its counterparts (in principle at least, fossil fuel producers and car companies can claim to be diversifying into low-carbon energy and vehicle technologies, respectively), such that it makes fewer detailed, textual 'green' claims, and instead mostly relies on *Nature/Environment* imagery to subtly 'green' the image of its polluting *Airplanes*.

On the one hand, this less overt, less standalone (from 'Business-as-Usual' narratives) 'Green Innovation' messaging, reliant mostly on *Nature/Environment* imagery, might be interpreted as a lighter form of greenwashing than that by fossil fuel producers and car companies, which one might colloquially term 'nature-rinsing.' As we discuss later, the term of art for this activity is 'executional greenwashing'⁷⁰.

On the other hand, the current business model of the airline industry is incompatible with the science of stopping global warming. A recent assessment of the "carbon performance" of companies by the Transition Pathway Initiative (TPI) found that "the airline sector continues to be the worst-performing...alongside oil & gas"⁴⁴. Only two of the five airlines in our sample, Aer Lingus and Iberia (as part of International Airlines Group), have made emissions reduction pledges aligned with 2050 benchmarks for the Paris Agreement, according to TPI's latest data¹³⁸. Moreover, such pledges do not appear to stand up to scrutiny. While investments in sustainable aviation technologies by our sample airlines are not available, a recent survey by InfluenceMap concluded that the European "aviation industry has lobbied to weaken and delay climate regulation." Assessed for engagement on EU aviation climate policy, Lufthansa scored a D- rating (on a scale of A to F), Air France-KLM, Aer Lingus, and Iberia (as part of International Airlines Group) scored Ds, while Wizz Air received a C-.¹³⁹

Seen in this light, even the seemingly benign *Nature/Environment* imagery in airlines' social media posts arguably affords the industry an unwarranted 'green' sheen. Indeed, nature imagery has in fact been shown to be highly affective¹²⁵. Parguel *et al.* (2015) demonstrated that the mere presence of a nature-evoking picture in advertising positively affects consumers' perceptions of the advertised brand's ecological image, which in turn prompts more favorable attitudes toward the brand than attitudes prompted by the same advertising without imagery of nature⁷⁰. Schmuck *et al.* (2018) subsequently showed that associating greenwashing claims with nature-evoking images activates an "affective persuasive mechanism that appeals to consumers' affinity for nature, which... positively influences their evaluations of ads and brands"⁷¹.

Moreover, 15% of airlines' 'Green Innovation' posts do contain textual discourses, as shown in figure 10 (left, blue bars). While it is beyond the scope of this report to scrutinize each of these claims in detail, many appear to exemplify 'claim greenwashing.'

Tweets by Air France-KLM and Lufthansa, for example, celebrate “#Connecting Europe Days” by “uplifting #SustainableAviationFuel”^{103,140}. Air France-KLM boasts that “five #AirFrance, #KLM and #Transavia flights have been operated with at least 30% of sustainable aviation fuel”. These posts omit to mention that sustainable aviation fuels constitute just 0.05% of total jet fuel consumption, according to the European Commission¹⁴¹. They also overlook the fact that the climate mitigation potential of sustainable aviation fuels is controversial; while some experts maintain their vital role in decarbonization, others consider biofuels a “myth” that “won’t power climate-safe air travel”¹⁴².

Another issue is the “cloudy backdrop of claims and certifications,” as Baum (2012) terms it, exemplified by Facebook posts from Lufthansa and Wizz Air^{47, 143, 144}. Lufthansa calls its Airbus A350 aircraft “eco-efficient”, while Wizz Air claims to be the “greenest choice of air travel. #flythegreenest”. While the A350 is indeed reportedly 25% more fuel efficient, and Wizz Air does indeed appear to be taking steps to reduce its emissions, such terms nonetheless confer an environmentally-friendly impression that belies the fundamentally carbon-intensive nature of their operations^{139, 143, 145}. Moreover, Wizz Air’s Facebook post links (with one hop) to a company website that clarifies that “We want to be the greenest choice for air travel” (emphasis added)¹⁴⁶. Wizz Air is not the only airline claiming to be the “greenest”: Ryanair says it is Europe’s “greenest and cleanest airline group”¹⁴⁷.

MISDIRECTION

Having explored ‘Green Innovation’ and ‘Business-as-Usual’ above, here, we examine fossil fuel interests’ other master narrative in detail.

The red circles in figures 6b-d show that narratives of ‘Misdirection’ constituted one-in-five of all analyzed posts (21%): 23% among fossil fuel producers, 22% among car manufacturers, and 15% among airlines.

It is startling that the social media content of both fossil fuel producers and car companies features ‘Misdirection’ narratives more often than ‘Business-as-Usual’ narratives. Not only do these industries foreground ‘Green Innovation’ over their core business operations, they also collectively communicate more about *Sports, Youth Empowerment, Charity, Fashion and Design LGBTQIA+ Issues, and Other Social Goods* than they do about their primary operations.

As with ‘Green Innovation’, we emphasize that there is nothing inherently untoward about a company engaging with social causes. They have the right to do so, and when practiced in good faith, should be applauded for doing so.¹⁴⁸ Again, however, this does not absolve such content from scrutiny, particularly given fossil fuel interests’ documented history of climate change disinformation, propaganda, and corporate issues management, including by way of corporate philanthropy^{1, 12, 149, 150}.

Among fossil fuel producers, ‘Misdirection’ is split relatively evenly between *Sports* (37% of ‘Misdirection’ posts), *Youth Empowerment* (18%), *Charity* (18%), *Conflation* (which, following Influence Map (2020), we define as the omission of climate change when talking about the environmental impacts of fossil fuels and energy²⁶) (13%), *LGBTQIA+ Issues* (11%), and *Additional Social Goods* (32%)(figure 16: right, green bars). Figure 17 presents examples of some of these forms of ‘Misdirection’.

