

Applications of social data science to environmental communication on social media



Mary Sanford

St Cross College

Supervised by Professors Greg Taylor & Renaud Lambiotte

A thesis submitted for the degree of

Doctor of Philosophy

Trinity Term 2023

Word Count: 78,655

Acknowledgements

Anyone familiar with the DPhil would likely agree that there is no standard or easy path from beginning to end. From the COVID-19 pandemic to four different primary supervisors, this process has been *interesting* to say the least. There is no way it would have been possible without the support of my family, friends, colleagues, and mentors.

First, thank you to my family who have always been there to love and support me, near or far. I would never have had the confidence or ability to take on this challenge without the foundations you provided me.

The friends I have made over these years were instrumental in getting me through the day-to-day obstacles of DPhil life. Lynn, I literally couldn't have gotten through these last years without you. There's nothing that a chat and a glass of wine (or two) with you can't fix. Raquel, the lockdowns just wouldn't have been the same without our Port Meadow walks and workouts. Rav G., Florence B., Lejla D., Adam F., Alena W., Dmitri L., Michelle P., Rosie O., Dion S., Fede D., Felix S., and Monika G.: you all contributed to the richness of this experience in your own ways and I will be forever grateful and proud to count you as close friends. To all my teammates at Wolfson College Boat Club, thank you for giving me the sport community of a lifetime. And a special thanks to Thomas M., who although only crossed my path towards the end, changed it immeasurably for the better. I look forward to see what our future holds.

I would also like to recognise my supervisors and co-authors – Greg Taylor, Renaud Lambiotte, Jamie Lorimer, Robert Gifford, Marta Witkowska, Magdalena Formanowicz, and James Painter – each of whom helped shape and refine my research interests and skills over the course of the projects we worked on together. In particular, thank you Magda for adopting me into your research group and exposing me to such wonderful colleagues and collaborators. And thank you especially James for your thoughtful mentorship, encouragement, and delightful tea breaks.

Finally, I must thank the ESRC's Grand Union doctoral training programme for funding my DPhil and making this experience possible. The Grand Union staff have been a pleasure to work with over these years and have been instrumental in helping me get the most out of the opportunities available to me here.

Abstract

Effective environmental communication and activism are critical to the development of public support for the policies, ideological shifts, and behavioural changes needed to systemically address climate change. The last five years have seen a significant increase in global environmental activism on social media, yet there are still many gaps in our understanding of the strategies used, their effectiveness, and the challenges they face in supporting the pro-environmental movement.

This thesis presents a combination of interdisciplinary case studies examining three understudied contexts of environmental communication and activism on social media. Together, they advance our understanding of important dynamics impacting the effectiveness of online activism and provide motivation for key methodological shifts in the way scholars approach researching this topic.

The thesis begins with general motivation and contextualisation of the work in Chapter 1. Then, I provide an overview of the research which has analysed environmental communication and activism on social media so far and identify key blind spots in Chapter 2. I then present four empirical chapters, each addressing one of these gaps using mixed-method and interdisciplinary computational social science approaches.

The first empirical chapter (Chapter 3) addresses commercial engagement and controversy in vegan activism as a site of targeted environmental activism. The second empirical chapter (Chapter 4) investigates the relationship between psycholinguistic framing in posts of environmental activists and audience engagement on Twitter. The third empirical chapter (Chapter 5) presents an experiment in which the correlational findings of the previous chapter, and a potential cognitive mechanism driving them, are investigated offline. The fourth and final empirical chapter (Chapter 6) compares the topic and sentiment framing used to discuss COP26 conference outcomes in a sample of English-language mainstream (Australia, India, UK, and US) and social media (Facebook and Instagram), paying particular attention to how different stakeholders

(major news outlets, politicians, activists, and NGOs) overlap and diverge in their commentary and discussing what implications this has for the development of coherent public dialogue on environmental policy moving forward.

To wrap up the thesis, the Conclusion (Chapter 7) summarises the empirical work and individual contributions of each chapter. It also discusses contributions of the thesis as a whole, bringing the findings of each study into conversation with one another to motivate the importance for future research to 1) take increasingly interdisciplinary approaches to the study of environmental activism and evaluations of its effectiveness, and 2) move away from social media-only studies and connect social media dynamics to micro- and macro-level offline outcomes.

Contents

Abstract	iii
1 Introduction	1
1.1 Setting the scene	1
1.2 Overview of case studies	2
1.3 Why study environmental activism on social media?	4
1.4 A computational social science approach	6
1.5 Thesis structure	8
1.6 Social media platforms examined in this thesis	9
1.7 Ethical considerations	12
1.8 Paper authorship statements	13
2 Literature Review	15
2.1 Dominant themes of environmental communications research on social media	16
2.1.1 The role of social media as a tool in the pro-environmental movement	16
2.1.2 Two primary analytical approaches	17
2.1.3 Main takeaways from this research	18
2.1.4 Communication versus activism	21
2.2 Emerging literature on environmental activism on social media	26
2.3 Gaps	28
2.3.1 Corporate engagement with environmental discourses on social media	28
2.3.2 Specific action campaigns	31
2.3.3 Connecting environmental psychology, linguistics, and audience engagement	33
2.3.4 Comparing representations of environmental issues on social and mainstream media	34
2.4 Conclusion	36

3	Veganuary and the vegan sausage (t)rolls: Conflict and commercial engagement in on-line climate-diet discourse	37
3.1	Introduction	38
3.2	Background Literature	42
3.3	Research Design	46
3.3.1	Overview	46
3.3.2	Data	47
3.3.3	Method	48
	Identifying discourse structure	48
	Labelling the communities	53
	Detecting audience structure	55
3.3.4	Limitations	60
	Limitations of the Twitter sample	60
	Limitations of the methodological framework	61
3.4	Results	63
3.4.1	Polarisation and contention	63
3.4.2	Audience separation	69
3.5	Discussion	72
3.6	Conclusion	77
4	The psycholinguistics of environmental activists on Twitter	79
4.1	Introduction	80
4.2	Background Literature	81
4.2.1	Social media and pro-environmental behaviour	81
4.2.2	Psycholinguistics and pro-environmental behaviour	83
4.3	Research Design	93
4.3.1	Overview	93
4.3.2	Data	94
4.3.3	Method	98
	Linguistic analysis	98
	Regression analysis	100
4.3.4	Limitations	102

Limitations associated with Twitter	102
Limitations associated with LIWC	102
Limitations associated with the sample of activists	103
Limitations of retweets as indicator of engagement	104
Limitations of the analytical framework	106
4.4 Results	107
4.4.1 Linguistic analysis	109
4.4.2 Regression analysis	110
4.5 Discussion	113
4.6 Conclusion	119
5 Manipulating emotional framing of pro-environmental tweets	121
5.1 Abstract	121
5.2 Introduction	122
5.3 Previous experimental work	123
5.4 Mood as a mechanism	129
5.5 Research Design	131
5.5.1 Overview	131
5.5.2 Participants	131
5.5.3 Procedure	132
5.5.4 Stimuli	133
5.5.5 Measures	134
5.5.6 Analysis	138
5.5.7 Limitations	138
Limitations of the participant sample	138
Limitations of the stimuli	139
Limitations of the response variables	141
Limitations of the mediation	143
Reflections on the manipulation checks	143
5.6 Results	144
5.6.1 Mood: valence and arousal	144
5.6.2 Action intention	145

5.6.3	Path analysis and mediation	145
5.7	Discussion	146
5.8	Conclusion	149
6	#COPflop or real progress? Divergent discourses on mainstream and social media after the 2021 Glasgow summit on climate change	153
6.1	Abstract	153
6.2	Introduction	154
6.3	Theoretical Framework and Background Literature	158
6.3.1	Framing	158
6.3.2	Field theory	160
6.4	Research Design	164
6.4.1	Overview	164
6.4.2	Mainstream media coverage	166
Data collection		166
Analysis		168
6.4.3	Facebook and Instagram coverage	172
Data collection		172
Analysis		174
6.4.4	Limitations	176
Limitations of mainstream media sample		176
Limitations of social media sample		177
Limitations of the methodological framework		178
6.5	Results	179
6.5.1	Mainstream media	179
Topic prevalence		179
Sentiment analysis		181
Comparative analysis		182
6.5.2	Social media	184
Expansion of codebook		184
Topic prevalence and interaction share		186
Sentiment analysis		188

Comparative analysis	189
6.6 Discussion	193
6.7 Conclusion	204
7 Conclusion	207
7.1 Summary of studies	207
7.2 Contributions, limitations, and implications for future work	213
7.3 Final Comments	216
A Approved CUREC Application	217
B Authorship Statements	241
C Chapter 5 Survey	247
D Chapter 6 Supplementary Materials	259
D.1 Media profiles for each country and description of news sites	259
D.1.1 Australia	259
D.1.2 India	261
D.1.3 UK	262
D.1.4 US	262
D.2 Examples of NGO messaging	264
D.3 Examples of accounts of each type	266
D.4 Example posts for each codebook categories from the social media dataset	267
D.5 Distribution of topics across account types for Facebook and Instagram samples	269
D.6 Boxplots for each comparative analysis	270
Bibliography	281

List of Figures

3.1	Initial tweet exchange between Piers Morgan and Greggs. A screenshot, taken by the authors, of the post in which Greggs announced the launch of the vegan sausage roll with Morgan’s initial reply and Greggs’ counter below.	40
3.2	Example bipartite network and resulting projection.	58
3.3	Veganuary 2019 projection network.	70
3.4	Sankey flow chart to illustrate the composition of the communities in the projection network in terms of the retweet network communities.	71
4.1	Schematic representation of VBN theory recreated from P. C. Stern (2000).	82
4.2	Normalised weekly average of climate-related tweets posted by activists in the sample and retweets received by these posts.	108
4.3	Schematic representation of the path analysis model used to determine the direct and indirect effect of followers, tweet content, positive, and negative emotion on retweet popularity for activist tweets.	112
5.1	Flow of survey experiment.	133
5.2	The tweets shown to participants; the tweets from the positive condition on the left, tweets from the negative condition on the right.	134
5.3	SAM scales for emotional valence and arousal, image reproduced from Bradley and Lang (1994).	135
5.4	Geneva Emotion Wheel, image reproduced from Sacharin et al. (2012).	136
5.5	Affective grid, image reproduced from Russel (1989).	136
5.6	Visualisation of the mediation analysis showing the direct relationship between content and collective action, along with an indirect relationship between the two mediated by mood.	145
6.1	Topics discussed by account type in full dataset.	189

List of Tables

3.1	Results of the labelling process for the 200 randomly selected tweets per community.	55
3.2	Example tweets for each label.	56
3.3	Descriptive table of the top 12 communities in the retweet network.	63
3.4	Users with top 10 ratios of retweets per tweet posted with community label.	69
4.1	Username, primary country association, number of tweets, and sum of retweets for each account included in the sample	96
4.2	Semantic domains and sub-domains examined in the study with example words.	99
4.3	Examples of high-scoring tweets per feature examined in the study.	100
4.4	Descriptive statistics for the variables included in the regressions.	110
4.5	Correlation coefficients for the variables used.	111
6.1	Number of articles by country, political leaning, and media title.	167
6.2	Relative presence of each account type.	175
6.3	Number of articles showing the presence of key messages by country and topic area.	179
6.4	Content analysis results by media's political leaning.	181
6.5	Sentiment analysis of mainstream media sample, by country.	182
6.6	Results of ANOVA and Tukey HSD tests for sentiment distributions across countries, political leanings, topics themes, topic theme-country pairs, and topic theme-leaning pairs in the mainstream media sample	183
6.7	Raw prevalence and share of interactions of each topic for each platform.	187
6.8	Sentiment analysis of social media sample, by platform.	188
6.9	Results of ANOVA and Tukey HSD tests for sentiment distributions by account type.	191
6.10	Results of ANOVA and Tukey HSD tests for sentiment distributions by topic.	191
6.11	Results of ANOVA and Tukey HSD tests for log interaction distributions by account type.	192

6.12 Results of ANOVA and Tukey HSD tests for log interaction distributions by topic. . 193

Chapter 1

Introduction

1.1 Setting the scene

On 20 August 2018, Greta Thunberg went on strike in protest of the Swedish government's inaction on climate change. Her actions ignited a social movement of online and offline protests against international governments and corporations for their inaction against the climate crisis. This activism, particularly its online face, brought increased attention, discussion, and political controversy to environmental issues. As the movement grew, it contributed to increasing scholarly interest about the online presence of environmental activism more generally: How is the public engaging with environmental activism on social media? What factors shape this engagement? What kinds of challenges does it face in mobilising the public to take pro-environmental action?

With these questions serving as motivation, this thesis presents a suite of case studies, each using approaches of interdisciplinary computational social science to address a unique gap in the current understanding of environmental activism on social media. When referring to *environmental activism*, I mean contexts in which pro-environmental stakeholders, including activists, scientists, politicians, advocacy groups, and individuals, use social media to engage with and mobilise a global audience in the name of taking action for environmental protection. It is important to note upfront that I examine activists and media mostly coming from wealthy English-speaking countries in the Global North (predominately the US and UK). These individuals and media sources have strong and powerful international presence. They therefore constitute a sample of stakeholders in the global environmental movement. As a consequence, the analyses are limited to contexts of the movement unfolding on the broadest of international stages and, with the exception of the work in Chapter 3 focusing on a campaign in the UK, cannot speak to more specific nuances

about how strands of global environmental activism may be localised within individual regions or countries.

Historically, the topic of environmental activism has not belonged to any single field of study, but rather has been attended to by scholars across a range of disciplines with various theoretical and methodological frameworks. Thus, the overarching goal of this thesis is two-fold: First, to bring these disciplines into conversation with one another over the course of three case studies in a way that contributes to each field individually while also demonstrating how interdisciplinary approaches can yield insights greater than the sum of their disciplinary parts. And second, to characterise the strengths and limitations of computational social science to the study of online environmental activism.

1.2 Overview of case studies

The first case study examines the Twitter discourse surrounding the 2019 Veganuary campaign using network and content analysis. Veganuary is a UK organisation which runs a campaign every January to encourage people to go vegan, and in recent years, the environmental motivation for veganism over meat-based diets has become a stronger pillar of their campaigns. I focus on this context because it serves as a case study of environmental activism focused on specific behavioural change, as opposed to more general discussions of environmental science, politics, or protest, which have dominated the literature thus far. Moreover, analysing this discourse also allows me to examine the presence of an under-researched stakeholder in environmental activism: corporations. To my knowledge, this study is the first to analyse corporate engagement within a specific context of climate-diet activism and it demonstrates the importance of considering the role of stakeholders beyond "the usual suspects," i.e., activists, politicians, and scientists, in environmental activist discourses.

Next, the second case study analyses the psycholinguistic features of environmental activists on Twitter and how framing information with different features affects on- and offline engagement. This is done in two parts: First, I measure the use of key psycholinguistic features across fifty prominent climate change activists (based mostly in the US and UK but selected because of their global audience) on Twitter from November 2015 to December 2020. There are several psycholinguistic features that have been previously identified by environmental psychologists as influential in shaping public opinion and behaviour on environmental issues, but have not been

surveyed in environmental activism on social media. The purpose of this analysis is to a) systematically examine the psycholinguistic features of communication used by key stakeholders in their attempts to engage the public about issues related to climate change, and b) measure how use of these features correlates with audience engagement with activist content using statistical regression models. While previous studies have taken the approach of studying any and all posts belonging to a given discourse, this study singles out sets of users who are actively engaged in trying to mobilise people on the topic of environmental action. In doing so, it offers the first attempt to measure the relationship between psycholinguistic framing in the communication of influential activists on a social media platform and user engagement.

The second part of this case study builds on the results of the Twitter analysis to experimentally measure how the emotional framing of activist tweets influences reported intention to engage with the pro-environmental movement offline with a sample of participants in the US. The purpose of this chapter is to see if the results of the Twitter study correspond to trends in reported offline action intent, as well as if and how the mechanism of mood mediates this relationship. I conducted an experiment using Qualtrics and Prolific in which 200 participants were presented with a series of tweets with messages dominated by one of two different emotional framings of climate action. The findings reveal a previously undiagnosed *suppression effect* of mood in the relationship between message framing and reported collective action intent. To my knowledge, this is the first study to examine the role of emotional framing within social media activism in shaping collective action intent as part of a multivariate pathway. It corroborates concerns in the literature that studying framing in isolation of other external and internal factors, as has been the norm in environmental communication research to date, cannot provide the nuance and validity required to make definitive suggestions about how to optimise framing of pro-environmental communication.

The final case study uses content analysis to compare representations of the 2021 United Nations climate conference (referred to as COP26) of mainstream news media outlets and prominent stakeholders on Facebook and Instagram. Strong divergences in terms of topical focus and sentiment framing are found between the two arenas, particularly regarding evaluations of the conference's outcomes. Where mainstream media is generally balanced in describing the conference's achievements and shortcomings, social media posts are negative and critical of the inefficacy of the conference and world leaders to initiate effective reform. I argue that this divergence reflects

a potentially problematic diffusion of discourse about environmental policy, and the issues they seek to address, which works against efforts to foster constructive public dialogue and consensus around these topics. Moreover, I suggest that the focus of activists on the failure of political summits and world leaders as a method of legitimising their agenda may undercut faith in institutions and support for international environmental policy, and thereby the process of effective policymaking as well.

1.3 Why study environmental activism on social media?

The importance of studying environmental activism is directly related to the growing menace of anthropogenic climate change. It is becoming increasingly vital for the general public — particularly in rich, developed, high polluting countries — to pay attention to and learn about the critical state of global climate breakdown. The past few years have seen a sharp increase in extreme weather events around the world. Scientists have repeatedly connected this increase to anthropogenic climate change (ACIA, 2005; IPCC, 2007; IPCC, 2014; IPCC, 2019; USGCRP, 2009). They have also issued grave warnings about the trajectory towards full climate catastrophe if sufficient global effort is not taken to reduce carbon emissions (IPCC, 2014).

Meanwhile, it is commonly agreed upon by scholars across disciplines that addressing climate change will require *systemic* change (Chapin et al., 2022; Guthman, 2008; Hobson, 2002; Maniates, 2001; Moloney, Horne, and Fien, 2010; Senge et al., 2007; N. Stern, 2007; Strijbos, 2006; WWF, 2008), i.e., a shift in how entire economies function, along with the norms, ideologies, and values underlying them. Individuals, corporations, and governments will need to take a united stance in order to effectively execute this process. Activists' efforts aimed at raising awareness about the risks of climate disaster and the routes we can take to avert it have the potential to mobilise collective action and political will for change (Anderson, 2017; Hestres and Hopke, 2017; O'Neill and M. Boykoff, 2011; Segerberg and Bennett, 2011). Examining environmental activism is therefore important for understanding the effectiveness of these efforts, along with ways of potentially improving them to maximise engagement across platforms and audiences.

This thesis focuses on environmental activism on social media in particular because of the way in which social media platforms have come to constitute a critical arena of public discourse and opinion formation for the environmental movement (Pearce, Niederer, et al., 2019). Throughout

this thesis, I use the term *discourse* in the Foucauldian sense to describe the concept of text as framing, defining, normalising, and policing our thoughts, relationships, and behaviour. While social media platforms comprise just one set of inputs in the formation of the public's understanding and opinions on environmental issues, they have become key sources of information (Andersen et al., 2020; N. Newman, 2021; N. Newman et al., 2022; Shearer and Mitchell, 2021; M. Walker and Matsa, 2021) and central to the organisation and mobilisation efforts of many pro-environmental stakeholders (Boulianne and Theocharis, 2020; Chen et al., 2022; Earl, Maher, and Elliott, 2017; Mavrodieva et al., 2019; Molder et al., 2022; Sabherwal et al., 2021). They have also been found to reflect public attitudes and awareness towards environmental issues (Loureiro and Alló, 2020; McKinnon et al., 2016; M. G. Russell et al., 2014). These platforms are therefore of critical importance for mapping and understanding current strengths and weaknesses of environmental activism discourses.

There is an extensive literature across multiple disciplines exploring environmental communication on social media. As will be further detailed in the next chapter, this body of work has so far predominantly focused on capturing general topic or sentiment (limited to positive or negative) trends in social media discourses surrounding events, terms, or topics pertaining to environmental issues. This literature consists mostly of studies of what the universe of public discourse looked like at a coarse level without focusing on the role of specific stakeholders acting within it. These studies have revealed the presence of activists in various contexts but have not tried to understand their communication strategies, nor how they compare, contrast, or interact with those of other stakeholders. Thus, while this approach has yielded tremendous insight into how social media discourse reflects and may influence public opinion and understanding of environmental issues, it tends not to differentiate between observational commentary on and discussion of these issues from the input of activists and their efforts to explicitly engage their audiences towards taking specific collective action. Analysis of and comparison across the communication features of activists and other stakeholders have only just begun to be studied in their own right, forming a prominent gap in the literature of environmental communication.

In particular, there has also been little work synthesising observations of environmental activism on social media with the findings of environmental psychology regarding communication framing. This literature contains many experimental studies demonstrating how various framings of environmental communication affect the public's understanding of environmental issues,

as well as their likelihood to take action. Yet, few studies have sought to examine the framing strategies present in environmental activism on social media through this lens, nor attempt to quantify their relationship with audience engagement online and connect this to offline engagement and behaviour.

Finally, there has also been little consideration of how social media activism interacts with traditional news outlets and their coverage of environmental issues. This comparison is important to scrutinise given how these two media arenas are differentially influential across demographic groups, the range of voices and belief systems that they platform, and the diversity of sentiments and narratives that they propagate. To date, the literature offers very few comparisons of mainstream news and social media, specifically within the climate space. Potential consequences of these divergences on the pro-environmental movement have yet to be evaluated.

Therefore, the motivation for this thesis is to investigate the gaps detailed above, adding further nuance and clarity to how previously understudied features of environmental communication and activism on social media contribute to the advancement of the pro-environmental movement and the ways in which it influences offline behavioural and political trends.

1.4 A computational social science approach

Each case study in this research agenda synthesises theories and knowledge from multiple fields relevant to human communication and behaviour. They also all leverage qualitative and quantitative methods to analyse large datasets derived from social media platforms. In the Veganuary case study, scholarship and debates about vegan activism as they impinge upon environmental activism are brought together with methods of network and content analysis; in the study of psycholinguistics of environmental activism, knowledge of environmental psychology as it relates to engagement and collective action is combined with methods of computational linguistics and experimental psychology; and finally, in the COP26 study, literatures on the relative impacts of different media and stakeholder presence on public understanding and engagement with environmental issues are studied using comparative thematic and sentiment analysis. The research in each case uses the synergy of the fields involved to build a unique analytical context in which new and meaningful insights about environmental activism can emerge. These approaches can be best described as applications of *computational social science* (CSS).

CSS emerged in response to the advent of the internet and social media platforms producing large amounts of a new kind of data in new contexts for researchers to study. This online data is a treasure trove of information about a variety of human behaviours that have themselves been transformed as digital technologies change the way we communicate and interact with other people, ideas, and values. However, this source of data is larger than anything researchers have had to contend with in the past. As such, it often requires computational tools and techniques to collect, clean, and analyse.

CSS has led to several theoretical and methodological advances. Applications continue to reveal the ways in which the study of online data can inform our understanding of human behaviour in the digital age. It encompasses a broad range of methods, data sources, and topics. It commonly blurs lines between disciplines, combining theories and methods from multiple fields to make sense of complex patterns reflecting human psychology and behaviour, as manifested in online data. It includes descriptive as well as causal and predictive paradigms, each contributing uniquely to our understanding of key social, communication, and political phenomena unfolding in digital spaces. As the objective of this thesis is to analyse social, political, and linguistic phenomena underlying environmental activism in different contexts on social media using mixed methods, the work fits well within the remit of CSS.

Nonetheless, the rise in popularity of CSS and the development of new analytical tools to deploy on large social media datasets also risks neglecting the importance of connecting the findings of these studies to their implications for offline reality. For example, studies of polarisation in large and nebulous social media communication networks are impactful to the extent that they may reflect offline ideological landscapes and reveal phenomena that smaller-scale, targeted research can verify. But on their own, these studies do little to inform our understanding of how such polarisation affects real-world decision-making and behaviour, nor what action can be taken to mitigate any negative consequences. Moreover, given the "hype" around many of these methods and datasets as novel and impressive, there is also a risk of attributing too much explanatory power and value to them without recognising their limitations and costs. Therefore, I also use this thesis as an exploration of the strengths and weaknesses of using CSS to study environmental activism on social media, providing recommendations for future research based on the findings and limitations of each case.

1.5 Thesis structure

The following paragraphs lay out the structure of the thesis. Because it is comprised of related but mostly separate studies, it can best be thought of as an “integrated” thesis: Each of the studies draw on different datasets and use different methods, but ultimately speak to the same base literature on challenges facing environmental activism on social media. They have all been adapted individually for publication, with the exception of Chapters 4 and 5 which were combined and published as a single paper (further justification for including them as separate chapters is provided below).

In Chapter 2, I present a high-level review of recent trends in scholarship of online environmental activism. A challenge of interdisciplinary work is providing adequate context from all the sub-fields relevant to a given project. As such, this review sets the scene for the thesis by establishing what we know about the topic in general, exploring the empirical and theoretical constructs relied upon so far, and identifying the specific gaps which motivated the studies in this thesis. I save further contextualisation required to foreground the unique research objectives and methodological choices specific to the studies for their respective chapters.

Chapters 3-6 constitute the empirical chapters of the thesis. In Chapter 3, I present the analysis of the 2019 Veganuary campaign. This chapter is an extended version of the manuscript published in *Nature Humanities and Social Science Communications*. The next two chapters present the studies of psycholinguistics in environmental activism. Chapter 4 describes the analysis of activists on Twitter, and Chapter 5 presents the offline experiment. Due to how they are related, Chapters 4 and 5 were condensed into a single manuscript for publication. This manuscript has been published in *Frontiers in Environmental Psychology*. They are included as separate chapters in the thesis because they are separate studies with distinct methods, data, and results. Finally, I present the COP26 analysis in Chapter 6. This chapter is currently being adapted for submission to the *International Journal of Press/Politics*.¹

In Chapter 7, I bring the findings of these chapters into conversation with one another and discuss their implications for future research on environmental communication and activism. I address more general limitations of the thesis while reaffirming its contributions to the field. I then conclude with some further reflection on the opportunities for future work suggested by the findings of the thesis.

¹Full transparency: A previous manuscript based on this chapter went through peer review with *Climatic Change*. After completing a first round of revisions, it was rejected by the sub-editors for not including Twitter data.

The next few sections of this chapter pertain to the social media platforms studied in the thesis, the ethical considerations required when working with social media data, as well as an overview of the authorship breakdown for each paper. Signed statements from each co-author are included in the Appendix.

1.6 Social media platforms examined in this thesis

Twitter

Twitter was launched in July 2006. The platform is commonly referred to as a "micro-blogging" social network. Each registered user is able to follow other users and thereby have the content of these users summarised in a *Newsfeed*. Content on Twitter is shared in the form of messages containing up to 280 characters. These messages, known as *tweets*, can include links to other content, images, and videos. Users can interact with other users by *liking* or *retweeting* their tweets, by *mentioning* another user in one of their own tweets, or by *replying* to the tweet of another user. Retweeting a tweet posts that tweet to the retweeting user's profile and is commonly interpreted as a sign that the content of the tweet has influenced the retweeting user. Hashtags, e.g., *#ClimateChange*, are used to tag tweets with relevance to a given topic, theme, or event. They are commonly used in research to track specific discourses.

As of December 2022, the platform had approximately 368 million monthly active users (MAU), ranking the platform fifteenth by this metric (Statista, 2022a).² Of the accounts belonging to individuals, most of these users tend to be aged 25-34 (Statista, 2021) and at least within the US, they are most likely to be higher educated (M. Walker and Matsa, 2021). Moreover, individuals with views on the right side of the political spectrum are significantly less likely to use the platform than those with more left-leaning views (ibid.). Twitter has become increasingly popular with journalists, news lovers, politicians, and members of the public more interested in politics to relay and discuss breaking news, political developments, and other current events (Cornia et al., 2018). The platform is also used by organisations, government bureaus, and brands to promote their agendas, events, products, and services.

²Implications of how the platform's acquisition by Elon Musk are discussed below.

Twitter is one of the most studied social media platforms by academic researchers. This preference is due in part to how open the platform was with respect to data access relative to many other social media platforms (until the spring of 2023). For example, through Twitter's academic licence, researchers were granted full access to the entire Twitter archive including all posts from all users with a public profile. Researchers could then collect up to two million tweets, each with a considerable range of metadata, per month for free. Meanwhile, most other platforms do not offer remotely comparable access for even academic purposes, making collection and analysis at scale much less tangible. Moreover, the majority of Twitter content is text-based, making it easier to automatically analyse in comparison with visual content. As a result, Twitter has become incredibly popular as a means of examining manifestations of various social, cultural, political, and even economic phenomena.

However, this will undoubtedly change as a result of Elon Musk taking over the platform at the end of 2022. It is not yet fully clear how the acquisition will impact the number of users who stay with the platform, the volume of new users who join, nor how the demographics of the user base will evolve as a result. Some initial survey work from Pew Research has already found that 6 in 10 American Twitter users are using the platform less often after Musk's acquisition (Faverio, 2023). Moreover, Musk has also begun shutting down the academic research API and has made instructed Twitter's engineers to artificially promote his content above others (Schiffer, 2023). Twitter's newsfeed algorithm was never transparent and had been criticised many times for reflecting various biases (Chowdhury, n.d.; Huszár et al., 2022), but now that we know that he is intentionally interfering with it, it will be hard for researchers to trust whatever data they are able to scrape from it.

Facebook

Founded in 2004, Facebook is the world's largest social network platform in terms of MAU with an estimated nearly 3 billion at the end of 2022 (Statista, 2023). Users become "Friends" with each other when one sends a friend request to the other and the latter accepts. This connection is undirected, unlike on Twitter where you can follow someone without them following you back. Users post *status* updates to their timeline which can include text, images, links, and videos. These posts then appear on the timelines of their friends. Posts are capped at 33,000 characters, which makes Facebook more amenable to longer and more thematically complex messages than Twitter.

Users can also create and join "Groups" for a given community or topic. Groups can be open to the public or strictly private. There are also public "Pages" that may be administered by an individual, brand, or organisation which users can *Like* to receive updates about, much like a notice board.

Likes are the primary form of interaction between users on the platform, although users can also share a post from another user to their own timelines, much like a retweet on Twitter. Originally, there was only one kind of *Like* reaction, but now users have more options in how they choose to indicate their reaction to a given piece of information including the original Like, Love, Haha, Wow, Sad, and Angry. Users can also comment on a post or they can reply to a previous user's comment.

As with Twitter, most Facebook users fall within the 25-34 year-old range (Statista, 2022b). However, it is also the favourite platform among users 35-44 years old (Hootsuite, 2022). Unlike Twitter, Facebook shows no gap between right- and left-leaning users, with equal percentages of Democrat and Republican users in the US reporting regular Facebook usage (M. Walker and Matsa, 2021). Because of the scale of its user base, it is perceived as having a wider and more egalitarian audience than other platforms, specifically Twitter, and for the presence of more personal and detailed content (Cornia et al., 2018).

Only a portion of Facebook data is accessible to academic researchers. Once granted permission by the company, researchers are allowed to query an archive of Facebook posts from 7 million public pages, groups, and individual profiles. This is done through an interface called CrowdTangle. The archive includes public pages with more than 50k likes, public groups with more than 95k members, US-based public groups with more than 2k members, and all verified individuals (CrowdTangle, 2023). The *verified* status denotes that Facebook has confirmed that the profile is the "authentic presence of the public figure or global brand it represents" and is usually given to celebrities, politicians, organisations, prominent activists, and influencers (Facebook, 2023). Researchers can collect these posts as well as how many interactions, including which type, each post has received at time of collection.

The scope of the data available to academic researchers is obviously much smaller than that offered by Twitter. Whereas Twitter provides access to posts from all public profiles, Facebook only yields those by prominent public figures. As such, research with Facebook data is not able to provide a sense of public understanding or opinion the way Twitter can approximate, although it can give important insight into the narrative priorities, tone, and popularity of influential and

prominent accounts.

Instagram

Launched in 2010 and acquired by Facebook in 2012, Instagram is the 4th most popular social media platform (behind Facebook, YouTube, and WhatsApp) with roughly 1.2 billion MAU (Statista, 2022a). It is the third most popular platform among users under 25, behind Snapchat and TikTok (ibid.). While the biggest difference between Facebook and Twitter in terms of the type of content shared on the two platforms can be boiled down to the character length of posts, Instagram traffics exclusively in photos and/or videos. The main content of an Instagram post is its visual component, with an optional text field for captions and hashtags to describe/complement it. While visual media are common on Twitter and Facebook, the default post type on those platforms is text whereas on Instagram it is an image or video.

Similar to the other platforms, a user's profile can either be made publicly accessible or only to specific users by request. However, like Twitter follower relations as opposed to Facebook's, follower connections on Instagram are not necessarily bidirectional. Users can interact with others by liking or commenting on their posts. Also like Twitter, hashtags are used in post captions to tag posts thematically and can similarly be used to track discourses on a given topic.

Instagram data is accessible via the same interface (CrowdTangle) as Facebook data and access is subject to similar restraints; researchers can collect posts from all verified accounts and all public accounts with more than 50k followers. This amounts to between 2 and 3 million accounts, many of which represent individuals but others represent organisations and companies of different kinds.

1.7 Ethical considerations

Data collected from social media platforms poses myriad ethical challenges to academic researchers. While the terms and conditions of most platforms (including the three studied in this thesis) require users to acknowledge that any content posted publicly on their sites may be made available to third parties, it is widely recognised that many users do not fully read or understand these agreements before giving their consent (Obar and Oeldorf-Hirsch, 2020). Case in point: as much as 10% of US Twitter users do not realise that their profiles are public and therefore accessible to anyone with an account (M. Walker and Matsa, 2021). Bearing these points in mind, scholars

have argued that while user agreements legally provide for academic access, researchers should also consider their ethical and moral obligations in handling, storing, and publishing social media data (M. Williams, Burnap, and Sloan, 2017).

In carrying out the research for this thesis, I adhered to the university's ethical guidelines for social media research. These guidelines stem from the framework established in M. Williams, Burnap, and Sloan (2017) for work with Twitter data. Specifically, the guidelines require researchers to treat the data collected from individual social media users as one would treat data collected in a survey or experiment: the identity of individuals should be protected so that triangularisation and deanonymisation would be impossible. This includes refraining from citing an account's handle or name in published work, unless the account corresponds to a public figure, organisation, or company. It also requires paraphrasing any posts in published work so that a reader would not be able to enter the text into a search engine and track down the original post (along with the posting user's identity). Finally, the data should be stored securely and with access limited as narrowly as possible beyond the principle researcher. Ideally, the data will be anonymised with usernames removed from the original dataset and stored separately in an encrypted file.

Studies including Facebook and Instagram data are slightly less ethically precarious because the only data available for mass collection from these platforms are those associated with public figures, organisations, and companies. Under the Williams et al. framework, the privacy and consent of these accounts receive less protection because they represent entities willingly living and working in the public eye.

I have taken every step detailed above in carrying out the research for this thesis. Further details about the ethical requirements and precautions taken for each study are provided in each chapter. The full approved CUREC application is also attached for reference in Appendix A.

1.8 Paper authorship statements

Given the nature of this thesis as a collection of chapters that have been extended from co-authored papers, this section details the contributions of the collaborators on each of the projects. In general, the co-authors for each study acted as mentors/supervisors in guiding me through the design, execution, and writing up. Signed statements from each collaborator attesting that the following accurately represent the authorship breakdown of each paper are included in Appendix B.

The work presented in Chapter 3 on Veganuary 2019 was a collaboration with Professor Jamie Lorimer (JL) of Oxford's School of Geography and the Environment. I developed the research question and methodological approach. I undertook all of the data parsing, cleaning, and processing. I executed all of the analysis and solely drafted the original manuscript. JL aided in developing the conceptual framework within which we interpreted the results and assisted in editing the manuscript for publication.

The work presented in Chapters 4 and 5 on the psycholinguistic framing of environmental activism was conducted in collaboration with social psychologists Dr Magdalena Formanowicz (MF) and Dr Marta Witkowska (MW) of the SWPS University in Warsaw, Poland, and environmental psychologist Professor Robert Gifford (RG) of the University of Victoria in British Columbia, Canada. I was responsible for the original conceptualisation of the research question and objectives. With regards to the social media end of the project, I collected and cleaned the Twitter data, developed the methodological approach, and executed the analysis. For the experiment, I drafted the experimental materials and designed the analysis, while MF and MW helped me to refine the materials using their experience in experimental psychology. They also ran some of the statistical analyses via their access to the go-to software tool in the field (MPlus), for which Oxford does not have a licence. I replicated all analyses in R. I then drafted the manuscript, while MF and MW contributed to revising and polishing it for publication. RG assisted in scoping the literature, provided guidance for how to frame the work, and helped revise the manuscript.

The work presented in Chapter 6 on COP26 was done in collaboration with Dr James Painter (JP) of the Reuters Institute for the Study of Journalism at Oxford. JP and I worked together on the conceptualisation of the project. I conducted all of the social media data collection and analysis, while JP and another coder conducted the collection and coding of the mainstream media articles. I then undertook the comparative statistical analysis of the two arenas. In the manuscript for publication, I drafted all text except portions of the mainstream media method section and results sections of the published version, which JP drafted, that I then further expanded upon and edited for the thesis chapter.

Chapter 2

Literature Review

The empirical studies in this thesis each touch on different datasets, methods, and issues at the intersection of online environmental activism and communication. As such, they require individualised literature reviews to properly contextualise them. However, as a unit, the chapters speak to important gaps in the study of environmental communication on social media, specifically regarding global activism, and therefore benefit from a more general contextualisation within the literatures that have been dedicated to topics in this area so far.

Most of the literature that this thesis draws on relates one way or another to how environmental issues are *framed* by the stakeholders discussing them within mainstream and social media. Framing can be thought of as the ways in which communicators calibrate their messages to convey an issue, who is responsible for it, and what – if anything – should be done about it (Iyengar, 1996). Formally, framing has been defined as how communicators

“select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation” (Entman, 1993, p. 52)

This can include thematic, moral, emotional, and normative appeals (Chong and Druckman, 2007). The application of framing to communications research was originally inspired by findings in the psychology literature demonstrating the ways in which a piece of information is presented affects our judgement and rational choice (Kahneman and Tversky, 1984). Framing has been readily applied by researchers in several disciplines to research on environmental discourses within mainstream media and increasingly on social media (Vu et al., 2021). As such, various elements of framing will be revisited often over the course of the thesis.

This chapter begins by guiding the reader through an overview of the dominant themes and priorities in research pertaining to environmental communication and activism on social media

to date. Doing so provides the background context necessary for the reader to understand the motivation for this thesis. Then, I introduce the gap that the thesis as a unit addresses: The lack of attention paid to nuances of environmental activism as distinct from more general environmental communication. The second section of the chapter walks the reader through the foundations of this distinction and why it is important to carry forward in examinations of environmental discourses on social media. Next, I review the few studies which have been dedicated to environmental activism on social media so far, before identifying and detailing specific places in which further research is needed.

2.1 Dominant themes of environmental communications research on social media

2.1.1 The role of social media as a tool in the pro-environmental movement

I begin with a brief summary of the work identifying the importance of social media to discourses around the pro-environmental movement. As new digital media platforms rose to prominence in the early 2000s, scholars recognised the power these platforms would have in shaping public discourse, collective action movements, and protest ecologies pertaining to all kinds of issues. Social media has come to function as an important tool for citizen activity, and to foster engagement with a variety of social movements (Dahlberg, 2001; Goldberg, 2011; González-Bailón et al., 2011; Hwang and K.-O. Kim, 2015; Mavrodieva et al., 2019). Papacharissi (2002) argues that the internet does not only facilitate access to a wealth of information, but also lowers the barriers to participate in public discourses and to interact with others.

A vast body of scholarship on environmental communication highlights the important participatory potential for expert communication via social media platforms that is not confined to the experts themselves but includes members of the general public who can now more readily access, share and discuss information related to environmental issues on their own (see Anderson (2017), Bowman and Willis (2003), O'Neill and M. Boykoff (2011), and Koteyko, Nerlich, and Hellsten (2015) as referenced in Lörcher and Taddicken (2017). In this context, Lörcher and Taddicken (2017) argue that "one of the urgent questions nowadays is how climate change is discussed online where low barriers to communication allow contributions from laypeople" (p.2).

At the centre of this impact is the way in which social media platforms have opened up direct communication (and conversation) channels between the public and climate scientists, activists, politicians, and other stakeholders (Pearce, Brown, et al., 2015). In an essay on the role of new media for engaging the public on climate change, O'Neill and M. Boykoff (2011) discuss the power of new (social) media to increase information access, open up opportunities for more people to get involved with public discourse, build global communities, and remove some of the gatekeeping and agenda-setting restraints of traditional news media.

In one of the first studies of environmental discourse on Twitter, Segerberg and Bennett (2011) describe the platform as both an organisational tool that can be used to share information and mobilise collective action in response to it, as well as a window into protest spaces with the potential to reveal important structural and dynamic features of a protest's ecology at scale. Meanwhile, Anderson (2017) describes social media platforms as a way of personalising and concretising environmental issues in a way that makes them more understandable and relatable to the general public, thereby mitigating the problem of "issue abstractness" within environmental communication.¹ The affordances of these digital communication channels culminate in lowering some of the barriers to collective action with the pro-environmental movement (Hestres and Hopke, 2017), allowing for the facilitation of radical grassroots movements and the participation of previously marginalised voices (North in Schäfer and North (2019)).

While this literatures makes clear that social media can be a useful tool for expanding the pro-environmental movement, it is also important to acknowledge the reality that these platforms feed counter-movements as well and have been argued to create new challenges for the pro-environmental movement (c.f. Tucker et al. (2017) and Schäfer in Schäfer and North (2019)). It is outside the scope of this thesis to fully trace those challenges but some of the will be discussed throughout the empirical chapters, as they are relevant to the findings and context of each case study.

2.1.2 Two primary analytical approaches

In response to the calls in these papers for more attention to social media platforms as arenas of public discourse on environmental issues, the last 10-12 years have seen a strong effort from

¹"Issue abstractness" refers to how many topics within environmental communication are difficult to engage the public with because of how global, complex, and spatially and temporally distant the issues are. This will be further discussed later in this chapter.

researchers to empirically analyse and understand these discourses on social media platforms, particularly Twitter. The majority of the studies in this area set out to characterise environmental communication in a general sense, i.e., to identify salient features in the full universe of messages and other information posted and exchanged between any and all users on a given social media platform. The general motivation underlying these papers was the idea that these discourse contexts could reflect public understanding and opinion regarding important environmental issues and topics.

These studies normally take one of two approaches which can both be thought of as forms of "trawling" the full universe of social media data anchored to search criteria related to topics of interest within environmental discourse, and then allowing salient features to emerge via various forms of analysis. Researchers then use these results to draw conclusions about trends in public discourse and what they might indicate about public opinion and understanding of environmental issues.

The first kind of approach is to collect all posts on a given platform related to a specific discourse event. The most commonly studied events include major protests, political conferences, the publication of scientific reports, and extreme weather events. The second approach is to collect all posts containing a certain set of more general keywords related to environmental issues, e.g., "climate change" or "global warming", over a given period of time. Once the data is collected via one of these pathways, the studies then apply a number of different analyses, including content, sentiment, network, and temporal analysis, to comprehensively describe and/or quantify interesting features of the discourses manifested in the samples.

2.1.3 Main takeaways from this research

All together, these studies have led to an understanding of various structural and qualitative features of various environmental discourses on social media at a high level. They reveal that the most active users tend to be elite public figures, e.g., politicians, news media outlets, and inter-governmental organisations (Kirilenko and Stephenkova, 2014; Mavrodieva et al., 2019; Pearce, Holmberg, et al., 2014; H. Williams et al., 2015), but in some cases, the most influential (or most propagated) posts come from individual bloggers and other non-elite actors (T. P. Newman, 2017). The major frames include discussions of scientific findings to promote public understanding, warnings about consequences, and policy discussions about health and economic implications

of environmental issues (Dahal, Kumar, and Z. Li, 2019; De-Lara, Erviti, and León, 2022; O'Neill, H. Williams, et al., 2015; Pearce, Holmberg, et al., 2014). The sentiment and/or emotional tone of the discourses tends towards negativity and aggression (Dahal, Kumar, and Z. Li, 2019; De-Lara, Erviti, and León, 2022; Loureiro and Alló, 2020; Tyagi, Uyheng, and Carley, 2020). Although, there is some disagreement about how emotional framing may relate to engagement in different communication settings (Barrios-O'Neill, 2021; Chapman, Lickel, and Markowitz, 2017; Fernández et al., 2015). The relationship between emotion and online engagement in particular has received low and sporadic attention in the literature.

Moreover, there is significant evidence of the discourses being prone to controversy and polarisation, often resulting in the formation of echo chambers between audience groups (Falkenberg et al., 2022; Garcia, Galaz, and Daume, 2019; Jang and P. Hart, 2015; Kaiser and Puschmann, 2017; Olausson, 2018; T. P. Newman, E. C. Nisbet, and M. C. Nisbet, 2018; Sanford et al., 2021; Tyagi, Uyheng, and Carley, 2020; H. Williams et al., 2015). Additionally, trends in what users post about in these discourses reflect elements of public opinion as captured by large-scale representative surveys (Loureiro and Alló, 2020; McKinnon et al., 2016). And finally, the dominance of scientific information to increase public understanding of environmental issues is likely less effective in garnering engagement in comparison with more relatable or actionable information (Evensen, 2019; Grundmann and Scott, 2014; Hmielowski et al., 2013; Kahan, 2012; Moser, 2010; Olausson, 2019; Petersen, Vincent, and Westerling, 2019; Schäfer and Schlichting, 2014).

There has also been some work in more miscellaneous directions. For example, Holmberg and Hellsten (2016) examine differences in how members of the public of different genders communicate about environmental issues, finding that women tend to get more involved with discourses around specific campaigns and events while men engage more often with political and scientific debates. Fernandez, Piccolo, Alani, et al. (2017) draw on theories of behavioural change to develop a language classifier to identify which stage in the transition from less to more environmentally-friendly users are from the language they use in tweets about climate-related events. Hopke and Hestres (2018) study the visual frames used by a selection of stakeholders (e.g., activists, NGOs, news outlets, and fossil fuel companies) in the Twitter discourse surrounding the UN climate change conference in 2015, comparing and discussing the strengths and weaknesses of the focus points of these frames across stakeholders. Su and Borah (2019) compare the relative agenda-setting strength of mainstream media and Twitter discourse in response to former US President

Trump's announcement to withdraw from the Paris Climate Agreement in 2017, determining that Twitter is more likely to influence mainstream media in moments of breaking news while mainstream media is more likely to influence Twitter in ongoing discussions.

More recently, there has been a growing focus on discourses surrounding the youth activist movement. Some have described how the movement connects to other topics and initiatives through hashtag tracking on Instagram (Herrmann, Rhein, and Dorsch, 2022). Others have sought to dig deeper into the qualitative features of these discourses. For example, Suitner et al. (2022) show a steadily growing volume of tweets about climate action protests between 2018 and 2020, as well as a changing linguistic nature of the discourse to include more agency and affiliation over time. These results hint at an increasing emphasis on collective action themes.

This suggestion is confirmed in Chen et al. (2022) who compiled a database of 5.5 million tweets related to climate strike discourses from August 2018 to January 2021 using a set of 33 climate-related hashtags. They found that the main narratives represented in these tweets included more active frames, primarily advocacy for policy changes and political action. Moreover, that work also offers the first comparative analysis between environmental discourses on social media and news articles from mainstream media outlets in the post-FridaysForFuture time frame. It is therefore the first to detect differences in how the two arenas frame environmental topics and reflect on their significance. However, as shall be further explored later in this chapter, their analysis is very high level and therefore lacks granularity and context within which to anchor the comparisons and their implications.

Finally, Hautea et al. (2021) focuses on the affective qualities of a small set of highly popular posts related to climate change on the video-sharing platform TikTok, lamenting the tendency of environmental communication research to "overlook the more ephemeral affective processes propelling the circulation of climate messaging" specifically among younger non-expert creators and audiences (p. 1). Their analysis provides tremendous insight into how the younger generation are using the new platform and its affective affordances to construct new narratives within environmental communication.

The studies surveyed above have all been interested in characterising elements of general communication between members of the public about topics related to environmental discourses represented by social media datasets. While some refer to the increasing presence and importance of

activists online as motivation for why they are studying these contexts, none distinguish communication from more explicit activism. In particular, none investigate specific activist campaigns, nor the presence of individual activists within these contexts. In sum, the majority of research on environmental discourse on social media has given little focus to the activists creating these discourses as "opinion leaders" seeking to mobilise the public towards collective action. The next section describes my motivations for making this distinction and why it is important.

2.1.4 Communication versus activism

The importance of distinguishing targeted activism from general communication stems from the unique challenges inherent in engaging the public on environmental issues relative to other problems, e.g., within political mobilisation or public health. Much of this derives from features of environmental issues themselves. For example, many environmental problems are abstract and invisible (Moser and Dilling, 2007), i.e., most people cannot look out their windows and see climate change or pollution. We cannot immediately observe the effects of the exhaust from the cars we drive, planes we fly, single-use plastics we discard, nor from the factories that make our clothes.

Moreover, while some areas of the world are beginning to experience the consequences of pollution and anthropogenic climate change, the full impact of these emissions will not manifest until a relatively undefined point in the future. This temporal distance, in addition to the fact that the impacts are not felt universally and are therefore also spatially distant to many populations, renders environmental issues virtually irrelevant to most individuals' day-to-day lives in comparison with shorter term worries (Gifford, 2011; Lorenzoni, Nicholson-Cole, and Whitmarsh, 2007; Norton and Leaman, 2004; O'Neill and Hulme, 2009; Poortinga and Pidgeon, 2003; Scannell and Gifford, 2013). There is also not one singular effect or symbol that the public's attention may be drawn to in order to build and mobilise awareness (Patterson and Wilkins, 1991). Thus, environmental issues are too abstract, complex, and diffuse for most people to readily comprehend (Moser and Dilling, 2007).

Finally, when environmental issues are discussed in the news or on social media, they often follow the "information deficit model" (IDM) in which the public are treated by communicators as "empty vessels" into which they can pour information and expect it to be understood and internalised (Whitmarsh, O'Neill, and Lorenzoni, 2011). The idea is that any scepticism or inaction is

the result of a "knowledge deficit" which can be overcome by supplying more information about an issue (Dickinson, 2015). However, IDM has been extensively discredited as a way of communicating environmental issues mostly because this information tends to be highly scientific and fails to make clear what the information implies for individuals in their everyday lives (O'Neill and M. Boykoff, 2011; Irwin and Wynne, 1996; Moser, 2010; Whitmarsh, O'Neill, and Lorenzoni, 2011). Yet, until recently this model has been the norm of environmental communication by a variety of stakeholders, including journalists, scientists, and activists (Evensen, 2019; Hopke and Hestres, 2018; T. P. Newman, 2017; Stecula and Merkley, 2019). There is evidence that some of these stakeholders recognise the need to speak more clearly and directly about climate issues in order to build stronger public understanding and awareness, and have made significant efforts to drive this change in climate media narratives, e.g. the [Oxford Climate Journalism Network](#). However, as the datasets in these thesis will show, especially in Chapters 4-6, much of activist and media communication is still very vague, lacking direct action orientation, and/or complex.

These elements have established a self-reinforcing cycle of challenges for environmental communication: features inherent in the relevant issues make it hard to engage the general public and when they are communicated, they are often done so in a way that fails to make the underlying concepts and consequences readily understandable. The result is little progress in building active engagement and public understanding of what environmental issues mean specifically for individuals, households, and society at large in the short and long term, despite increasing media coverage (Chen et al., 2022).

Fortunately, this is beginning to change with the new strands of activism that have gained momentum and attention in recent years. The vanguard of this progress is the *Fridays For Future* youth movement, led by Greta Thunberg, but also includes NGOs, activist groups such as *Extinction Rebellion* and *Greenpeace*, and pro-environment politicians. As discussed in the previous section, while this increase in activism has reinforced a focus within environmental discourses on information spreading and building awareness, they have also caused an increase in the presence of calls to action in ways that earlier environmental communication on social media did not (Chen et al., 2022; Han and Ahn, 2020; Molder et al., 2022; Vu et al., 2021).

Thus, while they still face limitations, these activists have changed the tone of environmental discourse on social media. They have built a new cohort of "opinion leaders" or "influencers" challenging traditional narratives and demanding action. The concept of "opinion leaders" was first

presented Lazarsfeld, Berelson, and Gaudet (1944)'s two-step model of communication resulting from a study of influence on voting behaviour. In this model, which was further developed in Katz and Lazarsfeld (1955), mass communication and its effects on public opinion are mediated by knowledgeable, respected, and socially-active opinion leaders who are able to influence those in their social environment.

Subsequent work has led to modifications of the two-step model. Perhaps the most relevant for social media communication is Weimann (1982)'s focus on network effects, particularly "the marginal flow of information between groups" through the lens of Granovetter (1973)'s "Strength of Weak Ties" theory (p. 766). Weimann referred to this modification as accounting for *multi-step and horizontal flows* between individuals which he argues is a more realistic conceptualisation of communication. In validating this theory, his empirical work found that while network "centrals" – defined as well-integrated individuals – are responsible for intergroup flow of communication, network "marginals" – individuals positioned at the boundaries of multiple groups – drive intra-group flow. Given the ways in which social media platforms give rise to extensive and constantly evolving social communication networks, this networked theorisation of opinion leadership is strikingly prescient.

There have also been further elaborations of the model within the digital age, particularly focused on the rise of social media. Sonzogni (2022) examines the implications of the rise of social media influencers for mass communication, confirming the importance of comparing the original two-step model with multi-step and network models. There have also been empirical attempts to validate the appropriateness of the original two-step model as well as network modifications in social media datasets. For example, Hunt and Gruszczynski (2023) adapt the two-step model to account for the ways in which social movement organisations as non-media actors use prominent public figures and media outlets as traditional opinion leaders to amplify their message on Twitter. They find that this "horizontal" conceptualisation of the two-step model is able to capture how information originating from the social movements spread on the platform. Meanwhile, in a study of social movement activism in Chile via Twitter, Hilbert et al. (2017) find evidence of the original two-step mode of communication, as well as one-step broadcast and elaborate multi-step network modes. The authors argue that their results provide justification for moving away from, what they call, "simplistic views" of a uniform step flow model of communication applicable to all opinion leaders and towards the consideration of how different types of opinion leaders on different digital

platforms will experience different flows of communication.

These modifications and explorations demonstrate the complex nature of influence and communication in the social media age, and make clear the need to further interrogate how well traditional models such as the Katz-Lazarsfeldian two-step model apply in different contexts. However, they nonetheless continue to emphasise the power of well-positioned and popular individuals to influence public discourse and opinion via social media platforms (Stehr et al., 2015).

It is important to also consider how these theories on communication and opinion leaders sits within larger discussions and theoretical developments of *media effects* more generally. In parallel to the study of opinion leaders, the understanding of media effects has also evolved over the last century alongside the changing media landscape. This begins with the articulation of *minimal effects* in the mid-20th century by Klapper (1960). In this work, Klapper argues that media communication have limited direct effects on individual behaviour and attitudes, and that any effect is moderated by our pre-existing beliefs and tempered by our social environment, i.e. our family, friends, and community. In particular, the media is most likely to reinforce these predispositions instead of transforming them.

This was then followed by a transition towards *strong effects* by the 1980s and 90s, led by Iyengar and Kinder (1987), Iyengar (1991), and Zaller (1992). Drawing on new methods, frameworks, and media (particularly television), these scholars found evidence that the media did indeed have significant direct effects on the public's attitudes and behaviours. They were also wary of the impact of media biases and selective exposure on the public, presaging the echo chambers observed on social media platforms today (Cinelli et al., 2021). More recently, scholars have begin to criticise earlier theorisations of media effects, particularly the lack of attention paid to the sociotechnological advancements alongside which the media system operates (Bennett and Iyengar, 2008). They suggest that as digital platforms and media sources proliferate, communicators will compete for attention and prominence in the public arena. This will make effects more difficult to produce and measure, indicating the need to take more carefully into consideration the way the technological affordances of the media landscape as well as the social norms and practices around media consumption evolve and vary.

For example, social media platforms have greatly increased the reach and potential influence of social activists, as well as the general public's proclivity for and ability to participate in social

issue discourses (Boulianne, 2015; Vissers and Stolle, 2014). New research shows that these opinion leaders on social media can significantly shape the discursive environments in which they operate (Hilbert et al., 2017; Hunt and Gruszczynski, 2023; Boatwright, 2022) and, most relevant for this thesis, they have strong mobilising power for pro-environmental action (Anderson, 2017; Dekoninck and Schmuck, 2022; Han and Ahn, 2020; M. C. Nisbet and Kotcher, 2009).

Moreover, these users engage in discourses with different motivations than other stakeholders, e.g., traditional media outlets, primarily to mobilise their audience and cultivate specific narratives, as opposed to objectively reporting information or commenting passively on recent developments (C. S. Park, 2013). This volume and accessibility of such direct communication was unheard of before the last twenty years. Finally, opinion leaders can play a critical role in making the complex nature of environmental issues more comprehensible to the general public by providing the necessary framework of values, norms and beliefs to help their followers better relate to controversial topics (Dekoninck and Schmuck, 2022; M. C. Nisbet and Kotcher, 2009). In doing so, they break down barriers to involvement and understanding of controversial social issues and may pique their followers' interests in new topics, thereby prompting them to engage.

It is therefore important to study these individuals directly. As demonstrated in the previous section, most studies of environmental discourses on social media focus on large swaths of social media data, as represented by the posts of all users who engage with a given topic. These analyses treat users and their posts as "sensors" emitting signals, which when pooled together can provide an indication about public understanding and opinion on different topics (D. Boyd and Crawford, 2012; Kirilenko and Stepchenkova, 2014; Kirilenko, Molodtsova, and Stepchenkova, 2015). While some of these studies identify the most prominent or influential users and/or narratives ad hoc, they tend to not examine these opinion leaders separately. We know relatively little about the features of specific activists, or what makes some of their posts more influential than others, whether it be features of the content, or how the topic or user resonates with important elements of the greater movement. By examining activists as opinion leaders, we acknowledge their importance in shaping environmental discourses, thereby deepening our understanding of how and why they develop the way they do, and what can be done to optimise this trajectory towards maximum awareness and mobilisation.

To summarise: the nature and landscape of environmental discourse on social media has

changed in the last few years, and thus our approach to studying it must also evolve to recognise that. In particular, new opinion leaders have emerged and they are driving new narratives and objectives. Environmental discourses are no longer dominated by experts communicating key facts and figures to the public in order to spread awareness about environmental issues, but now by activists and politicians explicitly motivating them to action. Researchers must attend to these changes and in turn change the way we approach our analyses of environmental discourses on social media. To do so, we can start by paying more attention to activists and analyse the specific ways in which they are seeking to harness these platforms for public engagement and mobilisation.

2.2 Emerging literature on environmental activism on social media

A small branch of environmental communications literature has emerged around the study of activism more specifically on social media. This section introduces these studies and identifies some of the gaps they leave to be filled.

The first studies to investigate individual accounts in environmental discourses on social media include Merry (2014)'s work examining the activity of environmental organisations in the Twitter discourse surrounding the Gulf of Mexico oil spill in 2010, and Hodges and Stocking (2016)'s analysis of organisations supporting and protesting the Keystone XL pipeline project, also on Twitter. Both papers were interested in characterising the features of the content the organisations themselves shared about the issues at hand versus the kind of content with which they chose to interact. Interactivity was a strong focus of these papers as it has been theorised to help grow support for collective action movements on social media platforms (Bennett and Segerberg (2012); see Merry (2014) for a fuller discussion).

These studies provide some insight into how environmental organisations contribute to environmental discourses on social media. However, the authors recognise that their findings are limited to a narrow range of stakeholders. Many of the organisations included in these studies have themselves come under fire by proponents of more recent activism for failing to do enough to initiate meaningful policy reform (Han and Ahn, 2020). Moreover, neither study considers the presence of specific narratives and linguistic features in the organisations' communication strategies, nor their effectiveness in engaging the public. Therefore, the authors of both papers call for further research on additional types of stakeholders, the examination of contexts beyond major

political events, including those which might be more personal, and analysis of narrative and affective features of these strategies specifically with respect to how they impact engagement.

Parts of this call have been taken up by researchers in the last few years. Examinations of specific stakeholders in more generic contexts include Vu et al. (2021)'s analysis of the frames used by 289 NGOs in eighteen countries to advocate climate action on Facebook. They found a strong focus on spreading information about the threats of climate change as well as emphasis on personal and collective efficacy to act against them. Moreover, Barrios-O'Neill (2021) examined the retweet popularity and sentiment of tweets from nine prominent environmental NGOs specifically related to biodiversity, finding that tweets with more negative emotion were retweeted more. This study is the only one I have found which uses statistical analysis to relate retweet popularity to content features of tweets from a set of activist stakeholders. However, the author acknowledges how the narrow focus of the paper on biodiversity should be expanded in future work. Furthermore, the targeting of international NGOs in both these works neglected alternative groups, such as Extinction Rebellion, and influential individual activists and politicians.

The first major study to focus specifically on an individual activist in this space is Molder et al. (2022)'s qualitative analysis of Greta Thunberg's posts on Instagram. They found that frames of morality, opportunity, hope, and motivation for action dominate the youth activist's posts. Their analysis provides the literature with a fundamental understanding of how Thunberg tries to build support for the movement and address the hopelessness and low efficacy that pervades public sentiment about the climate crisis. However, the authors did not examine how the presence of these frames affects Thunberg's audience, nor how framing might vary in different contexts, e.g., in response to a natural disaster versus the promotion of a protest action. Therefore, they recommend future research into how different framings of environmental activism elicit audience engagement, both on and offline.

By focusing more specifically on activist communication on social media, this small but impactful body of work has begun to address the gap in the literature regarding how key stakeholders engage the public on environmental issues via social media platforms. However, as indicated throughout the previous sections, there are many open questions to pursue. The next section identifies the selection of them which are investigated in this thesis.

2.3 Gaps

While the larger body of environmental communication research described in the first section of this chapter, as well as the smaller branch of environmental activism on social media described in the previous section, have covered significant ground, there are still several areas to investigate. First, as a result of the literature's focus on general communication contexts, relatively few individual action campaigns have been analysed. Moreover, the literature has yet to consider the role of corporations in environmental activism online. Additionally, there are no studies of the relation between activist communication on social media and audience engagement, the factors impacting it, or the implications online engagement has for offline behaviour. And finally, there have been few efforts to investigate how environmental activism on social media compares with discourses of environmental issues within mainstream media, despite the widening divergence in function and audience demographics that the two arenas serve. The following paragraphs describe and motivate these gaps in further detail.

2.3.1 Corporate engagement with environmental discourses on social media

Some of the first elements that jump out as missing from this literature is exploration of a broader set of stakeholders, as well as investigations of targeted action campaigns on social media. As summarised above, most prior research has not taken the approach of analysing environmental discourses through the communication of specific stakeholders. The few which have done so have analysed a small number of individual activists, mostly Greta Thunberg (Han and Ahn, 2020; Molder et al., 2022), and NGOs (Barrios-O'Neill, 2021; Comfort and Hester, 2019; Hodges and Stocking, 2016; Merry, 2014; Vu et al., 2021). None have considered corporations and the ways in which they engage with environmental activist discourses.

Yet, there have been studies of how corporations contribute to and influence environmental discourses via mainstream media. In particular, these studies find evidence of disproportionate attention given by mainstream news outlets to corporations, specifically the largest and most polluting, in discussions of environmental issues in comparison with the perspectives of advocacy groups, scientific research organisations, and government bureaus (Miller Gaither and Gaither, 2016; Wetts, 2020a). For example, Wetts (2020a) analysed the prevalence of nearly two thousand press releases from various corporations and other organisations in articles from *The New York Times*, *The Wall Street Journal*, and *USA Today* between 1985 and 2014. The author found larger

corporations receive more coverage in these outlets than the other organisations by a significant margin, emphasising the privileged position that corporations with large "structural power" have in shaping representations of environmental issues in public discourse.

Moreover, in a study of the press releases themselves, Wetts (2020b) determined that the tone and focus of the releases tend towards a paradoxical recognition of climate changes as a major threat to humanity while maintaining the importance of a "measured response, mindful of the needs of the business community and involving their input in the policymaking process" (p. 1362), essentially attempting to position themselves as protagonists in climate action to ward off further scrutiny and regulation. The author argues that this stance restricts the growth of public awareness and mobilisation of political will by devaluing the role that individuals and civil society can play as contributors to environmental action. However, these issues have yet to be examined in corporate communication on social media where, as described above, these discussions are becoming increasingly prominent.

When corporations have been examined on social media, the focus has been on identifying ways that corporations can engage meaningfully with public discourse on political and social issues from a public relations and brand management perspective. Scholars have argued for the potential of corporations to act as "powerful social" and "deeply entrenched" political actors (Hutter, Hoffmann, and Mai (2016) and A. A. King and Lenox (2000), as cited in Saffer, A. Yang, and Qu (2019)). Over the last thirty years, the concept of "corporate social responsibility" (CSR) has become increasingly prominent in the public sphere. CSR is defined as "the social responsibility of a business that encompasses the economic, legal, ethical, and discretionary expectations that society has of organisations at a given point in time" (Carroll, 1979, p. 500). CSR is commonly used by companies to achieve "legitimacy", as well as compensation for the detrimental elements of their operations (Du and Vieira, 2012). Consumer demand for commercial organisations to commit to pro-social causes has significantly increased in recent years (Kavakli, 2021; Perry and Towers, 2013; Pigors and Rockenbach, 2016). The companies which have responded to this have been rewarded by consumers with increased loyalty and trust (M.-K. Cha, Yi, and Bagozzi, 2016; E. Park, K. J. Kim, and Kwon, 2017; Vo, Xiao, and Ho, 2019; C.-C. Wang, 2018). For these reasons, many commercial organisations have begun incorporating CSR messages into their branding and marketing campaigns on social media (Pizzi et al., 2021; Song and Wen, 2020; Stoeckl, 2014; Suárez-Rico, García-Benau, and Gómez-Villegas, 2019; Vredenburg et al., 2020).

However, many researchers suggest that CSR can do more than communicate a company's commitment to act responsibly. These scholars argue that CSR can (and should) play a role in supporting activist causes related to a company's industry. Doing so would "provide true and transparent information" about how they integrate social and environmental concerns into their business operations and stakeholder interactions (Podnar, 2008, p. 75). For example, companies that produce goods for dietary consumption can advocate for more sustainable supply chains and encourage better consumer choices as part of their CSR campaigns. Kampf (2018) deems these kinds of information flow critical for bridging CSR to consumer social responsibility (CnSR), defined as "the push-pull dynamic between corporations and consumers with consumers pulling on corporate financial, environmental, and social responsibility through their purchasing actions" (p. 1). In particular, Kampf suggests that companies can assist the cultivation of CnSR by facilitating the flow of information to consumers about how to make better consumption choices. A. Zhou (2019) also proposes that partnerships between corporations and advocacy/activist groups can expand the audience of the latter, boost their influence, and develop their political power. Other work corroborates this suggestion empirically with analyses of social media discourses surrounding various consumer boycotts showing that these platforms can empower the mobilisation and organisation of consumer activism (Kang, 2012; Makarem and Jae, 2016).

In contrast, another branch of literature expresses scepticism of the motivations behind the CSR activities of many corporations, as well as the concept of consumer activism more generally. Researchers in this space argue that we should consider the ways in which the links between CSR and consumer activism have become performative and risk perpetuating values which can actually hinder systemic change for environmental protection (Guthman, 2008; Reese, 2020; Alexandra E. Sexton, Garnett, and Lorimer, 2022; R. White, 2018). They criticise CSR as empty pandering to an emerging segment of consumers seeking to make more environmentally-friendly consumption choices (Clay et al., 2020; Alexandra E. Sexton, 2018; R. White, 2018; Wrenn, 2011). In particular, it has been argued that companies are failing to provide enough transparency and information about why conscious consumption is important and details about how CSR pledges are being operationalised within a company's values, supply chains, and management (Clay et al., 2020; Weele et al., 2019; Wrenn, 2011). Moreover, others criticise the concept of consumer activism as a neoliberal ethic which suggests that consumers have the power to incentivise and regulate more socially responsible and sustainable industrial practices through their consumption choices (Butcher, 2018;

Dominick, 2015; Guthman, 2008; Harper, 2010; Twine, 2012; R. White, 2018; Zarling, 2018). These scholars claim that promoting consumer activism obfuscates government responsibility, at the national and international level, as well as industrial responsibility to initiate and comply with reforms. These arguments will be further unpacked in Chapter 3, but already this brief introduction demonstrates the need for a critical analysis of commercial engagement within activist discourses on social media to put these debates into context.

2.3.2 Specific action campaigns

The majority of previous work focuses on general discussions of environmental issues or on protest events, global conferences, scientific reports, and natural disasters. While these are important events and the discourses surrounding them can be effective in focusing public attention and developing public understanding of environmental issues, they are not often anchored to discussion of specific solutions or mobilisation efforts (beyond participation with specific protest events). As such, these discourses tend to remain mostly abstract and general, without concrete action points for households and individuals (Evensen, 2019; Gifford, 2011; Moser, 2016; Patterson and Wilkins, 1991). Therefore, it is worth considering more action-oriented contexts to understand a deeper dimension of how social media communication and activism can be used to mobilise collective action.

In other areas of public interest, researchers have examined contexts that are inherently more action-oriented. For example, when studying political dynamics on social media, it is natural for researchers to focus on discourses surrounding election campaigns in which stakeholders seek to influence the public to take a specific action on a specific date in time – that is, voting for a specific candidate (see Becatti et al. (2019), Bovet and Makse (2019), Bruno, Lambiotte, and Saracco (2022), Garcia, Galaz, and Daume (2019), Gaumont, Panahi, and Chavalarias (2018), Grčar et al. (2017), Gruzd and Roy (2014), Tumasjan et al. (2010), and Yasseri and Bright (2016)). Similarly, in the case of public health advocacy, research tends to centre around campaigns again encouraging people to take a specific action — usually to seek regular medical consultation — as soon as possible (see Ayers et al. (2016), Evans et al. (2015), Fond et al. (2015), and Noar et al. (2015)). However, in the case of environmental discourses, the tendency amongst researchers has been to focus on events which, while receiving lots of attention and therefore suggesting themselves as natural case

studies, are most of the time not tied to specific actions or issues that affect or are immediately relevant to the general population in the short term.

Therefore, a significant gap in the literature is the identification and study of more action-oriented activism contexts within environmental discourse on social media. With the exception of a cluster of studies examining tweets around the campaigns for Earth Hour in 2014-2016 (Fernández et al., 2015; Fernandez, Piccolo, Maynard, et al., 2016; Fernandez, Piccolo, Alani, et al., 2017),² I have found no other studies of specific action campaigns in the literature. Examples of relevant settings include the social media discourses surrounding initiatives to reduce non-essential driving (*World Car Free Day*), meat consumption (*Veganuary*, *Meatless Mondays*), fast fashion purchases (*Second Hand September*), and energy usage (*Switch Off Fortnight*). These initiatives encourage specific behavioural changes and are typically accompanied by information about why the changes are important. In doing so, they can help elucidate systemic issues hindering larger scale reforms. Thus, these kinds of campaigns are distinct from coverage of scientific reports, international conferences, extreme weather events, and even calls to join marches and protests. The latter, which can be useful for directing public attention to environmental issues and constitute an important mode of collective action, are not always focused on building awareness of what individuals can do in their daily lives to become longer term agents of change.

Because of the more granular and concrete focus of targeted action campaigns, the prominent users, strategies, features, and dynamics observed in these settings are likely to differ from those that have dominated the literature thus far. Therefore, they warrant more careful inspection. Moreover, they can also reveal streams of push-back that are not likely to emerge in more general discussions, and which the literature has not yet done enough to characterise (Pearce, Niederer, et al., 2019). It is possible that specific campaigns have received less attention from scholars because they may be perceived as less likely to yield generalisable insights due to their focus on more specialised issues and potentially narrower audiences. However, as the study presented in Chapter 3 reveals, examining these contexts can yield insight into how elements of environmental issues relate to complex political, social, and cultural dynamics in ways that studies of more generic contexts may not.

²Earth Hour is a worldwide movement organised by the World Wildlife Fund held annually to encourage businesses and households to turn off non-essential electric lights for one hour.

2.3.3 Connecting environmental psychology, linguistics, and audience engagement

While several studies of framing and sentiment in environmental discourses are common in the literature, there are no studies examining the links between environmental psychology, linguistic elements of activism on social media, and audience engagement.

Environmental psychology provides a rich literature on the ways in which our perceptions and actions regarding environmental issues can be influenced by the information we intake about them, as well as how this information is framed with respect to various psycholinguistic features. This literature, and the tensions within it, will be more deeply introduced in Chapter 4, but I offer a few examples here to illustrate.

Previous studies of environmental discourses on social media reveal a bias towards the prevalence of negative emotion in general (Barrios-O'Neill, 2021; Dahal, Kumar, and Z. Li, 2019; DeLara, Erviti, and León, 2022; Loureiro and Alló, 2020; Sanford et al., 2021; Tyagi, Uyheng, and Carley, 2020), but they have not examined how activists in particular frame their communications using emotion or other linguistic features, nor how these features may then impact audience engagement. While Fernández et al. (2015) carry out regression analyses to determine how emotion relates to retweet engagement in the 2014 Earth Hour campaign, they do so within the general discourse setting without focusing on the role of key stakeholders in setting the agenda and/or tone of the discussion. Moreover, a significant limitation of studying social media data alone is its inability to reveal how individuals internalise the information they encounter or engage with on the platforms. No studies have endeavoured to investigate the impacts of different (psycholinguistic or topical) framings of activist communication via social media on offline behaviour.

In other contexts, the study of social media content through the lens of psycholinguistics has yielded important insights. For example, Tumasjan et al. (2010) examined the psycholinguistic features of tweets posted by German politicians in the lead up to the parliamentary elections of 2009. Their results reveal strong patterns of association between feature use in the tweets and the positions of each politician, therefore indicating that the content of the politicians' Twitter posts "plausibly reflect[ed] the offline political landscape" at the time (p. 178). On a more general scale, Sterling, Jost, and Bonneau (2020) examined the linguistic trends in Twitter posts of 25k users. Drawing on theories of political psychology, they developed twenty-seven hypotheses to explain how the linguistic style of users might vary by political orientation. Their results confirm twenty-three of them, demonstrating how social media data can manifest theoretically-salient features of

political psychology. Tay (2021) compared temporal trends in psycholinguistic content of articles published by three major newspapers, each aligned with a different political position, during the Hong Kong protests of 2019. Doing so enabled the author to identify how linguistic variables in neighbouring time periods interrelate and how their use in protest discourse manifested offline social realities.

Beyond politics, Dyer and Kolic (2020) found evidence of a psychological numbing effect in Twitter discourse by relating patterns of certain psycholinguistic features in the early months of the COVID-19 pandemic to daily trends in case and death rates. And finally, as introduced in the first section of this chapter, Suitner et al. (2022) applied psycholinguistic analysis to samples of Twitter posts mentioning the *Fridays For Future* (FFF) movement, characterising the trend with which the discourse around FFF protests has changed to include more agentic and affiliative language over time.

Still, one rarely finds studies linking use of these features on social media with offline engagement and/or behaviour. This is likely because such investigations are more costly and logistically difficult to carry out relative to social media analyses. Nonetheless, the psycholinguistic framing of activist communication has clear implications for the success of these stakeholders in engaging and mobilising their audiences. It is therefore an important area of research to pursue. As such, the study presented in Chapter 4 examines the psycholinguistic features of activist posts on Twitter over a five-year period and the relation between these features and retweet engagement. Then, the experiment presented in Chapter 5 tests how framing social media content with these features impacts reported action intent.

2.3.4 Comparing representations of environmental issues on social and mainstream media

Finally, the literature contains no studies comparing the narratives and sentiments of social media opinion leaders with how the same environmental issues are represented in mainstream media venues. This comparison is important not only because of the ways in which the two media arenas contribute to our understanding and engagement with environmental issues, but also because of how they differ in terms of the populations they serve (Andersen et al., 2020; N. Newman, 2021; N. Newman et al., 2022; Shearer and Mitchell, 2021), the stakeholders to whom they give voice (Boulianne, Lalancette, and Ilkiw, 2020; Carvalho, 2010; Gurwitt and Timmons, 2015; Gurwitt, Malkki,

and Mitra, 2017; J. Smith et al., 2001), as well as with respect to the forces and incentive structures governing their communication objectives (Kunelius and Eide, 2012). It is therefore important to monitor how the two arenas may diverge in terms of their responses to critical awareness-raising events because of the implications these divergences may have for building cohesive narratives pertaining to environmental action.

The analysis in Chen et al. (2022) gives us a general idea of how social media discourses and mainstream news differ in representations of issues related to climate change. However, it does so over a long time range without focusing on specific stakeholders or events. While limited in terms of temporal scope, we can generate deeper insight into the communicative strategies (as well as the motivations which may underlie them) of stakeholders in the two arenas by comparing responses to a single event. By doing so, we are able to put our observations about the content of the communication into precise context and therefore develop more detailed discussions about their implications.

O'Neill, H. Williams, et al. (2015) almost fulfilled this in their analysis of media coverage in the US and UK pertaining to the publication of the IPCC's Fifth Assessment Report completed in 2014. To do so, they mapped the dominant frames in a sample of mainstream news articles from the most popular outlets in the two countries as well as a selection of tweets from prominent users. The authors found that articles in their news media sample focused mostly on political and/or ideological struggles regarding how to address environmental issues raised by the report, while the Twitter sample was dominated by emphasis on the validity of the science underlying it. While this study is one of the first to bring analyses of the two media arenas together, the authors did not devote much time to developing the comparison or discussing the implications of the differences between them.

Other papers which have brought elements of mainstream and social media discourses together include G. King, Schneer, and A. White (2017)'s and Su and Borah (2019)'s analyses on how the two contribute to agenda-setting. These papers demonstrate how the two arenas interact but neither includes a comparative element nor considers the implications of any similarities or divergences found between them.

Besides these examples, I have found no other literature pertaining to environmental discourses in which mainstream media and social media are treated as distinct and potentially competing sources of information and influence. Therefore, using Bourdieu's field theory as a theoretical framework, Chapter 6 opens this line of inquiry by comparing how prominent public figures and organisations on Instagram and Facebook represented the outcomes of the COP26 conference in November 2021 with how the conference was covered by popular mainstream news media outlets in Australia, India, the UK, and the US. I also compare the similarities and differences among the various stakeholders present in the social media sample, which includes activists, activist groups, politicians, celebrities, government agencies, international organisations, NGOs, as well as the accounts representing several news outlets. Doing so provides the first detailed comparative analysis of how different stakeholders operating in separate but intersecting media arenas frame pivotal events within the pro-environmental movement.

2.4 Conclusion

In this chapter, I have presented the literatures which motivate and inform the empirical work of this thesis. Moreover, I identified the gaps in this interdisciplinary mosaic of studies that the next four chapters collectively address. To summarise once more, these gaps include studies of corporate engagement with the pro-environmental movement on social media, targeted action campaigns, the relation between the psycholinguistics of activist messaging on social media and audience engagement on- and offline, and comparisons of environmental discourses within social media platforms and mainstream news media. As mentioned at the beginning of the chapter, this review is meant to give the reader the requisite context in order to understand where the case studies make their contributions. However, each of the case studies are further contextualised within their respective literatures to more rigorously scope and define these contributions in turn. The structure of this chapter reflects the sequence of the case studies. As such, the next chapter targets the first two gaps, namely corporate engagement within the context of a targeted action campaign: Veganuary 2019.

Chapter 3

Veganuary and the vegan sausage (t)rolls: Conflict and commercial engagement in online climate-diet discourse

This chapter has been extended from the manuscript published by Nature Humanities and Social Sciences Communications on 19 December 2022. DOI: 10.1057/s41599-022-01464-2.

Abstract

Social media platforms have become critical venues for a wide spectrum of influence campaigns, from activism to advertising. Sometimes these two ends overlap and it remains unknown how the latter might impact the former. Situated within contemporary scholarship on vegan activism, this chapter examines corporate involvement with the Veganuary 2019 campaign on Twitter, as well as the antagonistic backlash it received. The results show that activists and commercial entities in the discourse engage mostly separate audiences, suggesting that commercial campaigns do little to drive interactions with Veganuary activism. They also reveal strong threads of antagonism reflecting the "culture wars" surrounding discussions of veganism and climate-diet science. These findings inform the field's understanding of the challenges facing climate-diet discourses on social media and motivate further research into the role of commercial agents in online activism.

3.1 Introduction

As described in Chapter 2, the literature on social media environmental communication is low on both investigations of corporations as stakeholders in environmental discourses and as well as specific action campaigns. The work presented in the first empirical chapter of this thesis simultaneously addresses these gaps in an analysis of the 2019 Veganuary campaign on Twitter.

Veganuary is a UK-based charity that runs a month-long campaign each year in January to encourage people to go vegan. It is "the largest coordinated global exercise in vegan outreach" (Percival, 2022, p. 199). The yearly campaigns form a key part of the organisation's mission to "end animal farming, protect the planet and improve human health" (Veganuary, 2022b, p. 3). As science confirming the relative impact of plant- versus meat-based diets on climate change becomes more well-known (Godfray, Aveyard, et al., 2018; IPCC, 2019; Poore and Nemecek, 2018; Willett et al., 2019), discourse on the link between climate change and diet choice, hereafter termed climate-diet discourse, on social media has grown and Veganuary has become an important venue for environmental activism (Percival, 2022, p. 117).

Much of the outreach conducted during the Veganuary campaign occurs on social media platforms, especially Twitter. This outreach is spearheaded by users/accounts associated with the Veganuary organisation, as well as independent activists and activist groups. Moreover, due to the focus of the campaign on influencing dietary consumption choices, corporations with vegan products also engage with the discourse to advertise their products and signal to consumers their engagement with the campaign. Indeed, a big focus of the Veganuary organisation's general operations includes working with businesses to expand their vegan options and to "capitalise on the audience" it creates (Veganuary, 2022b, p. 3). Therefore, the interests/agendas of activist and commercial stakeholders collide in the yearly Veganuary campaign discourse on social media.

However, as noted in Chapter 2, there is significant tension between different streams of scholarship regarding commercial engagement with activist discourses, particularly on social media. For example, many scholars from the fields of public relations and brand management view corporate engagement with activism as having significant potential to effectively raise awareness and rally support to the underlying cause (A. Yang and Saffer, 2019). The potential of corporations to do so stems from the observation that the advertisements we are exposed to influence our consumer behaviour (Caraher and Landon, 2006; Manning, 2013). Scholars in this literature also emphasise the duty that corporations have to act in prosocial ways, reinforcing moral norms of

corporate social responsibility (Saffer, A. Yang, and Qu, 2019; A. Zhou, 2019). Yet, scholars in other fields, specifically those related to diet choice and veganism, stress that enthusiasm for corporate engagement with activist causes should be tempered with evaluations of what substance lies behind this outreach (Clay et al., 2020; Guthman, 2008; Reese, 2020; Alexandra E Sexton, Garnett, and Lorimer, 2019; R. White, 2018; Wrenn, 2011). These scholars fear that if corporate engagement is insincere, it could dilute genuine public interest and engagement with activist groups. Indeed, researchers have found instances in which companies have marketed specific products as aligning with certain pro-social values while still maintaining operational practices which contradict them (Alexandra E Sexton, Garnett, and Lorimer, 2019). This hypocrisy is not received well by the public and fuels streams of antagonism against activist campaigns (Garcia, Galaz, and Daume, 2019; Sanford et al., 2021).

As will be further discussed in the next section, vegan activism has become heavily commercialised. At the same time, it has become inextricably linked with environmental activism. Thus, it is a prime context to study commercial engagement with an activist discourse related to environmental issues. Moreover, because the campaign is focused on specific consumption behaviour, it qualifies as more targeted than the majority of discourse contexts currently examined in the environmental communications literature.

The 2019 Veganuary campaign is of particular interest due to a controversy which erupted in the beginning of the month and subsequently dictated much of the trajectory of the discourse. On 2 Jan 2019, UK fast-food giant Greggs announced the launch of a new vegan version of their traditional sausage roll on the social media platform Twitter. The vegan sausage roll had been specially made by Greggs to coincide with Veganuary. The popular, right-wing TV presenter Piers Morgan responded to the launch with a string of disdainful tweets. The savvy marketing team at Greggs promptly responded, seeking to make the best of Morgan's tirade (see Fig 3.1). A few days later, Morgan ate a vegan sausage roll live on *Good Morning Britain*, promptly spat it out, labelled it disgusting, and returned to Twitter to further lambast Greggs. Discussion subsequently escalated, going viral to draw in a large, diverse and often antagonistic range of social media users who debated the ethics and politics of vegans, veganism, climate change, and corporate involvement in food politics. Despite Morgan's counter-campaign, the release of the vegan sausage roll boosted Greggs' sales by 58% in the first half of 2019 (Starostinetskaya, 2019).



FIGURE 3.1: Initial tweet exchange between Piers Morgan and Greggs. A screenshot, taken by the authors, of the post in which Greggs announced the launch of the vegan sausage roll with Morgan's initial reply and Greggs' counter below.

Furthermore, a report examining the negative consequences of the global food system's reliance on meat and the benefits of plant-based diets was published by the *EAT-Lancet* commission on 2 Jan 2019 (Willett et al., 2019). The *EAT-Lancet* commission is an initiative focused on nutrition combining the non-profit startup *EAT* with *The Lancet* group of medical journals. The commission comprised nineteen commissioners and eighteen co-authors representing sixteen countries in a diverse range of disciplines, including health, agriculture, political science, and sustainability. The report explicitly advocated the reduction of meat consumption as a way of improving nutrition and reducing carbon emissions. The composition of the commissioners, perceived by many on social media as liberal elites, in combination with the forthright recommendation to consume less meat, precipitated significant backlash and antagonism. Likely due to the timing of the report's publication, many users also mentioned the Veganuary campaign in their criticisms of the report. It therefore contributed significantly to the antagonistic tenor of the Veganuary 2019 discourse.

Thus, this chapter takes the 2019 Veganuary campaign and the Greggs Vegan Sausage Roll (GVSR) incident as illustrative of three important dimensions of contemporary food and cultural politics related to environmental activism as they play out on social media. The first is the growing corporate involvement in social media activism, in which prominent brands seek to align themselves with good causes in the interests of brand enhancement and driving sales. The second is the antagonistic backlash to this involvement from both the political left and the political right

that manifest in what have become known as online "culture wars". And the third is the controversy erupting from campaigns targeting the reform of dietary choices towards environmentally-friendly trajectories. This chapter uses network and content analysis to provide an in-depth investigation of the online community and the social media discourse associated with Veganuary 2019, focusing in particular on the GVSR in order to address two broad aims: i) to examine the character and the effectiveness of corporate involvement in veganism and; ii) to describe and explain the content and sentiment of the vegan culture wars.

In so doing this chapter offers an analysis of the users, narratives, and communities of the 2019 Veganuary discourse, contextualised within literature examining contemporary veganism and controversy in climate-diet discourses. While previous studies have begun to examine discussions of veganism on social media and in mainstream media (Cole and Morgan, 2011; Goodman and Jaworska, 2020; Morris, 2018), this work offer the first examination of the structural implications of commercial engagement with veganism and climate-diet discourse and an evaluation of its potential to serve as a bridge between commercial audiences and activism. The findings inform current discussions regarding the state of climate-diet discourses on social media and fix a spotlight on the role of corporations in online activism. I identify powerful streams of politicised antagonism to vegan activism, often fuelled by observations of commercial engagement, and examine the ways in which social and political tensions co-opted the discourse. I show how veganism has become exemplary of the hot topics that serve as performative flashpoints for the online expression of entrenched and antagonistic opinions, splitting those on the left and the right of the political spectrum.

The chapter is organised as follows: In the next section, I introduce the literature pertaining to how veganism and vegan activism has been "mainstreamed", partially as a consequence of corporate engagement, as well as the debates around it that have been born as a result. In this section, I also discuss the findings of previous studies on social media discourses at the intersection of environmental activism and veganism. Then, I describe the data and methods used for the analysis, including a discussion of the work's limitations. Next follows a presentation of the results and a discussion of their implications. I conclude with a summarisation of the work and the avenues it opens for future research.

3.2 Background Literature

Veganism has been popularised in Western contexts in recent years as an effective measure for reducing environmental harm, especially by tackling the carbon emissions and land use changes associated with livestock agriculture and meat- and dairy-based diets (Godfray, Aveyard, et al., 2018; IPCC, 2019; Poore and Nemecek, 2018; Willett et al., 2019). There is low but growing public awareness about the implications of consumption and dietary choices on the environment (Kristiansen, Painter, and Shea, 2020; Neff, Chan, and K. C. Smith, 2009; Pendergrast, 2016) and more consumers are seeking vegan alternatives, if not fully vegan lifestyles (Shoup, 2019). Some argue that veganism has become "cool", appealing to younger, urban, and wealthier demographics (Doyle, 2016; Jallinoja, Vinnari, and Niva, 2018; S. Nguyen, 2017). This mainstreaming of veganism has created new ways of understanding it "as a tripartite practice of health, animals, and the environment," in comparison with earlier conceptions of the movement as radical or extreme (Oliver, 2021, p. 209). It has also presented economic opportunities for corporations seeking to capitalise on this new consumer segment, fuelling innovation and growth in sales of novel "plant-based" meat and dairy alternatives (Santo et al., 2020). Companies in this sector often present these products as animal-saving, environment-healing, and social justice-promoting options (Weele et al., 2019).

This shift has been driven by, and now empowers, online activist movements such as Veganuary who use social media campaigns to spread awareness and to encourage people to try veganism. Since it launched in 2014, a central aim of Veganuary has been to collaborate with corporations to "make plant-based foods more visible, tasty and accessible to the population", seeing this as an important means of "break[ing] down mind barriers to vegan eating" (Veganuary, 2022b). This framing encourages flexible and accessible "middle-ground" solutions over strict adherence to stringent dietary regimes (Jallinoja, Vinnari, and Niva, 2018). Both on social media and on the organisation's official website, Veganuary advocates use terms such as "plant-based" and "flexitarian" as part of a strategy to make the vegan lifestyle seem more approachable and less extreme, to the benefit of corporations wanting to expand their businesses and to activists hoping to encourage hesitant meat consumers to consider alternatives (Veganuary, 2022a).

This emerging model of mainstream, corporate or "Big Veganism" has been criticised on several fronts (Alexandra E. Sexton, Garnett, and Lorimer, 2022). First by "traditional" vegan activists and other advocates of alternative food networks, who are generally on the political left. While

some vegan activists (such as those at the People for the Ethical Treatment for Animals) are happy with a reduction in meat consumption by whatever political and economic means (Dutkiewicz and Dickstein, 2021), traditional vegan critics suggest that merely promoting and selling vegan products is not enough. They argue that more must be done to educate consumers about the problems with meat and dairy and to change the status quo. They suggest that Big Veganism is ineffective or worse, sheer capitalist opportunism (Guthman, 2008; Reese, 2020; R. White, 2018) and caution that it will lull consumers into a false sense of righteousness, preventing critical evaluation and widespread change (Wrenn, 2011).

Anarchist vegan scholar Richard White (2018) explains how the older model of veganism was "never just about food choices but is rather a radical activist praxis (in both theory and action) of a manifest desire to act in a way that prefigures an interspecies politics of justice and total liberation" (R. White, 2018, p. 5). He sees recent Big Veganism as completely divorced from these principles, and therefore diluting the collective understanding of what it means to be vegan. Giraud (2021) summarises the concerns of many vegan scholars and activists that the popularisation of vegan foods leads to the loss of "the more radical dimensions of veganism that characterised its origins" in favour of veganism as purely a dietary choice, without the "holistic understanding of vegan practice that questions human-animal relations more broadly and their connection with other forms of oppression" (Giraud, 2021, p. 8).

These critics argue that Big Veganism offers a "palatable disruption" (Clay et al., 2020); a change to the food system that does not actually disrupt its underlying values and power dynamics. As such it exemplifies the neoliberal political orthodoxy in which consumer choices are framed as the key lever to regulate harmful corporate activity. Food justice advocates argue that the growing industry of meat-free, plant-based alternatives merely secures the political economy of the mainstream corporate food system that was once the target of vegan critique (Butcher, 2018; Dominick, 2015; Guthman, 2008; Harper, 2010; Twine, 2012; R. White, 2018; Zarlino, 2018). These criticisms contrast with the optimism of the public relations and brand management literature regarding CSR initiative and have been extensively covered in academic literature (see Giraud (2021); Santo et al. (2020); Alexandra E. Sexton, Garnett, and Lorimer (2022) for comprehensive reviews).

The rise of Big Veganism has also been criticised by some representatives of the mainstream meat and dairy industries, as well as by a heterogeneous collection of pro-meat and anti-environmentalist

voices on the political right. Some of these argue that livestock can and should play a vital role in sustainable landscape management, and that meat and dairy are a necessary part of a healthy diet. They promote either a "less and better" model of "regenerative agriculture" that would support small-scale traditional farming and shift towards high quality and low intensity production (Fairlie, 2010; Giller et al., 2021; Percival, 2022). Or they advocate for a "more, but greener" model of sustainable intensification involving the scaling up of production to increase yields, and the further application of biotechnology for mitigating emissions and the harms associated with land use change (Godfray and Garnett, 2014)). Both approaches make strong appeals to a pastoral ideal of livestock production as a traditional and significant part of European and American culture (Monbiot, 2022). For overview of these arguments and the debates they provoke see Cusworth et al. (2022) and McGregor and Houston (2018).

Existing work has shown how online discussion and antagonism towards the merits of veganism peaks in response to the publication of high profile reports. For example, the *EAT-Lancet* report precipitated an intense and discordant debate and led to the emergence of the hashtag *#yes2meat*, which became a focal point for the pro-meat discourse (Garcia, Galaz, and Daume, 2019). Similarly, in August 2019 the Intergovernmental Panel on Climate Change reported on the detrimental environmental impact of the livestock industry (IPCC, 2019). Although the report made no explicit recommendation for diet change, the ensuing discourse on Twitter was heavily polarised and contained high levels of toxicity, i.e., disrespectful, rude, or otherwise unreasonable comments (Sanford et al., 2021).

Moreover, Olausson (2018) and Olausson (2019) find significant polarisation in discussions pertaining to meat versus vegan diets and the science advocating the latter as climate action among Swedish Facebook users. Specifically, the author shows participants "antagonistic" to veganism and other plant-based diets in these discourses take issue with the threat that veganism poses to farmers and others who depend on the livestock industry, along with the criticism of the industry (i.e., their way of life) that they perceive to be levied by vegan activists. Users also demonstrate distrust in the media and information they receive about climate change issues, a sense that is potentially heightened by the threat they perceive to their status quo.

This work demonstrate the polarisation and conflict in climate-diet discourses, specifically those related to the science underlying the link between the meat industry and climate change and advocacy for plant-based diets. They also show that the polarisation found in these discourses is

not always driven unilaterally by denial of the science linking climate change and the livestock industry. Instead, it also derives from perceptions of unfairness, hypocrisy, and frustration with the insinuation that the general public should make sacrifices while corporations and the wealthy continue as usual. As we will see, the Veganuary 2019 discourse was no exception and the results evidence several shades of antagonism, therefore contributing further evidence of the importance of understanding where these sentiments come from and how to deconstruct them.

The polarisation found in these studies, along with analyses of other contentious discourses, reflect the increasingly concerning tendency towards the formation and expansion of "echo chambers" and "epistemic bubbles" around these issues on social media platforms. Jamieson and Capella refer to echo chambers as "bounded, enclosed media space[s] that [have] the potential to both magnify the messages delivered within it and insulate them from rebuttal" (2008, p. 76). They are spaces in which other relevant voices have been actively excluded and where users often learn to distrust outside sources (C. T. Nguyen, 2020). Given the way most social media platforms run on algorithms designed to show you what you are most likely to enjoy – based on inferences from your previous interests – echo chambers become nearly unavoidable. They fuel the spread of online culture wars and take earlier fears of selective exposure and media bias in the pre-digital age to whole new levels (Törnberg, 2022). While previous research in the climate-diet space has explored polarisation and the formation of echo chambers, the literature lacks an analysis of this phenomenon in contexts in which activists together with commercial entities target individual consumption choices, such as with Veganuary.

A note on terminology

There is strong debate amongst scholars on how researchers should define veganism, from those favouring a simple practice-only definition (Dutkiewicz and Dickstein, 2021) to others advocating a more holistic praxis-based conception (R. White, 2018). Without wanting to oversimplify the concept, this chapter adopts a definition of veganism which best resembles what the Veganuary organisation advocates: the practice of abstaining from animal-based products for the purposes of protecting animals, the environment, and improving one's health. Throughout the chapter, the terms "vegan activism" or "vegan activists" are used to refer to anyone advocating for veganism within the Veganuary context. I do not intend to generalise beyond the movement as the full scope of vegan activism covers a highly complex tapestry of beliefs, motivations, and practices.

3.3 Research Design

3.3.1 Overview

The objective of this chapter is to examine the character and effectiveness of corporate involvement in Veganuary 2019, as well as to describe and explain the content and the sentiment of the culture wars it sparked. To deliver on these aims, a network approach is used to identify the structures of influence and audience interaction in the discussion of Veganuary 2019 on Twitter.

Thinking with networks offers an established way of understanding the social world, and a helpful spatial metaphor for theorising the place and role of social media in contemporary society. Computational network analysis builds on rich literatures in sociology which underscore the importance of social ties in influencing opinions, intentions, and behaviour, beginning in earnest with Granovetter (1973), and further literatures which trace the ways in which social structures are materialised and performed through digital media (Castells, 2009; Taffel, 2019). As noted by Yuan (2013), "network analysis provides a robust empirical approach to social structure as network ties. It turns merely metaphorical understanding of social embeddedness into a precise tool for investigating patterned relationships among actors in social networks" (p. 667).

In this chapter, I focus on the network of interactions comprising a specific discourse on Twitter. This includes any and all messages posted or exchanged between users pertaining to Veganuary on Twitter in January 2019, as detected using the search terms specified below. I chose to work with Twitter because it was the main platform used by the Veganuary organisation for the 2019 campaign. I am interested in how the practices described and contested on social media enact forms of food system governmentality with real world consequences for what people eat and what people associate with acts of eating (Alexandra E. Sexton, 2018).

The Veganuary discourse on Twitter is examined as a potential space for not only encouraging vegan consumption habits but also as an example of what Stolle and Micheletti (2013) refer to as *discursive political consumerism* — using communication and deliberation to change how people view consumption and how corporations assess social responsibility (p. 171). Messages posted on Twitter by the Veganuary organisation are considered as representing a snapshot of the organisation's attempts to inform, educate, and engage their public about why veganism is important. At the same time, Twitter users engaged with this content and its supporters, along with the

content posted by commercial entities, via the action of sharing select content to their own profiles (known as a "retweet").¹ These interactions spread the shared information to new audiences, thereby constructing a discursive environment pertaining to Veganuary which can be represented as a network. The focus of the analysis in this chapter on activist versus corporate communication on a social network also directly responds to the call made by A. Yang and Saffer (2019) to use network science and theory to "examine how digital networks of activists form online and how such networks interact with other social actors... [and] the connection between polarising ideas and discourses" (p. 6).

3.3.2 Data

The data was originally collected by Dr Bharath Ganesh, who was then working as a postdoctoral fellow at the OII. The sample was collected using Twitter's search API, as it functioned in 2019. At that time, the API took search queries, i.e., keywords, and returned a random sample of 1% of all tweets within the last seven days matching those keywords. The dataset was built by querying the API with the keywords *vegan*, *veganuary*, and *veganuary2019* four times during the month of January 2019.² A random sample of tweets containing one of any of the search terms were returned. These terms were used because they were identified as the key hashtags used by the official Veganuary account in their posts. The results of each query were combined and duplicates removed. The final dataset contains over 460k tweets. As Veganuary is a UK-based organisation, the majority of tweets are written in English and are from UK users, but there are also tweets from the US, Australia, New Zealand, Canada, Turkey, Sweden, Italy, Germany, France, and Japan.

The data collection and ensuing methodological pipeline were approved by the University of Oxford's Social Sciences and Humanities Interdivisional Research Ethics Committee (see Appendix B for the full approved CUREC application), but I would like to highlight a few key considerations. While Twitter only allows collection of tweets from public profiles, none of these users explicitly consented to having their tweets analysed for the specific academic research purpose of this paper. Instead, the users agree to Twitter's general terms and conditions when they

¹Further treatment of retweets and a comparison with other forms of user interactions afforded by Twitter is provided later in this section.

²It is important to note that the dataset only covers 1-28 January and excludes 29-31 January. At the time of analysis, it was not possible to retrieve tweets from the missing period so I acknowledge the absence of these days as a limitation of the dataset.

join the platform, and these include any academic research purpose the platform deems fit to permit. While this mode of granting permission has been construed as potentially "paternalistic" and therefore unethical (Benzon, 2019), it is standard practice for researchers to protect the anonymity of users in the Twitter samples they collect, with the exception of public figures and organisational accounts, following the framework set out by M. Williams, Burnap, and Sloan (2017). This includes refraining from publishing the names and direct tweet quotations of individual accounts. In this work, I adhere to these rules and only directly name and/or quote public figures, corporations, and organisations. Moreover, in the results section, I include examples of tweets from individual accounts which have been paraphrased so that they may not be searched and identified.

3.3.3 Method

Identifying discourse structure

To identify the dominant interactions and communities in the Veganuary discourse a retweet network is used. I choose to work with retweets because researchers have determined that of the modes of interaction on Twitter, including likes, mentions, followers, and retweets, the latter are the most reliable signal of influence spread. The following paragraphs lay out the previous research which has led to this conclusion.

The *follower* network consists of unidirectional edges defined between individuals if one of them *follows* the other. A *mention* on Twitter occurs when one user includes the username of another user in their tweet or retweet. Each bears its own implications of a user's influence over others. For example, users with many followers may not necessarily carry the same potential influence as those who are mentioned or retweeted more frequently (M. Cha et al., 2010; Kwak et al., 2010). Moreover, Twitter's algorithm routinely pushes posts from outside a user's follower network. So if one were to rely on follower networks, one would miss out on interactions resulting from these cases. Likes can also constitute a form of influence, as they indicate appreciation and signal agreement with the content conveyed in the tweet (Lipsman et al., 2012). However, it is not possible to see who has liked a given post at scale, and therefore it is not possible to construct a network of users based on this mode of interaction.

Many researchers have worked to determine which interaction provides the best indication of influence across the population of Twitter users. Most of this research uses the Merriam-Webster

dictionary's definition of influence: "the power or capacity of causing an effect in indirect or intangible ways." As M. Cha et al. (2010) admit, there is no concrete way to measure or define the force of influence on social media, despite the many sociological theories on the topic. Instead, researchers of social media networks have accepted the practice of representing influence by the interactions between users as they discuss and share information.

In the early days of research on Twitter, scholars were tempted to believe that the more followers a user had, the larger their audience base, and therefore the more influence they could yield. Kwak et al. (2010) first set out to challenge this idea by comparing the impact of the number of followers, retweets, and mentions a user has on their potential to lead others to engage with a certain act and drive information spread. They found that the number of followers, or in-degree, provides a poor reflection of influence, mostly due to the fact that a user's followers does not reliably represent the full scope of the other users who might interact with them. Instead, there results suggest that the number of retweets, due to the function retweets serve to facilitate information diffusion to different audiences (boyd, Golder, and Lotan, 2010), to be a better indication of a user's potential ability to engage others and mobilise action. The authors also found that mentions correlate with retweets but they often do not bear the same intent nor information content as retweets, i.e., mentions are mostly meant to engage others in conversation instead of spreading information. They are therefore considered to have lower influence potential. M. Cha et al. (2010) carried out similar analyses and arrived at the same conclusion.

Relatedly, Teng et al. (2016) applied the formulation of collective influence presented in Morone and Makse (2015) to Twitter networks. Generally, they found that nodes with high collective influence are those who are responsible for the most diffusion of interactions across the network by virtue of their proximity to other nodes with many neighbours, or potential audience size. When applying this concept to Twitter, Teng et al. (2016) found that operationalising influence as retweets produces the best identification of users with the top diffusion scope and out-of-network audience reach over follower-count based metrics.

In the end, researchers have arrived at the consensus that retweets are the most reliable and straightforward indication of a user's influence over others. As described by Kwak et al. (2010), *"Retweeting in a social network can serve as a powerful tool to reinforce a message [...] Individual [Twitter] users have the power to dictate which information is important and should spread by the form of retweet, which collectively determines the importance of the original tweet. In a way we are witnessing the emergence*

of collective intelligence [via the retweet mechanism]" (p. 598).³

As such, retweets have become the standard approach to measuring influence on Twitter. Further studies suggest that beyond influence, retweet interactions can be indicative of ground truth alliances and opinion trends offline (Becatti et al., 2019; Cherepnalkoski and Mozetic, 2015; Cherepnalkoski and Mozetič, 2016; Grčar et al., 2017; Laflin et al., 2013; Mastroeni, Naldi, and Vellucci, 2020; Tumasjan et al., 2010). Furthermore, retweets do not only signify influence but also membership to a specific audience. The act of retweeting another user is explicit evidence of the consumption of that user's content. It may not always mean endorsement or support, but it does indicate that the retweeting user is part of the original user's larger audience of content consumers on the platform.

As a result of this consensus in the literature, I am confident that the reliance on retweets in the present study builds on a well-established foundation of previous work in which retweets are presented as the key influence metric on Twitter. This approach enables the identification of how the discourse environment was shaped by the activity of key stakeholders (Veganuary activists and commercial entities), specifically how these users influence their audiences, and how this activity builds links between commercial audiences and Veganuary activists. This type of influence on Twitter is distinct from the object of other kinds of influence analyses, e.g., Goodman and Jaworska (2020), which compares the "influence stature" of key influencers based on the size of their digital audience. Instead, the approach of this chapter is inspired by the work of Becatti et al. (2019), who used the retweet network to extract the community structure of the target discourse, i.e., groups of users who engage with each other more than those outside their group, and thereafter signals of influence spread within it. With careful annotation, the retweet network allows us to characterise the identities and narratives of each community, as well as any conflict or controversy between them. The community structure then provides the input needed to determine how the audiences of the communities overlap.