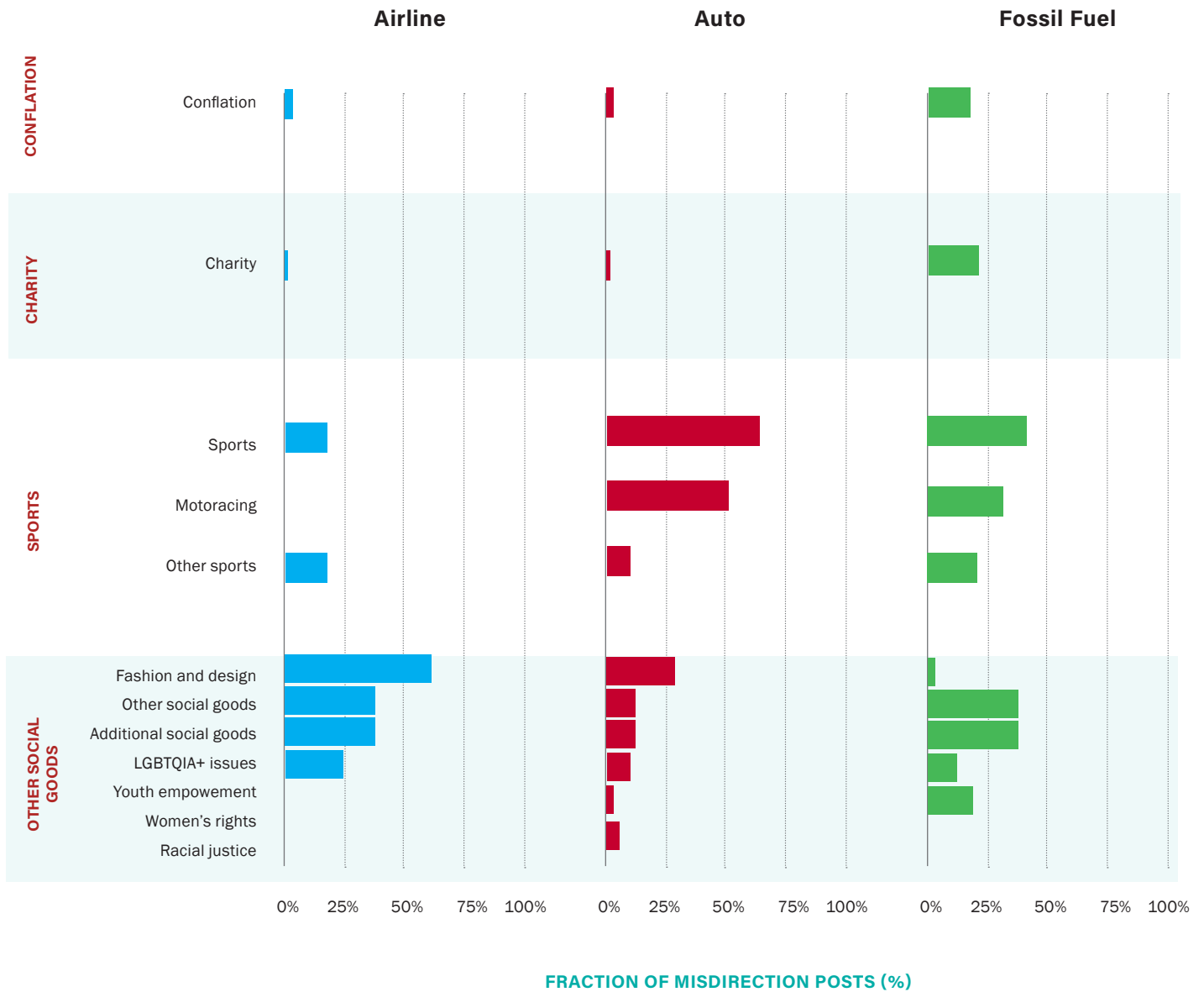
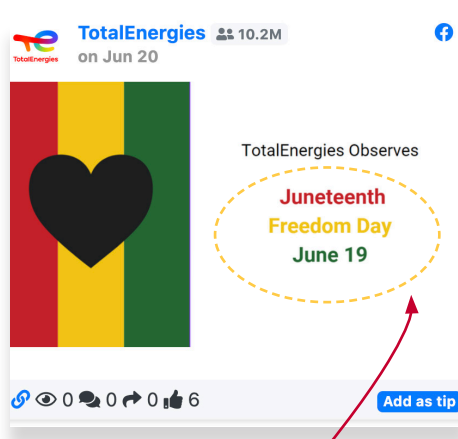
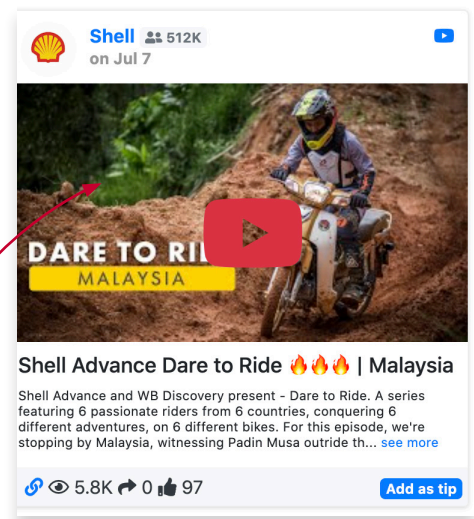
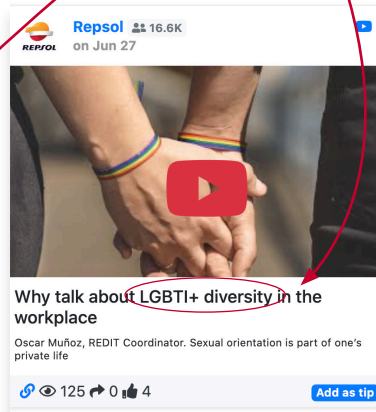


Figure 16. Relative prominence of each coded discourse in the 'Misdirection' narrative, as a fraction of "Misdirection" posts from airlines (left, blue bars), car manufacturers (middle, red bars), and fossil fuel producers (right, green bars)



Virtue signaling support for LGBTQIA+ diversity, racial justice, and inclusivity



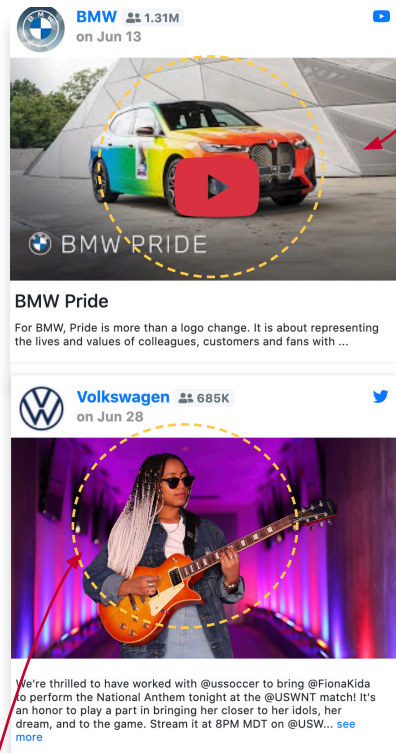
Sports sponsorship promotion

Sponsorship of education

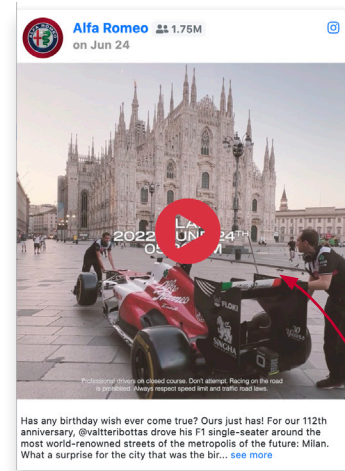


Figure 17. Examples of 'Misdirection' posts by fossil fuel producers¹⁵¹⁻¹⁵⁸.

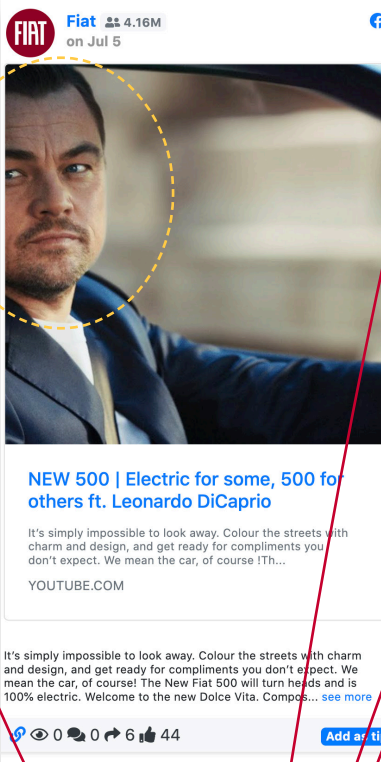
Car companies' messages of 'Misdirection' are generally more squarely centered around *Sports* (63%), and *Motor racing* in particular (56%), yet 29% of 'Misdirection' posts also concern *Fashion and design* (figure 16: center, red bars). Figure 18 highlights examples of these discourses.