There are many different ways to construct a retweet network. Some researchers use directed networks with edges weighted by the number of times one user retweets another (Cherepnalkoski and Mozetič, 2016), some with unweighted edges (Grčar et al., 2017), while others use undirected

³Beyond these arguments, there is also the need to address the diversity in motivations for why people retweet and what it means for deriving conclusions from analyses based on retweet measures. I save a discussion of this for the next chapter, where the retweet count of environmental activists tweets will be used as a measure of audience support and engagement. Here, the retweet is used as a structural link, connecting two users in the discourse thereby affecting the way information flows across it. For this reason, retweet motivation is less of a concern as I am most interested in whether or not it happened, not what it might imply about the retweeting user.

weighted edges (Evkoski et al., 2020). In this work, the latter is used and the retweet network is defined by connecting user A to user B if user A has retweeted a tweet originally posted by user B. This connection, or edge, is weighted by the number of times user A retweeted user B and is undirected. In the case that users A and B retweet each other, the edges are summed.

By using undirected edges, I neglect the ways in which the status of users might affect their retweet count and instead focus on detecting potentially shared interests. Such undirected retweet networks have proven useful for identifying communities of users who share common views (Evkoski et al., 2020), which is the primary focus of this work. Undirected networks are less useful for providing additional measures of individual influence beyond retweet count, which rely on in- and out-degree ratios. As such measurements are not necessary for the present research agenda, the undirected network is more appropriate.

Moreover, I exclude the first-level network *leaves*, i.e., the users in the network that only connect to one other user. These users interact just once with the discourse and as such this one-off engagement is not viewed as significantly active or impactful, therefore removing them helps more meaningful interactions to stand out (Mastroeni, Naldi, and Vellucci, 2020). The resulting network yields an overview of who retweeted whom within the sample, and with what frequency. As I am interested in identifying the community structure of the network, a community detection analysis using the Louvain algorithm is implemented (Blondel et al., 2008). This algorithm operates by iteratively optimising the Newman-Girvan modularity of the network, meaning the clusters of users connect more between each other than with users from other clusters (M. E. J. Newman, 2006). The process to determine this optimisation consists of two steps. In the first step, changes in each community are made to optimise internal modularity. Then, a new network is built that consists of one node for each previously found community. The algorithm repeats the iterations until the first phase can make no further improvements in modularity. Ten rounds of the community detection are performed to ascertain the stability of the community allocation. Less than 0.1% of nodes change membership across the rounds so I conclude that the detection algorithm is stable.

Based on this community detection, I calculate the modularity and assortativity of the network. Modularity provides an indication of how polarised the communities in the network are and assortativity quantifies the extent to which nodes preferentially attach to nodes similar to them. Formally, modularity is defined as the ratio between the fraction of edges that fall between

the network communities and the fraction one would expect if edges were distributed randomly (Blondel et al., 2008; Brandes et al., 2008). It is calculated using the formula given in the following equation:

$$Q = \frac{1}{2m} \sum_{i,j} [A_{ij} - \frac{k_i k_j}{2m}] \delta(c_i, c_j) \quad (3.1)$$

where A_{ij} is a matrix containing the weight of the edge between nodes i and j (in this case, the number of times each pair of users retweeted one another), $k_i = \sum_j A_{ij}$ is the sum of the weights of the edges attached to node i (i.e., the number of retweet interactions each node is involved in), c_i is the community to which node i belongs, the function $\delta(u, v)$ is 1 if u and v are in the same community and -1 otherwise, and $m = \frac{1}{2} \sum_{i,j} A_{ij}$. Modularity is increased by edges falling within communities and lowered by edges falling between communities. This value reflects the extent to which communities in a given network are connected to one another. It can take on values between [-1, 1], with positive values closer to 1 indicating stronger separation between communities. This measure is routinely used as an approximation for the polarisation of a network (Conover et al., 2011; Garimella and I. Weber, 2017; Porter, Onnela, and Mucha, 2009; Waugh et al., 2009).

However, this measure is also known to be misleading for large networks and is not robust to several sampling biases (Shizuka and Farine, 2016). As such, I complement the modularity score with a measurement of the attribute assortativity of the network based on the detected community structure. Attribute assortativity is defined as a correlation coefficient that measures the association patterns between different types of nodes based on a given attribute of interest (M. E. J. Newman, 2002; M. E. J. Newman, 2003). It is calculated using the formula given in the next equation:

$$r = \frac{\sum_i e_{ij} - \sum_i a_i b_i}{1 - \sum_i a_i b_i} = \frac{\text{Trace}(\mathbf{e}) - \|\mathbf{e}^2\|}{1 - \|\mathbf{e}^2\|} \quad (3.2)$$

where e_{ij} is the fraction of edges that connect a node with attribute type i to attribute type j , a_i and b_i correspond to the fraction of each type of end of an edge that is attached to nodes with attribute type i , \mathbf{e} corresponds to the matrix whose elements are e_{ij} , and $\|\mathbf{e}\|$ is the sum of all elements in e . As such, it takes on values between [-1, 1], where positive values indicate a stronger tendency for nodes to connect with nodes which are similar to them in some way, a phenomenon commonly referred to as homophily (McPherson, Smith-Lovin, and Cook, 2001), while negative values indicate the absence of this. Homophily has been found in several social

networks including climate discourse on social media (H. Williams et al., 2015), and it is commonly utilised in investigations of echo chambers and polarisation (Baumann et al., 2020; Bessi et al., 2015; Blex and Yasseri, 2022; Cinelli et al., 2021; Karimi et al., 2018; E. Lee et al., 2019; Sayama, 2020; Singh et al., 2012). In the retweet network here, the network's attribute assortativity is diagnosed in terms of the community identities provided by the community detection algorithm. In doing so, assortativity is not assessed based on some qualitative feature of the nodes but rather on their connections to other nodes, i.e., their interactions with certain kinds of information or narratives.

To ascertain the robustness of the modularity and assortativity measures, 100 random networks are simulated with the same number of nodes and edges as the retweet network, community detection is performed, and the resulting modularity and assortativity scores are calculated. The simulations generate a confidence interval for the scores in random graphs against which to compare the values observed in the Vegauary 2019 network. If the confidence interval does not contain the observed values, it is possible to conclude that the observed values are not the result of chance and therefore indicates significant modularity and/or assortativity in the network. With this validation, the modularity and assortativity scores provide a compelling diagnosis of the extent to which the retweet network is divided into distinct communities of users engaging with similar topics and ideas.

Labelling the communities

To determine the themes and narratives active in each community, random samples of 200 tweets were examined for each community containing more than 1% of total retweets. This threshold is chosen after discovering that communities smaller than this tended to be much more incoherent and random than the larger communities. It has also been used in previous work examining retweet networks (Stewart, Arif, and Starbird, 2018). The original dataset was collected without the intention to analyse tweet content and as such, the tweets have been truncated at 140 characters even though many extend beyond to an upper limit of 280 characters. Therefore, if the tweets in the samples extended beyond the truncation point, the full text was retrieved using either the Twitter Intelligence Tool (TWINT)⁴ (and then re-verified later with the Twitter Academic Research API as TWINT is not an officially licensed Twitter research tool).

⁴<https://github.com/twintproject/twint>

In the first instance, the tweets were coded generally as pro-Veganuary, anti-Veganuary, and/or representing commercial engagement. However, it soon became apparent that there would be a need to be more specific in these annotations. First, there is a) both commercial promotion of vegan brands and products specifically tied to the Veganuary initiative, and b) commercial content unrelated to the initiative, e.g., promotions of vegan brands and products that run at all times of year. This happens most likely due to the inclusion of vegan in the search criteria which returns both content relevant to Veganuary, particularly the GVSR, but also many semi-false positives: content related to veganism in general but not related to Veganuary. This content is kept within the sample because it is still related to the discourse on veganism and as such, it is helpful to know if the users promoting it interact with the core Veganuary discourse.

Thus, I use Veganuary-commercial (*VPromo*) and generic-commercial (*Promo*) labels to differentiate the two types of commercial content. Within the pro-vegan activist content, there are posts defending veganism against the criticism it receives (labelled *Defence*) as well as some aggression from vegans against non-vegans and vegan critics (labelled *Vegan aggression*). I also differentiate the explicitly pro-vegan activism (*Pro*) from other more random posts mentioning veganism (*Other*). While there is a range of additional types of vegan activism in the sample, reflecting the diversity of types of vegan activism offline, they are all concentrated in a single community (*Pro*). Therefore, I do not attempt to further classify the strands of activism as it is of stronger interest to identify how communities of significantly different ideologies and/or intentions interact in the network.

Moreover, there is a significant portion of posts dedicated solely to commentary and debate on the Greggs' vegan sausage roll (GVSR) which often differs in nature and intent from other posts. As such, I differentiate the GVSR content from the other categories. These posts range from positive sentiment generally in support of the GVSR to more negative sentiment, either against the GVSR or defending the GVSR against its critics. I use the label *GVSR+* for more positive (in terms of valence) GVSR-focused tweets and *GVSR-* for more negative GVSR-focused tweets.

Once the labelling framework was finalised, I began the annotations. For each tweet, I manually recorded which label best applied. Many tweets were simply direct re-postings of the original source tweet without any additional commentary. However, some are what the platform refers to as "quote retweets", where the retweeting user can add additional content to their sharing of

another user’s tweet (Twitter, 2023a). For such posts, the text of both the original tweet and the additional text from the quote retweet are considered in determining the annotation. Once all tweets per community have been labelled, I counted how many times each label occurs in the sample for each community. A community is then given a name representing the label with the highest score, i.e., the one that is most frequent among the sampled tweets of that community. Table 3.1 shows the results of this process, while Table 3.2 includes examples of tweets associated with each community. The antagonist communities vary in terms of focus, primarily in line with Piers Morgan against 1) veganism and the GVSR, 2) discussing vegan conspiracy theories, 3) complaining about the poor accessibility of vegan diets, and 4) denigrating vegans. As such, I further specify the prevailing focus of each of these communities in the label.

TABLE 3.1: Results of the labelling process for the 200 randomly selected tweets per community.

Community name	Pro	Vegan aggression	aggression	Vegan defence	de-	Anti-vegan	GVSR-	GVSR+	Veganuary commercial	Generic commercial	News	Other
Core Support	157	0		0		0	4	4	16	11	1	7
VPromo1	4	0		3		1	1	5	113	66	4	3
VPromo2	7	0		0		1	3	5	102	73	2	7
GVSR+	10	2		6		6	65	78	3	13	1	16
GVSR-	11	2		9		12	109	10	12	19	6	10
Access/Trolls	45	2		20		83	4	1	1	15	0	29
Piers Morgan	4	5		4		85	13	16	6	5	29	33
Conspiracies	9	0		5		154	2	3	1	2	11	13
News	19	0		0		9	0	9	14	18	114	17
Promo1	5	0		0		1	1	2	26	143	4	18
Promo2	18	3		10		8	9	12	21	71	8	40
Mixed	33	15		26		11	4	7	28	16	0	60

Note: Labels are listed in the first row. Communities are listed by name in the first column. *Core support* = primary Veganuary activism, *VPromo1/2* = commercial engagement explicitly tied to Veganuary, *GVSR+* = supportive/positive of GVSR, *GVSR-* = disparaging/insulting the GVSR, *Access/Trolls* = antagonist community focusing on low accessibility of veganism and denigrating vegans, *Piers Morgan* = antagonist community led by Piers Morgan and his attacks on the GVSR and vegans, *Conspiracies* = antagonist community espousing various malevolent conspiracies behind veganism, *Promo1/2* = commercial engagement not explicitly tied to Veganuary, *News* = community of news outlets sharing articles related to Veganuary/veganism, *Mixed* = community of random comments about veganism.

Detecting audience structure

The retweet network analysis allows for the identification of discourse stakeholders, their communities and the narratives they propagated, as well as any polarisation or conflict between the communities. The second part of the analysis builds on the initial discourse mapping to uncover the extent to which the audiences consuming information via retweet in the network overlap, an

TABLE 3.2: Example tweets for each label.

Label	Example Tweet
Pro-Veganuary	Animals' lives, your health, the planet—how many reasons to go vegan do you need? #NewYearNewVegan #NewYearsEve #Veganuary
Defense	Y'all are mad when animals go extinct but won't go vegan?
Vegan aggression	Oh look, four years later living on a plant-based diet and I'm still alive. IMAGINE THAT, f*ckers. #vegan
GVSR+	Not sure what people's problem is with @GreggsOfficial doing a vegan sausage roll. It's not replacing the regular one.
GVSR-	The f*ckwits that like to call you a "snowflake" are blockading a Gregg's in Manchester for selling vegan sausage rolls.
News	Which vegan milk is best for environment? @BBCScienceNews
Veganuary commercial	FOLLOW & RT to enter our #competition this #Veganuary You could #WIN this bundle of #Sriracha Mayo goodies! #FreebeeFriday
Generic commercial	Tomato Curry with Coconut Rice is #RecipeOfTheDay and it's glorious. It also happens to be easy, speedy and #vegan
Antagonist - Piers Morgan	Good Morning Britain - the vegan resistance starts today!
Antagonist - Access/Trolls	...Will this challenge be accompanied by Beyoncé and Jay Z vegan money...
Antagonist - Conspiracies	Why do processed food giant like Nestle/Kellogg/Pepsi support the push to make the world vegan (by EATLancet etc). Bc their foods ARE vegan: vast majority of cookies, crackers, chips etc in supermarkets are made from: wheat, corn, soy, vegetable oils, sugars and salt.
Other	Imagine having an all vegan family; is cocaine vegan

indicator of reciprocal engagement, specifically between the activist and commercial communities. This analysis indicates the degree to which posts of the users in these communities were consumed by the same sets of other users. Observing strong overlap here would constitute evidence that the audiences of the two communities are unified, i.e., that the commercial audiences also engaged with the Veganuary activists. If not, it would suggest that commercial engagement failed to drive its audience to engage with the activist core of the Veganuary campaign.

In order to measure this, a network projection analysis inspired by Becatti et al. (2019) is performed. That work presents a bipartite projection model for extracting influence dynamics of the political discourse on Twitter leading up to the 2018 general elections in Italy. They use the method to identify signals of influence and political alliances between sets of politicians indicated by their shared audiences using a framework established by Saracco, Di Clemente, et al. (2015) and Saracco, Straka, et al. (2017). While I am interested in identifying these ideological fault lines in the Veganuary case, higher priority is placed on comparing the ways in which interactions may or may not spread from commercial engagement to other parts of the discourse. This is what the projection network accomplishes beyond the retweet network and why it is an appropriate method to use for the objective of this analysis.⁵

⁵A similar projection method has also been applied to studies of audience fragmentation of news media audiences, as included in the work of Mukerjee, Majó-Vázquez, and González-Bailón (2018). The authors emphasise the advantage

The method requires first building an undirected bipartite network between the primary content producers and consumers in the data set. A bipartite network defines interactions between two mutually exclusive sets of users. In this case, these groups are the most popular users (those who received the most amount of retweets) per community and the users who retweet them.

A bipartite network contains two independent and disjoint sets of nodes, represented as $G = (U, V, E)$ where U and V are the sets of nodes and E is the set of edges. Sometimes these node sets are also referred to as the layers of the network. Moreover, edges can only exist between nodes of different layers, not between nodes of the same layer. In Becatti et al. (2019), the two layers of nodes are the content-producing and content-consuming users contained in their dataset. An edge exists between a content-producing user and a content-consuming user if the latter has retweeted the former. Retweets between producing users are not included, nor are those between consuming users.

Next, the bipartite network is projected onto the producing users layer to produce a weighted monopartite network of producing users, wherein the users share an edge if they have been retweeted by the same consuming users. Thus, two nodes in the projection are seen as equivalent not by the existence of an edge between them in the retweet network, but due to a strong overlap between their audiences.

Fig 3.2 depicts an example. The network on the left is a bipartite network with consuming users on the top layer and producing users on the bottom layer. Edges between users on the different layers signify that the consuming user has retweeted one or more posts of the producing user. For example, User a has retweeted User e , User b has retweeted Users e , f , and g , and so on. The network on the right is the monopartite network which results from projecting the bipartite network onto the producing users layer. The edges here connect the users who have been retweeted by the same users, implying that they have a shared audience of users. In this example, Users e , f , and g have been retweeted by the same users, while Users g and h share a different set of common retweeting users.

Popular users are defined as all those who received more than 1% of the sum total of retweets per community. Retweets are used as an indicator of popularity and influence due to the established use of this variable for such purposes in the literature (as described above). This approach preserves both globally and locally influential users. Thus, the projection is not biased towards

of studying audience overlap networks over those indicating audience reach alone for measuring polarisation and fragmentation in communication networks. Their work provides further evidence of the utility of such an approach to communication studies generally and the suitability of it for this case study in particular.

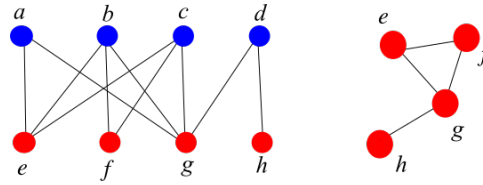


FIGURE 3.2: Example bipartite network and resulting projection.

The bipartite network is on the left: content-consuming users on the top layer, content-producing users on the bottom layer. The projection onto the content-producing users is shown on the right.

globally popular users as it would be if I was to take the top retweeted users over the full dataset. Doing so would obfuscate potentially important alliances between users in larger and smaller communities because those in smaller communities have a lower chance of being included in the top 1% of overall popular users.

Once the relevant users for each community have been identified, the bipartite network containing all of their interactions with other users in the dataset is extracted. Then, the statistically-validated projection from this bipartite network is built, and community detection is carried out on the resulting monopartite network. I take the same steps to validate these results as done for the retweet network. Next, the composition of each projection community in terms of the original retweet network communities is calculated. These results allow us to identify the common audiences shared by the users driving the discourse.

As discussed in Mukerjee, Majó-Vázquez, and González-Bailón (2018), a major challenge in constructing meaningful and sensible audience overlap networks is determining which connections are statistically significant. The projection method used here does so by filtering out statistically insignificant edges using an entropy-based approach that prioritises overlaps between users which cannot be explained by the raw number of tweets users post alone. This benchmark was initially presented in Saracco, Di Clemente, et al. (2015) and Saracco, Straka, et al. (2017), and subsequently refined in Bovet and Makse (2019) and Bruno, Lambiotte, and Saracco (2022) for application to audience overlap and influence detection on retweet networks. More specifically, once the network has been projected to the selected layer, the algorithm determines the statistical likelihood of an edge existing in an entropy-based null model with the same number of nodes but variable number of edges, proceeding from an empty network to the fully connected one, via all possible link configurations. The null model maximises the entropy of the system, constraining the degree sequence of the two layers in order to discount retweet contributions resulting only

from the activity of the users. This is done to avoid favouring users who post a lot, therefore receiving potentially more retweets overall, but having less influential retweets than users who may post less often but receive more retweets per individual post. The result is a probability distribution over all edges in the network, which can be interpreted as the independent probability of existence per edge. Per Saracco, Straka, et al. (2017), the p-value of each edge is then calculated using a Poisson distribution and only those below a given significance threshold are maintained to build the projection.

The publicly available `bicm` package for Python was written to implement the bipartite projection model for this purpose. The model's default presets are used to construct the projection, specifically a p-value value of 0.05 for the statistical testing of projected edges.

An alternative approach for selecting which nodes to use to build the projection would have been to take the same number of users per community, e.g., the top n most popular users. I implemented this approach with various values of n but could derive no theoretical criteria with which to rank or compare the resulting projections. As such, I decided that the most informative and sensible projection would be the one built from the same share of popularity per community, controlling for each community's contribution to retweet volume and therefore, aggregate influence. However, the results of forming the projection with the top 10, 20, 30, 40, and 50 users per community are compared and the results are robust.

Moreover, I use one final check of the projection results with 50 simulations of Erdős-Renyi random networks using random samples of the same number of users per community as in the projection built according to the logic described above. These simulations resulted in only empty projections so I also tried doubling the number of nodes sampled per community. These additional simulations all also yielded empty projections. This happens because the projection is predicated on the presence of V-motifs in the bipartite network of producing users and consuming users. A V-motif connects users on the consuming side via a mutual connection to the producing side. An empty projection tells us that none of the V-motifs found in the bipartite network, if there are any, are statistically likely to be present beyond random chance. As such, I conclude that the results of the original projection identify statistically significant audiences within the sample and the information production-consumption relations in the discourse.

3.3.4 Limitations

Limitations of the Twitter sample

The analysis conducted in this chapter only pertains to the 2019 Veganuary discourse and no subsequent year. I focused on this year because of the *EAT-Lancet* report and the dramatic yet insightful event of the GVSR, but a natural extension of the work would be to examine the discourse in subsequent years tracing the arc of increased environmental activism which began in late 2018, and continues to the present day with the Fridays for Future youth protest movement and further scientific work emphasising the role of the commercial meat industry on carbon emissions. The coronavirus pandemic also caused disruption to environmental activism, both on and offline (Haßler et al., 2021; Kunelius, 2020; Lyytimäki et al., 2020). The plummeting of carbon emissions as global trade and international travel came to near standstill during the lockdowns made clear the impacts of global consumption on climate change, and encouraged many governments to incorporate sustainable development into economic rebuilding plans post-lockdown (Hernandez, 2020; Tollefson, 2021; Plumer, 2020). Thus, comparisons between the 2019 Veganuary discourse and that of later years could yield interesting insights regarding the nature of these shifts in the intersection of vegan and environmental activism post-pandemic.

The focus on Twitter exclusively is limiting as the platform does not represent the global social media discourse on climate-diet issues. The data was also collected using the Twitter Search API as it behaved in 2019 (Twitter, 2023b). This version of the API only permitted access to 1% of the full scope of results for a given search query. The new Academic Research API was launched in January 2021, which gave academic researchers virtually unlimited access to search the Twitter archive (and which was used to collect the Twitter data for the project presented in Chapter 4). Because the collection and subsequent analysis all happened before the new API was available, the Veganuary dataset is limited to a random sample of the full discourse. As mentioned in the Data section, the sample also only includes 1-28 January, and not the last three days of the month. Additionally, there is evidence to believe that samples of discourses taken via the Twitter Search API may not be truly random (Morstatter, Pfeffer, H. Liu, and Carley, 2013; Morstatter, Pfeffer, and H. Liu, 2014; Pfeffer, Mayer, and Morstatter, 2018). Therefore, it is possible that the sample excludes elements of the discourse. It was unfortunately beyond my capacity in terms of time and computational power to recollect the data and re-run the analyses using the Academic API once it was launched. It is also possible that the search terms were not able to capture all tweets related

to Veganuary, i.e., it is possible that someone tweeted about the campaign without explicitly mentioning any of the search terms. I do not think this is highly likely but is still not beyond the realm of possibility.

While the Veganuary campaign strives to reach a global audience, the majority of the discourse reflected the UK and US context. This was exacerbated by the vegan sausage roll launch as Greggs' is a UK bakery chain and this likely decreases its relevance to a global audience. However, while the sample included no geolocation data about the users, there are tweets in many different languages, suggesting the reach of the campaign to communities beyond the English-speaking UK populace. Nonetheless, while the US and UK are known to share relatively similar views on policies to restrict meat eating (Dechezleprêtre et al., 2022), the work cannot speak to how pro-vegan campaigns might unfold in other countries and future work will be necessary to determine how the results generalise to additional contexts.

Limitations of the methodological framework

In addition, this method only considered retweets, which excludes the interaction signals that could be extracted from other interaction forms, e.g., mentions and replies. However, as discussed previously in this section, I am confident that retweets capture the most important interaction networks in the discourse. Nonetheless, none of the mineable interaction types (i.e., those for which it is possible to automatically collect the source and target users: retweets, mentions, and replies) can capture influence manifested by likes or passive consumption of content. For example, a user can be affected by a tweet without interacting with it in a way that we cannot track automatically. This is an unfortunate limitation of all social media analyses working with trace data.

Moreover, there is reason to suspect that not all retweets are created the same or represent the same thing for every retweeter. There has been some survey work to categorise the diversity of retweet motivations: Metaxas et al. (2015) surveyed a sample of 316 Twitter users in the authors' professional and social circles (US-based) about their retweet habits and motivations agnostic of topic context; Majmundar et al. (2018) surveyed retweet motivation in a sample of 915 Twitter users active in a discourse related to the use of tobacco products alongside 518 randomly-selected users (again, US-based); and Abdullah et al. (2017) examined retweet motivations among Twitter users active the discourse related to the 2011 Great East Japan Earthquake. In each of these studies, all aimed at different portions of the Twitter audience and in different topic contexts,

the authors found the intention to indicate approval of, agreement with, and commentary on the importance of the original tweet, along with trust in the message and its author, as a primary dimension of retweet motivation. Nonetheless, the users examined these studies were limited to small samples (less than 1000 participants) of mostly US users (with the exception of Abdullah et al. which examined a sample of Japanese users) and were all conducted at least five years ago. It is therefore not known how retweet motivation may differ in more recent samples with more geographic and cultural diversity, nor how stable this categorisation may be across environmental discourses. However, the fact that each survey independently identified the motivation of sharing the information because they think it is important and/or agree with it suggests some stability of it generally.

Additionally, the algorithm to curate users' newsfeeds on Twitter is largely unknown to outsiders. We do know, however, that it is designed to be tailored to the content that a user has interacted with in the past (i.e., to match what the platform infers to be the user's "interests") as well as to overall boost engagement with the platform (Twitter, 2023b; Huszár et al., 2022). Therefore, the likelihood of retweeting is also affected by the probability that the user comes across the content in the first place. Retweeting is therefore an "algorithmically confounded behaviour" (Salganik, 2017): What we see on Twitter is determined in large part by what the platform predicts we want to see. This is a major reason for why studying social media is so intriguing but also why studies of social media behaviours cannot be taken as direct indicators of offline reality. As previously noted, many studies have found various patterns of social media interactions to be able to reflect certain offline truths, but these must still be interpreted and generalised with caution.

Finally, the projection method used to identify audience overlap between communities in the retweet network cannot tell us definitively about the sequence or causality of interactions. It can only tell us if such mutual interactions occurred. This is necessary to establish the existence (or absence) of mutual interaction, but it is not sufficient for determining the sequence in which the interactions may have occurred. Conducting temporal cross-correlation analysis would be one way to further investigate this (as done in Bovet and Makse (2019)), but it still could not provide causal inference as to the directionality of cross-community interactions (or the lack thereof). In any case, the projection approach is an advancement beyond the standard retweet network as it allows us to establish whether or not the audiences of distinct communities overlapped in the discourse.

TABLE 3.3: Descriptive table of the top 12 communities in the retweet network.

Name	Description	Users	Retweets
GVSR-	Mixture of GVSR content with anti-vegan jokes and criticism of consumer activism	0.15	0.14
Core support	Veganuary-specific advocacy and engagement	0.14	0.22
GVSR+	GVSR commentary and other plant-based options in big food chains	0.14	0.12
Access/Trolls	General mixture of jokes and hate aimed at vegans, particularly for perceived elitism. Some vegan defense and aggression in return.	0.10	0.18
Mixed	Mixture of vegan activism (19%), Veganuary commercial promotions (16%), vegan defense (14.5%), aggression towards non-vegans and critics (9%), with many random posts (22.5%) tangentially mentioning veganism	0.10	0.09
Piers Morgan	Attacks on Veganuary and GVSR led by Piers Morgan	0.07	0.09
VPromo1	Vegan bloggers and influencers	0.04	0.03
News	Reporting on topics related to Veganuary: GVSR controversy, the carbon footprint of vegan vs meat diets, questioning the sustainability of vegan diets, recipes and guides	0.03	0.04
Conspiracies	Claims of corruption and conspiracy behind veganism and climate-diet science	0.03	0.02
Promo1	Brands and bloggers promoting vegan products	0.03	0.02
Promo2	Mixture of vegan recipe sharing and product promotion, little specific to Veganuary	0.01	0.01
VPromo2	Restaurants and brands promoting vegan specials for Veganuary	0.01	0.01

Note: Columns include the name given to each community, a qualitative description, proportion of unique users in the network, and proportion of number of the total volume of retweets received by users in the community.

3.4 Results

3.4.1 Polarisation and contention

Table 3.3 provides the name and descriptions of each of the largest twelve communities, including the proportion of the dataset they comprise in terms of retweets and users.

The discourse breaks down into communities comprising four main themes: Veganuary activism, antagonism, commercial engagement, and GVSR discussion. The *Core Support* community comprises the bulk of activists in the discourse. It includes the official Veganuary account, regional PETA accounts and other prominent animal charities, and other vegan advocates, most of whom are normal individual users (i.e., non-public figures). The main objective of the posts in

this community is to open up conversation about veganism with the greater Twitter user base and raise awareness about the movement, e.g.,

"Why did you go #vegan? Respond in the comments and retweet. #veganism #veganhour #VeganTuesday #HealthyLiving"

*"Thank you to all who have committed to #Veganuary
We all have our own journeys but if you want to hear some of ours, tune into our podcast #itallveganwithfriends where we hope to inspire you to go further and most importantly to not stop being #vegan"*

Some users post about the benefits of going vegan, along with their favourite vegan products, recipes, and restaurants. For example,

"HEALTHY VEGAN SHOPPING LIST: for anyone who's just starting a vegan journey or needs grocery inspo! Hope this helps"

"If you want a simple and easy to read guide to veganism then check this out! Happy veganuary!"

Others focus on emphasising the cruelty of the meat industry, for animals and the environment, along with the detrimental side effects on personal health, e.g.,

"Going vegan has only positive outcomes! Good for you, good for animals, good for the planet! #vegan"

There are also tweets defending Veganuary and its supporters, refuting challenges and criticisms, e.g.,

"I hate vegans' means 'I hate being reminded of the torture, exploitation, & murder that I facilitate when I eat meat'"

"I'd go vegan but it's too expensive' says someone who spends \$5 on a latte & buys meat fast food weekly."

There is also a small but noticeable volume of attacks against non-vegans and vegan critics for not doing enough to save the planet or to protect animals. There is even evidence of vegan

infighting, i.e., certain vegans claiming that other vegans are not "true vegans" if they are not vegan for the right reasons. This echoes Neuman (2020)'s studies of collective boundary building between different understandings of vegetarianism and veganism, as well as Greenebaum (2012)'s study of vegan identity and authenticity, specifically the tendency of ethical vegans to differentiate themselves from health and environmental vegans, who they see as being "not sufficiently vegan." For example,

"If you didn't go vegan to save animals, you aren't vegan, you're plant-based. Change my mind."

"ok idc [I don't care] if this is controversial but veganism is a lifestyle, not a diet! if you're not vegan in all your choices, then you're not really vegan."

The Veganuary-related promotional communities (*VPromo*) include influencers, bloggers, and several brands sharing recipes and promotions for vegan products (ranging from food, clothes, cleaning supplies, and cosmetics) via competitions and giveaways. For example,

"Oh, have we got a #veganuary deal for you! Just follow and RT to WIN four tubs of our delicious #dairyfree fudge! We'll pick the winner on Friday. GO! #FreeFudgeFriday"

These *VPromo* communities differ from those labelled simply *Promo* as the latter are not tied to Veganuary, but constitute more generic promotion of vegan products which could happen at any time of year, e.g.,

"#Vegamaro is the 1st #vegan #negroamaro #wine in the world. #FeudidiGuagnano"

There is a much wider variety of communities antagonistic to Veganuary in the discourse. The largest antagonist community, *Access/Trolls*, includes criticism and debate about the elitism and inaccessibility of vegan diets. This speaks to what Goodman and Jaworska (2020) find in their study of so-called "good food" influencers on Twitter – many of whom promote vegan or otherwise plant-based diets – specifically with respect to how these influencers reinforce the image of veganism and other "good food" diets as privileged to the white, hetero-normative, and socio-economic middle- and upper-classes. It also includes a significant volume of general insults targeted at vegans. For example,

"Stop arguing about veganism in my mentions pls until a whole vegan meal can be cheaper than fast food don't pressure people w low incomes to go full vegan that's it that's my point that's all"

"You feel better eating vegan/vegetarian because you didn't eat any vegetables before, Karen"

*"lol [laugh out loud] we don't all want to be vegan and drink soy milk gosh please stfu [shut the f*ck up]"*

Some of the criticisms here also focus on the involvement of big corporations with the Veganuary campaign, and echo arguments made in the literature against "Big Veganism", specifically about how it is not intrinsically free of exploitation, nor does it automatically guarantee a lower carbon footprint. For example, the following tweet captures this theme:

*"When corporations start paying workers a proper wage and give them benefits then I'll try f*cking veganism. There's human exploitation and cruelty in veganism, prove me wrong"*

Another antagonist community, *Conspiracies*, focuses on contradicting the health and environmental benefits of vegan diets. Users in this community include a diverse range of nutritionists, food journalists, and far-right enthusiasts. They claim that veganism is part of a conspiracy led by left-wing politicians, large food corporations, and scientists, and that a lot of it, especially commercial participation, is elitist and insincere. They also tie Veganuary to the 2019 EAT-Lancet report, which served as a key focus point for conspiracy theorists in the discourse. Critics in this group claim that the report is corrupt, and that "real" science finds that a vegan diet is detrimental to both one's personal health and the environment. Most of this kind of criticism appears to be levied at "junk food vegan" products, i.e., highly processed products made from artificial ingredients to look and taste like meat. The examples below illustrate these points:

"More of the same vegan propaganda supported by big food companies, making low nutritional foods, and and big pharma, making bank from consequential declining health through usual propagandist @guardian never questioning the always bad science #yes2meat"

"Activists for animal rights have infiltrated environmental and nutrition science... all getting money from big food and vegan elite who prefer to blame cows then their own private jets and corporate empires for climate change and fast food for poor health"

This denial of climate-diet science and calling into question the intentions of its practitioners is reminiscent of previous studies that demonstrate how the popularisation of science can be weaponised to erode public faith in its findings (Gunnarsson and Elam, 2012).

The most striking antagonist community surrounds Piers Morgan and his attacks on Veganuary and the GVSR. Users in this community include UK Conservative party pundits, farmer unions, QAnon enthusiasts and Trump supporters, and the account for the Russian Embassy in the US. The main narratives of these users were initially made in response to the GVSR but expanded to include general criticism of vegans for their perceived hostility, radicalism, and hypocritical virtue signalling. Morgan's right wing political stance and his ridiculing of vegans as "snowflakes" and "PC-crazed" liberals, attracted several posts from right-wing politicians, journalists, and commentators who joined the discourse to criticise veganism for its association with left-wing politics. In addition, Morgan claimed that vegan diets are actually more harmful to the environment than meat-based diets, due to the plastic packaging vegan items require, and as such implies that the narrative of veganism for climate change is a hoax. The tweets below illustrate, the first is from Morgan himself:

"I only moan about PC-crazed, gender-fluid obsessed, radical vegan/feminist snowflakes slowly wrecking the Planet. Whilst eating obesity-inducing crisps from environment-destroying plastic packets."

"Just ate a grass-fed rib eye steak. This makes me #vegan by proxy. #ClimateHoax"

"How to make a Vegan roll: Push the rose-eating, veg worshipping, flower chomping snowflake down a mountain #vegansausageroll"

"These militant idiots are damaging the #vegan cause more than anyone else"

*"I think I'll stay on twitter another week then f*ck it off. It's only vegan c*nts on about Brexit"*

Finally, two of the largest communities in the network are dominated by discussion of the GVSR. Both of the GVSR-dominated communities display what I refer to as a *defender effect* characterised by posts focused on defending the GVSR and veganism. The first community does so using ridicule and sarcasm in response to the criticism aimed at the GVSR and Veganuary. As such, it is labelled *GVSR-* because it is dominated by crude, aggressive, and even violent language from both critics and defenders. For example, this community contains several users attempting

to defend vegans and the GVSR by condemning the attackers' arguments. Many of these users openly state that they are not vegan but that they would stand up for people's right to eat what they want. Their tone matches the vitriol they perceive in the anti-GVSR/vegan rhetoric. Some also flag the extent to which right-wing British politicians, and specifically supporters of Brexit became offended by a vegan sausage roll, in comparison with other issues, as the primary locus of their criticism. For example,

"Has anyone compared the set of men outraged about the Greggs vegan roll and Brexit voters? They are surely the same people."

"I'm definitely not vegan, but I don't get the problem... some people in the UK are vegan, it's their right to choose their diet, why shouldn't a company like GreggsOfficial cater to them? There must be more pressing issues to get worked up about?"

The second GVSR community, GVSR+, is generally more positive. Users post about their desire to try the GVSR, their surprise about how good it is, and support for the idea of large franchises offering vegan options. There are also users exhibiting the defender effect by making jokes about the criticism it is receiving. Many of these users are not vegans themselves, but rather enjoy making fun of the people upset about the GVSR and veganism. Overall, while this community does contain some negative posts, the majority are more lighthearted and less vitriolic than those found in GVSR-. For example,

"I seriously want to try a vegan sausage roll, and yes, I know this means the marketing team at GreggsOfficial has roped me in"

"Greggs vegan sausage rolls taste like food and communism"

Moreover, when controlling for the number of posts each user contributed to the sample, users from the antagonist and GVSR- communities have the highest ratios of retweets per unique tweet. The top ten are listed along with their community labels in Table 3.4. With the exception of the account for the BBC TV show *Have I Got News For You* (handle *haveigotnews*), all the top accounts are normal individual users, i.e., neither belonging to an organisation nor verified nor otherwise prominent public figures. In terms of communities, 6 out of 10 belong to antagonist communities, 4 to the GVSR communities, and 0 from the pro-Veganuary communities. In fact, among users in the top 1% in terms of the retweet-to-tweet ratio, 42% come from the GVSR communities, 35%

from the antagonists, and just 5% from the core activist community. The first public figure or celebrity to occur in this ranking is Piers Morgan in place 36, followed by Gordon Ramsay in place 50.

TABLE 3.4: Users with top 10 ratios of retweets per tweet posted with community label.

Username	Community	RT per tweet
codyko	Access/Trolls	6537
haveigotnews	GVS-	5983
Cleverdics	Piers Morgan	5313
triviamons	Access/Trolls	4667
MikeStuchbery_	GVS-	4578
micahscotttt	GVS+	4128
Flashy_Words	Access/Trolls	3576
hexprax	Access/Trolls	3147
CupcakKe_rapper	Access/Trolls	2999
Fourens_	GVS+	2795

Note: Five users are in the antagonist community comprised of accessibility criticisms and trolling, two belong to each the negative GVS and positive GVS communities, and the final user is in the antagonist Piers Morgan community.

Five users are in the antagonist community made up of accessibility criticisms and trolling, two each belong to the negative GVS and positive GVS communities, and the final user is in the antagonist Piers Morgan community. The combination of the skew of the distribution of this metric towards users in the antagonist and GVS communities, along with the lack of public figures amongst the users with the highest ratings is striking.

3.4.2 Audience separation

Next, I discuss the results of the audience analysis. The monopartite graph, in which the most popular producer users are connected to one another if they have been retweeted by the same consumer users, contains 141 nodes and 996 edges. Fig 3.3 visualises the network.

Community detection to determine the extent to which the audiences of the communities in the discourse overlap, i.e., the relative magnitudes of which users tend to be retweeted by the same people, reveals ten communities. The modularity score of the network is 0.54. Based on the evaluations of modularity across various social media networks in Guerra et al. (2013), this value suggests high modularity for a social network. The same robustness checks as were performed for the modularity calculations in the retweet network are not undertaken here because the size of the projection is much smaller and therefore less likely to be biased (Shizuka and Farine, 2016). I did

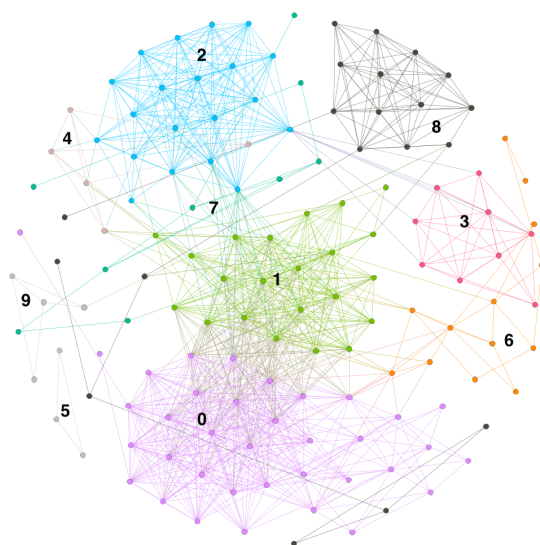


FIGURE 3.3: Veganuary 2019 projection network.

Shows network structure of users with overlapping sets of retweeting users. Ten distinct communities emerge. They are labelled arbitrarily with digits. These digits match those found on the right hand side of Fig 3.4.

not attempt to label these communities the same way I did the retweet network communities as the objective was to determine what the community membership reveals about the audience structure of the underlying retweet network. To do so, I calculated the composition of these communities in terms of the retweet network communities, e.g., what communities the nodes in the projection communities represent in the retweet network. Fig 3.4 shows the results.

Overall, there is strong separation between all communities in the projection, with the exceptions of communities 1 and 0. Community 1 contains almost all of the core Veganuary support activists with four from the news community, two from a generic commercial community (P2), one from the other generic commercial community (P1), and one from one of the Veganuary-specific commercial community (VP3).

Meanwhile, community 0 combines all nodes from the Mixed community, the more supportive GVSR community (*GVSR+*), the antagonist access community, one user from the antagonist GVSR community (*GVSR-*), and one from the core Veganuary support community. These communities make up a majority of the overall retweet volume of the network, signifying that the audience shared by these users comprises a large proportion of the users active in the discourse. The fact that the content posted and shared by users in these communities centres on the GVSR, discussions on the accessibility of vegan diets, and jokes against vegans further emphasises the

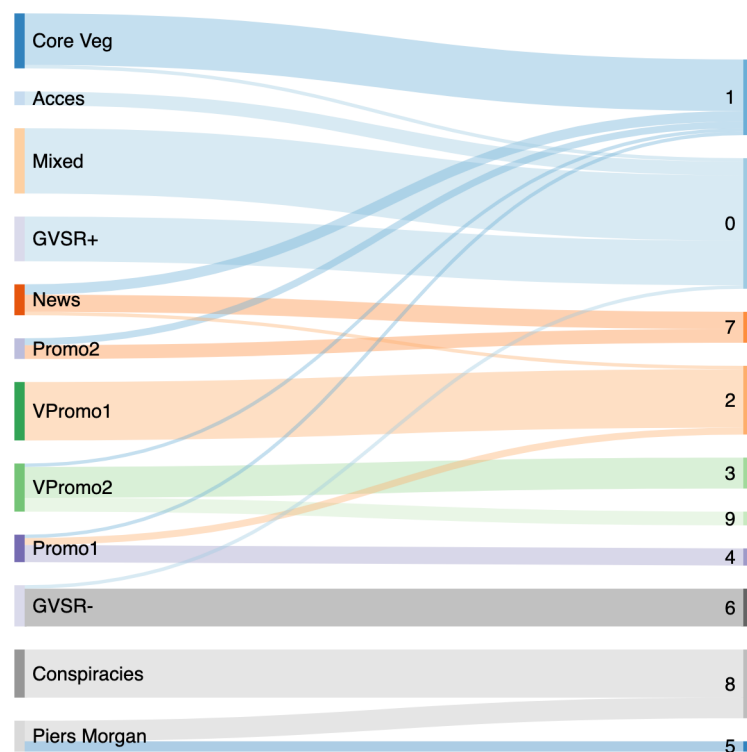


FIGURE 3.4: Sankey flow chart to illustrate the composition of the communities in the projection network in terms of the retweet network communities.

Retweet network communities listed on left. Projection network communities on right. Retweet network communities retain their labels while projection network communities are denoted with arbitrary digits. E.g., Community 1 in the projection network signifies that members of the following communities identified in the retweet network have overlapping audiences: *Core Veganuary activist*, *News*, *Promo2*, *VPromo2*, and *Promo1*.

extent to which these narratives exceed the prevalence of the activist narratives in the discourse.

Critically, the projection shows that the audiences of most of the commercial communities remain separate from any other audiences in the discourse, therefore suggesting that commercial engagement with Veganuary 2019 failed to connect its audiences to the original activist discourse on the topic. The GVSR discourse is an exception, as its audience overlaps with other parts of the discourse, but this is due to how controversial and politicised the discourse surrounding the GVSR campaign became. In sum, the GVSR appears to be the exception which illustrates the rule, as the projection results show it was not the typical experience of commercial campaigns.

Interestingly, the more negative GVSR community does not share an audience with the other antagonist communities, but rather stays isolated, suggesting that the users most active with the

negative elements of the GVSR discourse engaged an audience separate from the rest of the discourse. Meanwhile, the antagonist conspiracies community joins with most users from the antagonist Piers Morgan community to form one community in the projection, labelled 8, whereas the remaining users form their own community. These users are all supporters of the US-based far-right political conspiracy movement QAnon. They are connected to the Piers Morgan community in the retweet network but have their own separate audience distinct from the larger audience of the rest of the antagonist communities. It is possible that the politically right-wing and anti-vegan rhetoric of the Piers Morgan community appealed to these users and drew them into the discourse, thereafter further engaging their own particular audience of like-minded radicalised QAnon supporters. This is an example of one of the more serious and dangerous potential consequences of Morgan's tirade against the GVSR veganism, which appears to have at least contributed to a domino effect beginning with broad attacks on liberal politics and ending with the engagement of more radical groups and individuals.

3.5 Discussion

Contributions to understanding the impact of commercial engagement in Veganuary activist discourse

The analyses show that commercial agents contributed lots of content and generated considerable interactions in the Veganuary discourse. However, the results of the audience projection indicates strong separation between their audiences and those of the activists, demonstrating that in general, commercial audiences in the discourse did not significantly overlap with those of the activist core. These results imply that regardless of true intention, the majority of commercial activity in Veganuary 2019 was limited to the insular engagement of isolated audiences that did not meaningfully contribute to increasing the reach of the activist movement. Commercial agents fall short of synergising their product promotion to the narratives and goals of the activist discourse. Their engagement serves to encourage consumption of their vegan products, but not engagement with the underlying movement.

An alternative interpretation of the projection results might be that commercial actors helped engage a new audience on the Veganuary topic, one that was not attained by activists. I am sceptical of this interpretation as it implies that this engagement with the commercial communities

was as meaningful or informative as engagement with the activist community would have been, which cannot be known. Given the focus of the majority of commercial content on product promotion, and seemingly using the movement primarily as a marketing tool, and not explicitly on spreading awareness or information about the movement, as well as the example made by the GVSR campaign, I do not think this is likely.

This result is not surprising; it would be naive to assume that all corporations would want to do more than use the Veganuary campaign to promote their vegan products. While the Veganuary organisation frames part of their vision for corporate engagement with the campaign as just that, their vision for corporate involvement with the movement does not end there. They are not only interested in encouraging corporations to expand their vegan offerings and participate in the month-long campaign, but to also build the core vegan values of anti-cruelty and anti-exploitation into all their operations. As such, Veganuary as an organisation could do more to hold corporations accountable and work with them to ensure that when they engage with the campaign online, they do so in a way that actually benefits the movement, e.g., by building trust with sceptical consumers. As can be seen in several of the antagonist communities in the retweet network, perceptions of the vegan movement as elitist, insincere, and associated with "Big Veganism" can significantly damage efforts to raise awareness about how veganism can be a force for good. This resonates with the warning in Wetts (2020b) about how corporate engagement with environmental discourses, when not calibrated correctly, can feed "anti-elite and populist tendencies" resulting in increased distrust of corporations and the causes they are seen to support. Challenging corporate engagement in the future to be more transparent about what "veganism" really means to them may separate those who are just in it for the marketing – and therefore should be excluded from the campaign – from those who actually share the Veganuary commitment.

Contributions to understanding polarisation and contention in climate-diet discourse

The deep dive into the content of the tweets confirms the strong presence of polarisation and contention in the discourse. This is evidenced by the extent to which veganism was politicised in the discourse as well as the ways that commercial activity, specifically the GVSR, triggered severe antagonism, including the maligning of vegans as "liberal hippies", and the drawing of parallels between standing *against* veganism with standing *for* various right-wing political initiatives like Brexit, Donald Trump, climate denialism, and QAnon. Moreover, the GVSR in conjunction

with the *EAT-Lancet* report sparked many claims of veganism as a corporate and elitist hoax that further divided users. Although previous studies on climate-diet discourses provide reason to expect some polarisation and conflict in the Veganuary discourse, the observations presented in this chapter are indicative of greater potential dangers for radicalisation if left unaddressed. Moreover, this work shows how distracting these elements can be from the core narratives of the activist movement.

Some might see these observations and say that all publicity is good publicity; although the discourse turned ugly in some areas, the fact that the GVSR led more people to talk about veganism is good for spreading awareness and bringing the discourse into the mainstream. I am sceptical of this argument. Activity in both GVSR communities did not often extend to vegan advocacy, but rather remained rooted in the GVSR controversy itself, politics, and trolling. While the backlash to the GVSR and veganism did subsequently bring in new users to defend veganism, I suspect these users joined due to underlying conflicts related to certain polarising political and social undercurrents, not to engage in vegan activism itself. As such, I am not convinced that this defender effect outweighs the impact of the original backlash, which extended to highly politicised and radical attacks against vegans, not only the GVSR. Thus, it is clear that the GVSR campaign significantly affected the Veganuary 2019 discourse but in ways that were of more benefit to Greggs in terms of exposure and sales than support for the Veganuary movement.

Furthermore, the GVSR controversy highlights an additional concern: Given the way populist leaders and spokespeople normalise violations of the traditional moral order, e.g., racism, misogyny, and xenophobia (Bucy et al., 2020; Wodak, 2021; Wodak, Culpeper, and Semino, 2021), in their ascent to power, there is a risk that narratives such as those launched by Piers Morgan against the GVSR and veganism will embolden the subscribers of antisocial ideologies, therefore further entrenching sources of societal discord. It is likely that the engagement from users aligned with the right-wing of US and UK politics would not have happened without the intervention from Morgan. These users likely felt emboldened by the anti-vegan crusade initiated by Morgan and joined the fray, not because there is something inherently threatening about veganism, but rather because of how it is aligned with left-leaning political agendas.

This outcome illustrates how online discussions of veganism and diet choice exemplify online "culture wars" and manifests the menace of echo chamber formation in social media discourses. That it is to say, the activity that Morgan's tweets engendered would have also contributed to

the increased structural polarisation of those who interacted with his tweets. Those interactions would have served to signal to Twitter's algorithm that it should show those users more content with similar sentiment and from users who resemble Morgan in the content they tweet. From Figure 3.4 we see that the leaders of the protagonist and antagonist communities have no overlap in their audiences. This suggests that the users in their audiences receive little exposure to users with different views and are very likely only receive more information which confirms their views and/or further radicalises them.

While on first reflection one might argue that it is a good thing that the most extreme antagonist users are in a sense "keeping to themselves", it is definitely not a good thing that walls of these echo chamber are thickening. Moreover, the fact that the protagonists did not reach them is also evidence that activists may not be trying hard enough to persuade potentially antagonist audiences (although doing so may be considered by some a losing battle). In general, however, this case study epitomises the prominence of echo chambers in contentious social media discourses and provides additional justification for further consideration of what can be done to mitigate their formation. The results also resonate with research into the double-edge sword of social media platforms: Although they have provided for unprecedented growth and engagement with activist movements, they have given the same give space and opportunity for harmful conspiracy theories and radical movements (Tucker et al., 2017).

To address these points, scholars must critically reflect on why these discussions are such flash-points of antagonism, and investigate the foundations of these reactions in order to identify ways of deconstructing them. Rothgerber (2014) and Rothgerber (2020) has begun investigating sources of aggression to veganism, and suggests that it partly stems from a dissonance between an omnivore's dietary choices and the perceived vegan message that these choices are cruel to animals and the environment. This dissonance - or "the Meat Paradox" (Percival, 2022) - triggers responses of guilt and shame, which then lead to defensiveness. Determining a way to reform that reaction and/or address the underlying triggers may help resolve some of the conflict in discourses related to all kinds of vegan activism. However, psychological factors alone are not the only contributors to vegan antagonism. It is clear that additional kinds of cultural, social, and communication reforms are needed to neutralise the culture wars around veganism, specifically in relation to environmental protection. Future research should determine such pathways. It should be noted that the tenor of the culture war is not sustained by antagonistic voices alone; there is also evidence of

vegan supporters who are indignant, righteous and sometimes even rhetorically violent against non-vegans. It is important to understand the motivations of these users and the net impact of their rhetoric on the discourse as well.

Recommendations for improving commercial engagement with Veganuary activism

Recommendations for how to improve commercial engagement range across a spectrum of options. The most straightforward might be to simply tag the primary Veganuary account instead of just including the hashtag, as most did in the 2019 sample, because it would provide audience members with a direct link to a core source of information on the movement. Instead of clicking on the hashtag which directs the user to a selection of all posts containing it, many of which may not actually be informative about the movement, by clicking on the Veganuary account link, the user would see the organisation's official profile with all of its own posts, links, and information on how to get involved.