Virtue signaling support for diversity and LGBTQIA+ pride



Sports sponsorship promotion



Celebrities and sportspeople



Fashion and design language and imagery

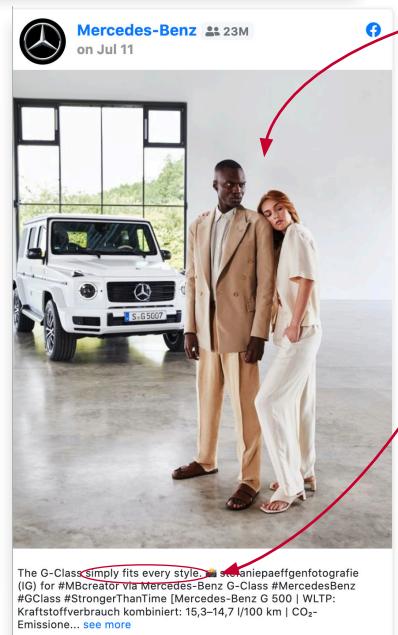
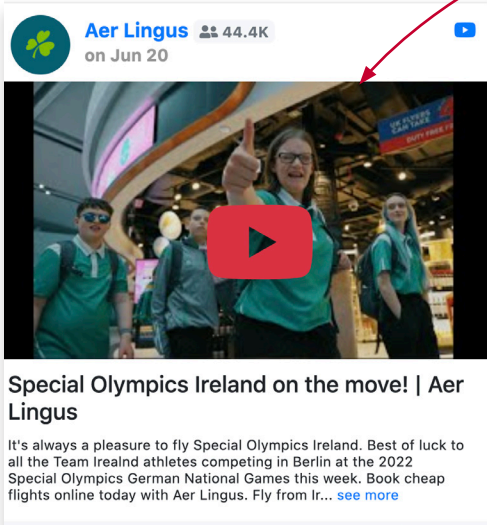
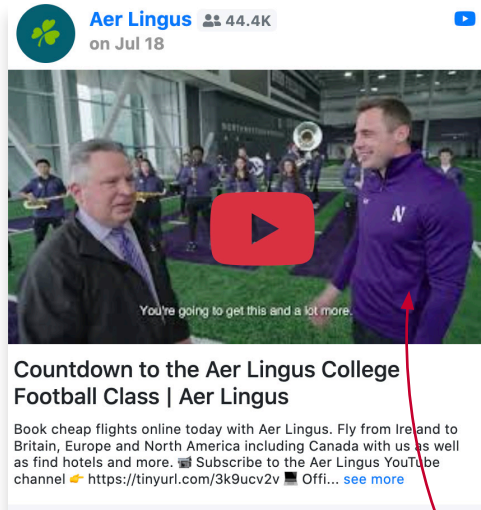
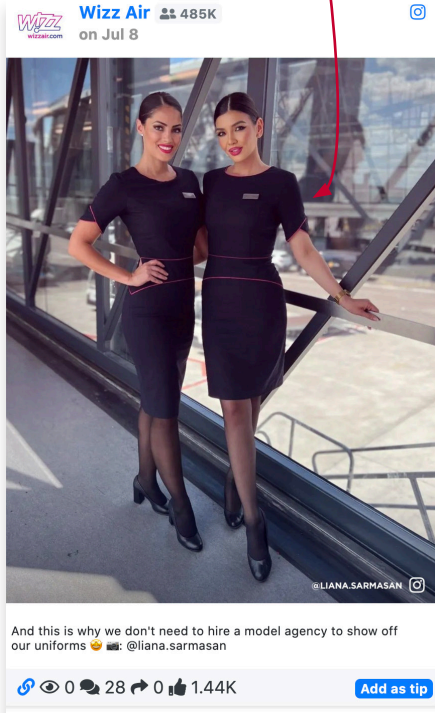


Figure 18. Examples of 'Misdirection' posts by car manufacturers¹⁵⁹⁻¹⁶⁸.

Airlines' 'Misdirection' messaging is dominated by discourses of *Fashion & Design* (54%), *LGBTQIA+ Issues* (22%), and *Sports* (14%) (figure 16: left, blue bars). For examples, see figure 19.

Objectification of female employees



Sports sponsorship promotion

Virtue signaling support for diversity and LGBTQIA+ pride

Celebration of glamour and fashion

Figure 19. Examples of 'Misdirection' posts by airlines¹⁶⁹⁻¹⁷³.

In sum, our content analysis reveals that fossil fuel producers, car manufacturers, and airlines have penchants for variously posting on social media about sports, social causes, and fashion and design, and their sponsorship of them.

This behavior appears broadly consistent with fossil fuel interests' central role in the history and evolution of strategic corporate philanthropy¹⁵⁰. Although that history is beyond the scope of this report, today, fossil fuel interests are among the most actively engaged in corporate philanthropy^{12, 149, 174}. Critical scholars and researchers interpret this philanthropy as often giving way to inauthentic virtue-signaling, or what Pope and Waeraas (2015) term 'corporate social responsibility washing'¹⁷⁴⁻¹⁷⁶.

A recent report by *The New Weather Institute*, for instance, discovered 258 advertising and sponsorship deals across 13 different sports, and found the most frequent sponsors to be car manufacturers, airlines, and fossil fuel producers⁵⁹. These industries have all accordingly been accused of 'sportswashing', whereby they "harness the positive impacts of sport to wash off negative associations with problems such as environmental degradation and human rights abuses"^{177, 178}. Although sports-specific social media accounts were ultimately excluded from our sample (see Methods), meta-analysis prior to exclusion showed that the 22 companies analyzed together hold 225 accounts, 21 of which are dedicated to specific sports; notably motor racing and cycling.

It has likewise been suggested that fossil fuel interests are among those brands that inauthentically market themselves as being concerned with issues of inequality and social justice through the practice of "woke-washing"^{148, 179-183}. After all, institutionalized violence, racism, and other forms of discrimination are deeply intertwined with the fossil fuel-based economy¹⁸⁴. Climate change resulting from the use of these companies'

products is inherently unjust, disproportionately harming those who have done the least to cause them: poor people, people of color, indigenous peoples, women, children, the elderly, and the unborn¹⁸⁵.

Finally, discourses of *Fashion and design* common among posts from airlines and car companies can be seen as part of an intertwined, century-long history between these industries with fashion houses¹⁸⁶⁻¹⁸⁹. From a marketing perspective, partnerships with exclusive labels and designers enable airlines and car companies to align their brands with luxury and glamor and to establish themselves as premium status symbols.

The overarching theme of 'Misdirection' is to focus the audience's attention on engaging topics unrelated to companies' core business operations. In so doing, 'Misdirection' has the effect of: (1) legitimizing fossil fuel interests' social license to operate by associating the companies with worthy or positive causes and emotions, conferring a 'halo effect' and 'reputation insurance'^{174, 190}; and (2) "distract[ing] from companies' problematic connections to a range of issues including climate change and pollution"¹⁷⁷. In the case of 'Misdirection' using fashion and design, an additional benefit is to (3) market a brand as exclusive, desirable, and relevant¹⁸⁸.

The distracting nature of 'Misdirection' is evident in the outsized level of public engagement that it generates: weighting posts by their relative engagement levels (likes plus comments), the overall fraction of all examined posts containing 'Misdirection' increases by a third, from 21 to 27%. Fossil fuel producers' 'Misdirection' is particularly engaging, leading to more than a doubling in the prevalence of 'Misdirection' (23% up to 57%).

GREENWASHING AND MISDIRECTION WEAPONIZE IMAGERY OF NATURE AND DEMOGRAPHICS

In this final subsection of Results, we describe a statistical test that we use to relate our textual and visual content analysis results. In the three subsections that immediately follow, we use this test to demonstrate how fossil fuel interests use imagery in social media to enhance their 'green' messaging and misdirection.

We conducted *post hoc* pairwise Fisher's Exact Tests for independence: between textual discourse variables and visual discourse variables; and between visual discourse variables themselves (only strictly independent (i.e. non-hierarchical) pairwise combinations of variables in our coding taxonomy were tested for associations, of course). We controlled for multiple comparisons by imposing a false discovery rate of 0.1 using the Benjamini-Hochberg procedure. We additionally controlled for familywise error rates in pairwise comparisons between multiple *Races* or *Genders* by using a Bonferroni-corrected $p < 5 \times 10^{-2,191}$.

Executorial greenwashing - or 'Nature-rinsing'

As seen in the section entitled 'Three shades of green(washing)' and in figure 10, *Nature/Environment* visuals are one of the most prevalent discourses of the 'Green Innovation' narratives of all three industries: 97% among airlines, 64% among car manufacturers, and 56% among fossil fuel producers. Fisher's Exact Tests corroborate this association, revealing the following statistically significant correlations between *Nature/Environment* visuals and thematic discourse categories within the 'Green Innovation' narrative:

- For airlines, the fraction of posts with *Nature/Environment* visuals increases from 56% to 91% in the presence of textual *Green marketing* ($p = 3 \times 10^{-5}$) (where *Green marketing* is defined to encompass *Clean energy marketing*, *Policy engagement*, *Plans/initiatives*, *Cuts*, *Sustainable transport*, and *Sustainability/conservation* - see table 1 and figure 10); and from 57% to 100% in the presence of visual *Global warming solutions* ($p = 3 \times 10^{-4}$) (figure 20a-b).
- For fossil fuel producers, the fraction of posts with *Nature/Environment* visuals increases from 22% to 54% in the presence of textual *Green marketing* ($p = 3 \times 10^{-5}$); and from 25% to 68% in the presence of visual *Global warming solutions* ($p = 8 \times 10^{-8}$) (figure 20c-d).
- For car manufacturers, the fraction of posts with *Nature/Environment* visuals increases from 35% to 42% in the presence of textual *Green marketing* ($p = 3 \times 10^{-3}$) (figure 20e).

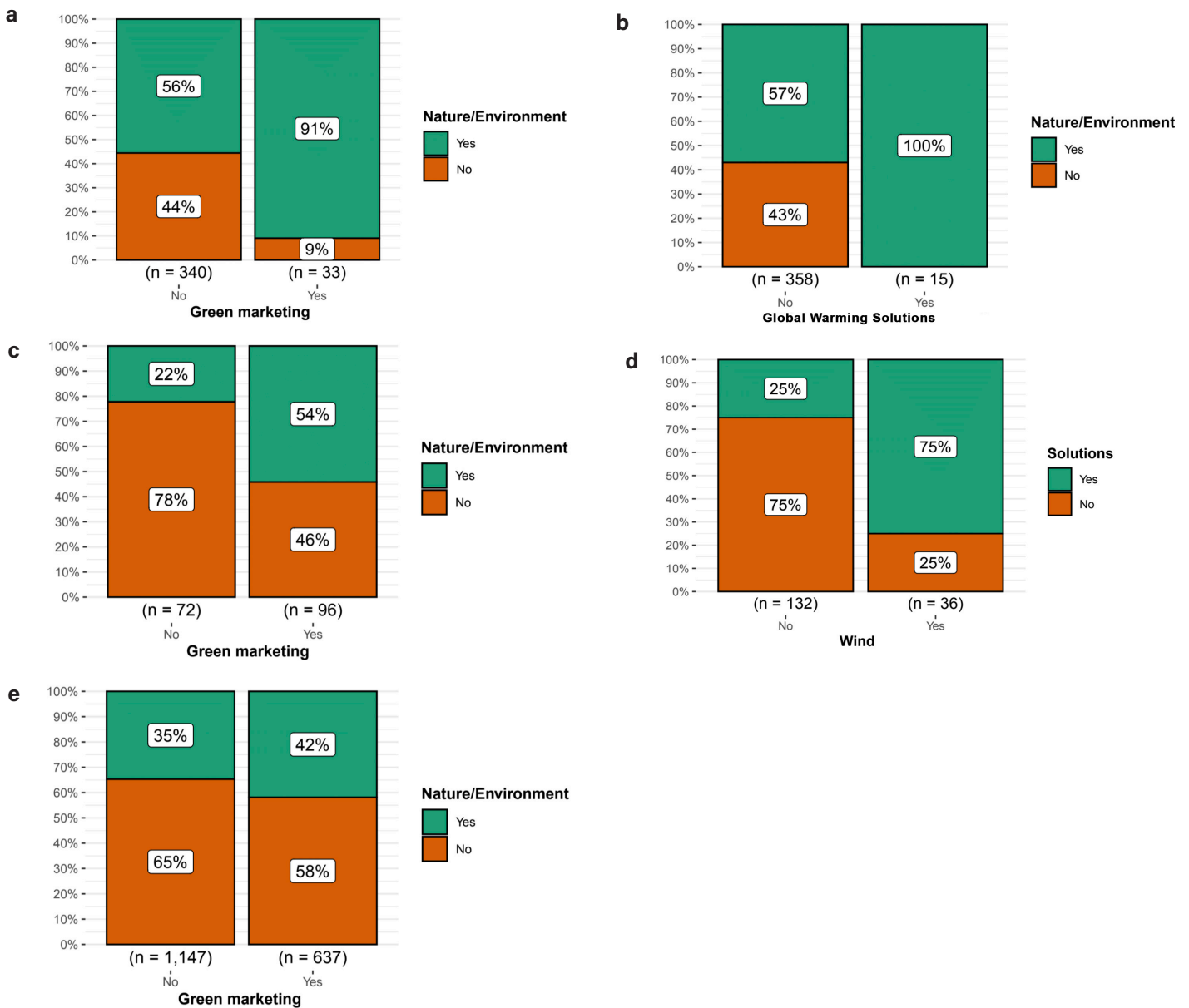


Figure 20. Stacked bar charts showing the percentage of posts by (a-b) airlines, (c-d) fossil fuel producers, and (e) car manufacturers containing Nature/Environment visuals (green areas) in the absence (left bars) and presence (right bars) of textual Green marketing (a,c,e) and visual Global warming solutions (b,d). Statistically significant associations were confirmed using Fisher's Exact Test at p-value levels of (a) 3×10^{-5} ; (b) 3×10^{-4} ; (c) 3×10^{-5} ; (d) 8×10^{-8} ; and (e) 3×10^{-3} .

These findings demonstrate a systematic use of *Nature/Environment* visuals in fossil fuel interests' social media posts to strengthen their 'green' messaging. Although this correlation may seem intuitive, to our knowledge it has never previously been quantitatively confirmed. It is significant because it speaks to the intentionality of fossil fuel interests' 'green' messaging: a subtle way of systematically appropriating the inherent "beauty of nature" (Banerjee *et al.* (1995)), and its implicit pristineness, to buttress a company's environmental image¹⁹². This soft-handed tactical subset of the strategy of greenwashing, which might be colloquially called 'nature rinsing', has more formally been termed 'executional greenwashing' (Parguel *et al.* (2015)).⁷⁰

Demographic 'greening'

What other imagery does fossil fuel interests' 'Green Innovation' narrative benefit from?

Among car manufacturers' posts, Fisher's Exact Tests reveal that the presence of textual *Green marketing* leads to the following statistically significant changes in the appearance of accompanying visuals:

- *Experts* increase from 0% to 2% ($p = 10^{-3}$) (figure 21a)*.
- *Iconography* (which includes *Scientific iconography* and *Futuristic lighting*) increases from 4% up to 14%, $p = 4 \times 10^{-15}$ (figure 21b).
- *All Caucasian-presenting* casts decrease from 55% to 46% ($p = 3 \times 10^{-3}$) and *Mixed race-presenting* casts decrease from 13% to 9% ($p = 4 \times 10^{-2}$), giving way to a commensurate increase in *All non-Caucasian-presenting* casts from 16% to 29% (figure 21c).
- *All male presenting* casts decrease from 46% to 24% leading to an increase in: *All female-presenting* casts from 25% to 44% ($p = 3 \times 10^{-7}$); *Male & female-presenting* casts from 20% to 23% ($p = 10^{-2}$); and *Non-binary-presenting* casts from 3% to 7% ($p = 6 \times 10^{-3}$) (figure 21d).
- *Youth* increase from 10% to 14%, $p = 8 \times 10^{-3}$ (figure 21e).

Car companies' visual Global warming solutions likewise see a decrease in *All male-presenting* casts from 39% to 8%, leading to an increase in *All female-presenting* casts from 32% to 46% (significant at $p = 8 \times 10^{-2}$ level) and in *Male & female-presenting* casts from 20% to 38% ($p = 2 \times 10^{-2}$) (figure 21f). The number of posts featuring *Children* also increases from 1% to 7% ($p = 10^{-2}$) (figure 21g). Finally, posts containing text about *Technological Optimism* see an increase in *Experts* from 1% to 28% ($p = 6 \times 10^{-7}$) (figure 21h).

Thus, on average, when car companies post 'green' messaging on social media, they variously increase the prevalence of experts, iconography, non-Caucasian-presenting people, female-presenting people, non-binary-presenting people, youth, and children in their posts, and decrease the prevalence of all-male-presenting people and all Caucasian-presenting people.

Similar trends are observed in posts by airlines and fossil fuel companies, however, due to relatively small sample sizes, the majority were not statistically significant at the *post hoc* significance levels defined above.

The increased presence of experts and iconography evoking scientific, futuristic themes within car companies' posts communicating a narrative of 'Green Innovation' is consistent with fossil fuel interests' documented history of using (apparent) experts as spokespeople to legitimize their public positions on scientific topics.* By contrast, the use of demographic diversity by car manufacturers to push 'green' messaging has not, to our knowledge, been widely recognized.

*Note: Individual discourses of the aggregated Green marketing category naturally show larger percentage shifts. For example, the presence of *Experts* increases from 4% to 21% ($p = 5 \times 10^{-3}$) when accompanied by *Efficiency language*; and from 1% to 20% ($p = 5 \times 10^{-3}$) when accompanied by *Sustainability/conversation* discourse.