A more involved option would entail companies explicitly coordinating their advertising efforts with those of the Veganuary organisation and of associated activists. For example, instead of competitions in which users retweeted a company's post for a chance to win some vegan product, these competitions could require users to also engage with the Veganuary account, e.g., retweet one of their posts, register for the campaign, sign a statement of support, etc. This way commercial engagement would be guaranteed to better support the momentum of the activist movement by more directly associating its product promotion efforts with the campaign and by driving its audience to engage with it. Here the Veganuary organisation could deploy its members (or a bot – see the "Gender Pay Gap Bot" that replied to organisations celebrating International Women's Day in 2022 with their current gender pay gap figures; Mellor (2022)) to directly challenge (or shame) corporations, especially those not formally aligned with them already, who make reference to the campaign in promotional tweets without fully committing to vegan values. In doing so, the organisation would show to potential naysayers that it acknowledges the darker side of veganism, and put distance between it and the ethic the organisation hopes to promote. This approach would help build credibility for the organisation and its supporters amongst those who perceive the vegan movement as beholden to corrupt corporate interests.

All potential improvements will need to contend with backlash from naysayers. It will therefore be critical for companies to take note of previous campaigns, such as the GVSR, and to develop strategies for navigating the challenges of engaging with the politicised landscape of veganism. This is a lesson that generalises beyond the Veganuary context to any discourse contending with climate-diet topics and debates.

3.6 Conclusion

The objective of this chapter as the first empirical work of the thesis was to address two gaps in the environmental communications literature: 1) a focus on corporations, and 2) concentration on a specific action-oriented advocacy campaign connected to environmental activism. To do so, I analysed commercial engagement within a sample of the Twitter discourse surrounding the 2019 Veganuary campaign. This campaign was selected for two reasons. First, it targets changing specific consumption habits instead of more generalised collective action that occupies most studies in the literature to date. Second, it was a highly controversial campaign due to the contemporaneous launch of the Greggs' Vegan Sausage Roll and the publication of the *EAT-Lancet* report. The methodological framework involved a network analysis approach with community detection paired with manual content analysis.

The results show that commercial engagement with Veganuary in 2019 fell short of connecting its audience to the Veganuary activist movement. These findings demonstrate that commercial entities do participate, but that this engagement is limited with respect to deepening public understanding of why veganism is important. In fact, in the eyes of many users, corporate engagement actively detracts from the perceived authenticity of the Veganuary movement. Given that one of the pillars of the organisation's strategy is to use corporate engagement to expand their reach, it is concerning that the participation of the companies that did engage with the movement on Twitter did not serve to facilitate interactions between their audiences and the Veganuary activists. Further research must therefore consider how engagement on social media from corporations who are at least ostensibly committed to the cause can meaningfully support its online activism.

The results also emphasise the need to better understand the roots of vegan antagonism. This chapter shows that a significant volume of interactions and conflict in the discourse would not have occurred had the GVSR not touched on such a strong trigger point of political controversy. This phenomenon is not unique to vegan discourses on social media. It is instead emblematic of

the culture war trend in which niche topics are politicised and turned into toxic and polarising public debates. Further research should endeavour to better understand the roots and dynamics of these debates, and to make them more civil and constructive.

This chapter makes significant contributions to the literature. It offers the first systematic analysis of corporate engagement with a discourse on social media related to environmental activism. It therefore provides a benchmark with which future work can compare corporate engagement within other activist discourses. To my knowledge, there are no studies of audience structure in any other social movement context particularly focusing on the overlap of commercial accounts with the core campaign. It would be interesting to determine how generalisable the trend observed for Veganuary 2019 is to other contexts, thereby establishing how much better or worse commercial engagement with climate-diet discourse performs in terms of audience mobilisation in comparison with other activist campaigns.

Second, it suggests ways in which the Veganuary organisation, as well as other charities with similar objectives, may better utilise social media for pressuring corporate collaborators to be more transparent and sincere in their involvement with activist campaigns. That is to say, this chapter shows that such organisations can do more to make sure that the net impact of corporations interacting with environmental activist campaigns is not limited to profiting off the CSR-induced boost to their bottom line, and offers some ideas for how this might be done. Finally, it contributes another example to those presented in Garcia, Galaz, and Daume (2019) and Sanford et al. (2021) of the fierce antagonism and controversy that discussions of diet choice as environmental action elicits on social media. In doing so, it provides further motivation for future research to focus on addressing the sources of this reaction and identify ways of reforming it.

Chapter 4

The psycholinguistics of environmental activists on Twitter

This chapter has been extended from the manuscript published by Frontiers Environmental Psychology on 30 January 2023. DOI: 10.3389/fpsyg.2022.1099331.

Abstract

This chapter investigates psycholinguistic patterns of activists in environmental discourse on Twitter. Specifically, the study explores how the use of language relates to content diffusion. Motivated by findings of environmental psychology, I measure the presence of four psycholinguistic features – agency, emotion, affiliation, and time – in over 500k tweets posted by environmental activists between November 2015 and December 2020. Regression analysis identifies how these psycholinguistic features correlate with tweet diffusion: Tweets related to climate change are found to be shared more when they contain less positive emotion and more negative emotion. This result provides evidence for the negativity bias in environmental communication on social media. Moreover, the lack of a significant relation between agency, social affiliation, and temporal focus on retweet engagement is important because it contrasts with what experimental studies have found in different communication settings regarding the impact of these features on engagement. This implies that there might be different pathways governing online engagement with environmental communication and the corresponding impact of this information on offline behaviour.

4.1 Introduction

Moving to a new context, the next two chapters address the second major gap identified in the literature review: the psycholinguistics of activist environmental messaging on social media and its relation to audience engagement on- and offline. In the present chapter, I begin with an analysis of how a sample of environmental activists use psycholinguistic features previously identified by environmental psychologists and other communication scholars as important for framing environmental communication – agency, emotion, social affiliation, and temporal focus – and the correlation between the usage of these features and online audience engagement.

The psycholinguistic associations of the frames, words, and narratives we use to talk about environmental issues affects the way we and others think about them, along with our motivation to take action towards environmental protection. There is a rich literature in environmental psychology which explores experimentally how various psycholinguistic features affect our thought processes and reported action intentions towards environmental issues. While some of these features have been studied within general samples of environmental discourse on social media, their usage specifically by influential opinion leaders has not. Moreover, there are no large-scale analyses of how these features are related to user engagement.

Therefore, the objective of the work presented in this chapter is to measure trends in psycholinguistic feature use in environmental activists on Twitter, determine how they correlate with audience engagement, and then to interpret these results through the lens of environmental psychology. It is the first study to bring to bear the wealth of knowledge that scholars have accumulated about how environmental communication can be refined to better engage the general public on actual trends in activist messaging on social media. Using tools of computational linguistics, I find that among the features tested, the only statistically significant predictor of retweet engagement is emotion: While activists do not use significantly more negative emotion when tweeting about environmental issues relative to their other posts, the former were more frequently retweeted the more negative emotion and the less positive emotion they contained. This result conforms with expectations of a negativity bias on social media, but contrasts with expectations based on experimental studies for the other features, suggesting that more research needs to be done to understand how these features affect audience engagement with social media activism.

The chapter proceeds according to the following structure. In the next section, I present the additional literature necessary to contextualise this study. First, I motivate the importance of

studying the psycholinguistics of activist communication on social media using Stern's value-belief-norm theory of pro-environmental behaviour. Then, I present studies from environmental psychology relevant to each feature included in the study, introducing hypotheses for what these studies lead us to expect regarding the prevalence of these features in activist communication and the engagement they elicit. From there, I introduce the dataset and methods used to extract the features and analyse their relation to audience engagement. A discussion of the limitations inherent of using the selected data and methods is also included. The results are then presented, followed by a discussion of their implications and significance. Finally, I conclude the chapter with comments on how this work can inform future research, and in particular, how it motivates the experimental study presented in Chapter 5.

4.2 Background Literature

4.2.1 Social media and pro-environmental behaviour

As discussed in Chapter 2, social media platforms have become an important arena for environmental activism and mobilisation (Anderson, 2017; Boulianne, Lalancette, and Ilkiw, 2020; Dekoninck and Schmuck, 2022; Koteyko, Nerlich, and Hellsten, 2015; Lörcher and Taddicken, 2017; Mavrodieva et al., 2019; Schäfer, 2012). The vast literature on environmental communication shows that social media is used by a variety of users to discuss and spread information about environmental issues, and that the resulting discourses are contentious. Moreover, studies of environmental psychology tell us that messages framed with different psycholinguistic features are differentially influential for shaping our behavioural responses. However, we currently lack a systematic understanding of the psycholinguistic features that are used by activists to engage and mobilise users via online discourse. Therefore, the focus of the study presented in this chapter is the presence of psycholinguistic features expressed in the posts of environmental activists on Twitter and the relation between these features and audience engagement.

I utilise Stern's *value-belief-norm* (VBN) theory of pro-environmental action and behaviour (P. C. Stern, 2000) as a framework for contextualising the importance of investigating how psycholinguistic features manifest in online environmental discourse and how they relate to user engagement. VBN theory begins with the premise that pro-environmental action can be viewed as an altruistic behaviour, which occurs in response to personal moral norms. These norms may be

activated by the belief that particular conditions pose threats to others, and by altruistic values, i.e., the conviction that one has the ability to initiate actions that could avert those consequences (Schwartz, 1977).

VBN theory further maintains that in addition to altruistic values, egoistical and biospheric values (e.g., caring about protecting the environment) have the capacity to activate norms. Here, Stern defines norms as one's sense of obligation to act and argues that those norms are mediated by a set of beliefs. These beliefs centre around personal estimations of the state of the planet's ecological health, of the kinds of people affected by such environmental conditions, and of the capacity of individual actions to alleviate threats to valued persons or things. Fig 4.1, recreated from P. C. Stern (2000), provides a schematic representation of the variables and pathways in VBN theory.

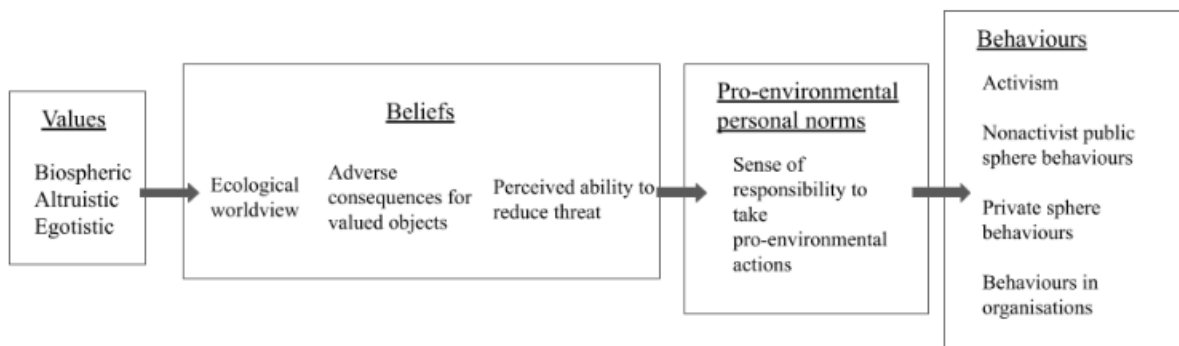


FIGURE 4.1: Schematic representation of VBN theory recreated from P. C. Stern (2000).

Stern argues that individuals' value-belief-norm propositions are susceptible to external influence exercised through information that may shape or change one's beliefs. This influence may not only come in the form of scientific findings, but also in the medium and mode, i.e., framing, in which they are presented and discussed, and in the discourses that spawn around them. Correspondingly, Stern suggests that environmentalist and anti-environmentalist discourses can be understood as "efforts to activate or deactivate people's environmental norms", or their sense of obligation, "by highlighting certain kinds of values or consequences" (P. C. Stern, Dietz, and Guagnano (1995) as referenced in P. C. Stern (2000), p. 414). According to Stern, activists may trigger these norms in their audience by raising awareness of the consequences of climate change, and by addressing their audience's ability to contribute to environmental action.

Stern states that pro-environmental movement support can span committed activism to more

general support, ranging from participation in demonstrations and extensive involvement in social movement organisations to activities such as writing letters to political officials and reading movement literature. Although Stern could not anticipate the emergence of social media activism when he first developed VBN, his conceptualisation of activism can be applied to online settings, with activists posting information, espousing specific values and beliefs, and calling for action via social media platforms. More general movement support, on the other hand, is reflected on the platforms in engagement with and sharing of activist content.

In a two-wave panel study of Austrian voters, Dekoninck and Schmuck (2022) provided an initial codification of the mobilising power of environmental activists via social media platforms. They found that participants who reported to actively follow environmental influencers or activists on social media were more likely to report stronger intentions to engage with offline pro-environmental behaviours and political participation over time. However, they did not examine specific communication features or strategies of environmental influencers and activists.

One element of activist communication which can mediate the mobilising impact on audiences is its psycholinguistic character. Different psycholinguistic features are known to have a significant effect on human cognition, including on the formation of our beliefs, memory, and behaviour. As I will explore in the next section, they also have strong implications for shaping our beliefs about environmental issues and for motivating action. These features could therefore play a significant role in the VBN pathway, but have yet to be considered as such.

4.2.2 Psycholinguistics and pro-environmental behaviour

As also discussed in Chapter 2, there is a strong focus on framing in environmental communication research. However, most of these studies focus on topical frames, e.g., what was talked about, and very few on the psycholinguistic frames employed. Yet, environmental psychologists have identified several psycholinguistic features that influence the way we perceive, understand, and engage with information related to environmental change. Occurring most frequently in these studies and conversations are agency, emotion, risk perception in time, and social affiliation. All of these features impact the way in which we use language to express our thoughts, the way we perceive such expressions from others, and how we formulate attitudes and actions in response, both within and beyond environmental discourses (Fusaroli and Tylén, 2012; Harding, Paul, and Mendl, 2004; Verhoef, E. Walker, and Marghetis, 2016). In what follows, I introduce each of these

features and provide an account of how they have been found to moderate the effects of communication in general, and within environmental discourses in particular. In this discussion, I refer to experiments involving these features and measuring some kind of engagement with messages containing them or reported behavioural intentions after viewing them. In doing so, I refrain from describing in detail the nature of messages, i.e., their length, audio-visual mode, content, and source. I will discuss these features at length in the next chapter, where they will be relevant in comparison with the materials used in the experiment presented therein.

Agency

Emirbayer and Mische (1998) define agency as:

"A temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented toward the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualise past habits and future projects within the contingencies of the moment)." (p. 963)

In other words, agency is our capacity to act on the basis of knowledge, experience, goals, and ambition, both on the personal and on the societal level. Abele et al. (2008) provides a comprehensive review of the extensive body of literature that considers agency as a critical ingredient for social judgement and engagement. In particular, agency is considered instrumental in enabling humans to self-categorise in social contexts, e.g., in evaluating one's actions, responsibilities, and obligations, and one's perception of power and efficacy relative to others (Abele et al., 2008). Agency is a crucial condition for individuals and societies to translate concerns into actions. Humans are more likely to act when they know that their actions will have a direct impact on their immediate circumstances (Bandura, 1977; Bandura, 1982; Bandura and D. Cervone, 1983). In this context, self-efficacy, defined as an individual's belief in their capacity to carry out actions that are necessary to achieve particular outcomes, is considered as the precondition for an individual's capacity for agency (Bandura, 2000).

Crucially, agency is the outcome of individuals' social and cultural contexts, which in turn are informed and reinforced by individuals' linguistic environment (Bandura, 1982; Duranti, 2005; Fausey et al., 2010). As such, agency can be viewed as a psycholinguistic property. Scholars have highlighted the importance of agency in motivating pro-environmental behaviour (Bamberg and Möser, 2007; Bostrom, A. L. Hayes, and Crosman, 2019; Hines, Hungerford, and Tomera, 1987;

J. H. Rees and Bamberg, 2014; Gifford and Comeau, 2011). A majority of the studies concerned with understanding the effect of the display of agency in communication on pro-environmental behaviour relies on online experiments. For example, Gifford and Comeau (2011) compared the effect of messages relying on motivational framing with that of messages employing sacrificial framing on reported engagement and intent to engage with climate action. While the motivational content reflects agency, sacrificial content emphasises passivity. They found that the messages which are framed by the former generated higher levels of engagement than those containing the latter.

Furthermore, P. Hart and Feldman (2016)'s online experiment reveals that exposure to stylised news content (indicated to be from the Associated Press) that emphasised efficacy increased respondents' intention to participate in political activities related to climate change because it increased their perceived levels of hope. Moreover, Hine et al. (2016) found that messages with specific and actionable adaptation advice increased reported adaptation intentions, even within participants previously showing dismissive attitudes towards environmental issues. In a more recent study, DiRusso and Myrick (2021) found that when individuals are presented with Instagram visuals containing higher efficacy content that seeks to convince their audience that changing their behaviour can make an important contribution to reducing plastic pollution, their feelings of hope increase while their feelings of anger decrease. The experiment also revealed a correlation between their feelings of hope with changing behavioural intentions towards climate change action.

In contrast with these contexts, agency has not yet been extensively examined within social media discourse related to environmental issues. The investigation presented in Suitner et al. (2022) provides the most comprehensive account to date of the presence of agency (in addition to social affiliation and future focus) in climate change discourse. Their analysis of the hashtag networks generated in tweets related to climate change published between 1 March and 19 April in 2017, 2018, and 2019 demonstrates rising levels of agentic language over time (along with affiliation and future focus, which will be discussed below). The authors argue that this result suggests that language which emphasises agency may play an important role in facilitating the growth of discourse relating to environmental activism on Twitter. However, the authors did not study how agency is used by activists specifically, nor how it relates to audience engagement. Therefore, there is a need to further clarify the presence and engagement potential of this feature in climate-related discourse.

This review of empirical and theoretical literature on the way in which individuals perceive agentic language in environmental communication suggests that messages containing efficacious content increases perceptions of individual and/or societal agency and the desire to take action. This is interesting because it implies that agency may be an important psycholinguistic feature in activist messaging in environmental discourse on social media, and that it is likely to be met with higher levels of engagement. As such, it leads to the following hypotheses about how agentic language will manifest in activist messaging on Twitter:

- H1a: Activist content related to environmental issues will contain more agentic language than the Twitter base rate.
- H1b: Activist content related to environmental issues with higher agentic language will be more likely to be engaged with than content with less agentic language.

Emotion

There are a variety of different theoretical conceptualisations of emotion. In this thesis, I use the definition in accordance with discrete emotion theory, which defines emotions as brief, intense, psychological, and evaluative reactions directed at stimuli that motivates behaviour to enhance survival (Ekman and Davidson, 1994; Nabi, 2002; Ortony, Clore, and Collins, 1988). Emotions thus have a significant impact on our cognition, including on the formation of beliefs, memory, and behaviour.

There is an emerging body of research concerned with the relationship between the discrete emotions displayed in environmental communication, and the attitudes and behaviour towards climate action that they inspire in the target audience. This line of inquiry is heavily related to and often incorporates measures of agency, as the primary outcome variable of interest is how likely participants report they are to take climate action and other pro-environmental behaviours generally upon viewing more positive or more negative content.

So far, much of this work relies on experiments that compare the relative impact of specific positive emotions, such as hope and empowerment, to the impact of specific negative emotions, such as fear, worry, and anger, on a variety of climate-related outcome variables, e.g., risk perception and engagement with the movement. Here, the results of Amy Chadwick (2014), P. Hart and Feldman (2016), Nabi, Gustafson, and Jensen (2018), and Jacobson et al. (2019) all suggest positive

relationships between messages containing hope and participants' attention and behavioural intentions towards environmental protection and policies. Moreover, in a study of tweets related to the 2014 Earth Hour campaign on Twitter, Fernández et al. (2015) found that tweets with positive sentiment were associated with higher levels of retweet engagement.

Further research reports a complementary detrimental impact of negative emotion in climate communication. Generally, communication that contains negative messages with a focus on risk, threat, and danger has been found to trigger emotional responses leading to feelings of helplessness, apathy, and contempt, all of which decrease attention and behavioural intention (Loewenstein et al., 2001; Lowe, 2006). For example, O'Neill and Nicholson-Cole (2009) examined participants' responses to visual representations of climate change and found that fear was ineffective at motivating engagement. Meanwhile, nonthreatening visuals linking everyday emotions and concerns to macro-environmental issues were more engaging. Moreover, Feinberg and Willer (2011) found that when exposed to fear-mongering about "apocalyptic consequences" of climate change in newspaper articles and videos, participants reported higher levels of apathy, denial, and avoidance instead of action. In a study of the responses of adolescents in Australia to negatively-framed climate change education, the authors found the majority reported feeling disempowered and helpless regarding climate change action (Jones and Davison, 2021).

This literature suggests that negative emotions make individuals feel less hopeful about the possibility to combat climate change, and therefore less likely to partake in this endeavour, while usage of positive emotions achieves the opposite. However, another body of scholarship suggests the inverse – that negative emotions in media communication may *increase* engagement and action intention. Beginning with Rozin and Royzman (2001) and Baumeister et al. (2001), we know that humans have a tendency to pay more attention to negative (bad news) than to positive content (good news) in media communication. As a consequence, this negativity bias has likely precipitated an emphasis on negative content in climate change communication on social media and in mainstream news media. Several studies of coverage and communication in both arenas confirm a general trend towards negative sentiment (Dahal, Kumar, and Z. Li, 2019; Loureiro and Alló, 2020; Sanford et al., 2021; Tyagi, Uyheng, and Carley, 2020; Wiest, Raymond, and Clawson, 2015).

Not only is negative sentiment more prevalent, but it has also been found to be more engaging for some audiences. In more general communication contexts, Del Vicario, Bessi, et al. (2016) and Zhu, Y. Kim, and H. Park (2020) determined that tweets displaying more negative emotion get

retweeted more than tweets displaying more positive emotion. Similarly, Fan et al. (2014) found that angry tweets in particular are more likely to spread than joyful or sad ones. More specific to environmental topics, in a study of the communication of nine environmental non-governmental organisations (NGOs), Barrios-O'Neill (2021) found tweets related to biodiversity with more negative sentiment received more engagement. Meanwhile, beyond social media, environmental communication scholars have used experimental studies to argue that negative emotions can help focus attention on climate-related problems, motivate deeper considerations of possible solutions, and prompt meaningful behavioural change and/or policy support than information framed with positive emotions (Bouman et al., 2020; DiRusso and Myrick, 2021; Hine et al., 2016; Hornsey and Fielding, 2016; Meijnders, Midden, and Wilke, 2001a; Meijnders, Midden, and Wilke, 2001b). Most recently, the results of Diamond and Urbanski (2022) suggest that participants who received prolonged exposure to negatively-framed news articles developed higher sustained levels of concern and perceived importance of climate change than participants exposed to positively-framed articles. However, they found no difference between conditions for reported pro-environmental behavioural intentions and policy preferences.

Given the negativity bias of social media content suggested in previous work, I formulate the following hypotheses for the presence of negative and positive emotion in activist environmental communication on Twitter:

- H2a: Activist content related to environmental issues will contain more negative emotion than the Twitter base rate.
- H2b: Activist content related to environmental issues will contain less positive language than the Twitter base rate.

However, given the lack of consensus in the experimental literature pertaining to the impacts of negative and positive emotion on audience engagement, there is little empirical evidence on which to base hypotheses for retweet engagement with the activists tweets in the sample. Therefore, I leave this as an open research question to be answered by the data and present the results as a benchmark which future research may test.

Social affiliation

In addition to the interconnected psycholinguistic categories of agency and emotion, the literature suggests that social affiliation may play an important role in the way in which individuals' engage

with environmental communication online.

Social affiliation, defined as one's sense of connectedness or belonging, and a belief in the in-community strength of that group (Tajfel, 1974), plays a critical role in motivating individuals to engage in prosocial action (Tajfel, 1974; Zomeran, Postmes, and Spears, 2008; Zomeran, Kutlaca, and Turner-Zwinkels, 2018). For example, Kawakami and Dion (1993) find that stronger group affiliation increases the likelihood of engaging in collective action, and B. Simon et al. (1998) demonstrate that stronger affiliation with one's in-group identity predicts participation in collective actions related to elderly and minority rights. Moreover, Ellemers, Kortekaas, and Ouwerkerk (1999) agree that a stronger sense of connectedness to a group increases individuals' concern for and interest in the respective groups' goals.

Social affiliation has also been found to be important for fostering engagement with pro-environmental actions and behaviours. For example, J. H. Rees and Bamberg (2014) demonstrated that individuals who reported feeling a stronger connection to their local community also reported higher intention to participate in local pro-environmental action. In a series of surveys conducted in the US, Bamberg, J. Rees, and Seebauer (2015) found that social identity was the single best predictor of reported collective environmental action intention across all studies. Moreover, Schmitt et al. (2019) found that engagement with environmental activism was consistently predicted by the extent to which respondents identified as belonging to a community of "politicised environmentalists." Therefore, emphasis in social media communication on the existence and efficacy of a global community of people engaging with environmental activism has the potential to be a strong recruiting and mobilising mechanism.

Scholars also find that social affiliation shapes the use of language in political discourses. For example, Lakoff (2010) and McClelland (1987) maintain that the language used in political motivations of US liberals emphasises social cohesion, while the language employed by conservatives emphasises cues of power and discipline. Correspondingly, Fetterman, R. L. Boyd, and Robinson (2015) found that liberals and conservatives differ significantly in the use of language in online chat rooms, news websites, and in US State of the Union addresses. Here, the authors confirm that liberals rely on words associated with social affiliation, while conservatives use words associated with power. Moreover, in the context of the 2019 Hong Kong protests, Tay (2021) determined that articles published by the pro-establishment and government-run *China Daily* newspaper, and those published by the independent *Hong Kong Free Press* differ significantly in the use of terms

related to social affiliation. While *China Daily* uses the most language condemning the protesters, *Hong Kong Free Press* uses the words associated with social affiliation to depict solidarity with the protesters. These findings are important given the degree to which environmental discourses in mainstream and social media have become politicised in recent years (Anderson, 2017; Pepermans and Maesele, 2016).

These studies show how social affiliation manifests in language and therefore provide reason to believe that it could be present in, and potentially impacting engagement with, environmental communication. Interestingly, the only study examining the relation between affiliation and diffusion on social media finds a negative relationship in tweets related to public health (Zhu, Y. Kim, and H. Park, 2020). The Suitner et al. (2022) study included social affiliation in its analysis and found an increasing presence of this feature in climate-related discourse over time, but it did not diagnose how social affiliation is used by activists specifically, nor does it measure how affiliation relates to audience engagement. Therefore, there is a need to further clarify the presence and engagement potential of this feature in climate-related social media discourses. To this end, I present the following hypotheses for social affiliation in activist communication on Twitter:

- H3a: Activist content related to environmental issues will contain more affiliation language than the Twitter base rate.
- H3b: Activist content related to environmental issues with higher affiliation language will be more likely to be engaged with than content with less affiliation language.

Time

As discussed in Chapter 2, one of the key obstacles to fostering more attention, concern, and engagement with environmental issues is the long-term timescale of most threats, especially to inhabitants of the Global North, where the consequences of climate change are not nearly as severe as they have already become in many countries of the Global South. The lack of temporal proximity tends to de-emphasise the urgency of mitigation and adaptation initiatives among populations where the consequences of climate change have yet to become part of their daily lives. Meanwhile, literature on temporal framing suggests that the ways in which the past, present, and future are emphasised in environmental communication may impact individuals' perceptions of environmental issues and the importance of immediate action. Seligman et al. (2013) present evidence that

suggests references to future outcomes based on present behaviour is potentially powerful for motivating behavioural changes. The authors found that perceptions of time, specifically in relation to conceptualisations of reward and punishment in the present and future, is a significant motivator of human behaviour. Supporting this theory, an emerging body of research has demonstrated that future-focused messaging increases the likelihood of individuals adopting more sustainable consumption behaviours (Bechtel, Verdugo, and Queiroz Pinheiro, 1999; Joireman, Lasane, et al., 2001; Joireman, Van Lange, and Van Vugt, 2004; Lindsay and Strathman, 1997).

Moreover, in their study of a sample of climate change discourse on Twitter, Suitner et al. (2022) also found an association between future-focused language and affiliation. Their results suggest that the association is growing over time, indicating that there is an increasing emphasis on future-focused language within the discourse and that this emphasis is potentially an important feature of how the climate change discourse is growing and evolving to be more action-oriented over time.

Meanwhile, the work of Kahneman and Tversky (1979) on prospect theory shows that humans do not rationally evaluate comparisons of short and long-term risks and rewards. In turn, Gifford (2011) and Leiserowitz (2007) leverage this theory, in addition to empirical evidence showing the human tendency to discount future environmental risks (Hendrickx and Nicolaj, 2004), to suggest that the emphasis on future risks in environmental communication may not be effective at engaging the public because the human brain is not evolutionarily programmed to attend to future risks when present ones seem more urgent and/or threatening. Instead, Gifford (2011) suggests that focus on the present may be more compelling. Moreover, while the focus of Hine et al. (2016) was more closely tied to agency, there is reason to believe that their findings of higher reported support for green actions and policies upon viewing messages containing specific, directly actionable solutions result not only from the agentic framing of the messages, but also from the anchoring on what can be done in the here and now. As such, there is still the need to clarify how references to the future, e.g., future consequences or opportunities, versus the present, e.g., what can be done by various stakeholders today or tomorrow, impact engagement with environmental activism.

Regarding past focus, there appears to be little incentive or motivation for activists to favour references to the past in their communication about environmental issues. While it is true that in specific contexts, e.g., in response to failed policy initiatives or inaction at global summits, references to the past failures of leaders and major industries, their legacy of inaction, and historic

lack of accountability, may spike (Han and Ahn (2020) and Boulianne, Lalancette, and Ilkiw (2020); see also Chapter 6 for an analysis of failure narratives on social media in response to the outcomes of COP26). However, it seems more logical that overall, references to the present and/or future would be more prevalent.

In contrast, scholars find that linguistic content from climate change deniers frequently draws on notions of nostalgia, which has become a central tool to support the narratives of many populist political groups around the world (Betz and Johnson, 2004; Kenny, 2017; Krange, Kaltenborn, and Hultman, 2021; Menke and Wulf, 2021). Climate change deniers use nostalgia as a rhetorical tool to justify the status quo and persuade people to oppose modern environmentalism (Krange, Kaltenborn, and Hultman, 2021). As such, it might be the case that activists may seek to counter this past focus with emphasis on what can be done now in the present to offset future risks.

This body of work suggests that temporal orientation may function as an important psycholinguistic feature in the environmental discourse, particularly in attempts to alert individuals of future risks and encouraging action in the present, but it has yet to be analysed in activist communication on social media. In light of this literature, I present the following hypotheses:

For past focus:

- H4a: Activist content related to environmental issues will contain less past-focused language than the Twitter base rate.
- H4b: Activist content related to environmental issues with more past-focused language will be less likely to be engaged with than content with less past-focused language.

For present focus:

- H4c: Activist tweets related to environmental issues will contain more present-focused language than the Twitter base rate.
- H4d: Activist tweets related to environmental issues with more present-focused language will be more likely to be engaged with than content with less present-focused language.

And finally for future focus:

- H4e: Activist tweets related to environmental issues will contain more future-focused language than the Twitter base rate.

- H4f: Activist tweets related to environmental issues with more future-focused language will be more likely to be engaged with than content with less future-focused language.

In summary, the literature examined above indicates that the psycholinguistic categories of agency, emotion, social affiliation, and time in environmental discourse may play an important role in generating engagement with the discourse. However, this chapter is the first to offer empirical research on the use of the four features by activists on a prominent social media platform and the correlation of these usage patterns with audience engagement.

4.3 Research Design

4.3.1 Overview

In response to the lack of rigorous *in situ* examinations of the psycholinguistic profiles of activists in environmental discourse on social media platforms, and of the impact on user engagement, this chapter contributes to filling this gap by testing the hypotheses stated above, thereby answering the following questions:

1. How frequently do environmental activists use agency, emotion, affiliation, and time when discussing climate change on Twitter? How does their use of these features differ within climate and not climate-related discourses?
2. How does the use of agency, emotion, affiliation, and time relate to retweet popularity of the activists in climate-related discourse?

To do so, I measure the usage of agency, emotion, affiliation, and time in tweets published by 50 environmental activists between November 2015 and December 2020, and build regression models to identify how the features relate to retweet popularity in tweets related to climate change. This analysis allows for a nuanced account of the extent to which psycholinguistic features in activist tweets may precipitate virtual engagement with environmental activism on Twitter.

4.3.2 Data

The selection of environmental activists to include in the analysis is nontrivial. The sample of activists examined comes from Luo, Card, and Jurafsky (2020) which used a list of Twitter users, each labelled as either a climate change *activist* or *denier* for a language classification task. The list contains 100 users of each category and was originally curated by Wikipedia users. In this work, I was only interested in the activists who still maintained active profiles at time of collection (January 2021). This resulted in a set of 50 users. As this dataset comes from Twitter, the same ethical considerations and commitments as those detailed in the description of the dataset in Chapter 3 Section 3.3.2 are taken.

The majority of accounts represent activists or groups from the US, UK, Australia, Canada, and Europe. There are inevitably important activists and activist groups excluded from this list. Moreover, these 50 accounts do not approximate a representative sample of all environmental activists on Twitter. However, they do include a diverse array of voices, from celebrity activists to politicians and activist groups. I manually evaluated the profiles of every account on the list to make sure none were "bots" or automated accounts. This process involved first passing each profile through the Observatory on Social Media's (OSoMe) Botometer to detect potential bot accounts. The Botometer is an artificial intelligence tool that compares a given Twitter account against a machine learning model trained on a labelled dataset of accounts known to be bots and returns a rating of how likely the account in question is a bot.¹

The Botometer cannot guarantee perfect classification. Thus, I further investigated all accounts that the Botometer scored within the top 10% of users with the highest estimation of bot status. This included all users with a bot likelihood score of 3.5 of 5 and above. These accounts include an English actress, the account for a Yale University magazine, two Canadian academics, a prominent Australian climate journalist, and multiple prominent climate activists. Many of these accounts are actually verified by Twitter and as such are vetted to make sure they are authentic.² For the others, I could not find evidence to suggest that these accounts were artificial or otherwise not who they claim to represent. Thus, I concluded that the algorithm mistook these users.

Eighteen of the fifty accounts on the list of activist account are not representing a single person, but rather a media group, environmental organisation, or collective of multiple individuals, e.g.,

¹<https://botometer.osome.iu.edu/faq>

²<https://help.twitter.com/en/managing-your-account/twitter-verified-accounts>

CarbonBrief, Oxfam GB, and Greenpeace UK.³ These accounts could be maintained by more than one actor, and that distinguishes them from individual accounts. Such accounts tend to have a greater capacity to create content, e.g., social media teams, and therefore be more active than individual accounts. At the same time, I cannot exclude the possibility that individual activists, especially the most high-profile, also rely on assistance when running their personal accounts. This points to a limitation of studying social media trace data: There may be a large variety in the ways in which content for social media is produced within individual and collective accounts that simply scraping data *en masse* cannot directly account for.

In any case, as will be further detailed in the next section, I control for posting frequency and number of followers when modelling retweet engagement to account for potential biases resulting from imbalances in the distribution of post volume per user. It is also important to highlight that the focus of this study is not to identify the relation of frequency in posting behaviour and user engagement, but primarily to identify the psycholinguistic tools employed by those accounts in the content they publish, and *how this usage resonates with the experimental literature and correlates with retweet engagement*. I am not concerned with what the usage of the psycholinguistic features tells us about the activists themselves, but about how the usage is perceived by the users who interact with their content.

All original tweets posted by the selected users publicly and still available from between November 2015 and December 2020 were collected using the Twitter Academic Research API in early January 2021. After removing all duplicates, retweets, and replies, the collection resulted in a dataset of over 510319 total posts. This figure is in line with the weekly average tweet rates across the users in the sample (calculated by Botometer and retrieved in the manual profile validation process described above). Table 4.1 shows the total number of tweets and retweets for each of the users in the dataset.

The time frame of collection begins with the United Nations Climate Change Conference (COP21) in Paris in November 2015, during which the Paris Climate Agreement was written. This conference represents a landmark in the recent timeline of global climate change events. These accords were one of the first steps taken by global leaders in response to the IPCC's 2014 report calling for global action (IPCC, 2014), and as such serves as a sensible starting point for observation of recent climate discourse. This time span also includes the increase of activism on social

³For the accounts in the list, the distinction of individual versus organisation is entirely transparent, as the biographies provided make plain whether an account is an individual, media group, activist collective or other organisation. There are none that fall into a questionable status.

TABLE 4.1: Username, primary country association, number of tweets, and sum of retweets for each account included in the sample

Username	Country	Tweets	Retweets	Username	Country	Tweets	Retweets
SierraClub ^O	US	38517	918620	MarkRufflao*	US	8019	8219176
ClimateHome ^O	UK	24002	100463	PaulEDawson	UK	7584	550998
cathmckenna	Canada/US	23175	449469	CarolineLucas*	UK	7551	3074254
guardianeco ^O	Int'l	23003	757668	LeoHickman	UK	7046	126018
NRDC ^O	US	21507	778247	EcoSenseNow ^O	Canada	7033	642578
MichaelEMann	US	20565	552026	sunrisemvmt ^O	US	6166	970689
EcoWatch ^O	US	20475	467762	dwallacewells	US	5966	265467
Treehugger ^O	US	18973	160138	GeorgeMonbiot*	UK	5751	1706603
grist ^O	US	17896	201289	dpcarrington	UK	5671	111518
tveitdal	Norway	17741	674460	MaryHeglar	US	5060	164648
DrShepherd2013	US	17131	157427	oxfamgb ^O	UK	5014	122000
James_BG	UK	16637	97349	Amelia_Womack	UK	4876	194875
EricHolthaus*	US	13386	1705911	AOC*	US	4747	30463907
EnvDefenseFund ^O	Int'l	13216	192897	ChrisGPackham*	UK	4499	1321073
350 ^O	Int'l	13085	625050	drvoltz	US	4210	390918
Earthjustice ^O	US	12577	518871	NaomiKlein	Canada/US/UK	3722	1041407
RichardMcLellan	Australia	11570	95316	bradplumer	UK	3708	87896
CarbonBrief ^O	UK	10920	92334	KHayhoe	Canada	3367	346684
MikeHudema*	US	10470	1381195	JayInslee	US	3098	521918
Yale360 ^O	US	10053	273760	Jamie_Margolin	US	2481	181885
UNFCCC ^O	Int'l	9788	889783	GretaThunberg*	Sweden/Int'l	1411	6064854
ExtinctionR ^O	Int'l	9238	603563	Ed_Miliband	UK	1194	964985
billmckibben*	US	9017	2086188	algore	US	1026	449524
ErikSolheim	Norway	8554	875843	BillNye	US	5714	769415
GreenpeaceUK ^O	UK	8318	388630	LeoDiCaprio*	US	591	1505864

Note: Accounts are organised in the table in decreasing order of tweet count. The primary country association of each account is also provided. *Int'l* denotes accounts that represent individuals/organisations with a strong international presence (or are the official international account associated with a given organisation/group). Accounts with the top 10 most retweets are denoted with asterisks for emphasis. Accounts that do **not** belong to individuals are demarked with an *O* superscript.

media spearheaded by Greta Thunberg which began in 2018.

Retweets are used as a proxy of engagement with the posts of activists, as opposed to likes, replies, or a combination of the three. The value of retweets as an indicator of audience interaction and influence is described in the previous chapter. A discussion of the limitations of using retweets as a proxy of engagement with the environmental movement is provided at the end of this section.

To identify the tweets most likely related to climate change, an iterative process to identify a set of keywords identifying content related to climate issues was undertaken. This consisted of first searching for tweets containing "climate change", "carbon", and "environment" and then examining random samples of tweets *not* including these terms to find tweets that were indeed related to environmental issues so as to identify further words or phrases to include in the query.

Iterations of this process continued until no additional terms could be identified to reliably expand the classification.

This process resulted in a final set of the following terms: *biodiversity, carbon, clean energy, clean power, climate, climate change, CO2, coal, ecofriendly, emission, environment**, EPA (the abbreviation of the United States' Environmental Protection Agency), *global warming, green, oil, pollution, renewable, solar*, and *sustainab**. The asterisks denote the stem of the word for the terms that have multiple forms, e.g., *environment* versus *environmental* and *sustainable* versus *sustainability*. The other terms are already in the stemmed version according to the stemmer algorithm available via the Gensim package for Python.

To evaluate the precision and recall of our approach to identify climate-related tweets in the sample, I took random samples of 100 climate-tagged and 100 not-climate-tagged tweets and manually evaluated their climate relevance. The results are satisfactory: all of the climate-tagged tweets were correctly identified as climate-related, while 94 of the not-climate-tagged tweets were actually not climate-related. Examples of these false negatives include the following three posts:

"The ocean between Cape Cod & Nova Scotia warmed 3.6F in under 10 years. These rising ocean temps are forcing fish to abandon historic territories and move to cooler waters."

"Future #pandemics are on the horizon if mankind does not stop its rapid destruction of nature #Coronavirus"

"Nuclear power can be, and should be, one major component of our rescue from a hotter, more meteorologically destructive world."

Each of these indirectly imply criticism of anthropogenic climate change by making reference to examples of threatening consequences. These tweets do not contain keywords or terms that could be adopted into the set of search terms to increase identification of climate-related posts without the risk of incurring false positives. They also focus on complicated scientific concepts that may well be inaccessible to much of the general public. Thus, while this filtering method includes false positives, I am content with the level of accuracy as well as the clarity regarding environmental topics present in the tweets tagged by the method as relevant to environmental issues.

The rest of the sample of tweets labelled as not climate-related cover a wide range of topics. Many refer to other social issues. For example, there are tweets commemorating celebrations such

as International Women’s Day and International Transgender Day of Visibility. Some include political critiques. This makes sense given the geographic bias of the accounts in the sample and that the collection time frame covers two US presidential elections, the UK referendum on leaving the European Union (Brexit), two general elections in the UK, and a Canadian presidential election. Others tweets are more mundane comments and anecdotes about personal experiences of the users.

4.3.3 Method

Linguistic analysis

The Linguistic Inquiry and Word Count (LIWC) dictionary is used to extract psycholinguistic properties from each of the tweets. Before conducting the linguistic analysis, the tweets are preprocessed to remove URLs, usernames, punctuation, numbers, and stopwords. LIWC uses a bag-of-words dictionary approach to quantify language use in socio-psychological categories (Tausczik and Pennebaker, 2010). It functions as a software program which takes text as input and returns a set of scores for 92 domains per input. For each domain, LIWC reports the number of words in the input text belonging to a unique dictionary of words defined specifically for that domain. These dictionaries were curated by psychologists, linguists, and sociologists, and then validated externally in experimental studies (Tausczik and Pennebaker, 2010; Pennebaker et al., 2015). Some of the domains pertain to grammatical features of text, e.g., the number of words, verbs, nouns, etc. Other domains refer to various emotions (e.g., sadness, anger, happiness, fear, etc.), cognition, relativity, and social processes. The score for a domain and subdomain is calculated by comparing the number of words per text corresponding to the domain dictionary to the total number of words in the text, according to the following formula:

$$Score(domain_x, text_t) = 100 * \frac{|words_x \cap text_t|}{|text_t|} \quad (4.1)$$

where x is a given domain and t is in the input text. The scores therefore represent the percentages of words in a text belonging to each domain (or subdomain).

Table 4.2, adopted from Pennebaker et al. (2015), shows the sub-divisions in each domain and some example words from the corresponding LIWC dictionary. A given word may be classified under multiple domains. The score for each domain is the sum of its constituent subdomains.

TABLE 4.2: Semantic domains and sub-domains examined in the study with example words.

Domain	Sub-domains and example words
Affect	Positive emotion (love, nice, sweet)
	Negative emotion (ugly, nasty, hate)
Cognitive	Insight (think, know)
	Causation (because, effect)
Drives	Affiliation (ally, friend, social)
	Achievement (win, success, better)
	Power (superior, bully)
	Reward (take, prize, benefit)
	Risk (danger, doubt)
Time orientation	Past (ago, did, talked)
	Present (today, is, now)
	Future (may, will, soon)

As discussed in Pennebaker et al. (2015), LIWC has been subjected to rigorous psycholinguistic evaluation across a variety of contexts including news media, social media, professional communication (e.g., email), and casual language (e.g., text messaging). As such, its validity and reliability in detecting grammatical and semantic categories in text is generally accepted by scholars in numerous research fields. This has led to its recognition as a standard method in computational linguistic analysis. A few notable examples of research with LIWC include Sharma et al. (2017)'s analysis of abortion discourse on Twitter; Tumasjan et al. (2010)'s construction of psycholinguistic profiles of major figures in the online German political discourse in the run-up to a major election; Pietraszkiewicz et al. (2019)'s investigation of gender-stereotyped use of agency and communion language in job adverts; Dyer and Kolic (2020)'s construction of semantic networks of death and affect in Twitter discourse related to Covid-19; and Tay (2021)'s comparison of the sociopsychological profiles of newspaper coverage surrounding the 2019 Hong Kong protest movement. Nonetheless, weaknesses, limitations, and alternatives to LIWC are discussed later in this section.

Corresponding to the features identified in the environmental psychology literature as discussed in the previous section, I am specifically interested in the following LIWC domains: positive emotion, negative emotion, present, past, and future focus, and social affiliation. To measure agency, I use a combination of Pietraszkiewicz et al. (2019)'s agency dictionary with the LIWC empowerment index, as introduced in Suitner et al. (2022). The Pietraszkiewicz et al. (2019) agency dictionary allows for the quantification of agentic language in text using the same logic as a LIWC dictionary. The LIWC empowerment index averages the following LIWC domains:

power, achieve, reward, insight and cause. The two scores are then averaged to yield the final measurement of agentic language. For illustrative purposes, Table 4.3 contains examples of tweets from the collected dataset scoring highly for each feature.

TABLE 4.3: Examples of high-scoring tweets per feature examined in the study.

Feature	Climate-related	Non climate-related
Positive emotion	Lots of ways to lower carbon emissions associated w/ dietary choices. Vegetarian is awesome, but pescatarian (what I am) better than meat, chicken is better than beef. Local food is less energy-intensive, etc. Each of us can find ways to improve consistent w/ our preferences	Thank you dear women of our lives! Thank you for your wisdom, courage, and strength! #100daysofresistance #WomensMarch
Negative emotion	Do you think it's right that we go on destroying the natural world? A bleached reef is a tragic sight. A desperately tragic sight, particularly if you've seen it before, and you know what it could have been like. #ActOnClimate #ClimateCrisis	Outrageous. Disgusting. Latin American leaders condemn Trump's Mexico wall #ImmigrantRights #CELAC #DumpTrump
Agency/Empowerment	Yes, winning the race to zero pollution is an ambitious goal – but it's 100% achievable. Here's what it'll take.	How a vampire squid inspired a Goldman prize-winning marine life champion #GoldmanPrize
Affiliation	We're giving #ClimateThanks to our 2.4 million members and activists that help NRDC protect and defend our environment. Thank you!	We welcome refugees battered by #HurricaneDorian. We are all members of a shared humanity!
Past focus	We remember those whose lives have been taken or forever changed because of the climate emergency	Congratulations! You've just won #Stupidist-TweetOfTheWeek
Present focus	Don't look away. This is a #climateemergency	Don't wait. Vote today.
Future focus	No plan for the environment. No plan for the economy. No plan for our future.	The PM will address Canadians soon.

Once the features have been extracted, their distributions in the climate and not climate-related subsets are compared between each other and with the baseline values for Twitter as presented in Pennebaker et al. (2015)). This quantifies how similar or dissimilar the average feature usage among activist posts are relative to the more generic Twitter discourse.

Regression analysis

Next, two sets of regression models are used to model the relationships between the variables of interests. For all models, tweets are nested within communicators as the model cases are not independent, i.e., the stylistic variability of each user and the fact that they have different numbers of posts and followers. This allowed for standard error estimations which are robust to the non-independence of the tweets. All models include fixed effects for year, month, and weekday given the periodicity of tweet activity and retweet engagement. The first year of the dataset (2015) is

used as the reference level for year, while the modal values of month (November) and weekday (Wednesday) are used for those variables.

The first model determined if the usage patterns of the psycholinguistic features differed in tweets that are climate related and those that are not. The second model determined if any of the features are related to higher or lower retweet engagement. In each model, the number of followers each user had at time of collection and the word count of each tweet, excluding usernames and URL links, are included as covariates. Word count is not usually included in Twitter studies, due to the short character limit (280 characters) imposed by the platform. However, it is possible there is some variation in tweet length which could reflect different communicative intentions and lead to more or less engagement. Indeed, there is significant variance in length among the tweets in the tweet sample, so it is included here to account for any impact this variable could have on retweet probability. Follower count and number of retweets are log transformed because they are dramatically right-skewed. Moreover, the regressions used bootstrapped standard errors which are robust to non-normality to further account for the skew in these variables.

Finally, the existence of a pathway between climate relevance of a tweet, the use of the target linguistic features, and retweet count is tested. To do so, path analysis is used with the variables determined to be significantly related to higher or lower retweet engagement. Path analysis is a type of structural equation modelling. It extends multiple regression to allow researchers to infer and test sequences of links between variables (Barbeau et al., 2019). It approximates the direct, indirect, and total effects of certain independent variables on other independent variables, along with how they all together influence the dependent variable. To do so, it uses a bootstrap method (Shrout and Bolger, 2002), in which a mean indirect effect is computed using re-sampling, typically consisting of 5000 iterations. The method outputs p-values, confidence intervals, and standard error values for estimations of the direct and indirect effects for the variables included in the model, which are used to interpret the mediation paths.

4.3.4 Limitations

Limitations associated with Twitter

As mentioned in the limitations discussion of Chapter 3, the external validity of research using Twitter data is inherently limited because it is not representative of any given demographic population. Moreover, it is likely not representative of the environmental discourse as a whole. However, the study is specifically concerned with prominent environmental activists engaging with social media discourse, given the rising importance of social media platforms and opinion leaders within environmental debates (as discussed in Chapter 2). Moreover, several studies have shown the strong extent to which Twitter analyses can reflect and predict offline trends, therefore serving as useful indicators of offline realities (Becatti et al., 2019; Bollen, Mao, and Zeng, 2011; Dyer and Kolic, 2020; Gaisbauer et al., 2021; Gaumont, Panahi, and Chavalarias, 2018; Shukla et al., 2019; Stella, Ferrara, and De Domenico, 2018; Stella, Restocchi, and De Deyne, 2020; Tumasjan et al., 2010; Yasseri and Bright, 2016).

Additionally, unlike other platforms such as Facebook and Instagram, Twitter posts are limited to 280-characters.⁴ While there is still significant variation in tweet length and this variation should be accounted for when modelling engagement (as is done here by including word count as a covariate), it is recognised by researchers that the character limit typically forces users to constrain each tweet to a single topic or message (C. S. Park and Kaye, 2019; Z. Zhou et al., 2010). This is convenient for my research design as it reduces the likelihood of a single post containing multiple dominant and potentially contradicting psycholinguistic features, e.g., high positive and negative emotion. As such, drawing correlational relationships between each feature and user engagement is plausible. Thus, while this study cannot generalise to all social media discourse on the topic nor to an external population, it can provide an initial characterisation of environmental activist discourse on one of the major social media platforms, which can then inform studies on other platforms as well as offline experiments.

Limitations associated with LIWC

LIWC continues to be one of the most popular choices for broad computational linguistic analysis. Nonetheless, research using LIWC is not without its limitations. First, LIWC does not enable the detection of higher-level semantic features such as irony, sarcasm, or more complex sentiment.

⁴This limit was 140 characters until November 2017.

Moreover, it is not able to account for context-related features of language which are not commonly detectable with a lexicon-based approach. As such, LIWC's feature extraction does not yield results with the same level of sophistication as more nuanced and contextually-specialised analysis may yield, e.g., manual content analysis. I attempt to offset this limitation by manually examining samples of tweets in the discussion of the prevalence results.

Moreover, LIWC is not the only option to score psycholinguistic features of language. There are various frameworks to score individual categories such as sentiment, toxicity, contextual affect, and verbal complexity. These frameworks assist in the quantification of how entities are portrayed along the dimensions of power, agency, and sentiment (Field and Tsvetkov, 2019). However, none of these frameworks provide one single method for identifying emotion, agency, social affiliation, and time. Unlike other scoring tools, LIWC allows for an exploration of the exact features of interest known to be influential in environmental communication, all within the same framework and all developed by the same panel of experts. Another major advantage of LIWC is that its developers calculate base rates, i.e., how prevalent each of the features are in broad samples of discourses from various sources, including Twitter, for comparison. These base rates are a very useful point of reference as they provide an indication as to how results from more specific discourse settings on the platform compare with the platform average.

Limitations associated with the sample of activists

The pre-labelled list of Twitter accounts associated with influential environmental activists and activist groups provides an exogenous classification of users and tweets are validated in previous peer-reviewed research (Luo, Card, and Jurafsky, 2020). However, the sample is limited to 50 users. This raises questions about the generalisability of the findings beyond the sample. Given the considerable volume of retweets that the users included within the sample generated, it is clear that the users reach and influence a considerable volume of other Twitter users. Thus, they are clearly prominent opinion leaders in environmental activism on Twitter. It is therefore still useful to study them to get an initial sense of the general trends in emotional framing that environmental activists use in their communication on Twitter. They present an initial benchmark for the link between psycholinguistic framing and retweet engagement for future work to expand upon with investigations of other users, perhaps on different platforms, and with other types of interactions. Furthermore, to my knowledge, there is no standard regarding sample size in Twitter research,

so I offer this analysis based on the sample as a starting point for further investigation of other prominent users in this space.