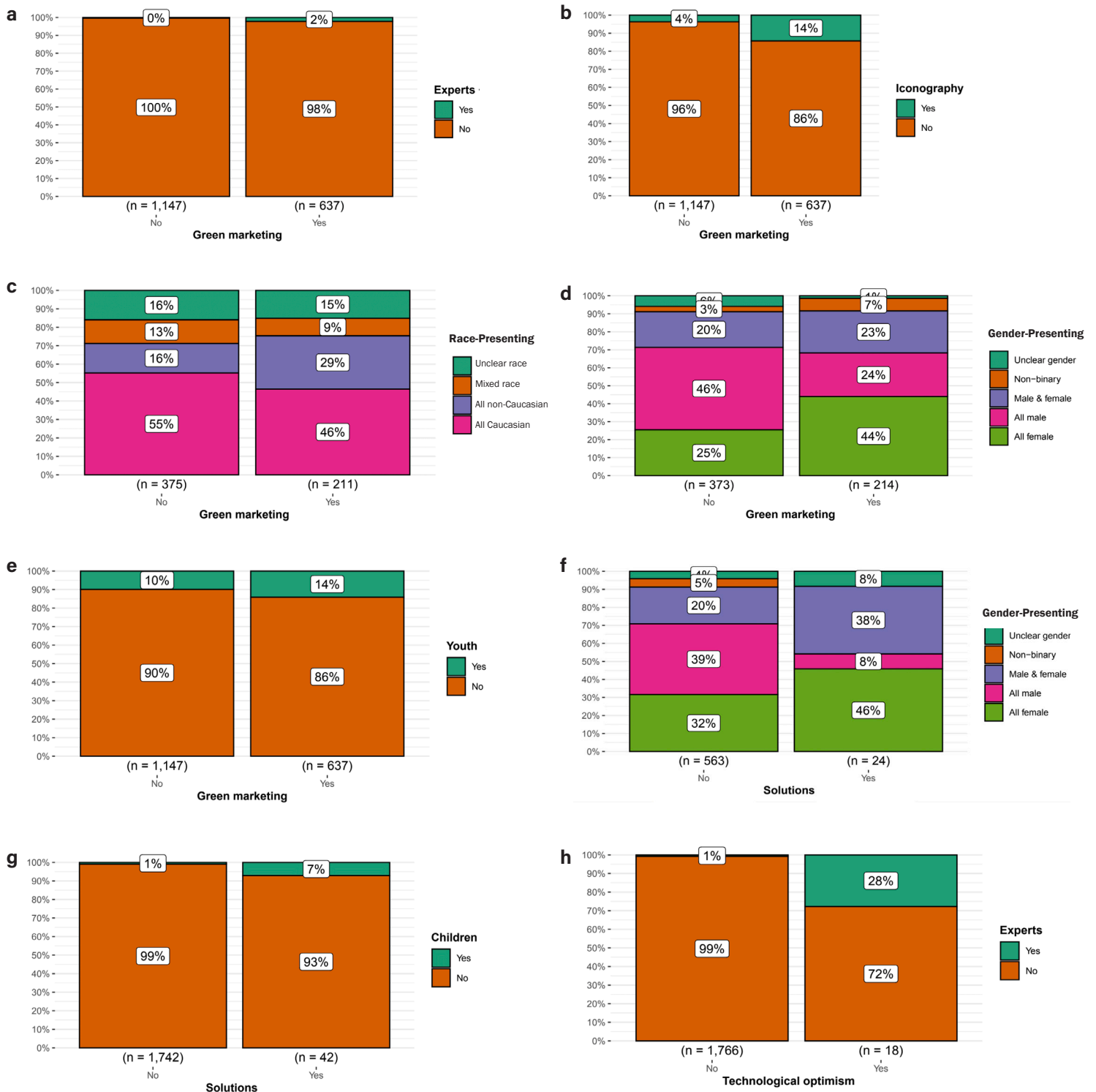


Figure 21. Stacked bar charts showing the percentage of posts by car manufacturers containing visuals of: (a) Experts, (b) Iconography, (c) different Race-presenting groups, (d) different Gender-presenting groups and (e) Youth in the absence (left bars) and presence (right bars) of textual Green marketing; (f) different Gender-presenting groups and (g) Children in the absence (left bars) and presence (right bars) of visual Solutions; and (h) Experts in the absence (left bars) and presence (right bars) of textual Technological optimism. Note that in figures concerning Race and Gender, the total number of posts (sum of left and right bars) includes only those posts coded as containing humans. Statistically significant associations were confirmed using Fisher's Exact Test at p-value levels of (a) 10^{-3} ; (b) 4×10^{-15} ; (c) 3×10^{-3} (All Caucasian-presenting vs. All non-Caucasian-presenting) and 4×10^{-2} (Mixed race-presenting vs. All non-Caucasian-presenting); (d) 3×10^{-7} (All male-presenting vs. All female-presenting), 10^{-2} (All male-presenting vs. Male & female-presenting), and 6×10^{-3} (All male-presenting vs. Non-binary-presenting); (e) 8×10^{-3} ; (f) 8×10^{-2} (All male-presenting vs. All female-presenting) and 2×10^{-2} (All male-presenting vs. Male & female-presenting); 10^{-2} ; and (g) 6×10^{-7} .

Demographic misdirection

Beyond 'Green Innovation,' we also find that the narrative of 'Misdirection' and/or its constituent textual discourses have the following statistically significant correlations with imagery:

- As expected, posts from fossil fuel producers, car companies, and airlines all contain more *Sportspeople* in the presence of 'Misdirection' (mostly about sports). In each industry's posts, the fraction of posts with *Sportspeople* visuals increases from: (fossil fuel producers) 1% to 26% ($p = 2 \times 10^{-6}$); (car companies) 1% to 29% ($p = 9 \times 10^{-71}$); and (airlines) 0% to 9% ($p = 3 \times 10^{-5}$), respectively, in the presence of textual 'Misdirection' (figures 22a-c).
- For car manufacturers, the fraction of posts with visuals of *Other (not sportspeople) Celebrities* increases from 7% to 21% in the presence of textual *Other social goods* ($p = 6 \times 10^{-3}$), and from 1% to 15% in the presence of textual Fashion and design ($p = 4 \times 10^{-11}$) (figures 22d-e).
- For car manufacturers, the presence of 'Misdirection' leads *Mixed race-presenting casts* to double in prominence from 9% to 17% ($p = 3 \times 10^{-3}$) due to a comparable drop in *All non-Caucasian-presenting casts* from 24% to 14% (figure 23a). All other changes in race are statistically insignificant. This squeezing out of *All non-Caucasian-presenting casts* is primarily due to the relative whiteness of *Sports* and specifically *Motor racing* (not shown) - 'Misdirection,' which see increases in *All Caucasian-presenting casts* from 49% to 63% ($p = 2 \times 10^{-6}$) and from 50% to 65% ($p = 4 \times 10^{-6}$), respectively (figure 23b). This leads to drops in *All non-Caucasian-presenting casts* from 25% to 4% and from 24% to 3%, respectively. In contrast, *Other social goods* - including specifically *LGBTQIA+ issues* and *Women's rights* (not shown) - all see *Mixed race-presenting casts* at least quadruple in frequency (from 10% to 40% ($p = 10^{-3}$), 11% to 50% ($p = 8 \times 10^{-3}$), 11% to 60% ($p = 2 \times 10^{-5}$), respectively), causing other groups to shrink (figure 23c).
- Presumably because airlines cover sports relatively less (figure 16: left, blue bars), their 'Misdirection' posts similarly show a sizeable increase in *Mixed race-presenting casts* from 12% to 46%, while *All Caucasian-presenting casts* more than halve from 71% to 33% ($p = 10^{-3}$) (figures 23d). Similar patterns are observed with respect to the presenting genders of casts.
- Posts from fossil fuel producers, car companies, and airlines all contain more young people in the presence of *Other social goods*. For fossil fuel companies, the fraction of posts with *Youth* visuals increases from 5% to 33% when *Other social goods* are discussed ($p = 6 \times 10^{-3}$) (figure 24a). For car companies and airlines, the fractions of posts with *Children* visuals increase from 1% to 15% ($p = 2 \times 10^{-6}$) and from 1% to 14% ($p = 3 \times 10^{-3}$) when *Other social goods* arise (figures 24b-c).

In sum, fossil fuel producers, car companies, and airlines all feature more visuals of sportspeople and young people in posts containing 'Misdirection,' and car companies use other celebrities to misdirect attention too. Car manufacturers and airlines additionally show more racially diverse casts to misdirect with posts about social goods such as LGBTQIA+ issues and Women's rights. When car companies post about sports, particularly motor racing, the trend is reversed, with more people - including sportspeople - being all-Caucasian.

These findings align with our earlier observations of how car manufacturers use diversity to push ‘green’ messaging, and offer a more generalized view; namely that fossil fuel interests variously leverage visuals of select demographics - sportspeople, celebrities, young people, and racial minorities - to misdirect audience’s attention with discourses about sports, social causes, and fashion and design. As with their use of ‘green’ imagery to strengthen ‘green’ text, these patterns make intuitive sense. Yet again, to our knowledge, this systematic intentionality to fossil fuel interests’ marketing campaigns has until now not been empirically demonstrated.

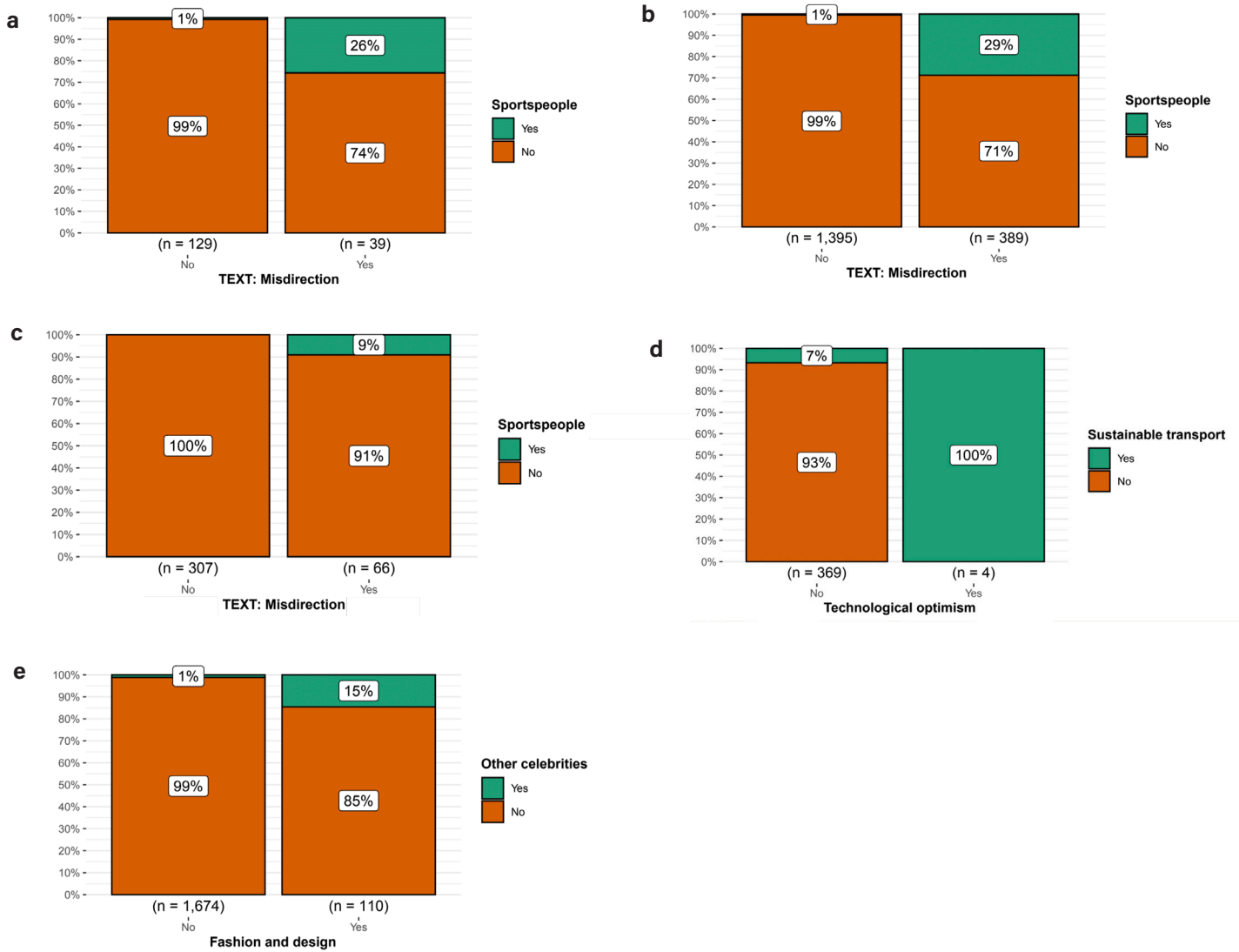


Figure 22. Stacked bar charts showing the percentage of posts by (a) fossil fuel producers, (b, d-e) car companies, and (c) airlines containing visuals of (a-c) Sportspeople and (d-e) Other (not sportspeople) Celebrities in the absence (left bars) and presence (right bars) of textual (a-c) ‘Misdirection’, (d) Other social goods, and (e) Fashion and design. Statistically significant associations were confirmed using Fisher’s Exact Test at p-value levels of (a) 10^{-6} ; (b) 9×10^{-71} ; (c) 3×10^{-5} ; (d) 6×10^{-3} ; and (e) 4×10^{-11} .

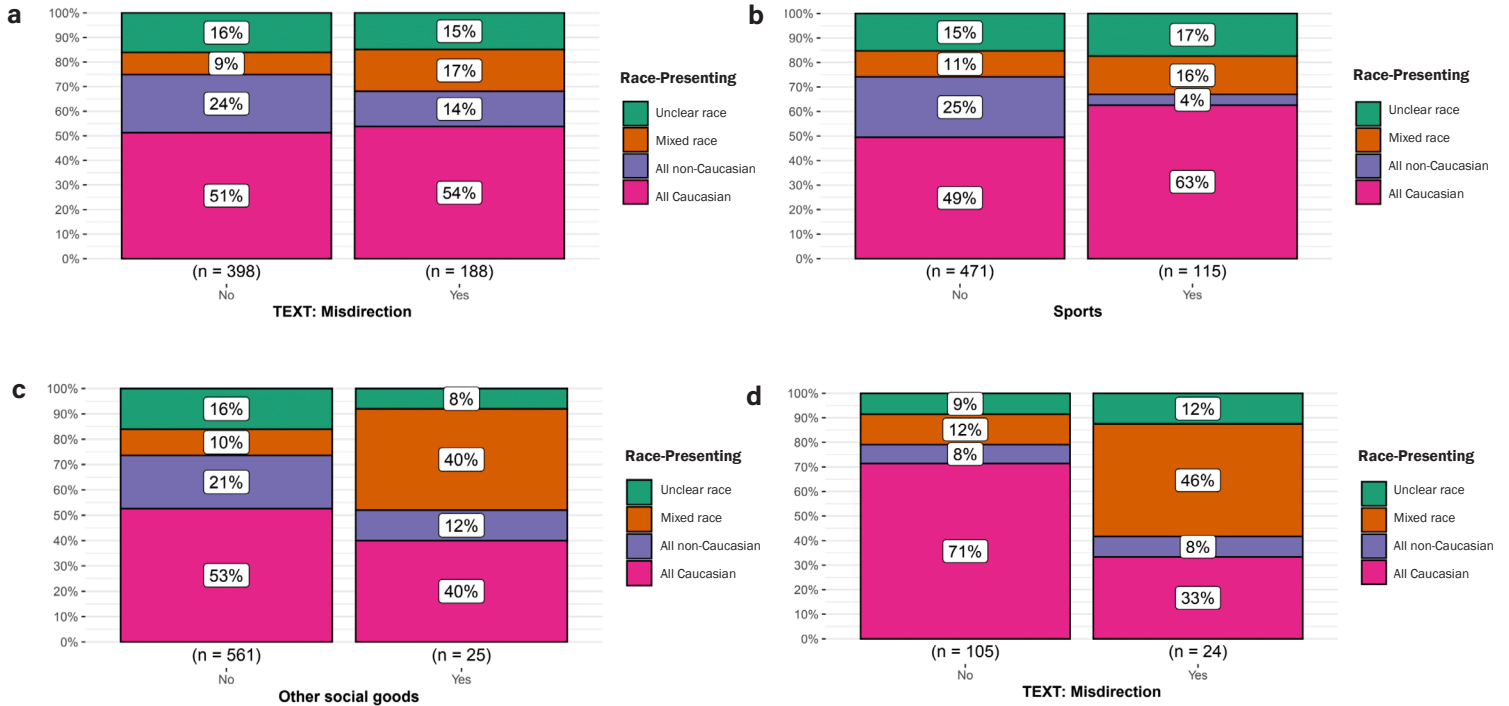


Figure 23. Stacked bar charts showing the percentage of posts containing visuals of different Race-presenting groups from (a-c) car companies and (d) airlines in the absence (left bars) and presence (right bars) of textual (a,d) 'Misdirection', (b) Sports, and (c) Other social goods. Note that in figures concerning Race and Gender, the total number of posts (sum of left and right bars) includes only those posts coded as containing humans. Statistically significant associations were confirmed using Fisher's Exact Test at p-value levels of (a) 3×10^{-3} (All non-Caucasian-presenting vs. Mixed race-presenting); (b) 2×10^{-6} (All Caucasian-presenting vs. All non-Caucasian-presenting); (c) 10^{-3} ; and (d) 10^{-3} (All Caucasian-presenting vs. Mixed race-presenting).