Additionally, most of the users in the sample are based in the US, UK, Canada, Australia, and Europe, and virtually all of them post in English. In doing so, they contribute to the global dialogue on environmental activism and not to the discourses that may be ongoing in more specific local contexts. As a consequence, the analysis of this chapter is not able to shed light on how the sample's globally-oriented activism affects and/or interacts with more local and context-specific activism, where cultural, political, and social values and norms will inevitably condition the focus points of various campaigns and their effectiveness. It should be emphasised that what drives interaction on the global level may not be the same as what mobilises social media audiences to engage with local issues. Future research should address the geographic and linguistic bias of this work by repeating the analysis for sets of activists who produce content in different languages and who speak to environmental issues in more localised contexts.

Limitations of retweets as indicator of engagement

The value of using retweets to track interactions and influence on Twitter is described at length in Chapter 3. In that analysis, retweets were the most relevant mechanism to study because of how they have been demonstrated to signal influence of a tweet on the retweeting users (Abdullah et al., 2017; Metaxas et al., 2015; Majmundar et al., 2018) and how it serves to diffuse information across networks of connected users (M. Cha et al., 2010; Kwak et al., 2010). In this case, I am less concerned about retweets as a diffusion mechanism but more interested in how they signal engagement with the information contained in a given tweet.

The strength of engagement reflected by retweet count is distinct from that which is reflected by other types of interaction with individual tweets afforded by the platform, e.g., likes and replies. Lipsman et al. (2012) suggest that retweets are more salient symbols of engagement than likes because while the latter indicate appreciation and signal agreement with the content conveyed in the tweet, the act of retweeting expresses more commitment to the content and willingness to spread it. Furthermore, Kwak et al. (2010) and M. Cha et al. (2010) argue that replies and mentions are used more often to engage users in conversation than to reflect an inclination to engage with and spread the communicated information.

Returning to retweets, it is possible that a user might retweet an activist's tweet to ridicule or disagree with it, especially given the option to make a "quote retweet", i.e., a retweet with commentary. However, my design is limited to the metadata available from the tweets of each user in the sample. This includes the total like count, retweet count, and reply count, but does not distinguish "normal" from quote retweets. Therefore, I am unable to distinguish retweets signalling supportive engagement with the activists from that which may be seeking to disagree with or degrade them. In order to distinguish these two forms of retweet engagement, it would be necessary to track down and verify the stance of each retweet of each tweet in the sample. This was unfortunately beyond the scope of the study. It is not yet known how frequently malign quote retweeting occurs with tweets from environmental activists (or from any other type of user generally), and therefore presents an intriguing avenue for future research.

Moreover, as also touched in the last chapter, there is a diversity of reasons for why users decide to retweet. While much of this remains to be further investigated in the changing social media landscape, previous work has determined that agreement with and endorsement of the importance of the retweeted content as a common motivation across independent samples (Abdullah et al., 2017; Majmundar et al., 2018; Metaxas et al., 2015). An additional critique of using retweets as a proxy of engagement is not unique to retweets in particular as a mechanism of interaction and influence, but to all forms of engagement with activism online. Primarily, the study of online engagement at the level of counts of interactions, without ways of probing how this engagement affects individuals beyond their online activity, cannot distinguish between sincere movement support from what has come to be known as "clicktivism" (George and Leidner, 2019). The term has been used to describe participation in online activism which requires little effort or commitment, e.g., retweeting or signing online petitions. Critics of clicktivism argue that such actions on their own are insufficient for bringing about substantive developments (Bozarth and Budak, 2017; Gladwell, 2011; Morozov, 2019).

While it is true that not all participation with online activism reflects the same level of commitment to and engagement with the broader movement, it is also hard to deny the impact that the cumulative mobilisation achieved by online social movements has had on precipitating real-world change (Han and Ahn, 2020; M. Lee and Murdie, 2020; Y. Li, Bernard, and Luczak-Roesch, 2021; Tufekci, 2013; Tufekci and Wilson, 2012). Thus, it is clear that even if one cannot determine the precise character and underlying motivations of interactions with online activism, they are

still important to study as components of the success or failure of online social movements.

Limitations of the analytical framework

The analytical framework of this chapter relies on regression models relating measurements of psycholinguistic feature presence and retweet engagement, controlling for climate content relevance, word count, and follower count. It does not take into account non-content related variables of the tweets and how these might also affect engagement. In particular, I only analysed the text of each tweet, excluding any videos, images, or links that might be associated with them. This means I lose some information conveyed by these attachments, thereby potentially neglecting components of the full message conveyed. This is something to be taken into account in follow-up studies as multimedia posts become more popular.

Additionally, the work is vulnerable to the dependent variable problem: I examine the use of agency, emotion, affiliation, and temporal focus in tweets posted by accounts in my sample but not those of a control group of accounts from the same time period. This issue is somewhat mitigated by the comparison with the Twitter base rates for each feature but comparisons would have been made more robust with a randomised control set.

Moreover, while tweets are clustered by user to account for the stylistic non-independence between tweets of the same user, the models could potentially be improved by adding further user fixed-effects. Such controls could attempt to capture reasons beyond a tweet's psycholinguistic character for why users engage with certain accounts, e.g., general affinity for specific users, retweeting posts to support friends (regardless of how they frame their content), boredom, or, as mentioned in the previous subsection, for the purposes of disagreeing with or denigrating the original user.

Furthermore, the dataset ranges a wide span of time - just over five years. The study does not account for the fact that user communication on environmental issues might have developed or changed over this time period. My analysis assumes that each user has more or less the same profile year on year, but this may not be the case. Therefore, it would potentially strengthen the results by providing more granularity to examine the embedding spaces and psycholinguistic profiles for each year, rather than over the entire span. Moreover, the study could be enriched with further temporal analysis to dynamically chart the changes in the usage of the psycholinguistic features over time and the corresponding correlation with retweet interactions. This could also

include analysis of hashtag usage, e.g., does the use of specific hashtags correlate with the use of different features, and do these trends change over time.

Nonetheless, the focus of this work is to provide an initial understanding of psycholinguistic feature use within the communication of thought leaders on Twitter. It provides a benchmark on top of which future work can build. As the literature demonstrates, psycholinguistic features in environmental communication have been found to have a strong impact on individuals' intentions to engage in activism, and different psycholinguistic features may impact audience engagement to different extents. Therefore, while acknowledging that the study is not able to test for all possible variables that may account for user engagement with online content, it does provide valuable and unprecedented insight into the significance of a range of psycholinguistic features for engagement with environmental activism on social media which have not been investigated before.

4.4 Results

To get a sense of how tweet and retweet activity trend over time, Fig 4.2 plots the normalised weekly average of climate-related tweets posted by activists in the sample and retweets received by these posts. While temporal analysis is not the primary focus of this chapter, this basic overview demonstrates how the activists in the sample increased their activity over time, which can be interpreted as an intensification of their efforts to engage the public on environmental issues, as well as overall attention to these issues by a growing number of stakeholders.

The x-axis is marked with the dates of a selection of events within the collection time frame associated with environmentalism and/or climate action. This is a purely descriptive exercise to superficially investigate correspondences between activity peaks, retweet peaks and notable events. I identified these events by examining the tweets most retweeted on the given dates, and by finding the main topic of discussion in those tweets. Some of them correspond to annual intergovernmental-conferences such as the UN's Committee on Progress (COPs) which convene each year to discuss climate change, G7 meetings, and the World Economic Forum summits in Davos, Switzerland. Another set of dates correspond to pro-environmental policy initiatives, including the UK Parliament declaring a climate emergency in May 2019 and the announcement of the EU's green recovery plans in the aftermath of the COVID-19 virus. There are also some dates of key protest events, including the beginning of Greta Thunberg's *Fridays For Future* climate strikes in August 2018, the Global Strike Day in March 2019, and Global Strike Week of September 2019.

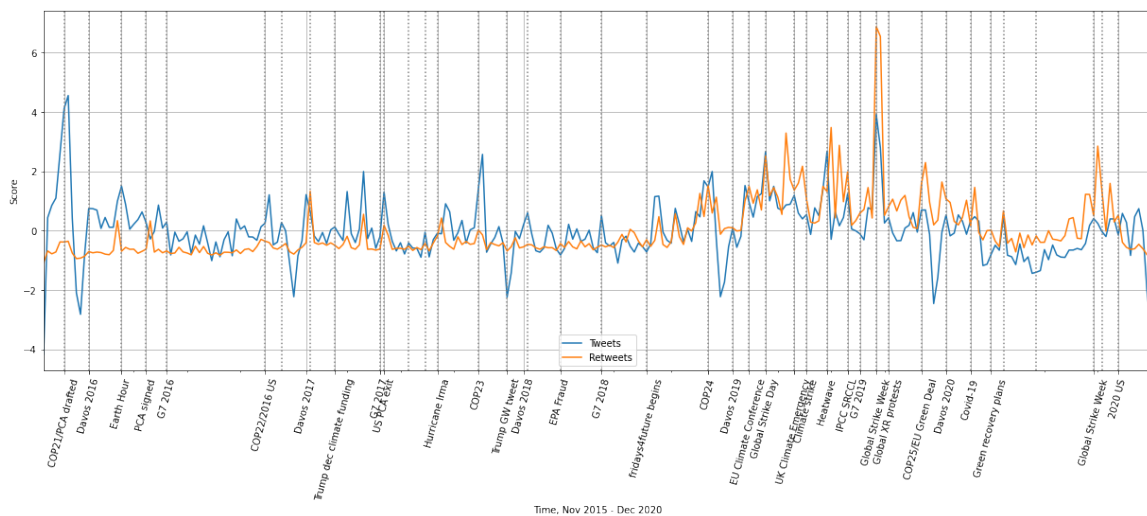


FIGURE 4.2: Normalised weekly average of climate-related tweets posted by activists in the sample and retweets received by these posts.

Note: A score of 2 for retweets means that in that week, the number of retweets received by activists was two standard deviations above the mean over the full dataset. The dates of major climate-related events are plotted along the x-axis to show how tweet and retweet activity spiked around them. PCA = Paris Climate Agreement, 2016 (2020) US = 2016 (2020) US presidential election, COP = Committee on Progress, i.e., instalments of the United Nations Climate Change Conference. IPCC SRCCL refers to the special report on climate change and land use published by the IPCC in August 2019 (IPCC, 2019).

Others include more controversial events, e.g., Trump's announcement to downsize the US's Environmental Protective Agency (EPA; Neslen (2017)) and his tweet from December 2017 denying climate change (Merica, 2017).

While I was not able to identify all events coinciding with the peaks, many of the identified events did in fact coincide with peaks of tweet and retweet activity. The largest activity peaks occur around the time of COP21 in November 2015 when the Paris Climate Agreements were signed and the September 2019 climate strikes inspired by Greta Thunberg's *Fridays for Future* movement. Peaks for retweet engagement pick up significantly around the dates of the global strikes organised by *Fridays for Future* in the spring and autumn of 2019. Interestingly, peaks in tweet activity and retweets received do not often correspond. For example, there are peaks around each of the COPs occurring in the time frame, but these peaks in activity lack a corresponding response in retweet activity. This suggests that the posts on this topic were not as commonly retweeted as those on other events, e.g., the climate strikes and Trump's clashes with the EPA in 2017.

The discrepancy in activity and retweet peaks is particularly intriguing as it implies that there is sometimes an incongruence between what activists focus on/perceive as important to communicate with their audiences, and what these audiences tend to engage with. Future research investigating this dynamic could provide insight into the topics and themes that most capture audience attention and engagement.

4.4.1 Linguistic analysis

Table 4.4 shows the mean (M) and standard deviation (SD) for each of the target linguistic features, word count, number of followers, and number of retweets received in the overall dataset, and within the climate-related and not climate-related subsets. The base rate on Twitter for each variable is also included for comparison.

Comparing the climate and not climate-related subsets with the base rates, we see the activists generally use less positive emotion and time focus than the Twitter norm, particularly in climate-related tweets. Negative emotion is only marginally higher in climate- and not climate-related posts than the base rate. Empowerment/agency in climate-related posts is higher than the base rate and not climate-related posts. Interestingly, the mean value for social affiliation in climate-related posts is lower than not climate-related posts as well as the base rate. This observation for

TABLE 4.4: Descriptive statistics for the variables included in the regressions.

Variable	Base Rate	Overall (N = 510319)		Climate-related (N = 218100)		Not climate-related (N = 292219)	
		M	SD	M	SD	M	SD
Positive Emotion	5.48	3.65	6.32	2.88	4.07	4.22	7.13
Negative Emotion	2.14	2.19	4.26	2.20	3.92	2.18	4.42
Affiliation	2.53	2.57	4.6	2.41	4.02	2.7	4.86
Empowerment/Agency	1.76*	1.81	1.63	1.96	1.54	1.7	1.65
Focus Past	2.81	1.5	3.39	1.28	2.74	1.67	3.67
Focus Present	11.74	8.47	7.68	7.68	6.23	9.06	8.28
Focus Future	1.6	1.17	2.88	1.27	2.67	1.10	2.98
WC	-	20.3	11.2	22.5	10.9	19	11.2
Followers	-	551540 (12.3)	1711547 (1.6)	365447 (12.2)	1038317 (.94)	690432(12.4)	2065427 (1.14)
Retweets	-	147.56 (2.79)	1749.98 (1.60)	92.3 (2.91)	841.9 (1.47)	188.9 (2.69)	2194.3 (1.68)

Note: Mean (M) and standard deviation (SD) for the linguistic variables in the climate-related subset are given first, with values for the not climate-related subset given in parentheses where different. For the variables *Retweets* and *Followers* the statistics are presented in addition to the logarithmic transformation in parentheses. Constant of 1 has been added to all the transformed variables for scaling reasons.

*The base rate given for the empowerment variable is an average of the LIWC variables included in it.

affiliation contrasts with the findings of Suitner et al. (2022). In that work, the authors sampled climate-related tweets from 1 March to 19 April in 2017, 2018, and 2019. These periods were selected because of the high levels of protest activity happening both on and offline within them. As such, it is likely that the sample contains a bias towards collective action advocacy, and therefore a bias towards affiliative language, e.g., encouraging people to come together to support a protest, than more generic communication about climate issues, as captured in the sample of this work.

4.4.2 Regression analysis

Before building the models, potential collinearity in the datasets is assessed by examining the correlation between each pair of variables. The results indicate that none of the variables are correlated above the acceptable threshold of 0.85 (Kline, 2005) so we proceed with the modelling. The correlation table is presented in Table 4.5.

Fig 4.3 visualises a schematic of the variables and relations modelled. First, the relation between each feature use and climate relevance is examined individually. The coefficients of climate-relevance for each psycholinguistic feature are listed to the left of the features. They indicate that climate-related tweets are significantly less likely than tweets unrelated to climate issues to contain positive emotion, affiliation, focus on the past, and focus on the present. Meanwhile, climate-related tweets are more likely to contain language with agency/empowerment and focus on the future. Presence of negative emotion did not significantly differ between the subsets. These results

TABLE 4.5: Correlation coefficients for the variables used.

Variable	2	3	4	5	6	7	8	9	10
1. Positive Emotion	-.106	.078	.136	-.036	.153	-.012	-.124	.022	-.064
2. Negative Emotion		-.034	.064	-.002	-.025	-.023	-.044	-.012	-.056
3. Affiliation			.022	-.003	.126	.014	.076	.083	.035
4. Agency/Empowerment				.017	.042	.033	.028	.02	.02
5. Focus Past					-.05	-.042	.078	-.009	.022
6. Focus Present						.052	.014	.073	.031
7. Focus Future							.016	-.004	-.007
8. WC								.048	.235
9. FollowersT									.519
10. RetweetsT									

Note: Subscript T refers to logarithmic transformations. Constant of 1 has been added to all the transformed variables for scaling reasons. All correlations are significant at $p < .001$.

provide evidence supporting hypotheses 1a, 2b, 4a, and 4e, while failing to support hypotheses 2a, 3a, and 4d.

Next, all variables, including the log of followers, climate content relevance, tweet length, and the linguistic features are used to predict the log of retweets. This model accounted for 34% of the variance of log retweets: $R^2 = .342$, $SE = .036$, $p < .001$, 95% CI = [.27, .41]. As in previous studies, the number of followers was a significant predictor of the retweet count ($B = .78$; $SE = .08$; $p < .001$, 95% CI: [.62, .94]). Tweet length in terms of word count is also positively related to log retweets ($B = .034$; $SE = .006$; $p < .001$; 95% CI: [.022, .046]). Importantly, we also found a significant effect of content climate relevance ($B = .28$; $SE = .22$; $p = .015$; 95% CI: [.06, .5]), suggesting climate-related tweets of activists were more retweeted than their non climate-related tweets.

In terms of the linguistic features, tweets were more retweeted the more they contained negative emotions ($B = .02$; $SE = .004$; $p < .001$; 95% CI: [.012, .028]), but the less they had references to positive emotion ($B = -.009$; $SE = .005$; $p = .078$; 95% CI: [-.019, .001]) although the statistical significance of this effect narrowly misses the $\alpha = .05$ significance level. None of the other variables are found to have a significant relation to retweets below $\alpha = .10$. These results fail to support the hypotheses for links between agency, affiliation, time focus, and retweet engagement (1b, 3b, 4b, 4d, and 4f). However, the results for negative and positive emotion suggest a pattern matching the negativity bias in other discourses on social media. This will be further discussed in the next section.

Because negative and positive emotion are the strongest predictors of retweet engagement,

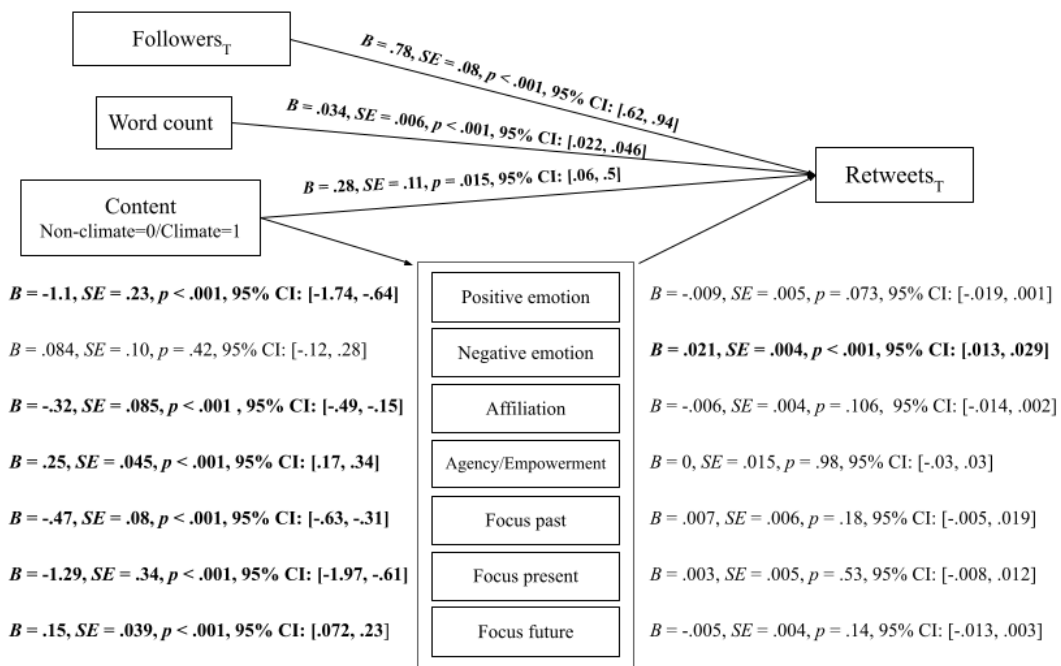


FIGURE 4.3: Schematic representation of the path analysis model used to determine the direct and indirect effect of followers, tweet content, positive, and negative emotion on retweet popularity for activist tweets.

Note: Coefficients, standard errors, p-values, and 95% confidence intervals for each coefficient are provided on the lines connecting each variable. Variables with p-values < 0.05 are bolded for emphasis. Number of followers and retweet count are marked with a subscript T to denote their log-transform.

as well as presenting a convenient binary for comparison, path analyses are conducted between them, climate content relevance, and retweet engagement. The path analyses reveal that the indirect effects through positive and negative emotion between climate relevance and retweet engagement both amounted to 0. Therefore, there is no evidence to suggest that activists used more or less positive or negative emotion when talking about environmental issues and that this in turn precipitated higher retweet engagement.

4.5 Discussion

Feature-specific findings

In this chapter, the presence and engagement potential of key psycholinguistic features in the communication of environmental activists on Twitter were investigated. The primary result is that although negative emotion was not any more prevalent in the climate versus not climate-related posts of the activists, it was the only strongly significant predictor of retweet engagement of all the psycholinguistic features. As discussed in the literature review, studies on the relation between emotion and retweet diffusion are informed by the observation that people tend to pay more attention to negative information. This has also been found to be true for other discourses on social media, but this work was the first to investigate whether or not this trend persisted in environmental discourses on social media.

The findings for negative emotion suggest that activists do not necessarily rely on over-emphasising negative sentiment or the negative elements of environmental issues in communicating about them on Twitter. A common criticism levied at environmental activists is the claim that they are "alarmist" in their communication, always overdramatising the threats of environmental issues (Hoffman, 2011; Küppers, 2022; Risbey, 2008). If this were true, we would expect to see higher levels of negative emotion in activist tweets related to environmental issues than the expected base rate and in tweets unrelated to environmental issues. This is not what the results indicate, therefore invalidating the claim of alarmism, at least within this sample of activists.

Meanwhile, the tweets that do contain negative emotion are the ones which tend to receive the most audience engagement. Examples of tweets with high scores for negative emotion include:

"We are in danger of destroying ourselves by our greed and stupidity. We cannot remain looking inwards at ourselves...#ClimateChange"

"We know that adults have heard our cries. Now we want them to cry with us #ClimateStrike"

"We cannot separate social justice from environmental justice - it's the poorest communities who suffer most from our inaction."

Whereas tweets with high scores for positive emotion include:

10 reasons why we love community solar.

"Remember our #ClimateOnTheMind series? We want to create more awesome stuff like this. Help us!"

"Embracing clean energy helps companies and communities thrive #ReadyFor100"

The result of tweets in the first set receiving more engagement than those in the second supports the negativity bias pervading social media. Moreover, it suggests that negative messages are more successful at eliciting support via retweet, which may or may not indicate a tendency towards engagement with offline environmental activism. However, the findings of this study do not tell us whether engagement with negative tweets extends beyond online activity and into offline behaviour. Thus, they raise questions regarding the extent to which exposure to climate-related content on social media with more negative content activates a sense of obligation to take offline action relative to more positive content. This question will be investigated in a follow-up experiment, presented in the next chapter.

The findings for agentic language are compelling in their statistical insignificance with engagement. While activists do tend to use more agency-related words in their climate-related tweets, this trend has no relation with engagement tendencies. This finding demonstrates that activists do highlight action and empowerment in their communication about environmental issues, but that it is not necessarily having the intended effect on audience engagement. This is interesting because the literature suggests that highlighting agency can be an effective way to increase engagement. However, when looking into the highest scoring tweets on the agency-empowerment index, the emphasis of these tweets is not on specific actions or empowering individuals. Instead, a lot of these tweets focus on legal and policy victories:

"Historic Victory: 4 Teenagers Win in Massachusetts #Climate Change Lawsuit"

"NZ law student takes government to court over climate policy 'failure'"

"Centerpiece Of #Obama's #Climate Plan Wins Major Victory #keepitintheground #ready-for100"

Discussions of goals and plans to achieve them:

"Ambition #Adaptation : Achieving agricultural transformation under #ClimateChange"

"Business Leaders Set Ambitious New Goals: #COP21 #ActOnClimate"

"How cities can lead on climate change solutions"

Recognition of leaders in climate change advocacy and sustainability:

"6 environmental leaders receive #EarthChamps award- UN's top environmental prize. Discover the winners"

"Goldman environmental prize: top awards dominated by women for first time"

"UNFCCC chief CFigueres wins prestigious Joan Bavaria #Sustainability Award"

Or generic comments about opportunities of the green transition:

"Economic opportunity of going green is massive! Best way to get ahead is to lead!"

"Watch: How technology is leading us to new climate change solutions."

"@JohnKerry calls #HFCphasedown a classic win-win-win: save money for consumers and #ActOnClimate"

These areas of focus lack specific emphasis on specific actionable information, a key ingredient in agentic communication according to the environmental psychology literature. As such, I do not think that these results are sufficient to suggest that agency in activist tweets is unimportant for driving engagement. Instead, this observation suggests that the dominant formulation of agentic language in this dataset, as detected by the LIWC empowerment index and the Pietraszkiewicz et al. (2019) agency dictionary, does not embody the kind of agentic language found by experimental studies to have an impact on engagement with activism and pro-environmental behaviour. An interesting avenue for future research would be to further examine this nuance in agentic language, from more specific or concrete to more generic or abstract, and its relation to audience engagement in other samples of activist communication on social media.

Regarding social affiliation, the results demonstrate that activists use less affiliation in climate-related tweets than in tweets not related to climate topics. However, this feature had no significant relation with retweet engagement. For reasons similar to those provided for agentic language, this result for affiliation is surprising. Experimental studies show that an increased sense of group affiliation reinforces intention and behaviour that favours engagement with collective action. Moreover, the Suitner et al. (2022) study suggested that affiliation could be an important feature of the climate discourse for its growth. Therefore, one would have expected that it would appear more frequently in climate-related tweets.

Looking at the highest-scoring tweets on affiliation, we see that they reliably contain appeals to collective identity through references to community, family, friends, and above all, a collective responsibility to take action in order to protect them from the consequences of climate change and inaction.

"In 50 days, we will stand together to protect our climate, our health, and our communities. Join us. #ClimateMarch"

"On April 29, @NRDC will march for our communities, our climate, our families & future generations. Will you join us?"

"The cost of climate change is our friends, our neighbours, our communities. When the people and places we love come under threat, we must act to protect them. #OurClimateMoment"

"We now have concrete evidence that the #TPP threatens our families, our communities, & our environment."

Therefore, it does not appear to be the case that the formulation of affiliation emphasis is falling short of what current evidence from environmental psychology reports is most likely to motivate people towards engagement, as might be the case with agentic language, but rather that the audience is having a different reaction to this content which researchers have yet to understand. One potential explanation is that this emphasis on collective identity and action might alienate audience members who have not yet joined these actions, and perhaps feel guilty about their lack of participation. Another is that while emphasising collective identity is a powerful motivator of pro-environmental behaviour, this simply does not extend to retweet engagement on Twitter. Future work comparing on- and offline engagement with affiliation-heavy communication should endeavour to clarify this tension.

In terms of temporal focus, none of the orientations were found to be correlated with retweet engagement, while all were significant in differentiating climate-related from not climate-related content. We see that when tweeting about climate-related issues, activists tended to use less focus on the past and present and more references to the future, relative to when they are tweeting about topics not related to climate. When looking into climate-related tweets with high scores for future focus, these tweets commonly refer to the imminently threatening nature of climate change. They also circulate findings of papers related to these future threats, e.g.,

"Scientists warn drastic climate impacts coming much sooner than expected"

"Climate change may soon diminish crop yields"

Others scoring highly refer to upcoming protests or other collective action campaigns, e.g.,

"Look who's coming to the #climatemarch tomorrow!"

"We're expecting to see loads more tomorrow. #ClimateStrike"

And finally, commentary on prospective policies changes or consequences of political controversies, e.g.,

"Shipping industry prepares for looming climate tax"

"#Australia #energy plan may breach Paris #climate commitments"

"Will Biden and Sanders poach Warren's climate plans?"

"Pentagon Moves Ahead With Obama-Era Climate Preparation Plan Despite Trump's Orders"

"Climate change: Nations will push ahead with plans despite Trump"

As discussed in Chapter 2 and in the literature review of this chapter, several studies suggest that environmental communication may receive less engagement when featuring more references to the future because of the human tendency to discount future risk. Therefore, the trend of activists emphasising it more in climate-related tweets may have a backfiring effect, especially if not paired with information expressing what can be done now to mitigate the long-term risks or to achieve long-term goals.

When looking at climate-related tweets with higher scores for present focus, the tweets commonly contain generic appeals to collective action, e.g.,

"TODAY we're joining a worldwide push to #StopFundingFossils - join us"

"Don't make me do this alone! #actonclimatenow"

"Please join the conversation #YouthClimateAction!"

or appeals to urgently watch some climate-related content, e.g.,

"#Innovate4Climate: watch live here"

"WATCH NOW: AlGore Joins SenSanders to Talk #ClimateChange"

While appeals to support collective action and spreading information about environmental issues are both very important pieces of audience mobilisation, previous experimental work demonstrates the effectiveness of anchoring audience attention to specific solutions in the present (Hine et al., 2016). Yet we see few references to concrete actions and solutions within these tweets. Overall, the discord between these results for temporal focus, across the three dimensions, and the predictions of the environmental psychology literature highlights the importance of further investigating temporal framing in environmental communication in order to clarify its effects on audience engagement with the discourse.

Importance for Value-Belief-Norm Theory

The findings of this study provide some preliminary contributions relating social media communication to Stern's value-belief-norm (VBN) framework. VBN theory posits that people's behaviours towards environmental issues are determined by the value that they place on themselves, other people, and the environment (P. C. Stern, 2000). These values can be influenced by the information audiences absorb from social media platforms such as Twitter specifically from influential opinion leaders (Dekoninck and Schmuck, 2022). Retweet engagement with activist content generally reflects influence and signals support for the content expressed (Metaxas et al., 2015). Therefore, the finding of preferential engagement with content containing more negative emotion and less positive emotion suggests that perhaps this type of messaging could be an effective way of activating the VBN pathway undergirding pro-environmental behaviour. However, the current study was limited to support for the environmental movement in the form of retweet engagement, which does not give us any reliable indication of how individuals who retweeted the content then went

on to engage in pro-environmental behaviour in their offline lives. An extension into offline behavioural intentions moderated by framing in social media communication is undertaken in the next chapter. Further discussion of how these two chapters collectively contribute to relating VBN to environmental communication via social media is also taken up then.

4.6 Conclusion

In conclusion, this chapter provides the first systematic evaluation of the psycholinguistic profiles of a sample of environmental activists on Twitter. It is the first attempt to hold the mirror of environmental psychology to activist messaging about environmental issues on social media. On one hand, the results imply that activists have adopted what environmental psychologists might recommend for the use of agency, affiliation, and future focus in their communication of environmental issues on Twitter. However, these usage patterns were not found to have the predicted corresponding relation to audience engagement. Instead, the results suggest that of the psycholinguistic features examined, only usage of negative and positive emotion had meaningful relations with audience engagement. To date, the literature has found mixed results for how we can expect emotion in communication to impact how we feel about environmental issues, and what actions we take in response. This result implies that environmental discourse on social media conforms to the negativity bias detected by studies in other social media discourses, and within mainstream media more generally.

Moreover, this study identifies areas where there is room to improve our understanding of how findings from environmental psychology, specifically experimental studies with other forms and formats of communication (as shall be discussed further in the next chapter, the most common in the literature to date are videos and longer-form content made to resemble news articles), relate to what we observe in terms of engagement with social media communication of prominent opinion leaders. As social media platforms become ever more important sources of information and mobilisation, it is vital that researchers endeavour to better understand how these platforms may challenge what previous work outside the social media context has led us to expect about the relations between message framing and audience engagement, specifically participation with environmental activism and adoption of pro-environmental behaviours.

Nonetheless, the findings of this work can only speak to correlations between the psycholinguistic features examined and audience engagement via the proxy of retweet count. The results

cannot speak to why we observe the preference for negative emotion over other features with respect to engagement. Nor do they allow us to speculate about how this feature may influence offline behaviour. It is therefore critical to complement studies of social media engagement with studies of offline engagement to see if the correlations observed in the social media studies meaningfully reflect offline trends and/or behaviours. Therefore, an experiment to further probe the relation between message framing and engagement with environmental activism is conducted and presented in the next chapter.

Chapter 5

Manipulating emotional framing of pro-environmental tweets

This chapter has been extended from the manuscript published by Frontiers Environmental Psychology on 30 January 2023. DOI: 10.3389/fpsyg.2022.1099331.

5.1 Abstract

This chapter tests the correlational observations of the previous chapter with an offline experiment (N = 200). The emotional framing of pro-environmental messages are manipulated and the corresponding impacts on reported behavioural intention with collective action are measured. Moreover, the effect of mood as a mediating mechanism between emotional framing and behavioural intention is examined. The results reveal both direct and indirect effects on reported climate action intentions when mood is used as a mediator. The negative mood resulting from seeing negative tweets makes participants more likely to report higher action intention (indirect effect) - congruent with the findings of Chapter 4. However, seeing negative tweets also makes participants less inclined to act (direct effect), indicating the presence of other mechanisms at work on the pathway between information and action intent formation. The work of this chapter highlights the complex and multifaceted nature of this relation and motivates more experimental work to identify other mechanisms affecting it, as well as how these processes may interact with one another.

5.2 Introduction

The previous chapter provided an initial exploration of the psycholinguistic landscape of international environmental activists on Twitter, as well as how their usage of key psycholinguistic features relates to retweet engagement. Among emotion, agency, social affiliation, and temporal focus, the results of that study identified significant correlations between the usage of negative and positive emotion and retweet engagement. Therefore, the conclusion of that study is that the audiences of the environmental activists included in the sample tended to respond to and engage more actively with tweets scoring higher on negative emotion than tweets with more neutral or positive emotional tones. These results are naturally limited to activity on Twitter and to the sample of activists; they cannot tell us how this preference for engaging with negative content affects an individual's tendencies to support the pro-environmental movement with participation in offline collective action. Thus, in order to understand how, or indeed if, retweet engagement can reflect offline engagement, experimental work with consenting participants must be undertaken. Such an experiment is the subject of this chapter.

Specifically, I sought to replicate the effect found in the Twitter study in a controlled experimental setting by focusing on climate-related content only and manipulating the emotional framing of tweets presented to participants. In response to the tweets, participants were asked to express their intention to retweet and engage in a suite of collective actions. I expected that in accordance with the Twitter study, tweets framed with less positive content and more negative emotion would elicit higher retweet and behavioural intention.

Additionally, I studied a psychological mechanism potentially underlying the decision to retweet or engage with climate action: mood. As will be described in further detail below, mood is influenced by emotional framing (J. Russell and Barrett, 1996) and thereafter influences our actions and perspectives (Barsade, Coutifaris, and Pillemer, 2018; DiRusso and Myrick, 2021; Rucker and Petty, 2004), and as such potentially acts as a mediator between information input and behavioural response in the context of environmental communication.

Experimental designs using messages taken from social media and presented in a format intended to simulate as much as possible the viewing experience are rare in studies of environmental communication. In particular, most experimental studies use longer-form messages or videos which have been specifically calibrated to manifest various dimensions of interest. However, few of these studies consider the extent to which these messages and the formats with which they are

delivered resembles how people would encounter this information in the real world, specifically on social media platforms. As these platforms continue their rise in prominence as a source of news and information about environmental issues, it makes sense to test materials and messages which resemble as strongly as possible how this information would actually appear to individual users "in the wild."

The next section presents a more detailed summary of the materials and design of past experiments in environmental communication framing, highlighting the relative novelty and importance of testing the influence of content written for sharing specifically on social media platforms, given their various affordances and constraints, in offline simulations and experiments. Then, I introduce mood as a mechanism mediating the pathway between emotional framing and action intent, and provide further motivation for why it is examined in the experiment. Afterwards, I discuss the experimental design, including an overview of the participants, procedure, stimuli, measures, analysis plan, and a rigorous reflection on the design's limitations. Then, the results are presented, their implications discussed, and directions for future research outlined.

5.3 Previous experimental work

The literature review section of the previous chapter summarised the studies which have been used to investigate and establish the role of agency, emotion, social affiliation, and temporal orientation in environmental communication and beyond. In order to further contextualise and motivate the specific design used in the experiment presented in this chapter, it is worth further examining the qualities of the messages tested in these previous studies, specifically how they were sourced and/or created, what format and length they took, and the extent to which they resemble how individuals would encounter such information in their daily lives. Because the Twitter study and this experiment focus on the emotional framing of text in Twitter posts, I only discuss studies experimenting with framing in text, excluding studies solely investigating visual framing without a text element.

The majority of the studies use materials written by the authors to precisely manipulate dimensions of interest. The work of Amy Chadwick (2014) exemplifies this approach. In that study, the author was interested in testing strong and weak messages related to four components: the importance of protecting the climate, the congruence of protecting the climate with other participant goals, the potential of protecting the climate to improve the future, and the feasibility of

protecting the climate. The strong versions were designed to evoke high appraisals related to each component, while the weak versions were designed to evoke low appraisals. For the strong and weak conditions of each component, separate paragraphs were composed. The author ensured that all paragraphs had similar word count and readability. The paragraphs were then combined in different ways, summing to passages 300 words in length (approximately one minute reading time), and presented to individuals as raw text. While this approach allowed the author to control with high precision the independent variables of interest, a significant disadvantage is that it did not test content which necessarily resembles what individuals might realistically encounter in the real world. The studies of Hornsey and Fielding (2016) and Zomeren, Pauls, and Cohen-Chen (2019) employed a similar approach, presenting participants with author-generated messages of comparable length to Chadwick's tailored to manipulate the presence of certain frames and/or emotions regarding various environmental issues.

In other studies, authors have adapted messages from pre-existing sources. For example, Spence and Pidgeon (2010) constructed 900-word passages adapted from the 2007 Intergovernmental Panel on Climate Change report and presented them to participants as a web page. The authors of that paper were interested in the effectiveness of gains versus losses frames and so the report text was adjusted to either describe the losses that will occur from climate change or the gains that will occur from mitigation. Moreover, Diamond and Urbanski (2022) use a sample adapted from real articles published by prominent newspapers but scrubbed of any images and/or formatting signals that could lead participants to identify the original outlet, as well as any political content that could activate partisan reactions.

While using author-generated text, a couple of other studies have endeavoured to make their materials appear more realistic, or at least resembling how individuals might find the information organically. Gifford and Comeau (2011) use a series of single-sentence messages designed by the authors to resemble how the items are "discussed within the context of consumer culture, particularly as presented in the media," but without providing a description of how this was validated. The statements vary in their inclusion of a sacrificial or motivational frame. Examples include: "To stop climate change, I have to make sacrifices" and "The economy will be stronger if we act first to cut greenhouse gases." Feinberg and Willer (2011) wrote passages of seven paragraphs (approximately 700 words) "written in a format meant to resemble a news article." They do not give precise details on what criteria they used to validate this approach but looking at the passages, it

appears that they endeavoured to mimic the tone and length of an article related to environmental issues as it might appear in a prominent newspaper. Nabi, Gustafson, and Jensen (2018) also use text written as news articles (also approximately 700 words) but went even further to simulate a real world setting by adding the heading and logo of a local newspaper that would be known by the participants. P. Hart and Feldman (2016) do something similar with constructed news stories but instead of presenting the texts as articles of local newspapers, they attribute the stimuli to the Associated Press.

Within this literature, the only example using unadjusted messages from external sources is Hine et al. (2016). In that work, the authors identified sixty climate change adaptation communications from prominent Australian entities working on climate change and other environmental issues: Commonwealth Scientific and Industrial Research Organisation, Department of Environment and Heritage Protection, Department of Climate Change Energy and Efficiency, Australian Bureau of Agricultural and Resource Economics and Sciences, and Australian Psychological Society. These communications included short and long-form messages (e.g., web pages, audio-visual presentations, and posters) about climate change. They were scored for the presence of six variables: negative emotion, collective responsibility, adaptation advice, local impacts, and financial costs. Of these sixty items, each participant in their study viewed a randomly selected six (two long and four short) as they appeared in their original form.

Besides the messages used in Gifford and Comeau (2011) which were individual statements comprising single sentences, all of the materials in these studies required at least 30 seconds and as many as four to five minutes for participants to read and process. In several of the studies, the passages are styled as longer form articles containing lots of detail and information. However, we know that as a consequence of the rise of social media platforms, people are spending less time reading longer articles and attending instead to article headlines, or at most the first few sentences of an article's text (Dunaway et al., 2018; Haile, 2014; N. Martin, 2018; Thurman, 2014). Moreover, they are more often using platforms such as Twitter as sources of news and current events (Andersen et al., 2020; N. Newman, 2021; Shearer and Mitchell, 2021). Thus, when trying to understand how emotional framing works on the tweet level, it is hard to know the extent to which the results of studies working with longer text generalise to tweets constrained to 280 characters, or approximately forty to seventy words.

To the best of my knowledge, the only study seeking to mimic content native to social media

posts within environmental discourse is DiRusso and Myrick (2021)'s experiment with Instagram posts about plastic pollution. In that study, the authors designed Instagram posts (both visual and text components) to emphasise hope versus fear and high versus low individual efficacy pertaining to the reduction of plastic pollution in the world's oceans. They then showed these artificial posts to participants as if they were posted on the platform by National Geographic.

In general, none of these studies comment directly on the decisions they made to make their test materials appear more or less "organic" to real world experience. While a trend towards more authentic content and viewing experiences is noticeable when looking at the literature from a distance, and perhaps there is even the implication that more realism is ideal, it is never explicitly mentioned or considered. It seems that in doing so, the field is trying to avoid addressing the proverbial elephant in the room: ecological validity.

Ecological validity, originally defined by Brunswik (1940) and Brunswik (1952), refers to the extent to which a study's variables, contexts, and materials reliably correspond to the real-world context and behaviours it is trying to approximate. In the case of most communication studies, ecological validity is inherently low. These experiments present participants with information that is often artificially curated to emphasise certain features over others in order to evoke a certain reaction. This information is shown to them in the "sterile" context of an experiment, very far from the real world settings in which they might normally encounter such communication via the news, social media, or other outlets. Without direct observations of individuals encountering environmental communication stimuli in real time, ideally in their natural everyday lives (i.e., with as few laboratory conditions as possible), it is difficult for any communications studies to achieve high ecological validity.¹

As described above, some researchers have tried to combat this limitation by making their materials appear more realistic aesthetically and adapting content from pre-existing communications, thus decreasing the distance between the experimental stimuli and messaging that participants are actually likely to encounter in their daily lives. To date, however, there have been few attempts to do this with social media content specifically, besides DiRusso and Myrick (2021) for Instagram.

¹The ecological validity of the experiment presented in this chapter will be addressed and scrutinised in the discussion of the work's limitations, included below within the Research Design section.

This leaves a significant gap in the literature that should be addressed for the following reasons.² First, longer texts are able to more extensively and comprehensively discuss the complicated topics underlying environmental issues. Social media posts, and tweets in particular, are constrained by character limits which require users to condense these complexities into byte-size posts. This process is not trivial and is likely to lead to scenarios in which the content of a social media discourse pertaining to a given topic falls out of sync with the nuances and complexities of the underlying details. Sanford et al. (2021) found this to be the case in the Twitter discourse of the 2019 IPCC Special Report on Climate Change and Land Use. In that case, the dominant topics and themes in the Twitter discourse differed significantly from the actual content of the report and its representation in mainstream media coverage. Furthermore, the analysis in Painter, Wetts, and Loy (n.d.) suggests the same of Facebook and Twitter posts pertaining to the 2022 report on climate change mitigation. Zheng and Shahin (2020) observed a similar phenomenon in the Twitter discussions pertaining to the 2016 US presidential debates. Because of the brevity imposed by the platform, there is a higher likelihood of digression and "runaway" narratives or debates that may obfuscate the heart of whatever matter is at hand (Gavin, 2009). Thus, it is possible that this distillation process creates and/or contributes to divergences in frames used in mainstream news and social media in environmental discourses (Chen et al., 2022; O'Neill, H. Williams, et al., 2015).

Moreover, the intentions of the communicators authoring news articles and social media posts are not always aligned. While they may sometimes overlap in their goal of raising awareness or supplying critical information about an environmental issue, the intention of many social media users, specifically activists, is to mobilise action, often using strong and emotional language (Han and Ahn, 2020; Molder et al., 2022). This leads to a difference in tone between the two arenas that may complicate the relations between information framing and attitude/behavioural outcomes.

Finally, the reasons and motivations for why individuals frequent social media platforms and the websites of mainstream news outlets are different. The most common framework for understanding these differences is Rubin's uses and gratification theory (Rubin, 2008). The key assumptions of this theory include the following: First, users have different media-related needs that can be satisfied through a range of activities; second, they engage in media use across a variety of channels to satisfy these needs; and finally, myriad social and psychological variables condition users' expectations of media platforms therefore affecting their evaluations of the extent to which

²This topic, the divergence between environmental discourse on social media and mainstream media, is the subject of Chapter 6 and is discussed at further length therein. The discussion here is limited to motivating experimental work pertaining to social media contexts, and using social media posts as stimuli.

the platforms satisfy their needs. The needs users may use media platforms to fulfil include: entertainment, passing time, information, mood management, social interaction, and status-seeking.

Previous research has demonstrated that while there is some overlap between the types of uses and gratifications afforded by traditional and social media platforms, there are also notable divergences for which framing research needs to account (Hsu et al., 2015; J. Kim, Bae, and Hastak, 2018; Lovejoy and Saxton, 2012; Scherr and K. Wang, 2021; Sundar and Limperos, 2013). For example, Sundar and Limperos (2013) suggest that the gratifications derived from media content may have different salience when manifested in new technologies, e.g., the relative novelty of interactive social media platforms versus "one-way" information consumption from traditional news websites. Moreover, Scherr and K. Wang (2021) suggests that social media platforms, due to their interactive nature, enable users to fulfil their needs of personal expression, interpersonal communication, and community building much better than mainstream news sites. Meanwhile, Hsu et al. (2015) found that among interpersonal communication, entertainment, and information seeking motivations, only the latter predicted online news media use. Therefore, this literature suggests that the existence of these stronger gratifications likely reinforces usage patterns for social media platforms with which mainstream news sites cannot compete.

This literature suggests that a good portion of the divergence in usage motivation between traditional and social media boils down to the interactions, interpersonal communication, and community building affordances of social media platforms which traditional news sites lack. Of course, most news articles posted to news websites have a comments section which allows for users to express their views and opinions. However, they do not provide the same extent of interpersonal communication and interactivity as on most social media platforms. The existence of these differences in terms of the motivations that audience members have for using social media platforms versus mainstream news sites casts doubt onto the validity of relying solely on previous experimental work imitating communication found in other contexts, predominantly styled after mainstream news articles, to inform our understanding of environmental communication on social media. Instead, these differences motivate experimental work attuned to social media content and contexts.

5.4 Mood as a mechanism

Recalling again the literature review of the previous chapter, the experimental work examining emotional framing in environmental communication has failed to show a consensus regarding the impact of emotion on behavioural outcomes. As such, the current state of the field reflects one of the major challenges underlying this area of research: It is not safe to assume that the behavioural response to any given emotional framing will be the same for every person who encounters it (Chapman, Lickel, and Markowitz, 2017; Ettinger et al., 2021). Thus, researchers should not consider emotional framing as a simple lever we can pull to elicit the desired behavioural response *en masse*. One has to consider how emotion interacts with other elements of communication and other internal mechanisms acting on the pathway between information intake and behavioural response. One such mechanism is mood.

Mood and emotion are often used interchangeably but most academics make clear that the two are "closely related but distinct phenomena" (Beedie, Terry, and Lane, 2005). J. Russell and Barrett (1996) propose the framework in which emotions are preconditions for establishing a given mood (also termed core affect), and that mood is therefore mediated by our emotional responses to ongoing events within our environment, including the information we take in from it. As demonstrated by the review of experimental work with emotional framing in environmental communication presented in Chapter 4, emotional framing significantly impacts our emotional responses to environmental communication and therefore likely also affects the mood these responses generate.

Links between social media emotional framing and mood build on research on emotional contagion, i.e., transferring positive and negative moods and emotions to others (Hatfield, Cacioppo, and Rapson, 1993). Emotional contagion is well established not only in the laboratory but also in the field, based on data from real-world social networks. Specifically, Rosenquist, Fowler, and Christakis (2011) show that an individual's symptoms of depression are correlated with depression scores in the individual's network of friends and neighbours. By the same token, individuals who are surrounded by many happy people are more likely to be happy in the future, based on a large sample study collected over twenty years (Fowler and Christakis, 2008). It suggests that emotional states can be transferred through social networks.

With the increase of social media use, research on emotion contagion started to look at the potential of social media networks as a platform of emotional transfer (see Goldenberg and Gross

(2020); Papacharissi (2014); Serrano-Puche (2016)). A large-scale (and controversial) Facebook experiment showed that exposure to emotional posts on Facebook led people to post content that was emotionally consistent with the exposure – those who were exposed to posts loading high in positive emotions posted messages containing more words mapping to positive emotions and the same happened for negative emotions (Kramer, Guillory, and Hancock, 2014). Ferrara and Z. Yang (2015) replicated this result on Twitter finding a linear relationship between the average emotional valence of posts users were exposed to, and the average emotional valence of their responses.

These observations suggest that social media communication influences recipients not only in cognitive terms, informing them about facts, sharing thoughts or feelings, but also influences their emotional states. Furthermore, emotional contagion has consequences that extend beyond mood induction into behaviour (Barsade, Coutifaris, and Pillemer, 2018). Similar to how emotions are generally related to certain action tendencies (Albarracin and W. Hart, 2011; Frijda, 1986; Rucker and Petty, 2004), so is emotional contagion to mobilisation: It has been recognised as a crucial driver of individual and collective action (see Goldenberg and Gross (2020)). Therefore, there is reason to believe that mood derived from emotional framing of environmental communication on social media may influence collective action intention.

There has been some work examining mediation pathways between information framing and behavioural responses in environmental communication. For example, the work of Nabi (2015) and Nabi, Gustafson, and Jensen (2018) suggest a pathway of emotional flow between framing and attitudes towards climate change policies and advocacy. In particular, Nabi, Gustafson, and Jensen (2018) conducted an experiment in which participants were shown messages with two sets of frames (combinations of high- versus low- threat and gain- versus loss-framed efficacy) designed to sequentially trigger sensations of hope and fear. They found that messages that triggered fear and then hope were the most consistent in generating greater reported support for climate policies and behaviours. The authors used this finding to conclude that emotional responses to the message framing fully mediated the responses participants gave. Their study makes clear the importance of emotional framing in environmental communication, but it does not speak to the mechanisms underlying these emotional responses, and how they might differ across participants. This is the primary contribution that the experiment presented in this chapter makes.

5.5 Research Design

5.5.1 Overview

In response to the lack of experimental work simulating the social media context and investigation of potential mediating factors on the information-behaviour pathway, this chapter contributes to addressing these gaps by investigating the following questions:

1. Do participants report more action intention upon viewing positively framed or negatively framed tweets related to climate change?
2. Does mood upon viewing the tweets mediate this relation?

To answer these questions, a between-subjects online experiment was conducted in a Qualtrics survey and distributed to participants via Prolific in January 2022. The experiment was financed by a grant from the Polish National Science Centre, awarded to collaborators Drs Magdalena Formanowicz and Marta Witkowska of the SWPS University of Social Sciences and Humanities in Warsaw, Poland. It was approved by the ethics committees at Oxford and SWPS University. The approved Oxford CUREC application associated with the experiment is included in Appendix A.

5.5.2 Participants

An analysis of statistical power aiming for a medium effect size with a 95% confidence and a power level of at least 0.8 specified the target sample size as 128 participants. In order to allow correction for low data quality based on attention and manipulation checks, 200 participants were recruited using online survey administrator Prolific. Prolific was chosen over the leading alternatives, e.g., Mechanical Turk and CloudResearch, because of its record for having higher data quality and fairer wages for participants (Palan and Schitter, 2018; Peer, Brandimarte, et al., 2017; Peer, Rothschild, et al., 2022). Because the majority of the activists examined on Twitter were based in the United States, only potential participants on Prolific who were also based in the United States were invited to participate in the experiment. The participants received the equivalent of £11.36 per hour for agreeing to take the survey, which took the participants on average 6.2 minutes to complete.

Twenty-four of the participants were excluded on the grounds of failing manipulation checks. These checks are further described in the "Procedure" subsection. Seven others were also excluded

because they indicated they do not believe that action to mitigate climate change is necessary. I did not repeat the analysis with these users because the target group only includes people who would be most likely to attend to and engage with environmental activist content, i.e., resembling those who engaged with the tweets analysed in the previous chapter.

After these exclusions, 169 participants remain. Of these, 75% identified as female, 23% as male, 2 participants preferred not to say, and 1 elected to provide their own description. The age of the participants ranged from 18 to 68, with an average of 35 years and a standard deviation of 11.7 years. The majority of respondents had at least a bachelor's degree (57%). Additionally, the majority (55%) of respondents reported a left-leaning political orientation, with a smaller yet sizeable proportion (30.8%) reporting neither left- nor right-wing. Regarding social media use, 94.1% of participants reported having used at least one social media platform in the last month. Of these, 75.1% reported using social media multiple times per day. All participants reported English as their native language.

5.5.3 Procedure

Upon recruitment to the experiment, participants were shown a description of the study, including its purpose, and further information on the study's voluntary nature, the confidentiality of responses, and data protection protocols along with Article 13 of the European Union's General Data Protection Regulation (GDPR). Participants were then asked to consent to join the experiment. Participants were then allocated randomly to the positive or negative condition. Depending on this allocation, participants were shown a set of tweets and asked to review them. Immediately after viewing the tweets, participants answered items about their mood (valence and the state of arousal), position on the necessity of climate action, likeliness to retweet the tweets they saw, and their likeliness to participate in a number of actions to support their stance on climate action (further detail about these actions and why they were chosen is provided in the "Measures" subsection). The survey then asked participants to write a slogan to encourage participation with climate action. The participants were made aware that providing a slogan was completely optional. Then, participants were asked to answer a series of demographic questions (the variables named in the description of the participants). The language of all questions was drawn from similar questions in other prominent surveys, e.g., the European Social Survey and Eurobarometer.