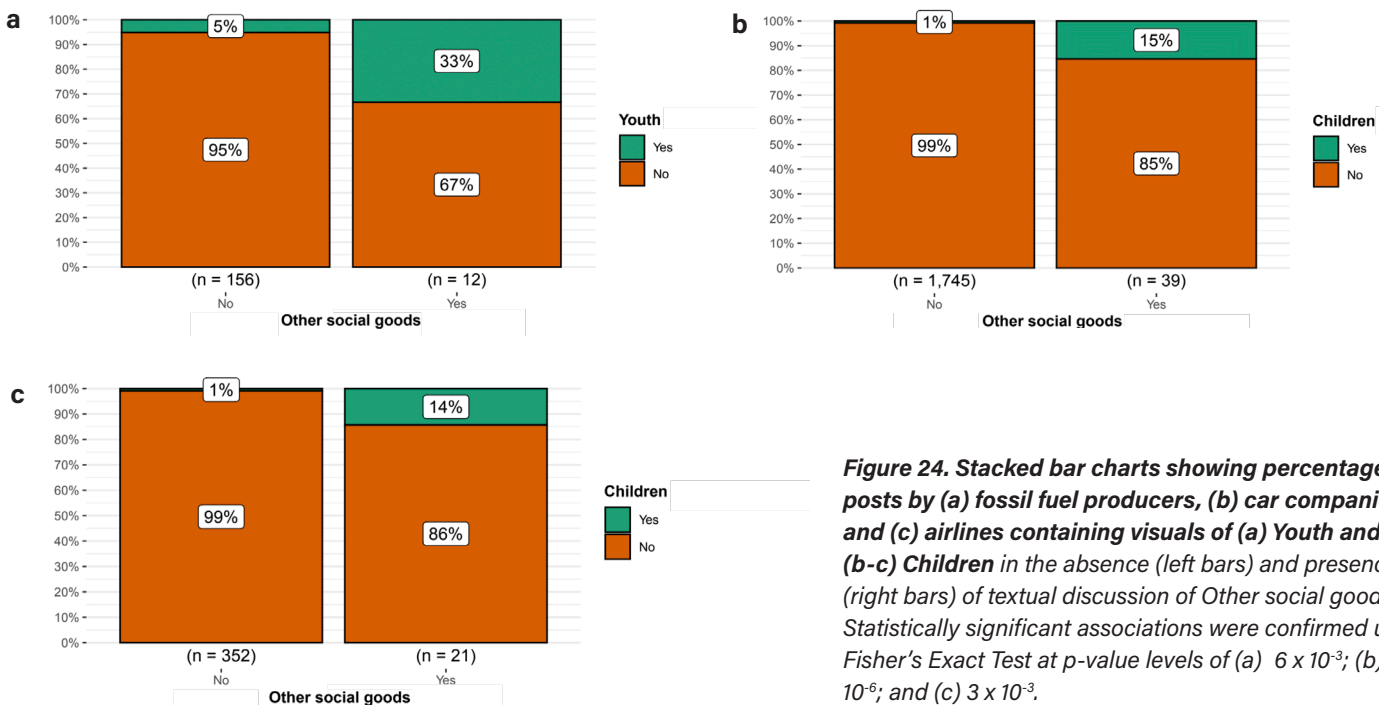


Figure 24. Stacked bar charts showing percentage of posts by (a) fossil fuel producers, (b) car companies, and (c) airlines containing visuals of (a) Youth and (b-c) Children in the absence (left bars) and presence (right bars) of textual discussion of Other social goods. Statistically significant associations were confirmed using Fisher's Exact Test at p-value levels of (a) 6×10^{-3} ; (b) 2×10^{-6} ; and (c) 3×10^{-3} .

DISCUSSION

CLIMATE SILENCE IN A RECORD-HOT EUROPE

In this pilot project, we have examined a two-month snapshot of the social media discourses of 22 of the most fossil fuel-intensive firms in the EU. During a summer of record temperatures, droughts, and wildfires in Europe, our content analysis finds these oil and gas, car, and airline companies to have been invariably silent on the explicit topic of “climate change” and “global warming”.

This ‘climate silence’ in the face of a crisis resulting largely from the use of these industries’ products is striking. It stands in contrast to reports of outspoken social media rhetoric from fossil fuel interests and others surrounding recent events with climate and energy implications, such as the COP26 United Nations climate talks in October-November 2021 and Russia’s invasion of Ukraine in February 2022^{24,39}. One explanation for this difference in tone is that our investigation is one of few to focus exclusively on mainstream EU companies²⁸. By contrast, most studies have tended to be dominated by other actors, such as U.S. companies and trade associations, radical fringe groups and individuals, and entities pre-conditioned by other search criteria (such as the highest social media advertising expenditures or associations with viral or previously debunked posts)^{25,31,33}. Perhaps, on average, our sample companies adopt lower-key public affairs strategies. Another possible reason is that three-quarters of the companies we have investigated are car manufacturers and airlines, whose environmental discourses on social media have received less attention than oil and gas producers. A third explanation is an unintended novelty of our dataset; namely that it was not, to our knowledge,

collected during any particular spike in internationally-impactful climate policy activity in Europe. Perhaps these factors, together with our focus on organic rather than paid content, are what led us to observe rhetorics and framings that at first glance appear benign compared to the shrill talking points documented by others.

DISCOURSES OF DELAY HIDING IN PLAIN SIGHT

Our initial work suggests that this hot, subdued summer from fossil fuel interests may in fact have been a particularly useful testbed for measuring some of the subtle, subversive discourses that have come to dominate Big Carbon’s twenty-first century propaganda. To identify public affairs strategies hiding in plain sight, we developed a broad, flexible taxonomy for content analysis based on an extensive literature review. As a result, our investigation is only the second that we are aware of to scrutinize the *visual* discourses of fossil fuel interests on social media⁴². Our content analysis of granular human- and non-human imagery, combined with rigorous statistical testing, yields interesting insights into the marketing techniques of fossil fuel interests.

Our analysis reveals three dominant narratives across all three industries’ social media messaging: ‘Green Innovation’, which appears in roughly two-thirds of all posts; ‘Misdirection’, which is in one-in-five; and ‘Business-as-Usual’, which is generally less prominent than both other narratives. Comparison to the latest available data on each industry’s current commitments to climate mitigation leads us to conclude that all three commit greenwashing in some of their social media communications.

Our results corroborate - and extend to cover other fossil fuel-intensive industries - those of a 2021 journalistic investigation by *DeSmog*, which similarly found that “Nearly two thirds [63%] of social media posts put out by six major European fossil fuel and energy companies since the end of 2019 present a ‘green’ image of the company, despite the majority of their business activity remaining in fossil fuels.”²⁸ Our results are also in line with those of the think tank InfluenceMap, which investigated a broad range of public communications from five oil and gas companies throughout 2021, including Shell and TotalEnergies²⁷. They found that overall, “60% contained at least one green claim, while only 23% contained claims promoting oil and gas.” For Shell specifically, these figures were 70% and 8%, respectively, while for TotalEnergies they were 62% and 22%. These values are broadly consistent with our finding that 72% of posts from investigated fossil fuel producers communicated ‘Green Innovation’, whereas 24% of their posts reflected ‘Business-as-Usual’. Our low-carbon capital expenditure estimates agree with *InfluenceMap*’s.

Our observation of the narrative of ‘Misdirection’ likewise echoes *DeSmog*’s conclusion that fossil fuel producers “dedicated a significant number of posts (16 percent of all analysed) to emphasising positive involvement in wider social initiatives...”²⁸ Our data show that this pattern is mirrored across the three industries. To our knowledge, we offer the first detailed breakdown of how fossil fuel interests devote social media air time to sports, social goods, fashion, and other topics unrelated to their core

businesses. Both for ‘Green Innovation’ and ‘Misdirection’ narratives, these breakdowns cover the use of both text and imagery.

Moreover, statistical tests for independent variables allow us unique insights into the conjunction of these textual and visual discourses, demonstrating that various fossil fuel interests systematically combine imagery of nature and/or specific demographics with complementary language-based (and image-based, in the case of nature imagery) messages about ‘Green Innovation’ and/or ‘Misdirection’.

IS ‘EXECUTIONAL GREENWASHING’ UNDERESTIMATED?

We find that fossil fuel interests’ use of *Nature/Environment* visuals on social media correlates significantly with their communication of textual ‘green’ messaging and visual global warming solutions (except for airlines, where the correlation is only significant with text). This is part of a broader trend. Earlier this year, for instance, Mercedes-Benz reportedly launched a “Nothing or Nature” advertising campaign to promote a new electric vehicle, superimposing the company’s logo on images of nature¹⁹³. Hartmann and Ibáñez (2009) have previously described branding campaigns by Toyota, General Motors, Volkswagen, BP, Shell, Esso/Exxon, Total, Renault, and others “depicting beautiful imagery of pristine nature”¹⁹⁴.

Hartmann and colleagues (2009) found that marketing containing “nature imagery” conditions consumers to make an implicit visual association with nature, evoking emotional arousal - a “virtual nature experience” - comparable to actual encounters with nature¹⁹⁴. This affective response in turn triggers “a significantly higher degree of brand attitude,” they concluded. As discussed earlier, Parguel *et al.* (2015) subsequently presented empirical evidence of a “misleading effect from nature-evoking” brand imagery, “regardless of [consumers’] level of topic knowledge,” which they refer to as an ‘executional greenwashing’ effect⁷⁰. Concerningly, Schmuck *et al.* (2018) found that embedding language-based ‘claim [i.e. substantive/textual] greenwashing’ within affect-laden images of pleasant natural scenery “seems to override the critical view of even highly knowledgeable consumers”⁷¹. Our work contributes a case study to this literature on the role of so-called “associative” (or “emotional”) green marketing such as nature imagery, and how it interrelates with “substantive” (or “functional”) claims.¹⁹⁵⁻¹⁹⁷ Our results show that fossil fuel interests are actively engaged in “strategic brand positioning” on social media to establish their green brand identity¹⁹⁶.

The dearth of attention to visual climate discourse on social media suggests that environmental scholars and advocates may be underestimating the significance of fossil fuel interests’ subtle representations of nature. ‘Executional greenwashing,’ or nature-rinsing, seems to have become so normalized in the public affairs tactics of fossil fuel interests that it generally does not impose on companies any burden of proof to demonstrate that they are helping - rather than harming - the environments that backdrop their messaging.

Parguel *et al.* (2015) point out that there has been “little research on, or regulation on, ‘executional

greenwashing”⁷⁰. Only the Australian Consumer Commission and the French advertising professional authority have apparently recommended against use of pictures or symbols suggesting environmental benefits. The French code specifically prohibits advertising visuals showing cars “in a natural setting and not on roads or ways dedicated to the normal usage of motor vehicles, with the main objective to not encourage irresponsible driving behaviours.” Parguel *et al.* argue that because current European directives are not sufficient to deter or counter ‘executional greenwashing’ unless consumers are experts, additional regulation is needed. They propose one possible remedy, experimentally demonstrating that a traffic-light label displaying a brand’s environmental performance information removes the ‘executional greenwashing’ effect. Our research highlights the extensive ongoing use of nature imagery by fossil fuel interests on social media, affirming the need for greater scrutiny and possibly regulation.

SELLING TO SELECT DEMOGRAPHICS - OR EXPLOITING THEIR IMAGE?

Our statistical tests for independent variables also uncover a variety of statistically significant correlations, particularly among car manufacturers’ posts, between ‘Green Innovation’ and ‘Misdirection’ narratives and the presence of images featuring specific demographics, such as female-presenting people, non-binary-presenting people, non-Caucasian-presenting people, young people, experts, sportspeople, and celebrities. Although, to our knowledge, fossil fuel interests’ use of these different groups in their public affairs campaigns has not previously been quantified, the qualitative roles of experts - and to a lesser extent influencers more generally - in legitimizing such campaigns has been explored elsewhere^{2, 198-203}. We therefore here focus our discussion on trends concerning women and marginalized groups.

The Gendered and racialized nature of advertisements has been long recognized^{204,205}. It has been widely observed that women and marginalized groups are generally underrepresented and portrayed in stereotypic ways in advertisements, including in technology advertisements and environmental groups' portrayals of outdoor recreation and nature conservation^{206,207}. It is intriguing, therefore, that we observe fossil fuel interests to variously feature these select demographics more often in 'Green Innovation' and 'Misdirection' messaging.

In the case of 'Green Innovation,' this pattern - or at least the increase in gender diversity - appears to parallel the established "eco gender gap" between men and women: "Generally, women show a more positive green consumption intention, consume less carbon, and purchase green products more frequently" (Zhao *et al.* (2021))^{206,208-212}. Racial and ethnic minorities report higher levels still of environmental concern²¹³. Based on these trends, we suggest three possible origins of the car industry's diversification of 'green' messaging.

First, marketers often use gender as a "branding segmentation strategy"; perhaps car companies are intentionally communicating brand gender in order to solicit the custom of women and minorities, possibly to tap into the eco gender gap.²¹⁴ By (albeit less subtle) analogy, fossil gas companies were recently caught using fake female spokespeople and social media profiles to promote gas cooking stoves to women^{198,215}. Second, car companies may be leveraging what Brough *et al.* (2016) have proposed to be an "implicit cognitive association between the concepts of *greenness* and *femininity*...", using the presence of women (and perhaps minorities, too) to enhance their 'green' image²¹². A third possibility is that those who produce the car industry's 'green' marketing

materials are themselves susceptible to these cognitive associations, such that they manifest in the demographic makeup of the posts. This seems less likely given the budgets and sophistication of these industries' public affairs efforts, but fully explaining the origins of these trends is beyond the scope of this report.

CONCLUSION

As a first step towards establishing a new social media research initiative, this scoping exercise reports the results of a textual and visual content analysis of 2,325 organic social media posts from 22 EU-based fossil fuel interests in June and July 2022.

We find that during a record-hot European summer exacerbated by global heating caused by the use of their products, these companies remained explicitly silent on the subject of climate change, mentioning it just 0.3% of the time.

We also observe that these companies, which are primarily invested in fossil fuel-based products and operations, devote the majority of their social media content (60% overall) to communicating a narrative of 'Green Innovation.' Fossil fuel producers and car companies not only foreground 'Green Innovation' over their core business operations, they also collectively talk more about sports, youth empowerment, charity, LGBTQIA+ issues, fashion and design, and other social goods (a narrative that we term 'Misdirection') than they do about their multibillion-dollar primary operations. The net result is that fossil fuel interests - particularly oil and gas and car companies - are publicly presenting themselves primarily as green, innovative, charitable organizations, while sidelining their core businesses and the climate crisis they contribute to.

We find this public narrative to be inconsistent with each industry's publicly disclosed commitments to decarbonization to date, based on various measures of investments, sales, and policy engagement. We conclude that the three industries are complicit in three shades of greenwashing: heavy greenwashing by fossil fuel producers, moderate greenwashing by car manufacturers, and subtle greenwashing by airlines.

We also observe that companies' messages of 'Misdirection' appear broadly consistent with fossil fuel interests' central role in the history and evolution of strategic corporate philanthropy. While it is beyond the scope of this report to definitively determine, this rhetoric may - and has by others - been interpreted as constituting forms of 'corporate social responsibility washing,' such as sportswashing and wokewashing.

Unlike most previous investigations, our content analysis explicitly codes the visual - as well as textual - content of social media posts. Statistical analysis shows that fossil fuel interests include images of nature more often in posts containing 'green' marketing language. Communications scholars have previously demonstrated that nature imagery can facilitate a subtle, effective form of so-called 'executional greenwashing,' and they have noted that current European advertising regulations are incapable of countering it.

We also find that companies (particularly car manufacturers) variously feature more female-presenting people, non-binary-presenting people, non-Caucasian-presenting people, young people, experts, sportspeople, and celebrities in posts containing narratives of 'Green Innovation' and/or 'Misdirection.' We speculate that these trends suggest, for example, that car companies are using imagery of women to target sales at that demographic and/or to leverage socialized associations between greenness and femininity to enhance firms' 'green' image.

Overall, our results indicate a shift in the social media communications of fossil fuel interests away from direct engagement with climate change and their contributions to it and towards strategic brand positioning through language and visuals that establish green, innovative, charitable brand identities.

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