Finally, the survey implemented manipulation checks to determine the effectiveness of the manipulation and how well participants had paid attention to the questions of the experiment (Hoewe, 2017). First, a question informed the participants that they had reached the end of the experiment and that they should select "No" to proceed. This was done to catch any participants who were not carefully reading the questions. Second, participants were asked to recall the tweets they had been shown and to rate their tone on a seven-point scale Likert from "very negative" to "very positive." This served as a manipulation check and was done to ensure that participants had perceived the tweets in accordance with their condition. Third, they were shown a list of tweets and asked to select the ones they had been shown. This was done to validate meaningful attention paid to the stimuli and veritable engagement with the experiment. Participants who failed to answer "No" on the first question, correctly report the tone of the tweets, or identify the tweets they had seen were excluded. The flow of the experiment is presented in Fig 5.1 and the full survey is presented in Appendix C.

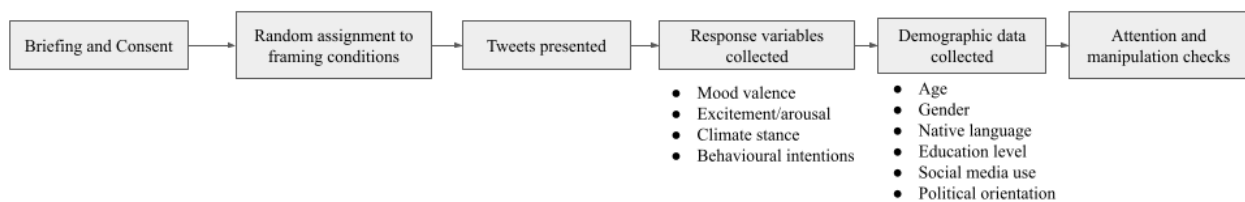


FIGURE 5.1: Flow of survey experiment.

5.5.4 Stimuli

Each experimental condition included a set of three tweet images. The three tweets were shown to the users all together. The text of the tweets was paraphrased from tweets in the dataset collected in Chapter 4 which scored highly on either positive or negative emotion, as determined by LIWC. The paraphrasing process was intended to render the tweets unsearchable by participants and in doing so, I was careful not to change the proportion of positive or negative emotion words present in each tweet. Fig 5.2 shows the three tweets from each condition: The positive condition tweets are shown on the left; the negative condition tweets are shown on the right.

Each pair of tweets were selected to be similar in word count and strength of sentiment valence. Moreover, each pair of tweets addresses a similar topic or theme within environmental discourse. The first pair are the most generic; they refer to climate action either as an opportunity (positive



FIGURE 5.2: The tweets shown to participants; the tweets from the positive condition on the left, tweets from the negative condition on the right.

emotion condition) or lament government inaction (negative emotion condition). The second pair reference examples of consequences of climate (in)action. Finally, the tweets in the third pair relate to national security. To isolate the effects of emotional framing as much as possible, tweets with high scores for agency, affiliation, and explicit time focus were avoided.

The images of the tweets were generated artificially using the website [TweetGen](#). This was done so that the number of retweets, likes, and comments received by the tweets would be the same between conditions, thereby reducing any bias which could result from impressions of retweet count popularity. The place where the user's name and Twitter handle would be is obscured to prevent any bias resulting from affinities or disaffinities for particular activists.³

5.5.5 Measures

The experiment measures four outcome variables: mood valence response, excitement/arousal level, stance on climate action urgency, and intention to support climate action.

Mood response was measured using the nine-point Self-Assessment-Manikin (SAM) scales for emotional valence and arousal (Lang, 1980; Bradley and Lang, 1994). The two scales comprise an established picture-based methodology for the extraction of an individual's emotional and arousal state in reaction to a given stimulus. Each scale consists of nine illustrations, depicting a caricature

³Limitations associated with this design are discussed later in this section.

manifesting various states. The scales are included in Fig 5.3 for reference. The emotional valence scale ranges from sad on the far left (value 1 on the scale) to happy on the far right (value 9 on the scale). The arousal scale ranges from calm on the far left (value 1 on the scale) to excited on the far right (value 9 on the scale). Immediately after viewing the tweets, participants were asked to indicate which figure best represents their current emotional and arousal state.

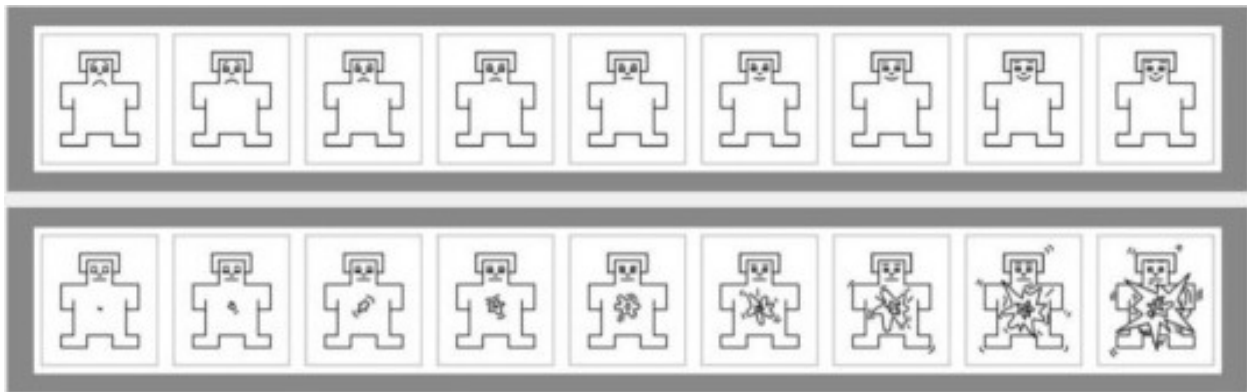


FIGURE 5.3: SAM scales for emotional valence and arousal, image reproduced from Bradley and Lang (1994).

The SAM scales are a representation of J. Russell and Mehrabian (1977) *pleasure-arousal-dominance* (PAD) model, which posts that these three dimensions are necessary and sufficient for describing nearly all affective (or mood) states. This framework originally draws on Wundt (1896) tripartite formulation of how to differentiate affective responses to various stimuli including *lust* (pleasure), *spannung* (tension), and *beruhigung* (inhibition). Following these categories, extensive empirical work has confirmed the utility of the PAD model as a highly reliable measure of mood (see Bradley and Lang (1994) for a review). I focus on the emotional valence and arousal dimensions, excluding the dominance dimension, because the dominance scale is intended to capture participant perception of personal situational control in their immediate environment which was not relevant to the study's objectives.

SAM is not the only representation of the PAD model which could have been used as a measurement in this study. Alternatives include the Geneva Emotional Wheel (Scherer, 2005; Sacharin, Schlegel, and Scherer, 2012), represented in Fig 5.4, and the Affective Grid (J. Russell, Weiss, and Mendelsohn, 1989), shown in Fig 5.5. The SAM model is preferable in most cases to these alternatives because of its picture-based simplicity which 1) does not require the labelling of specific emotions which may resonate differently across participants, and 2) is much easier to deploy in experimental settings because it is less visually and conceptually complex, and therefore, less time

consuming for participants to evaluate (Hayashi et al., 2016).

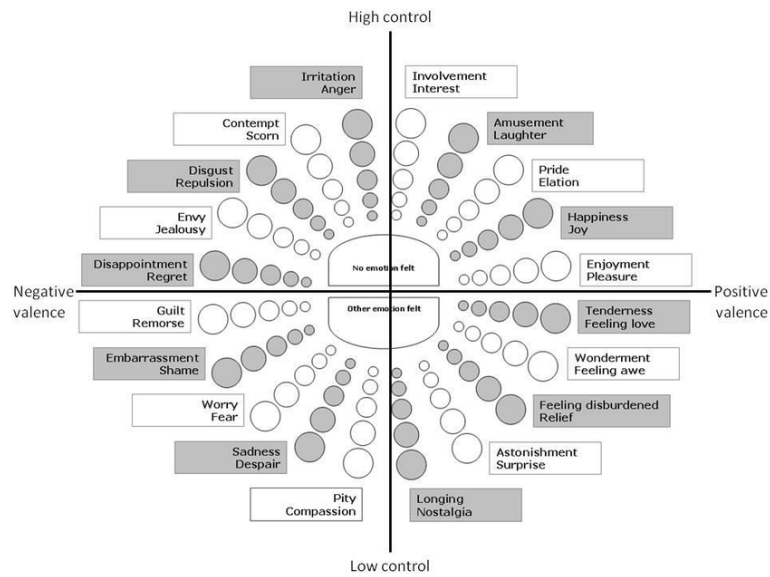


FIGURE 5.4: Geneva Emotion Wheel, image reproduced from Sacharin et al. (2012).

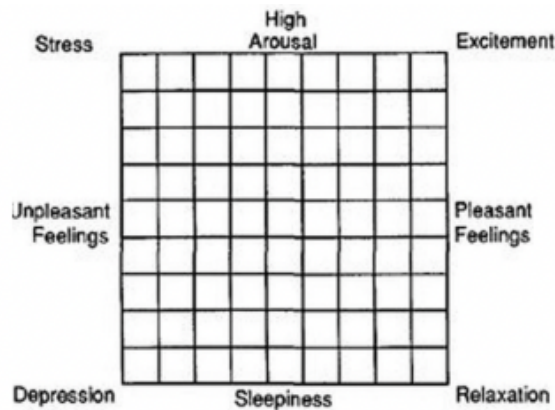


FIGURE 5.5: Affective grid, image reproduced from Russel (1989).

To determine the participants’ stance on the necessity of climate action, they were first asked to think about human-driven climate change. They were also told that it is the centre of a heated debate. The question text then informed the participants that the authors of the tweets they had just seen express the need for climate action to protect the environment, while others do not think climate action is necessary. They were then asked to indicate their position within this debate using a seven-point Likert scale with options ranging from "definitely unnecessary" to "definitely necessary." This question was designed to avoid exacerbating any social desirability bias which might prompt participants to indicate that they believe more strongly than they actually do in the necessity of action to combat climate change.

Finally, the primary dependent variable of the analysis is reported intention to partake in collective action to promote their position on climate change after viewing the tweets. The belief-aligned collective action scale presented in C. Cervone et al. (2023) is used. The scale items include the following actions:

- *I would carry out research to learn more about possible actions I can take to promote my position.*
- *I would sign a petition in favour of my position.*
- *I would attend a rally, a march, or a protest to assert my position.*
- *I would write to institutions and newspapers to promote my position.*
- *I would collaborate in organising an event to promote my position.*
- *I would hand out flyers or post on social media to promote my position.*
- *I would display posters or banners (e.g., on my balcony or front door) to assert my position.*

Participants are asked to rate their likelihood of engaging with each of the actions using a seven-point Likert scale with options ranging from "very unlikely" to "very likely." Additionally, to make the Study 2 coherent with Study 1, we added to the scale a question on likelihood of retweeting the presented tweets. These items make up the dependent variable of the analysis, capturing the reported intention to partake in collective action after viewing the tweets. The Cronbach's alpha score for the items is 0.905, indicating a very good level of internal consistency. For the analysis, the scores given for each item are averaged together per participant.

There are other response behaviours that I could have measured. From a practical perspective, I was concerned with the complexity of the experiment and decided that by focusing on a single cluster of response variables, the quality and reliability of the data would be higher. The cost of running the survey was a significant limitation and I therefore had to find an ideal balance between survey length and scope of the response variables.

I focus on collective action responses instead of other possible response variables, including explicit pro-environmental behaviours or support for environmentally-friendly policies, because I am most interested in investigating the extent to which retweet engagement can reflect and/or approximate engagement with collective action supporting the environmental movement. That is not to say that it is not of interest to examine retweet engagement as a proxy of pro-environmental

behaviours, just that it is not within the scope of the present study. Moreover, measuring pro-environmental behaviours as the primary response variable would have run the risk of sustaining the neoliberal notion, elaborated at length in Chapter 3, that environmental issues could be ameliorated if only individuals made more environmentally-friendly choices. Of course individual choices and habits do matter for reducing our collective carbon footprint, but the vast majority of the population cannot be held accountable for the perpetuation of carbon-heavy industries and the policies and government subsidies supporting them. As such, measuring inclination to collective action in terms of raising awareness of these truths and demanding stakeholder action avoids this risk and instead focuses on measuring the spread of support for environmental activism.

5.5.6 Analysis

The results were analysed in three stages. First, a one-way analysis of variance (ANOVA) is used to determine whether the experimental conditions differed with respect to the mood they elicit in participants. Then, another ANOVA is carried out to determine whether the experimental conditions differed with respect to elicited action intention. Finally, path analysis is used to measure the total, direct, and indirect effects of the experimental conditions, with mood as a mediator, on reported collective action intention.

5.5.7 Limitations

Limitations of the participant sample

Although the number of participants ultimately included in the experiment exceeded the amount determined by the power analysis to be sufficient, the analysis was calibrated to a medium effect size. Therefore, there is a risk of the results exaggerating a relatively small effect. However, by increasing the desired effect size, more participants would have been required and that would have pushed the costs of running the experiment beyond the available budget. As such, I acknowledge that the results of the experiment could have been made more robust by including more participants but also maintain that the experiment achieved the largest sample possible given resource constraints.

Moreover, while Prolific is known for maintaining a high-quality participant pool, and it was for that reason the platform was chosen over the alternatives, the demographic composition of the participants in the sample suggest some potential biases. First, the overwhelming majority

(96%) of the 176 participants who passed the manipulation checks responded that they believe climate action is necessary. While concern for environmental issues and calls for climate action are increasing in the US (Leiserowitz et al., 2022), it has yet to reach the level observed among the participants. Moreover, the sample is generally skewed towards younger, more educated, and more politically left-leaning participants. Three-quarters of the sample identify as women. These breakdowns are also not representative of the US population. Previous research has demonstrated that individuals with these demographic features are inclined to attend to and care more about environmental issues (e.g., Cruz (2017); Wiernik, Ones, and Dilchert (2013); Zelezny, Chua, and Aldrich (2000); Tyson, Kennedy, and Funk (2021)). As such, they may have more internally consistent and/or systematically different emotional responses to other individuals who are less inclined to pay attention to and engage with environmental issues, and who are not represented in the study's participants. Therefore, the results of the analysis speak only about a narrow selection of the US public, and future work will be necessary to test the generalisability of the findings.

Limitations of the stimuli

The experiment contains two conditions: positive and negative framing. No control condition is included. A control condition would have been useful to confirm the presence of a baseline effect of framing valence in either direction. However, the results of the Twitter study suggested that higher negative and lower positive emotion are related to higher retweet engagement, and as such the direct comparison between the two features via the two conditions in the experiment is still meaningful. Moreover, the decision of what content to include in a control tweet does not have an easy answer. One might think to look for tweets scoring low on both positive and negative emotion. For example, presenting users with dry scientific facts including as little emotional valence as possible. Such tweets are not only very rare in the dataset, but they are also likely to confound the design. Previous research demonstrates the poor performance, with respect to media attention and audience engagement, of environmental communication campaigns leaning too heavily on scientific facts (Evensen, 2019; Grundmann and Scott, 2014; Hmielowski et al., 2013; Kahan, 2012; Moser, 2010; Olausson, 2019; Petersen, Vincent, and Westerling, 2019; Schäfer and Schlichting, 2014; Wetts, 2020a).

Additionally, it is difficult to find tweets that are completely devoid of emotional valence as well as all other psycholinguistic features. For example, it would not benefit the design to include

a control low on emotional valence but relatively high on empowerment or affiliation. Therefore, the potential benefit of including a control condition does not appear to outweigh the risks of including a control that does not actually have a truly neutral effect on participants. Finally, returning to the power analysis, the design including two conditions and medium effect size was already at the edge of the resource budget. Expanding to three conditions would have meant ideally increasing the sample size, which would not have been possible within the budgetary constraints.

Another concern is the extent to which the observed effects of the experimental conditions result purely from the positive or negative framing of the tweets. Although the tweets were selected based on the dominance of positive or negative emotional valence over other psycholinguistic features, it is still possible that connotations of the content differed among participants. It is also possible that references to certain topics in the tweets resonated unevenly with participants, eliciting different reactions that had little to do with the framing manipulation. Additional piloting of the tweets could have helped to identify the existence of these potential confounding variables. Nonetheless, this is a tradeoff of using real tweets and not designing content to be as "sterile" as possible with respect to potential confounding variables. At the risk of increasing the presence of potentially confounding variables, I test tweets manifesting the true framing tendencies of environmental activists thereby increasing the external validity of the measures.

This point connects to a concern introduced in the literature review section of this chapter: ecological validity. As discussed above, most laboratory-based experiments in communication are not able to achieve high ecological validity. There have been some exceptions to this, including Kramer, Guillory, and Hancock (2014) who manipulated the Facebook newsfeeds of certain users for emotional salience without informing the individuals that they were taking part in an experiment. Such a design achieves high ecological validity but also poses tremendous ethical issues. An alternative would be to monitor a user's social media consumption and each time they encounter content related to environmental issues, measure the presence of whatever variable is of interest and ask the user to report how the content makes them feel (or any other desired response variable) in real time. This design requires significantly more resources than the standard laboratory or survey design, and certain elements – specifically the social media monitoring – may not be ethically or practically tenable. It would also potentially decrease the authenticity of the

user's viewing habits, as knowing that one is being surveilled combined with biases such as social desirability is likely to lead to atypical usage and consumption patterns relative to the user's norm.

Thus, my understanding of the current state-of-the-art for ecological validity in environmental communications research is to use materials that most strongly resemble what users would be likely to encounter organically in their daily habits, and reflect on how this limitation potentially affects the study's results. Because this study draws on empirical observations of Twitter interactions, I am able to maximise the experiment's ecological validity by using real tweets and presenting them to the participants in a format as close to what they would see if they were actually viewing the tweets on Twitter.⁴

Finally, the tweets are presented to the participants with the username and profile photo obscured. This was done to reduce the chance of inducing reactions to the tweets that might stem less from the emotional framing of the tweet, and more from the stature of the activist or opinions participants may have about the activist. I could not control for participants' awareness of specific activists in the design and as such, these identity effects were beyond the scope of this experiment. However, they have been demonstrated in previous work on social media to have significant effects on engagement (Rinscheid, Pianta, and E. U. Weber, 2021; S. J. Taylor et al., 2022). Therefore, it would be very interesting to attempt to isolate the effects of activist identity on engagement with environmental communication on social media. Moreover, there could also be interactions between identity and emotional framing that future work should consider examining.

Limitations of the response variables

The insights the experiment is able to offer are limited to self-reported behaviour. There are many critiques of these kinds of studies (Lange, Steinke, and Dewitte, 2018). One of the most salient is the social desirability bias which, as defined in Krumpal (2013), refers to a tendency of participants to "avoid reporting an attitude or behaviour that clearly violates existing social norms and thus is deemed unacceptable by society" (p. 2027). Previous work has found that participants are sometimes known to report themselves as more environmentally friendly in experimental settings than they actually are in real life (Kormos and Gifford, 2014), indicating the probable existence of the

⁴It should be noted that to date, there is generally little discussion of ecological validity in the environmental communication literature. Especially as studies of social media communication become more popular, it will be important for researchers to reckon with the question of whether or not the experimental norms which have been used for investigating other forms of communication are still valid for social media.

social desirability bias in such contexts. Although, other work has found that social desirability has only a weak effect on pro-environmental attitude reports and no effect on pro-environmental behaviour (Milfont, 2009). It could be very well be the case that pro-environmental norms are neither strong nor widely prevalent enough in most societies (examined to date, which is heavily limited to Global North countries) for social desirability to have significant impact. Nonetheless, it is important to acknowledge that I cannot rule out the possibility that participants in the present experiment may have over-reported their intention to engage in pro-environmental collective action.

Nonetheless, this limitation applies to all research into the audience effects of environmental communication using one-off experiments, which to date, makes up a bulk of the field. Longitudinal studies of participants controlling for the psycholinguistic features of their environmental communication intake over time would be ideal but unfortunately very resource intensive (and even the few existing longitudinal studies in this area are not able to do this with 100% validity, see Diamond and Urbanski (2022)). Laboratory experiments have also been suggested as an alternative, but reliable paradigms for conducting this kind of work with high validity are still underdeveloped (Lange, Steinke, and Dewitte, 2018). As such, one-off experiments with self-reported measures give us the best and most efficient glimpse into the human psyche, providing useful data upon which subsequent studies can build.

As noted in previous chapters, while using retweet as a proxy of influence and engagement is an accepted norm in social media studies, it is imperfect. Asking participants about a wider scope of engagement intentions along with the intention to retweet, and then calculating the internal consistency of these measures altogether, allows the design to approximate how well retweet engagement correlates with these offline intentions. However, it does not allow us to directly ask or answer any questions about *why* people retweet (nor why they report intending to engage with collective climate action), nor the diversity in the motivation to do so. This direction of analysis is beyond the scope of the present experiment but should be taken as a serious limitation of the work (as with all social media studies based on content sharing). However, as noted in the previous chapter, previous survey work has suggested that agreement with, endorsement of, and the desire to share content to their followers are primary drivers of the decision to retweet.

Limitations of the mediation

Mediation analyses can be extremely useful for identifying variables which may influence the pathway between a given set of independent and dependent variables. In this study, mood is hypothesised to act as a mediator between emotional framing and collective action intent. I do not presume that it is the only mechanism acting on this pathway. Therefore, I can and will not make any claims about the ability of mood to fully mediate the relation between emotional framing and collective action intent, as manifested in the responses of the participants. Instead, I will be confined to suggestions of partial mediation, which while weaker, would be a much more realistic finding. It is highly unlikely that any single cognitive mechanism exclusively mediates the relation of interest. Rather, it is more probable that mood is one of several, potentially competing mechanisms mediating the relation. While this study is constrained by its focus on one mechanism, it is one of the first to consider mediation pathways including a cognitive mechanism between framing and behavioural outcomes in environmental communication.

Reflections on the manipulation checks

As described in the "Procedure" subsection, the design uses manipulation checks at the very end of the experiment. Manipulation checks typically involve one or more questions aiming to gauge each participant's attention and awareness of the condition to which they were exposed. They are used in this experiment to determine whether or not participants were paying careful attention to the experiment – instead of rushing through the questionnaire and providing random answers – and if they registered the manipulation, i.e., the positive or negative framing.

Such checks are regarded by many researchers as valuable for drawing accurate conclusions about the relation between a study's independent and dependent variables, because they help researchers discern which participants correctly perceived and therefore reacted to the stimulus according to the logic of the original design (see Hoewe (2017) and Lench, A. B. Taylor, and Bench (2014)). Moreover, Flake, Pek, and Hehman (2017) argue that manipulation checks are essential for establishing internal and construct validity⁵ in experimental work. Going even further, Foschi (2014) posits that without manipulation checks, a researcher cannot be certain about the stability of the experimental design.

⁵Internal validity refers to the extent to which one is confident that the manipulated variables created the observed variations in a particular experiment, or in other words, that an observed causal relation cannot be explained by variables outside the scope of the experiment. Construct validity refers to the extent to which one's measures accurately assesses what they are designed to.

Nonetheless, some other researchers treat them warily. Fayant et al. (2017), drawing on Sigall and Mills (1998), question the extent to which manipulation checks provide any conclusive indication of internal or construct validity. The authors claim that some researchers have become too keen to use manipulation checks to protect against alternative explanations of the relations between the variables at hand which fall outside the original hypotheses of an experimental design. Instead, they argue that researchers should remember that manipulation checks cannot rule out confounding variables, so it is important to reflect and ideally control for any unmeasured variables that might correlate with the manipulation check. Finally, they firmly suggest that in no way should manipulation checks be used to enhance subjective confidence in the validity of findings. In the present experiment, I only use the manipulation checks to screen participants who did not sincerely attend to the content of the experiment and to ensure that the emotional framing was perceived as intended in the design. They are not used to exclude possible alternative explanations for the relation observed between the framing condition and action intent, and as such the analysis presented here is not at risk of falling into the false confidence traps identified by Fayant et al. (2017).

Taking a different angle, Hauser, Ellsworth, and Gonzalez (2018) express concern about the ways in which manipulation checks can affect the participants' thinking in a way that disrupts or biases the relation seeking to be measured between independent and dependent variables. However, the manipulation checks described in that paper with concern are those which come before the dependent variable has been measured. In the present experiment, all checks are carried out after all measures have been taken. Therefore, there is no risk of the checks disrupting participant responses.

5.6 Results

5.6.1 Mood: valence and arousal

In order to see whether the two experimental conditions differed with respect to elicited mood we conducted a one-way ANOVA. Indeed participants in the positive emotion condition had a more positive mood ($M = 5.84$; $SD = 1.34$) than participants in the negative emotion condition ($M = 3.94$; $SD = 1.26$); $F(1,167) = 89.07$, $p < .001$; $\eta^2 = .35$). Arousal on the contrary, was not affected by the experimental manipulation $F(1,167) = .43$, $p = .51$; $\eta^2 = .003$, so participants in the positive ($M =$

4.66; SD = 1.48) and negative condition (M = 4.49; SD = 1.87) were similarly aroused by the content of messages.

5.6.2 Action intention

Finally, we examined the direct relationship between the two experimental conditions and reported collective action intention. The latter was not affected by the experimental manipulation $F(1,167) = 2.04, p = 0.16; \eta^2 = .01$, so participants in the positive (M = 3.76; SD = 1.18) and negative condition (M = 3.47; SD = 1.50) were similarly keen on taking a collective action after seeing the messages.

5.6.3 Path analysis and mediation

In order to see whether presented content affected the valence of mood, which in turn had an effect on collective action intentions, we conducted the path and mediation analyses presented in Fig 5.6. This analysis tests direct and indirect relationships between content, mood, and collective action. There are two main findings.

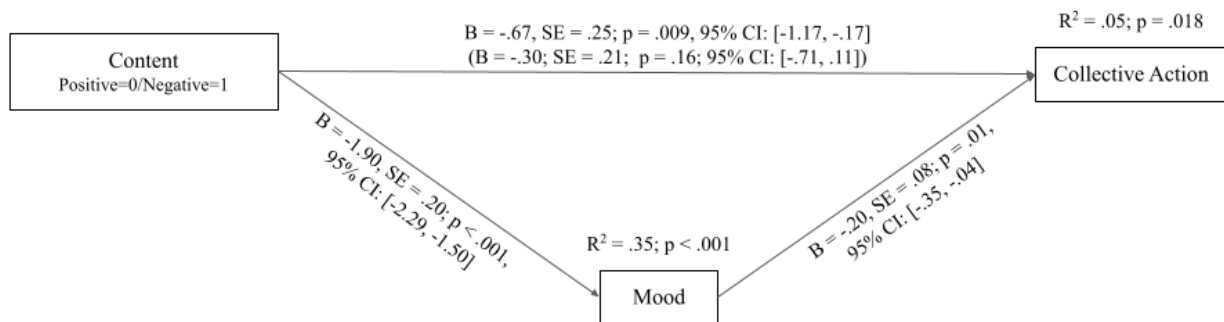


FIGURE 5.6: Visualisation of the mediation analysis showing the direct relationship between content and collective action, along with an indirect relationship between the two mediated by mood.

Note: The total effect between content and collective action is given in parentheses below the direct effect on the arrow connecting the two variables in the diagram. The coefficient of the direct relationship is negative while the effects of the indirect path (content to mood and mood to collective action) combine to yield a positive coefficient.

First, the path analysis revealed a significant negative direct relation between negative content framing and collective action. This appears to contradict the results from Study 1, which suggested that content with less positive and more negative sentiment may increase action tendency measured through retweet engagement.

However, the path analysis also revealed a significant indirect effect of mood on action intention, amounting to .37 (the product of the two direct effect coefficients) with a bootstrapped 95% confidence interval of .06 to 0.71. This interval does not include 0, and as such, the effect is statistically significant at the 95% confidence level. The indirect effect indicates that negative content increases the likelihood of engaging in collective action because it decreases mood and the higher the mood the lower the likelihood of engagement. Overall this positive indirect effect of content framing on collective action intent is congruent with Study 1.

Therefore, including mood as a mediator suggests a significant positive net effect of negative content framing on collective action. Given the insignificant total effect between negative content framing and collective action (coherent with the ANOVA results and given in parentheses below the statistics of the direct effect on the arrow connecting the two variables in Fig 5.6) and the negative direct and positive mediated effects detected in the path analysis, such a change in sign of the relationship between a predictor and an outcome variable when allowing another variable to mediate the relation indicates statistical suppression (also: inconsistent mediation, MacKinnon, Krull, and Lockwood (2000)). Specifically, within a mediation model, a suppression effect is present when the direct and mediated effects of an independent variable on a dependent variable have opposite signs.

In line with that, the results imply the presence of two opposing processes in the model. On the one hand, seeing negative tweets increases willingness to engage because it depresses mood (the indirect pathway) potentially increasing a sense of urgency. On the other hand, it decreases engagement in collective action (the direct pathway) potentially via another mechanism yet to be identified.

5.7 Discussion

The results of the experiment reveal a duality in the effect of emotional framing on action intention. When directly modelling the relationship, participants exposed to messages with negative emotion were less likely to report intention to engage with collective action. However, when

mood was used to mediate the relationship, framing with negative emotion elicited a more negative mood in participants, and therefore they reported to be more likely to engage with collective action. The contradiction between the direct and indirect effects is evidence of a suppression, or inconsistent mediation, of mood on the relationship between emotional framing and reported collective action intention. The indirect effect is similar to the results obtained in Study 1, where negative content elicited more engagement through retweeting. However, the direct effect goes in the opposite direction, showing that negative emotional framing can also inhibit readiness to act.

These results make clear that studies of emotional framing in environmental communication should not assume a direct linear relationship between emotional framing and action outcomes. Researchers need to incorporate additional processes which may mediate the potential of a given emotional frame to stimulate action intent. If mood had not been included in the model, the coefficient on the direct relationship between emotional frame and action intent would have led to the conclusion that the higher retweet engagement with messages containing more negative emotion observed in the Twitter study could not be replicated in an experiment offline. In which case, it would have suggested that engagement trends with environmental activists on Twitter may not reflect anything meaningful about offline engagement in this context. Instead, including mood in the model suggests that people may be more likely to engage with more negative content about environmental issues because it triggers a negative affective state, combining emotional reactions with other cognitive processes, e.g., appraisals of personal and/or social efficacy, idiosyncratic responses to elite cues, and synthesis of the information with background knowledge and world-view.

To date, most work on emotion in environmental communication has investigated how framing messages with emotion a) makes participants feel about the legitimacy and risks of climate change, or b) affects motivation for taking action. These studies have generally found mixed results regarding the connections between positive versus negative emotional framings and reported engagement with climate action and/or other pro-environmental behaviours. However, it is also important to recognise the unlikelihood that any given message within environmental communication will trigger a single, universal response in every individual who encounters it (Chapman, Lickel, and Markowitz, 2017). These responses will be governed by potentially several mechanisms that operate in different ways for different people, based on the emotional content of the message. Thus, the lack of consensus in these results likely stems from the exclusion of

mechanisms acting on the pathway between content framing and outcome variables. Our results show that it is imperative to explore and understand the mechanisms which lead to different, and perhaps competing, behavioural responses to the same message.

Mood is undoubtedly but one of several mechanisms governing this pathway. It is also likely that emotional framing is not the only type of communication framing with the power to influence mood. While many previous studies have examined different dimensions of framing in environmental communication (e.g., specific versus abstract advice, local versus global consequences, collective versus individual responsibility) and their effects on reported action intention, none have accounted for the psychometric mechanisms or processes which mediate this pathway, leaving a significant gap for future research to address.

These findings are also significant for the VBN framework. VBN postulates that certain external information, such as environmental communication, can activate key norms and behaviours, e.g., participation with collective action, when a certain value-belief system is in place. The research presented here shows that even when all participants have similar beliefs about climate change as a threat and a sense of urgency about the need to address it, the same information has an inconsistent effect on their behavioural responses. Therefore, I argue that in addition to accounting for the norm-activating effect of information congruent with an individual's values and beliefs, VBN must also account for how the differential affective states that this information elicits will moderate norm activation, as well as the factors which affect these reactions.

So far I have discussed the experiment results mostly in terms of the impact of negative framing, but they could also be described in terms of the positive condition: Seeing positive tweets facilitates engagement in collective action, however at the same time it decreases willingness to engage because it elevates mood. One potential explanation of the results from this perspective comes from relative deprivation theory (RDT).

The traditional focus of RDT is when, how, and why people subjectively experience unjust advantages, and how this perception can lead to collective action (Crosby, 1976; Crosby and Gonzalez-Intal, 1984; Folger, 1987; Folger and C. Martin, 1986; Pettigrew, 1967; Runciman, 1966; Stouffer et al., 1949; I. Walker and Heather J. Smith, 2002). RDT began from the observation that objective collective deprivation could not predict collective action outcomes. Instead, the *subjective experience* of collective deprivation could. As such, RDT has been used to determine what social comparisons foster collective action and which do not (Smith and Ortiz, 2002), as well as

whether affective components of group-based deprivation impact motivation for collective action (Guimond and Dubé-Simard, 1983; Tyler and Heather J Smith, 1998).

These investigations of RDT have led to the understanding that group-based anger towards a collectively-felt grievance or injustice is a powerful motivator for collective action. Therefore, because the positively-framed messages induce a positive mood about environmental issues instead of a sense of anger towards a collective grievance, the messages are not uniformly successful at motivating collective action. Rather, the positively-framed messages might elicit a kind of passivity, or a divorcing of individual responsibility from the problem because the messages give the idea that things are not so bad or that someone else is already taking care of it. Zomeren, Pauls, and Cohen-Chen (2019) make a similar argument in their study in which participants were presented with texts about solutions to climate change in which the level of hopefulness about these solutions had been manipulated. Their results showed that messages with more hopeful framings were associated with participants reporting an increased sense of hope about the future, but not increased motivation to engage in collective action. The authors interpreted this finding as evidence that hope (and potentially other related positive emotions) trigger *emotions-focused* coping instead of *problem-focused* coping which has been found to be more strongly correlated with motivation to take action against a collective grievance (Lazarus, 1991; Lazarus, 1993; Snyder, 2002). However, following from the discussion in previous paragraphs, it is likely that it is not the emotional framing of hope (or any other emotion) alone that initiates one coping response over another, but rather how the framings interact with other inputs contributing to how we process the information contained in a given message.

5.8 Conclusion

In this chapter, I have presented an experiment which extended the findings of a large-scale correlational analysis of Twitter engagement to flesh out the causal pathway between emotional framing in environmental communication and collective action intention. To my knowledge, it is among the first to explicitly consider the ways in which psychometric processes, induced by the emotional tone embedded in tweets, might interfere with this pathway and test one of them: mood. The results of both the Twitter study and the experiment suggest that negative emotion may be more effective in generating engagement within individuals who are likely to be concerned about environmental issues. However, the experiment only showed this relation when

controlling for mood and without it, predicts the opposite relation.

This finding is significant: With the experiment, this study demonstrates that pathways between emotional framing and action intent in the context of environmental communication should not be considered linear, as the majority of the literature to date does. Moreover, this finding suggests that some of the dissonance in the literature regarding the impact of positive versus negative framing on pro-environmental behaviours could be clarified if key psychometric mechanisms are accounted for. It is clear that we need to dig deeper into these mechanisms so that we can better understand where the inconsistencies emerge and why.

This study is the first in the environmental communication space to use Twitter content as stimuli in a framing experiment instead of longer-form stimuli. This is significant because, as discussed earlier in the chapter, the character count constraint imposed by many social media platforms adds extra challenges to the already considerable obstacles to effectively communicating environmental issues. It is not reasonable to assume that the relations between framing conditions and behavioural outcomes in studies using longer video and text content as stimuli will carry over to the social media context, especially Twitter. That is not to say that the psychometric mechanisms will be fundamentally different, but rather the extent to which content distilled to fit into short, pithy, attention-grabbing posts, may differentially stimulate these mechanisms in comparison with headier, more nuanced content. Yet, it is important to study these platforms given their increasing role as an instrument in the environmental activist movement.

The combination of the Twitter analysis and the experiment demonstrate the utility and importance of validating social media studies with offline experimental work: Both for the opportunity of drawing causal inference, as well as for investigating mechanisms driving observed trends and understanding psychometric correlates of online engagement behaviour that trace data alone cannot provide. Far too few studies combine the two types of research and addressing this disconnect should be a priority for future work.

Little in the data or methodological framework of the analyses presented in these two chapters is truly groundbreaking. I used a simple but effective approach to improve the field's understanding of how emotional framing of environmental activists on Twitter impacts audience engagement. The most novel and important element in the design was the inclusion of mood as a potential mediator, which led to the discovery of the suppression effect. This finding for mood in itself advances our understanding of how emotional framing affects our behavioural intentions,

but beyond that, the crucial contribution of this work is that it demonstrates the need to question the way researchers have so far investigated framing-behaviour pathways in environmental communication.

As Chapman, Lickel, and Markowitz (2017) suggest, we are clearly not working with linear relations between framing and behavioural outcomes. There are no "silver bullet" formulations of psycholinguistic framing in environmental communication. Yet, the research designs in most of the literature reflect the objective of identifying such formulas. Instead, we should design research which accepts the convoluted nature of these pathways and endeavours to add as much detail to them as possible with mixed-method approaches. This chapter takes a first step in this direction with mood, but as already noted, there are many more mechanisms and variables to consider, and therefore many gaps for future work to fill. Moreover, I will again emphasise the limitations of how far these findings may generalise to other cultures and topics within environmental activism. The content of the tweets tested here was in English and tested only with participants from the US. There is little reason to believe that these trends will hold for other demographics, nor for when environmental activism is targeting more personal topics or those literally closer to home. The work of this chapter provides but a small first step for environmental activism at a general level pitched to a US audience.

Finally, I would like to emphasise that although the main result of this study suggests that negative emotion framing is more engaging, at least among certain audiences, than positive emotion, I do not interpret these results as a suggestion to environmental activists to use more negative framing in their communication on social media. Instead, the findings reiterate the need to take a more nuanced and multivariate approach to studying framing in environmental communication. This will not only contribute to the optimisation of activist communication, but also to our knowledge about complex cognitive mechanisms and how they give rise to different psychometric reactions to the same content among individuals of different backgrounds, lifestyles, and belief systems.

Chapter 6

#COPflop or real progress? Divergent discourses on mainstream and social media after the 2021 Glasgow summit on climate change

6.1 Abstract

UN climate conferences referred to as COPs (Conference of the Parties) have become major prompts for scholarship on how mainstream and social media construct, shape and promote a range of discourses about climate change. However, previous research has not sought to compare responses to COPs in the two arenas. Building on previous work on framing in COP discourse and leveraging Bourdieu's field theory, this chapter presents a comparative analysis of the immediate reactions to the 2021 Glasgow climate conference (referred to as COP26) as presented by 141 articles across the top five English-language online newspapers in four countries (Australia, India, the UK and the US) with those of prominent individuals and organisations in a sample of 8,467 Facebook posts and 998 Instagram posts. The results suggest strong topical and sentiment divergences between the two domains. In particular, the articles in the mainstream media sample use a predominantly balanced attitude to describe the (minor) progress made at the conference, the coal deal, and the "interference" from India and China to water it down. In contrast, posts in the social media sample are more negative in sentiment and focus on the general failure of the conference and world leaders. In doing so, the social media discourse casts doubt on the ability of COP conferences

to take sufficient action on climate issues. The disconnect between the two media arenas raises important questions about the role of each platform in public discourse on climate change, the de-legitimation of COPs, and the impact of changing user demographics and preferences on public responses to climate issues.

6.2 Introduction

Moving once more to a new context of environmental communication, the final empirical chapter of the thesis compares the mainstream and social media discourses pertaining to the annual meeting of the United Nations Framework Convention on Climate Change (UNFCCC), referred to as the Conference of the Parties (COP), in November 2021. In doing so, it finishes off the thesis with a contribution to the study of environmental activism on social media not included in the other chapters: How it compares in terms of narrative and sentiment focus with mainstream media, and a discussion of the implications of these divergences for policymaking and collective action mobilisation.

Since the first COP meeting in 2005, mainstream news outlets have operated as the primary medium through which the public learns about conference discussions and outcomes (Kunelius and Eide, 2012). These outlets have therefore had significant power in determining the public's perception of policymaking and the effectiveness of the conferences. With the advent of social media, these platforms have become a parallel source of information about COPs (Kunelius, Tegelberg, and Pohjonen, 2022), while creating unprecedented opportunity for interactive public commentary, discussion, and often controversy (Anderson, 2017). As a result, some researchers suggest that the ways in which social media disrupt the dissemination and communication of climate policy developments may outweigh the benefits, and furthermore, may actually obstruct the policymaking process (Gavin, 2009; Schäfer and North, 2019). For example, research has found that elements of social media commentary misrepresent the main conclusions of climate science reports (Sanford et al., 2021), can open them up to intense controversy (as shown in Chapter 3), and be much more negative and pessimistic in their framing of them than mainstream media (Painter, Wetts, and Loy, n.d.).

Previous work in other climate-related discourse settings demonstrates a tendency of social media commentary to diverge from the content of mainstream media coverage of the same issues in a way that may contribute to this fragmentation (Chen et al., 2022; O'Neill, H. Williams, et al.,

2015). In particular, these studies have found that in the context of scientific Intergovernmental Panel on Climate Change (IPCC)¹ reports and climate protests, discourses in mainstream media and social media tend to gravitate towards different elements, therefore constructing different narratives around important climate events. It is not surprising that differences between the two arenas emerge. Nonetheless, given the evolution in how people of different nationalities, cultures, age groups, and education levels are differentially turning to mainstream versus social media for news consumption and to inform their awareness of environmental issues (Andersen et al., 2020; N. Newman, 2021; N. Newman et al., 2022; Shearer and Mitchell, 2021), it is important to investigate in more depth the nature of these divergences – where they emerge, who is driving them, and why – in order to understand their implications for public understanding of environmental issues, mobilisation around collective action, and support for key policies.

COP26 was selected as the case study for this question because COP meetings are landmark events in the production and shaping of public understanding and discourse on climate change. They are key moments in which stakeholders of climate politics use the proceedings and outcomes of the conferences to raise awareness and generate global dialogue about key environmental issues (Daly et al., 2022; Kunelius and Eide, 2012; Stoddart et al., 2023; Wolling and Arlt, 2017; Wozniak et al., 2021). COP26, held in Glasgow, Scotland in November 2021, attracted considerable public interest as it was the first COP to occur since the outbreak of the COVID-19 pandemic. It was also designed to solidify the Paris Agreements to keep global warming to below a 2.0C temperature rise above pre-industrial levels and review progress since they were initially negotiated at COP21 in 2015.²

The main goals of the COP26 conference included making plans to secure a target of global net zero emissions by mid-century, protecting at-risk communities and habitats, mobilising finance from developed to developing countries to facilitate climate action, and building solidarity to encourage collective action across all delegations. At the end of the conference, the parties adopted the Glasgow Climate Pact, which included a range of agreements which "strengthened efforts to build resilience to climate change, to curb greenhouse gas emissions and to provide the necessary finance for both" (UNFCC, 2021). However, as we shall see, perceptions of the conference's outcome were mixed with some observers seeing it as complete failure, whilst others saw it as a major step forward.

¹The IPCC is the United Nations body for assessing the science related to climate change.

²<https://ukcop26.org/>

COPs are important to study from an environmental communications perspective because they have become uniquely critical events for focusing media and policymaker attention on climate issues (Kunelius and Eide, 2012; X. Liu, Lindquist, and Vedlitz, 2011; Gurwitt and Timmons, 2015; Stoddart et al., 2023; Wozniak et al., 2021). They cause global spikes in attention to climate change within the mainstream and social media arenas (Daly et al., 2022; Schmidt, Ivanova, and Schäfer, 2013), which then go on to increase policymaker attention on environmental issues (X. Liu, Lindquist, and Vedlitz, 2011; Wozniak et al., 2021). They focus news coverage around the details and discussions foregrounded by each conference and in doing so, present critical opportunities to influence public understanding of climate science, highlight the urgency of the threat posed by climate change, and describe and analyse attempts to negotiate and implement international policy to address it (Birkland, 1998; Gurwitt, Malkki, and Mitra, 2017; Stoddart et al., 2023). More recently, they have also become increasingly important opportunities for environmental protest activities (Wolling and Arlt, 2017; UN, 2021; UN, 2022).

The existing literature pertaining specifically to COP coverage in the media have tended to focus on one or the other of these areas, but not both. For example, there are several studies of the frames used by mainstream media outlets in COP coverage (J. Boykoff, 2012; Castillo Esparcia and López Gómez, 2021; Dirikx and Gelders, 2010; Gurwitt and Timmons, 2015; Gurwitt, Malkki, and Mitra, 2017; Kunelius and Eide, 2012; Painter, 2010; Painter, Kristiansen, and Schäfer, 2018; Wessler et al., 2016; Wozniak et al., 2021), as well as others examining the community structure (Kunelius, Tegelberg, and Pohjonen, 2022) and ideological polarisation of the COP26 discourse (Falkenberg et al., 2022), and analyses of text and visual frames in discourses pertaining to previous COP meetings (Comfort and Hester, 2019; De-Lara, Erviti, and León, 2022; Hopke and Hestres, 2018). The literature therefore lacks a direct comparison of COP discourse between the two arenas.

Drawing on Bourdieu's field theory as expanded to environmental media coverage by Kunelius and Eide (2012), the present chapter contributes to filling this gap with the first comparative analysis of how the outcomes of a COP meeting were framed, discussed, and judged within samples of mainstream and social media, identifying similarities and divergences between them. Such a focus allows for the characterisation of how mainstream media outlets and prominent users on social media promote different visions of international environmental policymaking, and discussion of the implications of these differences on public acceptance and mobilisation around these processes. Moreover, within the studies examining social media, Twitter is over-represented with

relatively few studies of COP-related discourses on other platforms. Therefore, this chapter contributes to balancing this by focusing on Facebook and Instagram.

The results suggest that coverage in the mainstream media sample tended towards lukewarm and balanced evaluations of the conference, representing it neither as a success nor an outright failure. An exception might be in the relatively sensational emphasis on the coal deal and the narrative of India and China "watering it down" contrasted with the efforts of the EU and US to extract stronger commitments. Meanwhile, the tone of the Facebook and Instagram samples contrasted sharply, featuring many activists, activist groups, and other prominent stakeholders who were overwhelmingly critical of the failures of the conference and of world leaders to take sufficient action to keep the goals of the Paris Agreements alive.

These results are important because they illustrate the changing dimensions of COP information dissemination and framing across mainstream and social media. They also reinforce the observation made in previous work that the traditional role of mainstream media outlets in determining public discourse agendas – in general and around COP events – is being challenged by social media platforms as they give voice to demographics that have historically been underrepresented in mainstream media, and as celebrity activists follow their own agendas and contribute different priorities within the media landscape (Cardenal, Galais, and Majó-Vázquez, 2019; Chen et al., 2022; Heiberger et al., 2022; Margetts, 2017; Majó-Vázquez, Zhao, and Nielsen, 2017; Painter, Wetts, and Loy, n.d.; Sanford et al., 2021; Schäfer and North, 2019). These agendas often advocate the need to go beyond policymaking to more radical action, establishing their legitimacy by characterising international policy initiatives as sluggish and anticlimactic, and then contrasting this depiction with their action-oriented approaches. Thus, the final contribution of this chapter is the suggestion of a *legitimation tradeoff* between activism on social media in the aftermath of COP26 emphasising its failures as a way of legitimising collective protest action on the one hand, and the perceived legitimacy of COPs (and world leaders by association) in the public sphere to enact meaningful climate action policies on the other. I argue that this tradeoff may damage public trust in global policy initiatives and discuss potential implications that future research should explore.

The chapter proceeds along the following structure. The next section establishes the theoretical framework of the media analyses and provides an overview of the background literature to which this chapter contributes. Then, I present the study's research design, including the research questions and the methodological framework used to analyse the mainstream media and social

media samples. The section thereafter presents the results for the two media arenas, followed by an extensive discussion of their similarities and divergences, as well as the contributions they make to the relevant literatures. I then conclude the chapter with some reflections on the avenues of future research encouraged by the findings.

6.3 Theoretical Framework and Background Literature

The primary theoretical frameworks used to contextualise this study are those of framing in environmental communication and an adaptation of Bourdieu's field theory to climate-summit journalism by Kunelius and Eide (2012) in their analysis of transnational newspaper coverage of the COP13 (held in Bali in 2007) and COP15 (held in Copenhagen in 2009) summits.

6.3.1 Framing

As discussed in Chapter 2, frames and their effect on audiences and public engagement have become very popular research topics in environmental activism and communication (Vu et al., 2021). Yet there are still relatively few studies explicitly comparing framing between media arenas, and none specifically focused on COPs. O'Neill, H. Williams, et al. (2015) carried out a comparison of the frames present in UK and US mainstream media coverage of the IPCC's Fifth Assessment Report with those in the Twitter posts pertaining to the report of fifty influential users. They found that mainstream media tended to focus on political and/or ideological struggles regarding how to address climate issues, while the Twitter discourse was dominated by emphasis on the validity of the science underlying the report.

Chen et al. (2022) conducted a long-term comparison of Twitter activity relating to climate change protests between 2018 and 2021 with articles in mainstream media outlets in Australia, Canada, the UK, and the US about the topic published in the same time frame. They found that mainstream media coverage of climate change in these countries has tended to focus on political debates and controversies, the consequences of climate change such as extreme weather events, global collaborations, the role of industry, and climate protests. In contrast, posts in the Twitter sample tended to centre on calls for action, discussions of solutions, lamenting consequences of inaction, and providing information about environmental justice.

The Chen and O'Neill studies identify key differences between the framing strategies of mainstream news media and social media users, primarily that the former tends to get caught up in

covering political debates while the latter is more action-oriented. However, these studies did not include comparisons of more granular aspects of framing in the two arenas, such as sentiment. Sentiment analysis is defined as the computational study of the opinions, attitudes, and emotions expressed towards an entity in communication (Medhat, Hassan, and Korashy, 2014). As discussed in the previous two chapters, the emotions expressed in environmental communication are an important factor in the pathway influencing how members of the public make sense of and internalise the information they encounter about environmental issues. Although there is no single emotion that has been shown to consistently motivate attention and engagement with climate issues, the emotional and attitudinal framing of environmental communication nonetheless affects the way it is perceived (Chapman, Lickel, and Markowitz, 2017). Sentiment extends beyond emotion to include the attitudes and/or opinions expressed in a given message alongside their emotional tenor (Joa and Yun, 2022; Medhat, Hassan, and Korashy, 2014; Pang and L. Lee, 2008). It is therefore a layer of abstraction above emotion, capturing the composition of several rhetorical features. Therefore, comparing sentiment across communicators can reveal important patterns of how various stakeholders use it in their agenda-setting strategies, reflecting their values and potential biases (Chen et al., 2022; Joa and Yun, 2022). Yet to date, none have compared how sentiment is used in mainstream media and social media discourses surrounding high profile climate policy events, despite their importance in the policymaking process and the potential implications of different sentiment frames in affecting public perception of the issues raised at each conference.

The last two chapters of this thesis examined the framing of messages posted by environmental activists on Twitter at the level of discrete psycholinguistic features. Particularly in Chapter 4, the focus was using computational approaches to characterise the relationships between the prevalence of those features and audience engagement across a large dataset of tweets over a long period of time. A common disadvantage of applying computational approaches to large datasets is a loss of granularity and an inability to capture complex sentiment. In this chapter, I go in the other direction, taking a more qualitative approach to analysing framing in a smaller sample at a deeper topic and sentiment level. Specifically, this chapter focuses on how topic-sentiment frames vary between stakeholders present in the mainstream and social media arenas. Thus, the objective is not to use framing to measure how frames differentially affect audience engagement, but more about what the utilisation of different frames by different stakeholders in the two arenas reflects

about how prominent actors are seeking to impact public discourse surrounding international environmental policymaking. In one of the first comparisons of mainstream and social media in the environmental context, Chen et al. (2022) emphasise how the literature lacks this particular focus. As such, this analysis adds further research to fill this gap. Finally, this chapter also includes a comparison with the frames detected for COP26 with those written about in research on previous COP gatherings. Such a comparison gives a perspective on how frames in the media pertaining to COPs are changing over time, and how social media may contribute to this dynamic.

6.3.2 Field theory

Now turning to field theory. Bourdieu's field theory suggests that individuals construct *social fields* in which they interact and compete with one another in the pursuit of finite resources (Bourdieu, 1990; Bourdieu, 1998). Kunelius and Eide (2012) extended field theory to climate-summit journalism. To do so, they conceptualised COP meetings as "momentary representations of a transnational field of climate politics" (p. 268). The actors in this field include the politicians, civil servants, lobbyists, activists, and other such stakeholders present, but also includes mainstream media outlets. While the politicians debate and formulate potential agreements, journalists are distilling these proceedings into headlines and articles, inevitably conditioned by the values, incentives, and political agenda of their host publications. Kunelius and Eide (2012) give the comparison of coverage coming from *Fox News*, typically promoting rhetoric aligned with politically conservative ideology, and *The Guardian*, generally more left-leaning, to illustrate this point.

While not all media coverage necessarily contributes *directly* to the politicisation of climate issues, media coverage of COP proceedings constitute the primary source of information that the public receives about these gatherings. This reporting informs public understanding of and support for climate policies, as well as awareness of what leaders are doing to develop (or hinder) them. As such it is critical to the "production, reproduction, and transformation of the meaning" of environmental issues and policies as they evolve through this coverage (Carvalho, 2010, p. 172). It sets the public discourse agenda for weeks after and can have impactful consequences for mobilising social, political, and civic action (X. Liu, Lindquist, and Vedlitz, 2011; Wozniak et al., 2021). Thus, while journalists may not be directly involved in the negotiations, they nonetheless impact the field of climate politics as it coalesces around COP proceedings.

In this chapter, I propose further extending field theory to incorporate communication and activism about COP summits occurring on social media platforms into the climate-summit field. In the same way that Kunelius and Eide (2012) define mainstream media outlets as participants in this field, I argue that we can think of social media platforms and their users similarly. Social media platforms have become an alternative, parallel source of news and discussion about COPs (Kunelius, Tegelberg, and Pohjonen, 2022). More generally, they constitute "hybrid media spaces" (Andrew Chadwick, 2013) in which users encounter information about climate change and thereafter have the opportunity to discuss it and potentially mobilise around it (Anderson, 2017). Moreover, these platforms offer the unprecedented opportunity to develop "knowledge communities" around environmental activism and communication (Segeberg and Bennett, 2011), thereby reducing barriers to collective action (Hestres and Hopke, 2017) and influencing political decision-making (Mavrodieva et al., 2019).

While social media platforms create a space for the general public to discuss and engage with information, they also give voice to more diverse range of stakeholders in environmental discourses than mainstream media, many of whom may have been intentionally or unintentionally marginalised by the latter (Boulianne, Lalancette, and Ilkiw, 2020; Carvalho, 2010; Gurwitt and Timmons, 2015; Gurwitt, Malkki, and Mitra, 2017; J. Smith et al., 2001). Moreover, social media platforms also allow for certain users to become more popular and/or influential, often accumulating large audiences that become comparable with the readership of mainstream media outlets. In some contexts, these opinion leaders become equally, if not more, influential than news outlets on many issues (Earl, Maher, and Elliott, 2017; Maher and Earl, 2019; Heiberger et al., 2022). Some, e.g., Greta Thunberg, have been responsible for building strong and globally expansive action movements (Han and Ahn, 2020; Sabherwal et al., 2021; Molder et al., 2022). However, Heiberger et al. (2022) demonstrate how influential individuals on social media, particularly political actors, can contribute to polarisation and narrative fragmentation in a way that can reduce discourse cohesion and consensus building. As such, it is important to pay more attention to these individuals.

In the context of COP summits, individuals (activists, politicians, journalists) and representatives of organisations present can immediately post information and commentary about the proceedings. Their audiences no longer need to wait for the events to be digested and published long-form. This also applies to mainstream news outlets themselves: nearly all media companies

operate their own social media accounts to promote their content on users' news feeds, thereby compensating for the decrease in visiting outlet homepages for news, and to share information more directly, spontaneously, and casually (Dunaway et al., 2018; Haile, 2014; Majó-Vázquez, Zhao, and Nielsen, 2017; N. Martin, 2018; Thurman, 2014).

Thus, mainstream news outlets no longer serve as the sole conduit of information and commentary about COP meetings to the public. They now interact with popular social media users and compete with them for the public's attention, and in turn, influence over how members of the public perceive important environmental issues. In the terminology of Bourdieu's original theory, we can think of mainstream media outlets as the climate politics field's *incumbents* and social media platforms as *insurgents*. That is not to say that social media platforms are inherently antagonistic to mainstream media outlets in the sense that the former are actively trying to force the latter out of the field. However, it is clear that the two compete for influence over the public, and that they have different modes and means at their disposal to do so. Repeating a concern introduced in Chapter 5, due to the brevity of posts incentivised by social media platforms, there is a higher likelihood of digression and "runaway" narratives or debates that may obfuscate the heart of whatever matter is at hand. Thus, it is possible that this distillation process creates or contributes to divergences in frames used in mainstream news and social media in environmental discourses (Chen et al., 2022; O'Neill, H. Williams, et al., 2015), particularly when the substance of the content being communicated is highly complex or abstract, as is often the case with climate science and policy (Sanford et al., 2021; Painter, Wetts, and Loy, n.d.).

As such, it is likely that the framing of environmental issues and events will differ between the two arenas. Yet, as discussed above, there are still relatively few studies explicitly comparing them. O'Neill, H. Williams, et al. (2015) and Chen et al. (2022) provide very useful guidance but neither examine the unique COP context specifically. Moreover, neither study considered the differences of various types of stakeholders, e.g., activists, politicians, or news outlets, with respect to how they promote certain narratives over others and how they shape the public's understanding of the information through networks of co-production. As demonstrated by Lück, Wozniak, and Wessler (2016), the incentives and priorities of different stakeholders drive them to interact with the climate discourse in particular ways, and lead to the coproduction of specific narratives and interpretations of information emerging from COP events. However, the authors did not include analysis of the role of other important stakeholders, e.g., youth activists, who

are becoming increasingly important to the climate action movement on social media platforms (Boulianne, Lalancette, and Ilkiw, 2020; Eide and Kunelius, 2021; Han and Ahn, 2020; Murphy, 2021), as well as more vocal and present at COP events themselves (UN, 2021; UN, 2022). With the exception of De-Lara, Erviti, and León (2022), few have examined how the communication of activists, such as Greta Thunberg, compares to and interacts with other discourse stakeholders in environmental discourse, and none have targeted comparisons between them and mainstream media. As demonstrated by comparisons of politicians and mainstream media, e.g., Heiberger et al. (2022), such analyses could provide insight into how new stakeholders in climate discourse navigate the hybrid media space in tandem with more legacy actors, and what the outcomes of these interactions are for the development of public discourse.

Meanwhile, the literature pertaining specifically to COP discourses has mostly focused on identifying the frames used in meeting coverage either in mainstream media *or* in social media, never both simultaneously. The main takeaways from the research on mainstream media include a focus of frames on the consequences of climate change and government responsibility for action (Dirikx and Gelders, 2010; Kunelius and Eide, 2012; Wessler et al., 2016), a lack of detailed coverage of climate science (Painter, 2010), a bias towards developed countries at the cost of attention to issues relevant to developing countries (J. Boykoff, 2012; Gurwitt and Timmons, 2015; Gurwitt, Malkki, and Mitra, 2017; Wozniak et al., 2021), maligning of China and India for not committing enough to environmental protection (J. Boykoff, 2012; Kunelius and Eide, 2012), manifestations of political polarisation within US media (Castillo Esparcia and López Gómez, 2021), and a divide between the ways in which traditional media outlets report on the conferences and the practices of digitally native outlets (Painter, Kristiansen, and Schäfer, 2018).

The existing work pertaining to COP discourses on social media has focused on establishing social media platforms as critical to networking mechanisms in online protest ecology which surges after COP events (Segeberg and Bennett, 2011), characterising the success of the social media messaging of a specific environmental NGO on Twitter (Comfort and Hester, 2019), a sample of ten opinion leaders on Facebook (De-Lara, Erviti, and León, 2022), and analysing the use of visual framing in COP-related posts on Twitter (Hopke and Hestres, 2018). Most recently, Kunelius, Tegelberg, and Pohjonen (2022) examine the Twitter discourse around COP26, but only in terms of the discourse structure, i.e., who interacted with whom and the resulting community structure, not any content analysis. Therefore, no study has directly compared the framing strategies of news

media, NGOs, activists, and politicians directly, and with the partial exception of De-Lara, Erviti, and León (2022),³ there have been no studies of the dominant sentiments across various stakeholders in COP discourses, nor the consistency with which they are used in framing discussions of different topics.

6.4 Research Design

6.4.1 Overview

This chapter aims to contribute to filling the gaps identified above by answering the following research questions:

1. What were the main discourses found in the mainstream media coverage of the outcome of COP26, and what were the dominant sentiments expressed about the outcome? What is the distribution of sentiment across the discourses, outlets, political leaning, and countries?
2. What were the main discourses and sentiments found in Facebook and Instagram posts at the end of the COP? What is the distribution of sentiment across the discourses, stakeholder types, and between the platforms?
3. How did the two arenas diverge with respect to topical focus and sentiments? What are the implications of these divergences for building public policy support and mobilising collective action?

In order to answer these research questions, I propose the following methodological framework based on manual content analysis.⁴ First, an analysis of 141 articles from the mainstream media coverage related to COP26 in Australia, India, the UK, and the US, focusing on the dominant frames and sentiments pertaining to the conference's outcomes. Statistical comparisons of sentiment distributions by country, topic, and political leaning are also conducted. Second, manual sentiment analysis using the same codebook as for the mainstream media sample is applied to the top 250 most interacted with posts per platform (500 posts in total) from a set of 8,467 Facebook posts and 998 Instagram posts pertaining to COP26.⁵ Additional topics were added to the

³I say "partial" here because that study only included ten accounts, none of which represented a news media organisation.

⁴See the Limitations section for a discussion of why automated computational methods for content analysis were not chosen.

⁵See the Limitations section for a discussion of an alternative approach to sampling the social media dataset and argumentation for why this approach (using interaction volume) was selected.

codebook for the social media analysis where necessary, i.e., where a considerable number of posts referenced a topic that was not included in the original codebook due to not being present in the mainstream media sample. The distributions of sentiment and interaction rate over topics and account type (e.g., politician, activist, and news outlet) are also compared. The main similarities and differences between the two arenas in terms of topic and sentiment prevalence are identified, and the implications of these findings for the communication of climate policy issues in the public sphere are discussed.

This chapter focuses on Facebook and Instagram as a way of diversifying the focus of the thesis on Twitter. Moreover, as discussed in the Chapter 1 of the thesis, Facebook and Instagram provide access to a larger range of users than Twitter: As of 2021, Facebook has been estimated to be the most popular social media platform with nearly 3 billion monthly active users worldwide, while Instagram was ranked fourth (1.4 billion) and Twitter was ranked fourteenth (556 million).⁶ Facebook and Instagram offer their users a broader scope of purposes and interactions compared to Twitter and as a result, the latter is popular particularly amongst news-loving elites, whereas the scope of Facebook and Instagram users is more universal (Cornia et al., 2018). Moreover, due to the wider breadth of data access available to researchers on Twitter relative to other platforms (until February 2023), Twitter is the subject of a disproportionately large majority of studies in this area (Pearce, Niederer, et al., 2019). The focus on Facebook and Instagram in this chapter contributes to correcting that imbalance.

In comparing content on mainstream and social media, this work builds on the methods followed by previous researchers. The O'Neill, H. Williams, et al. (2015) study used the search engine NexisUK to identify mainstream articles from the UK and the US, and hashtag identification to collect Twitter posts for the relevant period. Items from both platforms were then analysed using manual content analysis and a similar codebook to identify the presence of key frames and themes. In similar fashion, Chen et al. (2022) used Twitter hashtags to identify discursive communities around a particular climate-related topic, then a data collection platform to collect the tweets. For their mainstream article identification, they used the Reuters Institute's Digital News Report for Australia, Canada, the UK, and the US, and included English-speaking countries beyond the US to better capture the social media discussions in a global media landscape. In both studies, the validity of the comparison between the two platforms is assumed, and not discussed.

⁶<https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>

6.4.2 Mainstream media coverage

Data collection

The five most popular online news sites in four countries, namely Australia, India, the UK, and the US were selected according to online survey results found in the 2021 Reuters Institute's Digital News Report (DNR) for the online news sites with the largest weekly reach in each country (N. Newman, 2021). The four countries were chosen to give a variety of media and political landscapes in which climate change is covered and discussed in English both in mainstream and social media.⁷ The UK and US were selected as their legacy media organizations have a strong worldwide presence in English (particularly online) and exert influence amongst policy makers outside of their home countries (Kristiansen, Painter, and Shea, 2020; O'Neill, H. Williams, et al., 2015). All four countries are major players at COPs and in the international policy world in general. All four also dominate the dataset collected for the social media comparison. Because of the size of its population, India has very large English-language audiences for its news sites. India, as a developing nation, was also included as a potential contrast with the other three nations and because, along with the Chinese, the Indian delegation at COP26 was heavily discussed throughout the conference. The process for selecting the outlets per country is the same as Chen et al. (2022) and strongly resembles that of O'Neill, H. Williams, et al. (2015), which also based their selection of outlets on popularity (proxied by circulation and readership estimates).

The following search phrase was used to collect articles from the selected outlets via the Factiva database: "Glasgow" OR "UN" OR "COP26". The time period of collection included the 48 hours immediately after the summit ended at 20:00 GMT on Saturday 13 November. In most cases, that included articles with a date slug of 13th and 14th November (14th and 15th for Australia and India), when the vast majority of the coverage was published. In some cases a few articles on the day after those dates were included when they were specifically about the outcome of the COP, often with a reaction from India and China, which took time to arrive in the coverage. The span of 48 hours was chosen for the following reasons: 1) the volume of mainstream news coverage and posts on Facebook and Instagram sharply declines after 48 hours, and 2) the objective was to capture immediate reactions to the summit's outcomes, given how influential this initial coverage is known to be for driving public discourse (as outlined in the literature review section).

⁷The BBC is fourth for weekly usage in India, but as the BBC was already included in the selection of UK outlets, it is excluded from the India sample and the outlet with the next highest popularity was included instead.

These searches yielded a corpus of 141 articles (after several articles had been discarded for being repeats, trails, video reports, or insufficiently focused on the outcome of the COP). Table 6.1 shows the distribution of the 141 articles by country and political leaning. The political affiliation of a particular media title is hard to pin down succinctly, and is not defined just by its readership profile. There are various ways to measure political identity (e.g., story treatments, editorials and opinion pieces, ownership, support for governments or political parties/individuals, support for policy options, viewership/readership profiles, newsroom ideologies), particularly across different countries (Painter, Ettinger, et al., 2023), so labelling is often contested. For example, a media outlet can be left-wing on social issues or the environment, but conservative on economic issues. However, for simplification, the three categories of "left-leaning", "right-leaning", and "centrist"/"non-aligned" for the online sites of broadcasters were selected, and align with designations used for the titles included in previous literature (Feldman and P. Hart, 2016; Fletcher, Cornia, and Nielsen, 2020; Painter and Ashe, 2012).

TABLE 6.1: Number of articles by country, political leaning, and media title.

Australia			India			UK			US		
Guardian AU	Left-leaning	24	NDTV online	Left-leaning	6	Guardian	Left-leaning	22	New York Times	Left-leaning	5
ABC News	Non-aligned	7	Republic TV	Right-leaning	4	BBC	Non-aligned	9	Washington Post	Left-leaning	7
news.com.au	Right-leaning	4	News18	Right-leaning	2	Sky	Non-aligned	9	Fox News	Right-leaning	2
7news.com.au	Right-leaning	5	Times of India	Right-leaning	6	Mail	Right-leaning	8	NBC/MSNBC	Non-aligned	2
9news.com.au	Right-leaning	3	The Hindustan Times	Centrist	7	Sun	Right-leaning	4	CNN	Left-leaning	5
Totals		43			25			52			21
											141

Note: Total counts and percentages of articles for each country, broken down by media title and political leaning.

The articles were distributed unevenly between the countries, as the higher volume of coverage in the UK and Australia was partly driven by the extensive coverage given to the COP in the Guardian, which is long known for its interest in climate change and the resources it deploys at COPs and at other times (Painter, Kristiansen, and Schäfer, 2018). The coverage in the Guardian UK website was broadly similar to the Guardian Australia website with some differences around the presence of five articles specifically about the Australian government response. This bias in the Australia and UK samples towards Guardian articles is taken into account in the analysis. Nonetheless, the articles were fairly evenly spread between news sites of different political orientation. Of the total sample of twenty sites, six titles were left-leaning, five were centrist or non-aligned, and nine were right-leaning.

Analysis

The method followed for the identification of the main discourses in the articles was first to take a sample of articles, conduct an initial assessment of the sample's thematic content inductively, and then compare this assessment with the themes present in the main messaging from press releases or briefings issued by a selection of prominent climate NGOs at the end of the COP. The first round of inductive coding resulted in the detection of topics related to the negotiations on emissions, coal, and financial aid. The comparison with the NGO messaging allowed for further specification of important subtopics within these broader themes. Research has shown that mainstream media rely heavily on NGO sources for policy outcomes and interpretations during COP summits (Eide and Kunelius, 2010; Lück, Wozniak, and Wessler, 2016), so taking this step gave additional support and detail for the finalisation of the codebook. Illustrative examples of the NGO messaging can be found in Appendix D, and in the discussion of the results which follows.

In the end, eleven variables were used to assess the presence of three broad themes in each article: the commitment to cut emissions enough to keep 1.5C as a target; plans to cut coal production; and finance for developing countries. These variables were coded for presence and/or salience. This framework is becoming more common in communication studies because it provides a more granular assessment of how much time/space journalists dedicated to each theme (Painter, Wetts, and Loy, n.d.). Presence here meant if the theme appeared to any degree in the headline or article text, while salience meant whether the theme appeared in the headline or first five sentences of an article.

One collaborator (Dr James Painter, co-author on the paper version of this chapter) coded all of the mainstream articles, then a colleague (Dr Nadine Strauss) coded five articles of each sample to check on the reliability of the first researcher's coding. Eight of the variables showed 100% agreement⁸. However, three of the variables – salience of the phase out of coal, salience of blaming India or China, and the presence of the agreement on adaptation funds) – scored .571 according to Krippendorff's Alpha. In these three cases, the text of the code book was discussed, clarified and re-written to ensure less ambiguity in its interpretation.

The first assessment was of the presence and salience in each article of the key commitment to cut emissions (from all sources, not just fossil fuels and coal) enough to keep 1.5C as a target. Four broad types of sub-discourses were identified:

⁸This was verified using the website <http://dfreelon.org/utills/recalfront/recal3/>

1. Outright Failure: *"The agreement fails to commit countries to keep 1.5 a realistic target"*.
2. Bare minimum but nowhere near enough: *"Just enough to keep 1.5 (technically) alive" or "On life support"*.
3. Some progress/but not enough: *"Progress was made, but not enough for meeting the 1.5 target"*.
4. Broadly positive: *"The deal offers a political lifeline for accelerating action to keep temperature rise below 1.5...and opens the door to accelerating action in the next 12 months"*.

Following the same method of identification, the next assessment focused on different discourses around plans to cut coal production, and who was to blame for the watering down of the language from "phase out" to "phase down". These were:

1. The agreement was weakened by language to phase down rather than phase out coal production: *"As a result of what took place here... nations that have never considered having the word 'coal' in a plan... it's on the books – it's part of the decision." He adds that 'you have to phase-down coal before you can end coal'"*.
2. India and/or China were blamed for the change in language: *"A commitment to phase out coal that was included in earlier negotiation drafts led to a dramatic finish after India and China led opposition to it."*
3. China, India, the US and the EU (collectively) were blamed for watering down language: *"Yet India and China pursued last-ditch interventions to soften language on coal usage, and the U.S. played a role in accepting that weaker position, calling into question their short-term commitment to curb coal usage"*.

This last discourse was included as some NGOs were promoting the message that the COP outcome was a collective failure, as illustrated by the headline of the NGO Global Strategic Communications Council (GSCC) in its briefing to journalists that "China, India, EU, US undermine global fossil-fuel phase out pledge", implying joint culpability.

Next, the presence of four discourses around finance for developing countries were examined (only presence was assessed here as an examination of an initial sample of articles showed that this issue was not salient, given the strong presence of the other discourses):

1. The agreement failed the poorest (in general), or a variant of the sentiment that rich nations refused climate crisis support for developing nations: *"As long ago as 2009, the developed*

world agreed it would provide \$100bn a year by 2020 to help poorer countries. But an expert report commissioned by the United Nations (UN) concludes the target has not been reached - even though a new and more ambitious target is now due to be set for 2025".

2. The lack of an agreement on a Loss and Damage funding facility: *"But we have to understand that when the so-called global north refuses to take the leadership role and still refuses to deliver on the loss and damage on the promised yearly \$100bn to the most vulnerable countries - the least responsible countries - of course that creates lots of tension".*
3. The US and EU blocked the fund for Loss and Damage, and were responsible for the lack of agreement: *"But after resistance from rich nations led by the United States and EU, the text omitted any reference to a specific finance facility for the loss and damage climate change has already caused in the developing world".*
4. An agreement on 2025 as the date by when developed countries need to double their collective funds for adaptation, based on 2019 pledges⁹: *"The new agreement tries to fill in some of those gaps. It calls out rich countries for failing to meet the \$100 billion goal and urges them to 'at least double' finance for adaptation by 2025".*

Finally, overall sentiment analysis regarding the success or failure of the conference was additionally coded for all articles on a scale of 1 to 5. A score of 1 corresponds to a prevalence of negative emotion and characterisation of the conference as an outright failure. A score of 5 corresponds to positive emotion and characterisation of the conference as a full success. An additional level 6 was used for articles espousing no particular sentiment towards the conference's outcomes. This assessment included not just the treatment of the commitment to keep to 1.5C (assessed above), but the overall advances (or not) in the areas of coal reduction, finance for developing countries, and other issues. As with any assessment of sentiment, there is a certain element of subjective judgement present, unlike an assessment of whether a particular message is present or not. Examples of the sentiment categories are presented below:

1. Very negative/a failure: *"A betrayal of vulnerable people by rich nations"; "Agreement was infuriating and disappointing"; "It's painful that diplomatic efforts have once more failed to meet the scale of this crisis"*

⁹The text of the Glasgow Pact in essence recognized the importance of Loss and Damage, but failed to agree on a dedicated new fund. See <https://www.reuters.com/business/cop/climate-loss-damage-earns-recognition-little-action-cop26-deal-2021-11-13/>

2. Some progress, but many failings/a long way to go/failings outweigh the positive: *"Some progress, but many failings"; "It's an important step, but it's not enough"*
3. Balanced: some progress, some failings: *"COP26: Evasive words and coal compromise, but deal shows progress"*
4. Better than expected, positives outweigh negatives: *"Agreement delivered much more than expected"*
5. Positive: *"The world is undeniably heading in the right direction"; 'A big step forward'; "We are closer than ever before to avoiding climate chaos"*
6. Neutral/Not-applicable: *"India criticised over coal at Cop26 – but real villain was climate injustice"; "Liberal backbenchers call for more ambitious 2035 emission reduction target"*

In order to quantify the differences in sentiment trends across countries, political leaning, and topic themes, a series of analyses of variance (ANOVAs) and pairwise Tukey honestly significantly different (HSD) tests were conducted (using the p-value threshold of 0.05). The ANOVAs determine the presence of a significant difference between the levels of interest, but they cannot say anything about which levels differ, nor the magnitude and statistical significance of these differences. Therefore, the Tukey HSD tests are used to identify the magnitude and significance of all pairwise differences between the levels of each categorical comparison of interest, while controlling for the increasing risk of detecting false positives as a result of making multiple comparisons (Tukey, 1949). While technically the sentiment levels are categorical variables, they are also ordinal and as such ANOVAs can be deployed. Using these tests, I compared the sentiment distributions at the following levels: 1) across countries, aggregating over political leanings and topic theme; 2) by political leaning level, aggregating across countries and topic theme; 3) by topic theme, aggregating across countries and leanings; 4) by topic theme-country (i.e., coverage of the coal negotiation in Australia versus the UK) aggregating over leanings; and 5) by topic theme-leaning (i.e., coverage of the coal negotiation in left-wing versus right-wing outlets), aggregating over countries. I aggregate over the emissions and finance subtopics into aggregate emissions and finance topic themes because of how the subtopics were constructed to suggest sentiment divergences. For example, the emissions theme includes subtopics ranging from references to the emissions deal as a failure to broadly positive evaluations, while the finance theme ranges from negative evaluations of shortcomings to praise for new targets. These subtopics are confounded

by the separate sentiment evaluation, so aggregating over them for the comparisons provides a more robust indication of how the distributions differ on each level.

6.4.3 Facebook and Instagram coverage

Data collection

The second part of the study seeks to understand the extent to which these discourses pervaded the Instagram and Facebook discourses about the conference. To collect data from these platforms, I used CrowdTangle (CT), a tool developed and hosted by parent company Meta. It allows free access for academic researchers to public accounts and pages. The posts of private individuals are excluded, as well as those that do not qualify as "public figures". CT defines public figures as accounts with more than 25k likes or followers on Facebook, more than 50k followers on Instagram, all users on both platforms with verified profiles,¹⁰ and all public Facebook groups with more than 95k members, all US-based public groups with more than 2k members. This scope encompasses more than 7 million Facebook profiles, pages, and groups, and more than 2 million Instagram accounts (CrowdTangle, 2023).

Although unable to capture the full public discourse, the restriction of data to only public figures and organisations enables a focus on the most prominent content producers of a particular message, discourse or theme. This is analogous to focusing on the most popular online news sites, as was done in the mainstream media analysis. All English-language posts were collected including the search term "COP26" during the same timeframe used in the mainstream media collection. In total, these searches yielded 8,467 Facebook posts (676k total interactions) and 998 Instagram posts (2.8 million total interactions).

CT search results for each platform vary slightly depending on the metadata collected and maintained by the platform. For Facebook, posts from both individual users and group pages are supplied by CT. A group page can represent an organisation, such as the UN, businesses, political groups, and other communities. In addition to total interactions for each post, the results also include the name of the user or page that posted it, the "category" of the page, the country location of the administrators of the page, and a performance score.

¹⁰Accounts may be verified to officially confirm their identity on both platforms. This is mostly reserved for users above the follower threshold on each platform. According to the Instagram and Facebook verification pages, in order to request verification, an account must "represent a well-known, highly searched for person, brand or entity" and is therefore not normally accessible to normal users.

The results for both platforms include a total number of "interactions" that a post has received. For Facebook posts, possible interactions include comments, likes, shares, and the other possible post reactions including love, wow, haha, sad, angry, and care. For Instagram posts, possible interactions include likes and comments. In this chapter, the total number of interactions per post is used to approximate its popularity. As noted in previous chapters, although interactions, i.e., "likes", alone may not be the strongest indication of *influence* (compared with content sharing or other "retweet" equivalents), they are nonetheless important for signalling engagement and spreading content across platforms.

It should be noted that although Instagram allows several different types of posts on its platform, CT only collects regular timeline publications and excludes "stories" as they are time-sensitive (only present for 24 hours) and "reels" (multi-clips videos with various audiovisual effects). The exclusion of stories and reels is addressed further in the discussion of the methodology's limitations.

The total number of interactions that a post receives can depend on several variables, ranging from aspects that are visible to researchers, e.g., the number of followers the user or page has, to things elements that are not, e.g., the way the platform newsfeed algorithms push certain content to certain users based on user profile characteristics. In this chapter, I do not conduct any inference regarding what might be driving post popularity. Instead, I use interactions only as a way of scoping the sample of posts to manually annotate, as a proxy for relative popularity and prominence in the discourse.

Before proceeding with the analysis, I performed validity checks on the search results. These included reading through random samples of the posts to be sure they did indeed mention the conference. I also manually searched the Facebook and Instagram profiles of fifteen accounts associated with NGOs whose messaging on Twitter during the conference was used to fine-tune the codebook. I found no posts in the 48 hours of interest which had not been included in the CT collection.

Moreover, I also examined the profiles of a random sample of users found in the dataset to make sure that the search queries caught all relevant posts, i.e., all posts from these users pertaining to the conference. The results of these checks were also satisfactory so I am content to conclude that the CT searches yield the full scope of posts available on the platforms relevant to COP26 in the desired timeframe.

Analysis

A sample of 250 posts per platform (500 in total) are selected for manual analysis. These were selected in decreasing order of the total number of interactions each post received. I used this sampling criteria instead of a random sample because I wanted to focus on the posts with the highest exposure in the sample, i.e., those that had the highest potential influence by virtue of the number of people who engaged with them. In addition to the thematic content, the type of account for each post was also annotated. A framework resembling Hopke and Hestres (2018) was used to categorise the accounts. This was done to enable comparison of focus points across different classes of stakeholders in the COP26 discourse. The account annotation process began with visiting the page of each account and verifying with a Google search. If the account belonged to a politician or political party, the account was given the label "political" and then a secondary label for leaning (left, right, or none/centre). If the account belonged to an environmental activist or activist group, it was given the label "activist". Other account types present in the sample include: *celebrity, government bureau, environmental non-governmental organisation (eNGO), environmental non-profit, other NGO, other non-profit, intergovernmental organisation (IGO), scientific research organisation, individual scientist, community, labour union, artist, individual journalist, influencer, business, news outlet, and other media.*

Several communities in the sample centred around a specific political leaning and, similar to the political account types, are further designated as either right-leaning, left-leaning, or neutral. News outlets are also broken down into subcategories. Accounts representing the most popular online sites for their respective country location (e.g., the UK for *The Independent* or Canada for *CBS News*) as determined by the 2021 Digital News Report, are designated as "Mainstream", while outlets typically associated with business reporting are categorised as "Business" outlets.¹¹ All other outlets are referred to as "Other". The category "Other media" refers to media channels not explicitly focused on general news, e.g., magazines (*Vogue*) and social-media based media organisations (*NowThis*).

Table 6.2 shows the breakdown of the sample across these levels. Examples of accounts associated with each label are given in Table D.1 of Appendix D. Following the example in Hopke and Hestres (2018), eNGO and environmental nonprofits were combined into a single category,

¹¹This was verified via manual search for each outlet.

while all non-environmentally focused NGOs and nonprofits were combined into another separate category. Due to their relative infrequency, the categories business, influencer, journalist, both communities, science-related accounts, and labour unions are combined into a single miscellaneous category.

TABLE 6.2: Relative presence of each account type.

	Facebook	Instagram
Activist	8.8	30
Artist	.8	4.4
Celebrity	4.8	9.6
Environmental Organisation	2.4	7.6
Other Organisations	4.0	2.4
Government	3.6	3.2
IGO	1.2	2.4
Political - left leaning	7.6	5.6
Political - right leaning	3.2	0.4
Mainstream News	12.4	6.8
Business News	2	6.4
Other News	31.2	6.8
Other Media	11.2	5.2
Miscellaneous	6.8	9.2

Note: Percentages correspond to the proportion of posts in the platform samples attributed to each account type.

Now turning to the content analysis: For Facebook posts, I examined the main text of the post along with the text of any image included in the post. For Instagram, all posts correspond to an image so the extractable text includes the main image caption and any text within the image. In the first instance, each post is annotated using the codebook applied to the mainstream media sample. This is done in order to approximate the extent to which the arenas resembled each other in the prioritisation of narratives and topics pertaining to the conference. However, new topic categories were added to the codebook inductively when a significant volume of posts mentioned topics not covered by the mainstream media codebook in order to capture the full thematic scope of the samples (Murthy, 2016). These new topics are described in the presentation of the results. Alternative approaches for automatic classification of the posts were trialled but insufficient precision of results made clear that manual analysis was the best way forward. These alternatives are discussed further in the limitations section below.

Once the annotations were completed, the following statistical analyses were undertaken. First, the raw prevalence of account types and topics in the sample were tabulated. Then, a

comparison of topic prevalence across account types was done using chi-square tests for independence.¹² Finally, comparisons of the sentiment and interaction distributions across each topic and account type were performed using the same ANOVA and Tukey HSD pipeline applied to the mainstream media sample. All analyses are first conducted at the aggregate level, i.e., across the combined set of Instagram and Facebook posts, and then on each platform individually.

6.4.4 Limitations

Limitations of mainstream media sample

The analysis of mainstream media coverage is limited to the most popular English-language news sites in four countries, three of which speak English as an official language. As such, the analysis ignores discourses in other cultural contexts and languages. The focus of the work is also skewed towards countries with advanced economies. India is included in the sample as a contrasting emerging economy and cultural context, but there are many other countries which have routinely been ignored in media coverage of environmental issues, as well as in academic research, that should be prioritised moving forward (J. Boykoff, 2012; Gurwitt, Malkki, and Mitra, 2017; Kunelius and Eide, 2012; Wozniak et al., 2021). It is highly likely that discourses in individual countries, unfolding in the native languages of those countries, will be focused on issues more specific to the country's culture, politics, economic priorities, as well as the unique threats climate change poses to them. These discourses will therefore diverge from what is observed in the sample examined in this chapter. Nonetheless, one of the primary motivations of this study was to capture how media hegemonies in countries responsible for high proportions of global carbon emissions discussed COP26 and the issues it emphasised, but it is important to acknowledge that the selected samples do not represent the full global discourse, no matter how dominant media coverage in these countries, particularly the US and UK (O'Neill, H. Williams, et al., 2015; Kristiansen, Painter, and Shea, 2020), may be over global coverage trends.

Finally, within the selected countries, the sample of articles was restricted to major mainstream news outlets known to carry influence over the political and economic elites of each country (J. Boykoff, 2012; Gurwitt, Malkki, and Mitra, 2017). These outlets tend to follow editorial principles of balance and impartiality, as reflected in the sample comprising mostly straight news reporting

¹²Chi-square tests are used because the account type and topic variables are categorical and therefore do not follow a normal distribution (A. F. Hayes, 2005). The data for each analysis was weighted by count, i.e., the number of times the variable pair was present in the platform samples. To test the strength of the relationships, Cramer's V test statistics are used. A higher Cramer's V signifies a stronger association between two variables (A. F. Hayes, 2005).

rather than opinion pieces. A wider selection of "opinion-driven" news sites and opinion pieces could have provided some interesting points of comparison with our social media sample, where many of the posts came from activists or commentators with a clear position. However, following previous research in this field (Chen et al., 2022; O'Neill, H. Williams, et al., 2015), such comparisons between large samples of mainstream and social media clearly provide important points of difference in treatments of the same issue (climate news) or the same climate news prompt (an IPCC report, or a policy event such as a COP). In any case, future work could examine how coverage varied in fringe outlets, as well as across other countries and languages.

Limitations of social media sample

The social media analysis also focused only on English-language posts mentioning COP26 on Facebook and Instagram, as collected via CrowdTangle (CT). As discussed in the description of the data collection, CT offers access only to the subset of "most influential" public accounts and pages on Facebook and Instagram. It therefore does not allow any analysis of or commentary on the discourse trends of members of the general public on these platforms. However, since the objective of the chapter is to analyse how influential opinion leaders framed their commentary of the conference, the limitation of the dataset to only public figures and organisations is justified. Given how the dataset includes exclusively English-language content, albeit including users from around the world, interpretation of the sample is inherently limited to how these stakeholders contribute to *global* dialogues on climate politics. This may differ in comparison with how they talk about more specific, local issues in their native languages. Therefore, it is important to emphasise that this study, similar to the previous chapters, is not making broad generalisations about all shades of environmental activism, but rather to that which seeks to influence a global audience towards awareness of developments in climate politics.

Moreover, CT only catalogues data pertaining to fixed timeline posts, and does not collect information on "stories" (both platforms) or "reels" (Instagram only).¹³ Therefore, it is impossible to know the extent to which the results are skewed by virtue of the samples excluding content related to COP26 posted as stories and/or reels.

¹³"Stories" are a feature that allows users to post photos and video clips on their feeds that vanish after 24 hours. They are available on Facebook and Instagram. "Reels", exclusive to Instagram, are multi-clip videos with audio, effects, and other creative tools. They were released on the platform to stay competitive with video platform TikTok.

Limitations of the methodological framework

Both samples are analysed using manual coding. While every effort was taken in developing the codebooks for the two samples to be as comprehensive as possible with respect to all present topics, the process involves a degree of unavoidable subjectivity. Potential biases and blind spots were counteracted by using a team of three coders to independently verify the framework and coding of the articles/posts.

Moreover, while the manual nature of the social media content analysis might stand out in this thesis, it is the end result of a process of trial and error with more sophisticated computational methods. While the mainstream media sample was small enough to enable manual analysis of all the articles, the social media dataset was not. As such, I experimented with topic modelling in an attempt to extract the thematic structure of the posts automatically. Despite trying several state-of-the-art frameworks (BERTopic, structural topic models, and latent Dirichlet allocation), the results were very unreliable and often required arbitrary customisation of model hyper-parameters that had no theoretical justification or objective method of evaluation. The models based on latent Dirichlet allocation (LDA) have the most robust evaluation metrics (DiMaggio, Nag, and Blei, 2013), but still yielded unsatisfactory stability and coherence. Thus, across the attempts with different frameworks and algorithms, I was not able to find a single model that I could objectively classify as the "best" or "most coherent". All of the models struggled with categorising a large proportion of the dataset, never identifying consistent thematic clusters. Moreover, I also experimented with identifying topic prevalence in the dataset using keyword searches for each topic but even after several iterations of fine-tuning the search criteria, I was never able to achieve high accuracy and reliability of classification in the full dataset. As a result, I opted to manually annotate a sample of the most interacted with posts from each platform. This allowed me to build a more detailed and reliable understanding of the thematic structure of the most popular posts in the dataset.

However, instead of the most interacted with posts, I could also have chosen a random sample to annotate. I preferred the former approach because it offered the best chance of characterising the content that was likely to have reached the most people by virtue of being interacted with more. While the newsfeed curation algorithms of Facebook and Instagram are proprietary, it is generally understood that content which receives more interactions tends to spread farther, and be shown to more people, than content which receives fewer interactions (Lipsman et al., 2012). There is no

parallel comparison for the mainstream media component of the chapter with respect to audience interaction. It is only introduced in the social media analysis to help scope a reasonable sample of posts to manually annotate from the full dataset which I did not have the resources to annotate in its entirety.

Moreover, while the focus of the sample on Facebook and Instagram instead of Twitter is justified by the relative dominance of the latter in social media communication studies to date, there are many more social media platforms deserving attention. Especially given the differences in content format, algorithmic spread, and user demographics across social media sites (e.g., TikTok and Weibo versus Instagram and Facebook versus Twitter; Statista (2022c)), future work should compare how COP outcomes are represented and discussed across these platforms, as well as between arenas.

6.5 Results

6.5.1 Mainstream media

Topic prevalence

The first assessment was of the relative salience in each article of the commitment to cut emissions (from all sources, not just fossil fuels and coal) enough to keep 1.5C as a target. As can be seen from the first four columns of Table 6.3, of the 141 articles, 31 articles (22%) prominently presented the agreement as the bare minimum, 25 (18%) as some progress, 8 (6%) as broadly positive and 8 (6%) as an outright failure. The remainder of the sample did not highlight this aspect of the COP outcome in their opening sentences.

TABLE 6.3: Number of articles showing the presence of key messages by country and topic area.

	Emission Cuts/1.5C target				Plans to reduce coal production						Finance			
	<i>Failure</i>	<i>Bare minimum</i>	<i>Some progress</i>	<i>Positive</i>	<i>Phase down/out</i>		<i>China/India</i>		<i>Collective blame</i>		<i>Failed the poorest</i>	<i>Loss and Damage</i>	<i>Blame</i>	<i>Adaptation</i>
	Salient	Salient	Salient	Present	Present	Salient	Present	Salient	Present	Salient	Present	Present	Present	Present
Australia	1	7	5	1	36	18	28	19	1	1	11	11	5	8
India	2	7	6	4	19	9	14	4	2	1	12	9	4	7
UK	3	16	10	3	45	35	41	35	1	1	14	16	6	20
US	2	1	4	0	17	9	17	9	0	0	13	11	9	7
Total	8	31	25	8	117	71	100	70	4	3	50	47	24	42
% of articles	6	22	18	6	83	50	71	50	3	2	35	33	17	30

Note: Some topics were coded for presence and salience, others only for presence. Last row shows percentage figures for presence and/or salience for each message.

The next assessment focused on the presence and salience of different discourses around plans to cut coal production, and who was to blame for the watering down of the language from "phase out" to "phase down". Table 6.3 shows that the agreement being weakened by language to phase down coal production was the most present discourse (117 articles, 83% of sample), and the most salient (71 articles, 50%). Table 6.4 shows that the change in language was much more salient in the right-leaning and centrist press (58-62%) than in the left-leaning (40%). When the media assessed who was to blame, the finger was firmly pointed at India (mostly) and China, with that discourse being the second most salient of our entire sample, present in nearly half of the articles (70 articles, 50%). As one might expect, the Indian media sample showed lower figures for the criticism of India and China: for presence, only 56% of articles compared to a range of 65-81% for the other three countries; and for salience, only 28% compared to a range of 43-67% for the other countries. The difference might have been greater if several of the Indian articles had not been based on Western agency reports, such as *Reuters*, *Agence France-Press* and *Bloomberg*. What was also notable was the inclusion of long quotes from Indian officials in several articles justifying the Indian stance on phasing down coal, and for others quoting Chinese support for the Indian position.

There was a notable difference between the left-leaning media, where the blaming India or China was present in 63% of articles and salient/dominant in 45%, and the right-leaning media where the presence (84%) and salience/dominance (53%) were higher. The centrist media came in-between.

One can speculate that a potential driver of the difference was the urge to find villains and scapegoats and blame China, particularly in the right-wing tabloid press in the UK. This "blame discourse" was also in part driven by headlining of the comments from the COP26's chair, Alok Sharma, and then British Prime Minister Boris Johnson, both pointing the finger at India and China. However, this alone does not explain the overwhelmingly strong presence of this message and the virtual absence of the collective responsibility message, which was present only 4 times (3%), and only 3 times salient (2%)

Next, the presence of four discourses around finance for developing countries was examined. The first, second and last of these discourses were each present in 30-35% of the articles. Some of the articles, particularly for example in the right-leaning UK press (*Sun* and *Mail*), presented the Loss and Damage text in the final agreement as a positive development. For example, a *Sun*

TABLE 6.4: Content analysis results by media's political leaning.

	Emission cuts/1.5C target				Plans to reduce coal production						Finance			
	Failure	Bare minimum	Some progress	Positive	Phase down/out		China/India		Collective blame		Failed the poorest	Loss and damage	Blame	Adaptation
	Salient	Salient	Salient	Salient	Present	Salient	Present	Salient	Present	Salient	Present	Present	Present	Present
Left-leaning														
Guardian (UK)	3	7	4	1	17	10	14	13	1	1	9	9	3	5
Guardian (AU)	1	3	3	1	19	9	12	9	1	1	8	8	3	4
NDTV online	0	3	0	1	5	3	4	2	1	1	3	2	1	2
CNN	0	0	0	0	4	2	4	3	0	0	3	4	4	2
New York Times	0	0	3	0	3	0	3	0	0	0	3	3	2	3
Washington Post	1	1	1	0	6	4	6	4	0	0	5	2	2	2
Total	5	14	11	3	54	28	43	31	3	3	31	28	15	18
% articles	7	20	16	4	78	40	63	45	4	4	45	41	22	26
Centrist/non-aligned														
BBC	0	2	3	0	7	5	7	5	0	0	2	3	2	4
Sky	0	6	1	0	9	9	8	6	0	0	1	3	1	4
ABC News	0	1	1	0	6	3	5	3	0	0	2	1	0	1
Hindustan Times	0	3	2	1	5	2	3	1	1	0	3	3	1	3
NBC/MSNBC	0	0	0	0	2	2	2	1	0	0	1	1	0	0
Total	0	12	7	1	29	21	25	16	1	0	9	11	4	12
% articles	0	35	21	3	85	62	74	47	3	0	26	32	12	35
Right-leaning														
Mail	0	1	1	1	8	7	8	7	0	0	2	0	0	5
Sun	0	0	1	1	4	4	4	4	0	0	0	1	0	2
news.com.au	0	0	1	0	4	2	4	3	0	0	1	1	1	1
7news.com.au	0	2	0	0	4	2	4	2	0	0	0	1	1	2
9news.com.au	0	1	0	0	3	2	3	2	0	0	0	0	0	0
Fox News	1	0	0	0	2	1	2	1	0	0	1	1	1	0
Republic TV	1	1	1	1	1	0	0	0	0	0	1	1	0	0
News18	1	0	1	0	2	0	1	0	0	0	1	0	0	0
Times of India	0	0	2	1	6	4	6	1	0	0	4	3	2	2
Total	3	5	7	4	34	22	32	20	0	0	10	8	5	12
% of articles	8	13	18	11	89	58	84	53	0	0	26	21	13	32

Note: Total counts and percentages of articles with each discourse variable detected, broken down by media title and political leaning.

article of 14 November outlined as an achievement of the COP "Boosting up the agenda the conversation about how to pay for the loss and damage that climate change inflicts on developing countries". Sky News included the same phrase, again without a mention of the failure to reach agreement on a dedicated fund.

However, more significantly, a much smaller percentage of the total sample of articles (and half of those which mentioned the lack of agreement) blamed the failure to achieve a Loss and Damages agreement on Western countries such as the EU and the US (24 – 17%). This was despite the widespread frustration from many developing countries on this issue. In general, references to the topic of financial aid were higher in left-leaning media (on average, 34% across all subtopics) compared to central/non-aligned (26%) and right-leaning outlets (23%).

Sentiment analysis

Table 6.5 shows the results of the sentiment analysis of the articles. As can be seen, the overwhelming majority of articles fell into the category of "some progress, but many failings", and "some good aspects, some negative". The former was assessed as being dominant in 33% of the

articles, the latter in 35%. Only 6% of the articles saw the outcome as an (outright) failure, epitomised in the oft-quoted tweet from Greta Thunberg that ‘*Small steps in the right direction*’, ‘*making some progress*’ or ‘*winning slowly*’ equals losing. #COP26 #UprootTheSystem”. Indeed, the media coverage overwhelmingly concluded in general that there had been some progress at the COP, despite some NGOs pushing the line of “failure” (see Appendix D), and despite the frequent appearance of quotes from Greta Thunberg in the sample of articles.

Positive or very positive appraisals were also hardly present, at 5% and 4%. One example of a positive appraisal was to be found in the Scottish edition of the *Mail* which hailed the COP26 outcome as a “*climate deal for the world*”, describing it as the most “*ambitious ever seen*”. Another was in a *Washington Post* editorial, headlined as “*slow, but real progress*”. But other positive appraisals were seldom to be found. An interesting exception was the Indian sample, where five of the articles (20%) stressed the positive outcome of the COP, and particularly highlighted the comments from the Indian environment minister, Bhupender Yadav, and his description of the conference as a “success”.¹⁴ Therefore, the dominant sentiment seemed to be lukewarm towards the conference’s outcomes, neither majorly positive nor majorly negative.

TABLE 6.5: Sentiment analysis of mainstream media sample, by country.

	Failure	Some progress, many failings	Balanced: Some good, some negative	Better than expected	Positive	Neutral/NA	Total
Australia	4	14	12	1	1	11	43
India	1	5	7	2	5	5	25
UK	3	21	22	3	0	3	52
US	0	7	9	1	0	4	21
Total	8	47	50	7	6	23	141
% of articles	6	33	35	5	4	15	

Note: Total counts and percentages of articles from each country coded to each sentiment category.

Comparative analysis

The results of the ANOVA and Tukey HSD tests used to compare the sentiment distributions at various levels of interest are presented in Table 6.6. These tests only included the articles with sentiment scores 1-5 on the sentiment scale, therefore excluding articles that did not express a discernible sentiment.¹⁵ At the country level (aggregating over themes and political leanings), the biggest differences are between the UK and India samples, and the Australia and India samples.

¹⁴See for example, <https://www.hindustantimes.com/india-news/cop26-summit-in-glasgow-proved-to-be-a-success-says-india-101636914435554.html>; <https://timesofindia.indiatimes.com/india/india-calls-cop26-summit-a-success/articleshow/87699976.cms>

¹⁵23 (17%) of the articles in the sample were coded as having no discernible sentiment towards the conference. I consider these articles and how they differ from the rest of the articles in the Discussion section of this chapter.

This is most likely driven by the contrast between the negativity in the articles of the left-leaning UK and Australian *Guardian*, and the more positive coverage from right-leaning outlets in the India sample, namely *Times of India* and *News18*. This disparity between left and right-leaning outlets is confirmed in the comparisons of sentiment across political leanings (aggregating over countries and themes): significant differences were found between non-aligned/centrist and left-leaning outlets, and between right- and left-leaning outlets.

TABLE 6.6: Results of ANOVA and Tukey HSD tests for sentiment distributions across countries, political leanings, topics themes, topic theme-country pairs, and topic theme-leaning pairs in the mainstream media sample

Comparison	DF	N	ANOVA	Tukey HSD
Country	3	118	4.54, .005	UK <India (.75, .008), Australia <India (.21, .004)
Political leaning	2	118	9.71, <.001	Non-aligned/Central >Left-leaning (.55, .014), Left-leaning <Right-leaning (.82, .001)
Topic	4	314	.44, .78	-
Topic-Country	16	314	3.39, <.001	Finance UK <Finance India (.997, .014), Finance Australia <Finance India (1.18, .0099)
Topic-Leaning	12	314	4.04, <.001	Emissions left-leaning <Emission right-leaning (.85, .038), Coal (any weakening) left-leaning <Coal (any weakening) right-leaning (.03, .029) and Coal (China and India) right-leaning (.77, .005)

ANOVA results given: F-statistic and p-value. Tukey results given: pairwise comparisons significant at the 95% confidence level with difference and p-value. Inequality signs between items indicate the direction of the difference, e.g., UK <India on the country comparison indicates that articles in the India sample evidenced significantly higher sentiment about the conference than articles in the UK sample.

Across the topic themes (aggregating over countries and leanings), no significant difference in sentiment was found in the ANOVA, nor in the pairwise Tukey HSD tests. However, when this is broken down further into comparisons of theme-country pairings (aggregating over political leaning), there are significant differences in how the UK and Australia framed the outcomes of the conference pertaining to delivering financial assistance to developing countries relative to articles in the India media sample. And finally, when examining theme-leaning pairings (aggregating over countries), there are significant differences between left-leaning and right-leaning articles for the coal and emissions themes.

6.5.2 Social media

Expansion of codebook

First, six new topics were added to the codebook for the social media sample.¹⁶ These are listed below with a description and example for illustration.¹⁷

- Summit leadership: Mentions of world leaders and their responsibilities, divided into negative, neutral, and positive framings, e.g.,
 - Negative: *"The Glasgow climate pact passed yesterday during the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) reflects the lack of political will of world leaders to end the climate crisis."*
 - Neutral: *"The outcome of #COP26 shows us that it has never been more important to hold our leaders accountable to their words and pledges."*
 - Positive: *"World Leaders Reach Climate Deal At COP26, US And China Agree To Collaborate. World leaders have reached a deal at the United Nations Climate Change Conference (COP26) in Glasgow, Scotland to help combat the effects of climate change."*
- Summit failure: General declarations of COP26 as a failure, not specific to any particular deal or topic, e.g., *"Angry , scared and betrayed. We have been failed and scorned by the stupid , the greedy and the evil. Life is now in mortal danger. But it's not over, it's just down to us to do what needs to be done and we need to go to it now."*
- Updates: General announcements and updates about the conference ending, e.g., *"WATCH LIVE: Prime Minister Boris Johnson and COP26 President Alok Sharma host a press conference following the COP26 climate summit #COP26 | #TogetherForOurPlanet"*
- Youth: Presence and role of youth activism at the conference, e.g., *"We've capped off the final week of COP26 and young people continue to demand their voices are heard when leaders make decisions during this climate emergency."*

¹⁶A handful of other topics were considered for addition during the annotation process but were excluded from the final selection because they appeared infrequently in posts on both platforms. These included: Justification of India and China's adjustment to the language of the coal deal (1% on Facebook, not present on Instagram), criticism of the Australian delegation at the summit (2% and 4%), the Indian government's denial to travel to COP26 of youth activist Disha Ravi after her arrest for actions related to her climate protest work (1% and .2%), the role of Indigenous Peoples in defending the environment (0.5% and 3%), and the importance of food systems and dietary choices on carbon emissions (0.5% and 2%). Finally, descriptions of COP president Alok Sharma's emotional reaction to the ending of the summit were also found in 5% of Facebook and 3% of Instagram posts.

¹⁷Examples of posts from the original codebook topic categories are included for reference in Appendix D.

- Collective/Hope: Emphasising collective hope and action to offset disappointments/shortcomings of conference, e.g., *"It's up to us and always has been. We must organise, disrupt, and smash fossil fuel's social licence. We have to build a mass movement of civil disobedience. Anything less simply leaves governments with too little incentive to change course."*
- Name drop: Referring to the conference in order to establish a background premise for focusing on something else, but lacking specific commentary about the conference itself. These often had an underlying political critique and/or message, e.g.,
 - *"Boris Johnson mocked for saying Glasgow's Cop26 took place in Edinburgh"*
 - *"With Irn-Bru and climate-funding pledges, Scotland's leader made a role for herself at COP26"*
 - *"A group of Liberal backbenchers facing election challenges from independent candidates have renew calls for a more ambitious 2035 emissions reduction target in the wake of the COP26 summit."*
 - *"Straight off the back of #COP26, tonight's Food Unwrapped looks at some of the positive changes that are being made in the food industry to help reduce carbon emissions. Starting with, the plastic-wrapped cucumber"*

The "Name drop" category was found in 27% (126 posts) of the total sample. There were a few dominating themes within these posts, which are best represented in the examples given above: Commentary of Boris Johnson for mistaking the host city of the summit at a press conference, highlighting Scottish Prime Minister Nicola Sturgeon's leadership of the summit, and coverage of the Australian Liberal party's reaction to the summit's outcomes. The rest of the posts are more random, lack convergence towards any overarching topic, and also do not express any discernible sentiment about the summit. These posts will be discussed in tandem with their counterparts in the mainstream media sample in the Discussion.

Moreover, it became apparent that when making reference to the negotiations pertaining to the emissions deal, most posts framed it either negatively or positively, and did not use as much nuance as in the mainstream media sample. As such, the first two subtopics about emissions (outright failure and bare minimum) are collapsed into a generally "negative" emissions category, and the second two subtopics (some progress and success) as a generally "positive" category. There

was a similar trend for references to the outcomes of the negotiations for financial aid to developing countries, so those subtopics were also combined into one generally negative and one generally positive category.

Topic prevalence and interaction share

The first two columns of Table 6.7 tabulate the relative prevalence of each topic in the samples by platform. The topics with the highest prevalence include pronouncements of the summit as a failure, discussion of the emissions negotiations, discussions of the coal deal, and references to world leaders. This ranking excludes the name dropping and update categories as the content of the posts in these categories provide little substantive commentary on the conference itself. In terms of how the emissions deal was discussed, the prevalence of positive and negative is evenly split on both platforms. Commentary on the deal mentioned corruption in government – especially China and India in contrast with the US and EU – and the finance industry (usually politicians and bankers beholden to fossil fuel companies), issues which did not get a lot of coverage in mainstream media.

Regarding the coal deal, it was most common on Facebook to see general mentions to the weakening of the deal's language from "phase out" to "phase down" without specific blame attribution, while on Instagram there was an even split between more generic descriptions and attributions of blame to India and China. Posts placing collective blame on the EU, US, India, and China were seldom on both platforms. In contrast with the news sample, focus on the failures of world leaders emerges as a discourse in its own right among activists on social media and is overwhelmingly negative. Many of these posts begin with disparaging comments on the inaction of world leaders and end with calls for hope and collective action, i.e., "taking matters into our own hands." This narrative is usually combined as well with references to youth activism, which were twice as common on Instagram compared to Facebook (5% and 3% respectively on Facebook versus 9% and 7% on Instagram).

Finally, references to outcomes for financial aid to developing countries, both positive and negative, were generally low on both platforms and rarely the primary focus of any of the posts. Instead, references to the financial deal were most commonly mentioned at the end of a summary of the outcomes and polarised in tone: either very positive, celebrating the deal (European Commission, UN Climate Change) or very critical, condemning it along with the rest of the summit

(Extinction Rebellion, The Climate Reality Project).

TABLE 6.7: Raw prevalence and share of interactions of each topic for each platform.

	Raw Prevalence		Share of Interactions		Share of Interactions w/o Greta Thunberg and Emma Watson	
	Facebook	Instagram	Facebook	Instagram	Facebook	Instagram
Coal Total	9.5	7	3.2	2.1	6	7.3
- <i>Language of deal weakened</i>	6	3	2	.9	4	3.5
- <i>India and China blamed for weakening</i>	3	3	.7	.9	1	3
- <i>US, EU, India, and China blamed for weakening</i>	.5	.8	.5	.2	.9	.8
Emissions Total	13	14	13	3	14	10
- <i>Negative</i>	6	7	10	1	8	4
- <i>Positive</i>	7	7	3	2	6	6
Finance total	4	6	1	1.4	2.4	5.5
- <i>Criticism</i>	3	3	.9	.5	2	2
- <i>Praise of new target</i>	1	3	.2	.9	.4	3.5
Leaders Total	14	20	19.5	30.5	15	27
- <i>Negative</i>	8	14	17	28	11	16
- <i>Neutral</i>	2	3	0.5	2	1	9
- <i>Positive</i>	4	3	2	.5	3	2
Summit failure	11	11	23	15	15	10
Collective/Hope	5	9	20	14	9	4
Youth Activism	3	7	1	26	3	8
Name drop	18	12	9	3	17	11
Update	13	3	5	3	10	10

Note: First two columns show the percentage of posts in which each topic was detected on Facebook and Instagram. Second two columns show the relative share of interactions received by posts including each topic on Facebook and Instagram. Last two columns show the relative share of interactions received by posts including each topic after removing outlier posts from Emma Watson and Greta Thunberg from the samples. None of the columns will sum to 100% because in 187 of the posts, more than one topic is present.

The second two columns of Table 6.7 tabulate the relative share of total interactions received by posts including each topic. On Facebook, posts about the summit's failures (23%), emphasis on collective hope and action (20%), criticism of leadership (17%), and criticism of the emissions deal in particular (10%) received the most interactions. On Instagram, the top most-interacted with topics include the criticism of leadership topic dominates (28%), mentions of youth activism (26%), mentions of failure (15%), and collective hope and action (14%). The differences in interactions with mentions of youth activism and emissions between the platforms (25 and 9 percentage points, respectively) are particularly noticeable. On Facebook, interactions with emissions posts appear to be tied to negative framings, while on Instagram interactions are more evenly split between positive and negative framings.

Given the dominance of the failure topic on Facebook and the leadership and youth activism topics on Instagram, I examined the distribution of interactions for these topics. They are all highly skewed towards a few outlying posts (all an order of magnitude larger than the next most interacted with posts) belonging to Greta Thunberg on Facebook and Emma Watson on Instagram. To adjust for these sources of skew in the data, the last two columns in Table 6.7 show the share of interactions for each topic per platform with the posts of these two users removed.

After this correction, the failure topic still has the largest share of interactions on Facebook and criticism of leadership still has the largest share on Instagram, but both have decreased substantially. The share of interactions with posts featuring collective hope and action also decrease noticeably on both platforms, and youth activism sharply on Instagram. The share of interactions with posts mentioning the coal and emissions deals increases on both platforms, along with the share for posts with neutral framings of world leaders, especially on Instagram. Moreover, the share of interactions are more evenly split between framings of the emissions deal, contrasting with the dominance of posts with negative framing in the full dataset, especially on Facebook.

Finally, when Thunberg and Watson are removed, the share of interactions with the less substantive name drop and update topics doubles on both platforms. This comparison demonstrates differences in attention and engagement between the Facebook and Instagram users interacting with content from youth and celebrity activists such as Thunberg and Watson versus those interacting more with other stakeholders on social media, especially news outlets who dominate posts in the coal, neutral leadership, positive emission, name drop, and update categories.

Sentiment analysis

Table 6.8 shows the results of the sentiment analysis of the social media sample. Nearly 25% of all posts fall into the "very negative, outright failure category", with just under 15% of posts in the middle, more balanced categories. Instagram is proportionally more negative than Facebook, while the latter contains more posts with neutral and/or no conference-related sentiment. These discrepancies are likely driven by differences in the prevalence of account types and topics across the two platforms, which will be further elaborated upon in the next section.

TABLE 6.8: Sentiment analysis of social media sample, by platform.

	Failure	Some progress, many failings	Balanced: Some good, some negative	Better than expected	Positive	Neutral/NA	Total
Facebook	42	19	20	15	12	142	250
Instagram	82	16	19	19	11	103	250
% of posts	24.8	7	7.8	6.8	4.6	49	
Total	124	35	39	34	23	245	500

Note: Counts of posts on each platform coded into each sentiment category, with total and overall percentage per category.

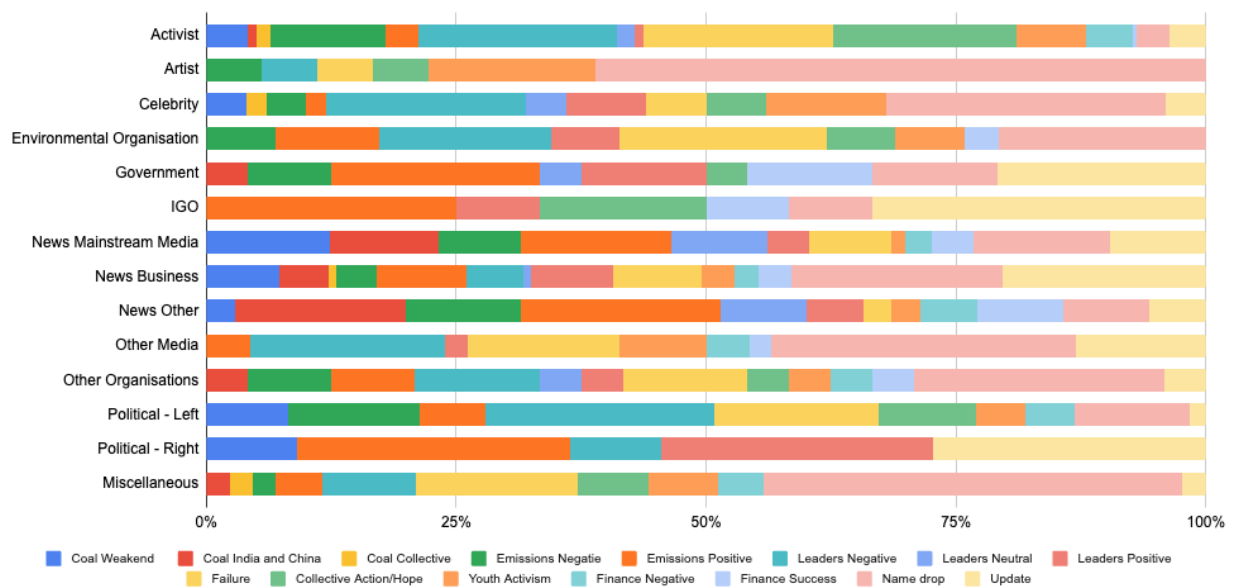


FIGURE 6.1: Topics discussed by account type in full dataset.

Comparative analysis

Now turning to the comparative analyses of the social media dataset. For each comparison, analyses are conducted at the aggregate level and then separately for each platform.

First is the comparison of topics across account types. Fig 6.1 visualises these distributions at the aggregate level (visualisations for each platform are included in Appendix D, Figures D.1 and D.2). The differences are found to be statistically significant overall (χ^2 (df = 182, n = 762) = 502.49, $p = .000$, Cramer's $V = .225$, $p = .000$) as well as on each platform (Facebook: χ^2 (df = 182, n = 340) = 260.14, $p = .0016$, Cramer's $V = .243$, $p = .000$), Instagram: χ^2 (df = 182, n = 422) = 412.01, $p = .000$, Cramer's $V = .274$, $p = .000$). Because there were several type - topic pairs with 0 observations, all tests are replicated with the Yates' correction to counteract the risk of overestimating the statistical significance of the comparisons. The results stay the same with and without the correction.

From Fig 6.1, the difference in the topic focus of posts from news companies (all categories) and activists/environmental NGOs and nonprofits becomes very apparent. Where the accounts of news companies posted frequently about the weakening of the coal deal, particularly India and China's role, the latter emphasised the failings of the summit, the weakness of the emissions deal, criticism of world leaders, appeals for collective hope and action, and praise of youth activism. When activists did mention the coal deal, they were more likely to mention their dismay at the weakening of the language but without proposing any particular culprit. Posts from left-leaning

politicians and political groups did the same and generally resemble the topical spread of activists.

Unsurprisingly, posts from accounts representing government bureaus and IGOs such as the UN, contain the highest proportion of positive commentary on the emissions deal. Right-leaning politicians and political groups also had high levels for that topic along with the highest proportion of praise of world leaders at the summit. The relatively high rates of the name drop topic across posts from artists, celebrities, business news outlets, other media channels, non-environmentally focused NGOs and nonprofits and the catch-all category for miscellaneous individuals and businesses reflects the tendency of accounts in these categories to mention the summit as a way of advertising tangentially related opinions, products, events, and/or controversies. This trend will be further addressed in the Discussion section.

Next, the sentiment distributions across each account type and topic are examined using ANOVA and Tukey HSD tests. Only posts with a clear sentiment, corresponding to values 1-5 in the sentiment codebook, are included. For each platform analysis, the number of posts per type are evaluated to make sure the distributions satisfy the requirement for ANOVA tests that all categories have at least $k + 1$ observations, where k is equal to the number of categories. In the case that there are type categories with less than this threshold number of categories, they are removed from the comparison.

Table 6.9 tabulates the results for sentiment across account types. Boxplots for each comparison are included in Appendix D (Figures D.3-D.5). The distributions of sentiment across account types are found to be significantly different at all levels of comparison. This effect appears largely driven by the difference between activists and news outlets, with the former consistently lower than the latter.

For the comparison across topics, the emission, leader, and finance categories are collapsed into single topics, e.g., one for emission, one for leaders, and one for finance, as was done for the mainstream media analysis. For this comparison, the total number of cases is larger than the number of posts because each post could contain more than one topic. Table 6.10 shows the results. Boxplots for this comparison along with the ANOVA results are included in Appendix D (Figures D.6-D.11). In general, the failure, youth activism, collective hope and action topics appear to be significantly correlated with lower sentiment on both platforms.

Finally, the distribution of interactions across each account type, topic, and sentiment category are examined. These analyses are conducted on the full dataset, i.e., including the posts with

TABLE 6.9: Results of ANOVA and Tukey HSD tests for sentiment distributions by account type.

	DF	N	ANOVA	Tukey HSD	Excluded categories
Overall	8	226	5.63, .000	Activist <mainstream news (1.40, .001), business news (1.32, .01), and other news (1.20, .001)	Artist, political right-leaning, other organisations, IGO, government
Facebook	5	88	3.81, .004	Activist <mainstream news (1.39, .032), other news (1.48, .01)	Artist, political right-leaning, other organisations, IGO, government, business news, celebrity, environmental organisation
Instagram	6	123	4.21, .001	Activist <mainstream news (1.52, .004) and business news news (1.27, .02)	Artist, political right-leaning, other organisations, IGO, government, other media, miscellaneous

ANOVA results given: F-statistic and p-value. Tukey results given: pairwise comparisons significant at the 95% confidence level with difference and p-value in parentheses. Inequality signs between items indicate the direction of the difference, e.g., Activist <mainstream news in the overall comparison indicates that across both platforms, posts from activists contained significantly lower sentiment about the conference than posts from mainstream news accounts. The last column indicates which account types were excluded from the tests as a result of having too few observations.

TABLE 6.10: Results of ANOVA and Tukey HSD tests for sentiment distributions by topic.

	DF	N	ANOVA	Tukey HSD	Excluded categories
Overall	8	526	12.06, .000	Leader >collective hope and action (.77, .006), fail (.8, .001), emission (.56, .01), youth activism (.83, .047); Collective hope and action <emission (1.33, .001), finance (1.23, .001), update (1.34, .02); Fail <emission (1.36, .001), update (1.37, .008), finance (1.26, .001), coal (India and China) (.98, .027); Youth activism <emission (1.39, .001), finance (1.29, .0011), update (1.40, .029)	Name drop, coal (all)
Facebook	6	190	7.32, .000	Fail <leader (.96, .01), emission (1.64, .001); collective hope and action <emission (1.67, .001)	Name drop, coal (all), update, youth
Instagram	7	317	6.95, .000	Fail <leader (.73, .024), emission (1.12, .001), finance (1.36, .001), coal (India and China) (1.17, .044); Collective hope and action <emission (1.04, .001), finance (1.28, .001); Youth <emission (1.11, .011), finance (1.33, .0055)	Name drop, coal (all), update

ANOVA results given: F-statistic and p-value. Tukey results given: pairwise comparisons significant at the 95% confidence level with difference and p-value in parentheses. Inequality signs between items indicate the direction of the difference, e.g., Leader > Collective hope and action in the overall comparison indicates that on average across both platforms, posts pertaining to world leaders contained significantly higher sentiment than posts pertaining to collective hope and action. The last column indicates which account types were excluded from the tests as a result of having too few observations.

no discernible sentiment. Due to the heavy skew in the distribution of interactions, the log is taken before inclusion in the ANOVAs. Boxplots of each comparison are included in Appendix D (Figures D.12-D.23).

First is the comparison of interaction distributions across account types. Table 6.11 tabulates these results. The differences across account types are significant at the aggregate and platform levels. On Facebook, this effect appears to be driven by posts from activists, Greta Thunberg above all. On Instagram, this effect is driven by the dominance of celebrities, primarily Emma Watson, over several account types including activists. Moreover, on Instagram, the interaction rate with mainstream news outlets is also found to be higher than that of activists. Looking into the posts

from mainstream news accounts with high interaction values, this difference appears driven by four posts from *BBC News*. These posts all fall into the "update" topic category, offering comments on the severity of the threat of climate change and announcing the end of the summit, but without any information on what was done at the summit or the importance of that information to readers in terms of how to understand, internalise, and or act upon the decisions and developments. The dominance of these kinds of posts in terms of total audience engagement, as reflected in the difference between the interaction distributions of activists (and left-leaning politicians and groups who, like activists, tended to make more explicit criticism of the summit and call for more action) and mainstream news outlets bears implications for audience preferences that will be further elaborated upon in the Discussion section.

TABLE 6.11: Results of ANOVA and Tukey HSD tests for log interaction distributions by account type.

	DF	N	ANOVA	Tukey HSD	Excluded categories
Overall	11	431	4.77, .000	Celebrities >all other types (all difference at least .99, highest p-value .026)	Political right-leaning, IGO
Facebook	7	201	2.98, .005	Activists >other news (.77, .01), other media (.79, .03)	Political right-leaning, IGO, environmental organisation, artists, business news, government
Instagram	9	198	5.07, .000	Celebrity >activist (1.54, .001), artist (1.66, .01), political left-leaning (1.86, .002); mainstream news >activist (1.36, .007), political left-leaning (1.68, .02)	Political right-leaning, IGO, other organisation, government

ANOVA results given: F-statistic and p-value. Tukey results given: pairwise comparisons significant at the 95% confidence level with difference and p-value in parentheses. Inequality signs between items indicate the direction of the difference, e.g., Celebrities >all other types in the overall comparison indicates that across both platforms, posts from celebrities received significantly more interactions than posts from all other account types. The last column indicates which account types were excluded from the tests as a result of having too few observations.

Next, Table 6.12 shows the comparison results for the distribution of log interactions across topics. The only significant difference between the distributions is found in the sample of Facebook posts, with posts including appeals to collective hope and action receiving significantly more interactions than most other topics. However, this result is driven purely by Greta Thunberg's posts in which she emphasises these appeals. When the test is re-run without her posts, no statistically significant difference is found across the interaction distributions for each topic, further emphasising the role she played in driving engagement with this narrative in the discourse over other stakeholders.

Finally, the rate of log interactions across sentiment categories was examined. The ANOVA and Tukey tests revealed no significant differences at the overall and platform levels. These indicate that while the difference is not statistically significant, posts in the lowest sentiment and

TABLE 6.12: Results of ANOVA and Tukey HSD tests for log interaction distributions by topic.

	DF	N	ANOVA	Tukey HSD	Excluded categories
Overall	9	756	1.65, .098	-	Coal (all)
Facebook	9	338	2.41, .011	Collective hope and action >name drop (.99, .007), update (.99, .01), finance (1.19, .026), coal (India and China) (1.34, .01)	Coal (all)
Instagram	9	418	2.08, .03	-	Coal (all)

ANOVA results given: F-statistic and p-value. Tukey results given: pairwise comparisons significant at the 95% confidence level with difference and p-value in parentheses. Inequality signs between items indicate the direction of the difference, e.g., Collective hope and action >name drop in the Facebook comparison indicates that Facebook posts related to appeals for collective hope and action received significantly more interactions than Facebook posts in the name drop topic category. The last column indicates which topics were excluded from the tests as a result of having too few observations.

non-discernible levels have the largest spread and the number of outlying posts for log interaction rate. Meanwhile, the distribution of interaction rate for the most positive sentiment level is by far the narrowest and has the lowest mean value. These observations are interesting because they suggest the strongest contrast in interaction popularity not between posts with the most negative and positive sentiment, but rather between posts with the most negative and no sentiment. Moreover, they also suggest a much higher volatility in interaction rate with posts on these levels in comparison with the most positive posts. This could reflect a wider diversity of responses to content within the former categories relative to the latter, which could correspond to different demographic segments. Future work could consider investigating this trend, first to see if it persists in other contexts and then to determine if there are any systematic patterns in the users engaging with each type of post.

6.6 Discussion

Comparison between mainstream and social media

The results of the mainstream media analysis show that overall, coverage in the sample focused on highlighting progress made at the conference, albeit the bare minimum, as well as the shortcomings of the deal on coal, which was commonly blamed in articles in Australia, the UK, and the US on last minute "interference" from India and China. The latter was strongly present across outlets but was particularly prominent in right-wing sources, in comparison with centrist and left-wing sources. Moreover, the prevailing sentiment of the coverage regarding the conference's outcomes was mostly neutral, neither flatly negative nor overtly positive. However, there was a notable contrast between the relatively strong negative sentiment within the Australian and UK

samples, both dominated by left-leaning *Guardian* articles, in comparison with the Indian sample. This difference is most likely driven by an attempt in the Indian media to offset the negative international press targeting India and China with accusations of weakening the coal deal. It is also important to note that the sentiment of the articles from the other outlets in the Australian and UK samples were positive and/or balanced enough to offset the negativity of the *Guardian* articles in the pairwise comparisons between them and the US sample, as evidenced by the non-significance of these comparisons in the Tukey HSD results.

In contrast, the most prominent discourses on Facebook and Instagram pertained to the failure of the conference, the particular failure of world leaders, and the ups and downs of the emissions deal. Although still present, the social media sample exhibited less emphasis on the coal deal relative to articles in the mainstream media sample. Furthermore, when the coal deal was mentioned on Facebook and Instagram, it was most often done without blaming India and China for the deal's failings. Perhaps unsurprisingly given the results of the mainstream media analysis, most of the posts mentioning the India-China angle come from accounts associated with mainstream and business news media accounts.

Instead, the most interacted with posts on both social media platforms point the finger at world leaders and are harshly critical of the conference's outcomes. The most popular of these posts were made by activist Greta Thunberg and celebrity Emma Watson. This suggests that these users carried strong influence over their respective audiences, thereby contributing notably to driving the salience of these narratives. Moreover, the content of Watson and Thunberg's posts differs qualitatively from those of global leaders, IGOs, government bodies, as well as some of the mainstream media, particularly with respect to how they praised the conference's successes often without acknowledging its shortcomings. In doing so, these stakeholders could be seen as playing into the activists' arguments about the ineptitude of the world's leaders to take adequate action.

With respect to the difference regarding focus on coal and the India/China narrative between mainstream media and social media discourse, one potential explanation is that the media outlets reflected dominant interpretations and quotes from representatives of the EU, UK, and US who may have hoped to divert attention from their failings regarding fossil fuel emissions in general by focusing on the coal deal. In fact, several paint India and China as the conference's "villains" while maintaining the EU, UK, and US as the thwarted heroes. A few accounts on social media noticed

this and thereafter attempted to shame the Western governments for scapegoating developing nations. However, these posts were far outnumbered by those emphasising the general failure of all world's leaders at the conference.

Regarding sentiment, most articles in the mainstream media sample tended to fall into the "some progress, but not enough" and the more balanced "some good, some bad" categories (68% in total), with relatively few articles on either extreme (success and failure). This distribution also characterised the sentiment made by mainstream media outlets in the social media sample. However, the sentiment distribution of posts from activist users is concentrated densely around the failure level and significantly differs from all news categories. Moreover, the analysis of differences across interactions by account type revealed that on Instagram, mainstream news outlets in the samples tended to receive more interactions than activists overall. These differences are particularly notable given posts from activists and activist groups comprised 30% of the Instagram sample, while posts from mainstream news outlets made up just 6.8%. This discrepancy between volume and interaction rate suggests a surprising dominance of mainstream media accounts in terms of audience capture over activists, as indicated by interactions. However, this may be partially explained by the fact that Greta Thunberg was not active on Instagram the way she was on Facebook. So perhaps had she posted on Instagram, this difference may not have been present.

In terms of Bourdieu's field theory, these results imply that in adapting to the changes in the climate politics field generated by social media platforms, mainstream media outlets have adapted reasonably well. They have found a way of using these platforms in parallel with their primary reporting practices to successfully compete with other stakeholders for audience attention and engagement. In doing so, they are able to maintain connections to and influence over populations that continue to consume their content in its "traditional" form, i.e., through the respective outlet's website, as well as those who are increasingly using social media platforms like Facebook and Instagram for their news consumption, at least for content related to environmental issues and policy.

Meanwhile, activists compete with these news outlets for attention and prominence on social media platforms and, as the results of this analysis indicate, do so using different topical foci and sentiment. Where news outlets tended to present the conference outcomes more balanced and mildly, activists were consistently more negative and critical, but also less interacted with. While

no significant differences for interaction rate across sentiment levels were found in the social media samples, it would be pertinent to further probe with offline and ideally longitudinal communication experiments what the net impact on audience engagement (online and offline, particularly in terms of perception of environmental issues as threats, acceptance of policy measures to take action, and likelihood of individuals to join collective action and support) these different strategies have within different demographic groups. This topic is explored in further detail in the last portion of this section.

Comparison of neutral and non-neutral articles and posts

While most of the mainstream media articles (83%) express a discernible sentiment on the conference's outcomes, just over half (51%) of the annotated social media posts do. This absence of direct sentiment is important to consider because of what it reflects about the agendas of different stakeholders engaging with the COP26 discourse within the two arenas. This is examined below.

In the mainstream media sample, several articles used the COP26 context to set up commentary on domestic environmental policy debates and issues. For example, an article from *ABC News* in Australia begins with the headline "*Liberal backbenchers call for more ambitious 2035 emission reduction target*" and goes on to state that "*in the wake of COP26*" liberal politicians are demanding more action. The article makes no commentary on the conference itself, but instead cites it in order to contextualise the information which follows. Similarly, several outlets published articles about Australian Prime Minister Scott Morrison's refusal to commit to coal reduction in response to then British Prime Minister Boris Johnson's commentary on COP26 as "*a death knell for coal*". The focus of these articles was not the conference but rather the geopolitical struggle reflected in the clash of the leaders of two advanced and carbon intensive economies. In a final example, *The Washington Post* used the conference to declare a "reclamation" by the US of leadership on international climate policy. Again, the focus of the article was less on what was actually achieved, and more on the glorification of US leadership at the conference, and within global environmental policy-making more generally, specifically under the Biden administration, potentially as a not-so-subtle criticism of the previous administration's regressive climate stance.

On social media, these posts often stated the COP had taken place and that leaders had the goal of making plans to fight climate change without any statement on what was done. For example,

see the post below from the BBC which leads with dramatic statements about the consequences of climate change, promising further detail in a corresponding article:

"If the temperatures across the planet rise by too much, it will have devastating impacts across the world.

World leaders, scientists and activists attended the climate summit, COP26, in the hope that they would bring climate change under control. To read more about how climate change will affect people across the world, tap the link in our bio. #ClimateChange #Environment #BBC-News"

As well as the following from the US State Department, which while communicating the importance of urgent action, remains very vague, offered no specifics as to what should be done, nor who should be doing it:

"This is not a challenge for future generations. The climate crisis is already here. We must confront it today. #COP26"

Others, such as the following from CNN, appear to be trying to be seen as not taking any particular stance and suggesting that the public should make up their own minds about the conference and its outcomes:

"Some are calling it a success, others a failure, and many say it's something in between. Here's what's in it so you can decide for yourself, writes CNN's Angela Dewan and Amy Cassidy."

Moreover, a very popular post from Emma Watson quotes a youth activist on the importance of collective action and demanding action from government leaders, but again makes no commentary on the conference or any other actionable information:

"I believe in our human capacity to care deeply and to act collectively.' - @lizwathuti, an Environmentalist, Climate Activist, Founder @ggi_kenya spoke boldly at @cop26 demanding our leaders to 'Open their hearts and act.'"

Here, Watson is clearly trying to use her platform to boost those of international youth activists, calling attention to their participation at the conference and in activism beyond. However, the post conveys little information about the activist, the initiative she founded, its work, nor how it connects to the negotiations at COP26. The effectiveness of this message relies on audience

members actively seeking further information by viewing the profile of the activist and her organisation, and considering ways to become involved. This may be enough to mobilise users with a high baseline inclination to engage with this kind of content, but it may not be for those who are less concerned or aware of the underlying issues, or who don't see how engagement with this content can help.

Other posts appeared to use the COP26 hashtag to tag content that spoke to environmental issues but made no explicit reference to the conference. This is similar to the mainstream media articles which used COP26 tangentially as a way of orienting/anchoring their primary focus point. For example, this post from eNGO Greenpeace:

"People don't want false solutions. It's time companies and governments stop procrastinating to make a quick profit out of our planet and take action on climate now! Go to the link in our bio to demand #realzero

98% of 2,681 people surveyed in 60 countries don't trust companies that pledge to net zero and keep burning fossil fuels and buy offsets. #COP26 #fossilfreefuture #cleanenergy"

Nowhere in the post does the author mention the conference specifically, but includes its hashtag at the end. This is done presumably with the hope that people following the conference hashtag would see it and the content of the post about distrust in corporate net zero pledges would be absorbed into the general discourse of the conference.

Finally, a post mentioning the conference's hashtag from UK Labour Party leader Keir Starmer is a blatant political criticism of Boris Johnson and offers no substantive contribution to discussion of the conference, nor any of its goals:

"Boris Johnson is the wrong man, in the wrong place, at the wrong time. #COP26"

For lack of a better term, I will use "name-dropping" to describe this trend, illustrated by the articles and posts cited above, of using brief references to COP26 in order to foreground other, often unrelated, issues and debates. This likely results from the recognition that COP events are uniquely salient landmarks that stakeholders can use to raise awareness about issues discussed at the meeting but also anything else related to environmental issues. They know that these events create a narrow window of time in which the public is paying more than average attention to environmental issues, and they may be seeking to capitalise on that context. However, the production

of too many narratives without a unifying structure might also lead to a lack of focus on a manageable amount of information and key takeaways. That is to say, the discourse never settles on or gravitates towards information that the public can act on, which previous research has lamented as a fundamental challenge of environmental communication (Downs, 1972; Gamson and Stuart, 1992; Gamson and Wolfsfeld, 1993; Patterson and Wilkins, 1991; Schäfer and North, 2019).

Moreover, as discussed in Wozniak et al. (2021), one of the main sources of agenda-setting power of COP events flows from their capacity to generate short-term attention and coordinate message production. One thing that stands out about the comparison between the neutral and non-neutral articles and posts in the datasets is a lack of coordinated message production across outlets and stakeholders. The question of how to best coordinate message production, especially across media channels and domains, is complicated but has long been highlighted by environmental communication scholars as a key weakness in driving public awareness and action on climate change (Gamson and Wolfsfeld, 1993; Trumbo, 1996). While there was clearly significant volume and attention paid to the conference in both arenas in the immediate aftermath, these findings suggest that in attempts to be unique and attention grabbing – and as is the case with several of Emma Watson’s posts, to promote youth activists – the messaging from each outlet/stakeholder was not calibrated to present a cohesive, digestible, and *actionable* narrative about what the conference achieved, where it fell short, and what the implications are in the short- and long- term for progress towards international climate goals.

It is not surprising that media outlets haven’t struck this balance, or demonstrated any inclination to do so in the future. As discussed in Gurwitt, Malkki, and Mitra (2017) in their analysis of online mainstream media coverage of COP21, the monetisation and incentive structures of the media industry favour "drama, novelty, and balance" in COP coverage, i.e., sufficient pandering to various elements of their audience base such that no constituency is ever alienated or bored. It is not in their interest to coordinate with other outlets, it would force them to sacrifice some of their competitive edge. However, activists and other stakeholders on social media are not bound by such constraints. Yes, they are still competing within the same limited attention market, but they could find ways of coordinating their communication in such a way as to present a united front of key messages that the public can use to inform their beliefs and behaviours. After their study of the spread of eNGO messaging among activists on Twitter at COP21, Comfort and Hester (2019) suggest that eNGOs, activists, and pro-environmental politicians would benefit from

better coordinating and targeting their campaigns to engage audiences beyond already-converted supporters. The findings of this chapter demonstrate that at least at COP26 on Facebook and Instagram, such strategies were not pursued.

Comparison with coverage of previous COPs

As noted in the description of previous literature, several studies have examined framing in news media coverage of previous COP meetings. The results of the mainstream media analysis presented in this chapter generally converge with these findings. Over the years, the following trends have been relatively stable in mainstream news media coverage surrounding COP summits. First, there has been a steady emphasis on statements from world leaders (particularly of developed nations in the global north), calls for action (albeit mostly vague and nonspecific), commentary on various procedural elements and updates, coverage of (geo)political conflicts and/or disagreements arising from the meetings, and attempts from outlets in countries leading negotiations to label the deal a success. Meanwhile, there has been a reliable absence of explicit criticism of conference shortcomings, attention paid to specific details of the consequences of climate change already being felt in the most vulnerable regions, and coverage of issues plaguing less developed countries hindering their green transition trajectories more generally. However, there has been a consistent thread of blame levied at emerging economies, particularly China and India, for not "comprehending the urgency of emission cuts" (Kunelius and Eide, 2012, p. 278).

In the case of mainstream coverage of COP26, the sample of outlets examined in this chapter suggest a continuing pattern of tepidity in mainstream media with respect to judgements of conference outcomes, parroting the reactions and comments of world leaders, vague descriptions of consequences of climate change, maligning China and India for insufficient commitment to emissions reduction (often implying a contrast with the efforts of the US, UK, and EU), and a lack of focus on urgent threats facing the most vulnerable nations. Thus, to quote a report on mainstream news media coverage of COP21 in the US, this trend of limiting reporting to superficial details results in "the average reader [coming] away from the talks with a piecemeal understanding dominated by a few big names and little in-depth knowledge of many of the main issues the conference attempted to address" (Gurwitt and Timmons, 2015). As the climate crisis becomes increasingly severe, this result reflects a critical shortcoming of mainstream news agendas to provide readers with actionable information on how they can contribute to solutions.

Meanwhile, activists appear to be trying to use social media platforms to bridge that gap. They emphasise the failures of global leadership and the importance of collective action in a way that contrasts sharply with the tone of most mainstream media coverage. The presence of this dissonance raises questions as to how members of the public exposed to both go about trying to make sense of these competing narratives. It could be the case that for some people more aligned with the activist perspective, the continued relative neutrality of mainstream media may be perceived as indifference and therefore contributing to the institutional lethargy behind the lack of progress towards satisfying the landmark agreements negotiated at COP21. On the other hand, for people less inclined towards, convinced by, or even intimidated by the activist movement, the tone of mainstream media may offer reassurance and perhaps even a false sense of security. While prescribing an ideal strategy for climate reporting is beyond the scope of this chapter, it is clear that there are ways that mainstream media can improve their reporting practices in order to better support climate action at the individual and societal levels (see Borchardt, Dunn, and F. Simon (2023)) and further work should be undertaken to draw attention to this potential and to continue motivating such shifts.

Implications of divergences: Legitimisation tradeoff

Overall, the failure narrative constitutes the main divergence between the two arenas: while only 6% of articles in the mainstream media sample describe the conference as a failure, this criticism and attribution of blame to world leaders in particular is present in 20-25% of annotated posts and is associated with up to 40-43% of total interactions. The salience of the failure narrative is also driven predominantly by individual activists or activist groups with 43% of posts mentioning failure coming from such accounts (the next highest proportions are 11% from the other news media category – mostly fringe Indian news media outlets – and 10% from left-leaning politicians and political groups).

This pattern makes sense given what is known about the narratives of recent environmental activism, particularly of the youth movement, which uses social media as its main vehicle for communication and mobilisation. Ever since the youth movement took off in 2018, criticism of world leaders to take adequate action has been a central theme of the movement's activism (Boulianne, Lalancette, and Ilkiw, 2020; Evensen, 2019; Han and Ahn, 2020), and appears to be

growing in salience relative to other communication objectives, such as raising awareness (DeLara, Erviti, and León, 2022) and inspiring hope (Molder et al., 2022). For example, Falkenberg et al. (2022) found that in COP discourse on Twitter, criticism of political hypocrisy and failure has increased significantly over time, with 7% of pro-environmental influencers tweeting about the topic during COP21 compared to 35% during COP26. It is not surprising that activists are becoming increasingly incensed by the empty promises and false hope world leaders have been giving, and therefore, that their online activism has shifted from raising awareness to criticism of leadership inaction. Moreover, framing policy summits and world leaders as failures serves to legitimise the activists' protest-led approach and bolsters their argument for collective action to lead global change, instead of relying on governments to do so. Han and Ahn (2020) provide a thorough description of how youth activists have done this generally within their communication to cultivate moral legitimacy over world leaders in the fight against climate change.

Thus, the growing emphasis on the failure narrative among activists on social media demonstrates the widening margin between the demands of environmental activism and the inadequate response from international governments. While a level of frustration with the progress of international climate policy is justified, I suggest that the focus on failure in activist narratives may damage the perceived legitimacy of COP and other global initiatives as an effective forum for addressing climate change. As such, I propose the existence of a "legitimation tradeoff": While the failure narrative may be used to legitimise and build support for protest action agendas, it may also hinder policymaking by reducing the public's belief in the efficacy and legitimacy of global policy initiatives. Several findings from previous research provide support for this argument.

First, research based on an experiment with 1520 American residents showed participant trust in political leaders affects their support for climate policies (Rinscheid, Pianta, and E. U. Weber, 2021). As such, if this trust is eroded by messages from activists, it is possible that the result will be an undermining of future support and compliance. Moreover, the focus on political failure may crowd out discussion of the policies and the issues underlying them, and therefore could be endorsing suggestions in previous literature that social media platforms are increasingly driving polarisation and edging out constructive discussion, societal consensus, and support for radical climate policy (Mike Schäfer in Schäfer and North (2019), Cardenal, Galais, and Majó-Vázquez (2019)).

Finally, in a study of press releases of US corporations, advocacy organisations, and government agencies about environmental issues, Wetts (2020b) found a dominance of "elite-oriented" and "value-neutral" narratives which portrayed scientific, political, economic elites as protagonists in climate action but fell short of defining specific actions they should take or how these actions could be connected to civil society. The majority of the releases framed climate action in abstract, elitist, and nonsubstantive ways. Drawing on previous literature, the author warns that doing so could result in individuals feeling disenfranchised and unaccountable for environmental action while also fostering distrust of experts framed in the press releases as responsible for leading action campaigns. Interestingly, even though the narratives are very different, a similar logic could be applied to understand how the political failure narrative observed in the COP26 social media discourse could have unintended consequences on mobilisation: Framing the international political system as inept, if not antagonistic, to concrete and immediate climate action may have the combined downsides of inadvertently de-emphasising and/or devaluing political efficacy to drive change, potentially having a demotivating and/or depressing effect on individuals in the audience, while reinforcing anti-elite and populist advocacy for distrust in the (elite) political system, thereby contributing to polarisation and disconsensus.

Although it is beyond the scope of this chapter to measure the effects on the pro-environmental movement of such messaging, much of the literature discussed in the last two chapters has shown how environmental communication and activism framed with different emotions, sentiments, and narratives is found to be differentially engaging within online publics. On the one hand, being confronted with negative emotion framing the conference's outcomes and the repeated shortcomings of world leaders could motivate individuals to become more engaged with climate action. Indeed, the findings of the Twitter analysis in Chapter 4 indicate a negativity bias in retweet engagement with activist content. On the other hand, such framings could also have the opposite effect by engendering a sense of demotivation, futility, and lost faith in social efficacy. However, as discussed in Chapter 5, focus on discrete emotions in communication is limiting and ignores other important features determining belief formation and behaviour. Therefore, more research into on- and offline engagement in response to social media posts, combined with qualitative interview and survey work, could confirm the existence of the legitimisation tradeoff and add insights into the impact of the failure narrative on different audiences with respect to motivating collective action and policy support.

6.7 Conclusion

Previous research has shown the importance of COPs for influencing environmental discourse and policy development. This chapter adds to this scholarship by providing the first theoretically-motivated comparison of mainstream and social media discourses of a major flashpoint event in international climate politics. We also assessed the implications of this divergence for hindering the curation of cohesive narratives around environmental issues, policies, and solutions around which public and political support can rally. These results are relevant to the discourses of future COP summits, as well as any other event at which global climate politics are discussed.

The topical and sentiment divergences underscore elements of what earlier work has implied about the tendency of social media users to manifest their own unique "editorial agendas" in certain themes, including climate change (Sanford et al. (2021) on the 2019 IPCC report; Zheng and Shahin (2020) on the 2016 US presidential debates; Painter, Wetts, and Loy (n.d.) on the 2022 IPCC AR6 Working Group III). This finding also fits neatly with one of the conclusions of Chen et al. (2022) that social media discourses about climate change in general tend to lament the consequences of inaction, where mainstream news media spends more time covering political struggles and controversies surrounding the question of responsibility for action.

Extensive previous research also demonstrates the tendency of social media platforms to polarise audiences and to serve as antagonistic culture war theatres (Baumann et al., 2020; Cinelli et al., 2021; Del Vicario, Vivaldo, et al., 2016). This is true also for the environmental movement (Falkenberg et al., 2022; Garcia, Galaz, and Daume, 2019; Sanford et al., 2021; Tyagi, Uyheng, and Carley, 2020; H. Williams et al., 2015). Such polarisation and divergence stands in the way of building consensus on the need to take radical climate action, which many would argue, needs multiple dimensions and approaches from different sectors of society across different age groups, working in tandem and not in opposition. There is evidence, mentioned above, that COP26 was the first where a high number of social media posts stressed the failure of the conference, and it will be important to monitor if this trend continues, or changes, in future COPs.

The results of the comparative analysis and the above context suggest three research priorities for the future:

The first is to better characterise the relationship between mainstream coverage and social media discourse with respect to agenda-setting and shaping public understanding of climate policy

issues, and what implications this relationship has for public discourse, policy support, and collective action on climate change in particular. For example, researchers need to better understand how trust in these arenas is evolving within different demographics, and how this in turn affects how these different demographics engage with the content they see in each, as well as how they perceive the institutions, initiatives and issues discussed.

Secondly, the potential effectiveness (and challenges) of coordination across media outlets and activist stakeholders has been examined in pre-Internet environmental communication studies, e.g., Gamson and Wolfsfeld (1993) and Trumbo (1996), but not in the digital age. Researchers should update this work to investigate the practicalities, challenges, and affordances of coordination within environmental communication and activism, and its relations with the contemporary hybrid nature of media practice and consumption.

A final and related research area is to find ways of measuring the extent to which the nature of social media activism effectively pressurises systemic change instead of contributing to polarisation and antagonism. Specifically, it should move beyond tracing discourses online and focus on developing ways of measuring, through quantitative and qualitative methods, how social media activism practically impacts formal policy initiatives and action. Han and Ahn (2020) present a list of achievements that can be reasonably tied to the youth climate strikes in 2018-2019 in general, but they did not investigate specific causal relations between the online side of this activism and the offline achievements. They also did not consider the potential of a legitimisation tradeoff, which, as suggested above, may be unfolding in discourses around major climate policy events. Such work will be critical to ensuring that online advocacy for climate action can be as effective as possible in driving real world global change.

Chapter 7

Conclusion

On 20 March 2023, the Secretary General of the UN António Guterres referred to the IPCC Synthesis report published on that day as *"a clarion call to massively fast-track climate efforts by every country and every sector and on every time frame. Our world needs climate action on all fronts: everything, everywhere, all at once"* (UN, 2023). The communication of these efforts, and the risks they seek to mitigate, play a critical role in their success. This thesis set out to explore the ways in which stakeholders engaging with climate action via social media activism are contributing to this goal, the challenges they are facing, and opportunities for future initiatives to improve. To do so, I brought together the literatures of multiple disciplines to identify gaps in our understanding of how environmental activism is playing out on social media, specifically focused on various mechanisms underlying its success. This led to the formulation of three case studies, all of which connect to questions of opinion leadership, the importance of social media activism to the pro-environmental movement, and the threats that vagueness and narrative diffusion across stakeholders and communication platforms pose to derailing it.

In this last chapter, I present one final summary of the findings of the individual studies, drawing them together to emphasise their contributions to the advancement of scholarship regarding the pro-environmental movement on social media.

7.1 Summary of studies

The primary objective of the thesis was to advance the understanding of heretofore unexplored or understudied elements of environmental activism on social media, particularly the nuances of how activists use different topic and sentiment frames in shaping their narratives. The existing literature, spanning several disciplines, suggested the presence of numerous gaps. Four of

these are identified and addressed in turn using marriages of multiple disciplines with different combinations of computational and qualitative social science methods.

First, there has been little focus on discourses surrounding campaigns targeting the reformation of specific lifestyle choices and habits as a form of pro-environmental behaviour. Instead, most studies examine more general discourse settings where awareness building and information sharing about environmental issues, along with protest action mobilisation, have been the main objectives. While these studies have identified streams of push-back, most of this has focused on climate science deniers and has not considered more nuanced forms of antagonism to the movement (Pearce, Niederer, et al., 2019). The lack of focus on campaigns targeting specific behaviours has resulted in little accumulation of knowledge pertaining to how the public responds to these campaigns (both from those seeking to support them and those seeking to undermine), which stakeholders get involved, and considerations of what implications they may have for offline trends. But it is exactly this kind of understanding that activists, researchers, and policymakers need in order to design effective action campaigns and policies to have meaningful impact on reshaping individual (and progressively, societal) values and behaviours to support the green transition.

Chapter 3 addresses this gap by using network and content analyses to study 460k tweets discussing veganism during Veganuary 2019, a campaign conducted on social media specifically targeting plant-based dietary reform as a form of pro-environmental behaviour. The mapping of the users, narratives, and communities in the sample revealed the presence of diverse threads of antagonism to the campaign, specifically its ties to environmentalism. One major theme appeared politically motivated, with users aligned with right-wing ideologies protesting Veganuary and its association with left-wing "snowflake" political agendas. This antagonism is not entirely surprising as most climate-related discourses tend to attract some level of contrarian criticism. However, not all of the push-back is so easily rationalised. Other users criticised the movement as corrupted by corporate interests who want to be seen as aligning themselves with pro-social and environmental causes while still engaging in damaging business practices. Still another stream criticised the movement for perceived elitism and lack of accessibility, lamenting that often the sustainable alternatives (in this case, vegan products) presented to consumers are more expensive than the default options. These are valid concerns that environmental activists need to address in their platforms in order to build trust and have the most impact. Yet, such observations of this more

nuanced tension within activist discourses often do not emerge in the studies of more general discourse contexts which have dominated the literature so far.

Second, the literature also lacks research on whether and how corporations engage with environmental activist campaigns on social media. Given the increasing scrutiny on and demand for corporate social responsibility initiatives, as well as the increasing emphasis on the role of industrial stakeholders in working with policy makers and consumers to facilitate the transition to net zero, it is apposite to collect evidence of how corporations are engaging with environmental activism. This evidence will be vital to critical discussions on the outcomes of commercial engagement as well as in defining reforms, calling for more action, and holding corporate stakeholders accountable.

The findings presented in Chapter 3 indicate that at least in the case of Veganuary 2019, corporations engaging with the campaign failed to drive their audiences to interact with the core of the activist movement. Moreover, the content of tweets posted by commercial accounts most often simply used the campaign to promote their vegan line of products, essentially hijacking the Veganuary hashtag without meaningfully engaging with the activism of the campaign. This superficial engagement validates the criticism described above, namely that veganism as a form of pro-environmental action has been corrupted by corporate interests. Moreover, it represents a significant loss in potential audience mobilisation – corporate accounts have large followings and therefore broadcast to sizeable audiences. If they chose to (or were incentivised to, or coerced to by regulation), they could act as powerful influencers on the activist issues they engage with. To date, there is little evidence of this happening while "greenwashing" and engaging with activist movements in a way specifically calibrated to maximise profits grows ever more rampant. The work in Chapter 3 is the first to attempt to name and discuss the implications of this issue. More research needs to be done to cast further light on this failing of the private sector in other contexts (within and beyond the pro-environmental movement) in order to motivate political action to restrict these practices.

Third, while there is extensive research on psycholinguistic framing in environmental psychology within mainstream news articles about environmental issues and longer form communication media (e.g., government information videos), there is next to no work on framing within social media in this space. Given the well-documented rise in social media activism and the importance

of these platforms to the growth of social movements, it is critical to conduct research to ascertain how users in the environmental activist movement go about using them to generate support and participation. Psycholinguistic framing is but one element contributing to the development of pro-environmental campaigns via social media activity, but it has been shown to have demonstrable impact in other media on shaping the public's beliefs, values, and tendencies to engage in pro-environmental behaviour. Yet, there has been little examination of the framing strategies of specific stakeholders in these discourses. Instead, most studies assess the presence of various features across a discourse sample, e.g., all posts with a given hashtag or term. These studies reveal overall trends in environmental discourse settings but they are not able to provide insight on how prominent users who are actively seeking to mobilise and influence their audiences use framing in their communication efforts. It is necessary to register such detail in order to assess the effectiveness of activist influence campaigns through the lens of psycholinguistics, given the importance of such framing to shaping beliefs and behavioural intentions.

Chapter 4 addresses this gap by computationally measuring the presence of four psycholinguistic features, identified by the environmental psychology literature as important levers for audience mobilisation, within 510k tweets posted by fifty prominent environmental activists over a five-year time period. I found that the activists used more agency and focus on the future in their posts about environmental issues relative to other topics, with also less social affiliation and focus on the past and present. These results suggest that the Twitter outreach of the activists included in the sample embodied what the environmental psychology literature would prescribe for use of agentic language and focus on the future for engaging the public on environmental issues. Meanwhile, it is at odds with prescriptions for use of social affiliation and present temporal focus.

Regarding emotion, where the experimental literature is less clear on what should be expected, the results demonstrated that activists were no more or less likely to use negative emotion, although they did use significantly less positive emotion. This result stands in contrast with criticism levied at activists for engaging in sensational alarmism to gain attention. Moreover, when examining how the presence of these features correlated with retweet engagement, none except negative emotion were significant (positive emotion had a marginally significant effect at the $p < .10$ level). The positive coefficient on negative emotion provides evidence for a negativity bias in social media engagement with environmental activism, which is similar to what has been found

in other discourse contexts on social media but had not yet been confirmed within environmental activism. This result bolsters the branch of environmental psychology research which has found negative emotion to be more engaging within other communication media. The lack of significance for the other features is curious and could suggest that the way in which framing messages about environmental issues with agency, affiliation, and temporal focus by activists on social media may have different engagement outcomes than predicted by previous work focusing on communication contexts beyond social media platforms.

While the results of Chapter 4 provide a helpful benchmark for psycholinguistic trends in activist social media discourse against which future research can compare, it reveals nothing about how social media activism mobilises its audiences offline. There have generally been very few studies seeking to link social media content consumption and engagement with offline behaviour, especially within the environmental activism space. As such, Chapter 5 presents an experimental study in which participants were shown tweets about environmental action initiatives framed with either strong positive or negative emotion. The participants were then asked to report their intentions to engage with a range of collective actions to support their stance on climate change. Recognising the lack of consensus in the framing literature on emotion combined with the observation that no previous studies had controlled for higher-order cognitive processes, I also tested the role of mood in mediating the relation between discrete emotional framing and reported behavioural intentions. The results of the mediation analysis indicated a direct negative relation between negative framing and behavioural intent – counter to the Chapter 4 results – but an indirect *positive* relation through mood. Thus, mood displayed a suppression effect on the relation between (negative) emotional framing and reported behavioural intention in the study.

This finding is important for the environmental psychology and communications literatures because it substantiates recently raised concerns about the validity of studying the impact of discrete emotional framing in environmental communication on behaviour without accounting for how such framing interacts with other factors affecting how individuals perceive, internalise, and act on environmental communication and activism (Chapman, Lickel, and Markowitz, 2017). While the study in Chapter 5 does not identify all such factors and processes, it does demonstrate their importance in the pathway between engagement with activist communication and behavioural intentions in a way that previous work has neglected.

Finally, there have been relatively few attempts to compare representations of landmark events

in environmental activism and politics between social and mainstream news media. Such comparisons are important to make because the two arenas give voice to different stakeholders and agendas, speak to still overlapping but steadily diverging demographic groups, and have their own unique influence on environmental politics. As such, identifying where they coincide, where they differ, and where they may come into conflict informs the field's understanding of how the two media arenas can support (or indeed hinder) the pro-environmental movement.

To advance this objective, the content analysis presented in Chapter 6 compared the topic and sentiment framing of the COP26 meeting between a sample of major mainstream news media outlets in four different countries and a sample of posts about the meeting from prominent accounts on Facebook and Instagram. The results show that the two samples focus on very different topics and do so with very different sentiments. While the majority of articles in the mainstream media sample used a lukewarm tone to discuss the conference's outcomes and gave most attention to describing political tensions between the US, UK, and EU on one side and China and India on the other, opinion leaders in the social media sample harshly criticised the failures of the conference and global leadership on environmental policy more generally. The two arenas manifest conflicting representations of the conference in a way that actively detracts from building a consensus in public awareness and understanding of the summit's conclusions, as well as for what they mean for individuals and their own action potential.

Communication studies predating social media advocated the need for media outlets, activists, and other stakeholders to collaborate on building parsimonious narratives around environmental issues in order to mitigate the inherent challenges sustaining public attention to the topic. This advice is even more important as social media sites continue to revolutionise the way movement stakeholders engage with the public to communicate, influence, and mobilise. The findings of Chapter 6 therefore provide justification for the importance of expanding this research agenda to additional comparisons of news and social media discourses around key events and topics in order to more comprehensively track potentially detrimental divergences between the two arenas. Finally, the findings and discussion also contributes to the study of environmental politics by motivating the need for such scholarship to more carefully consider how social media activism interacts with – supporting or hindering – policymaking efforts.

7.2 Contributions, limitations, and implications for future work

In addition to the individual contributions of each chapter described above, this thesis as a whole makes significant contributions to informing how future research into online environmental activism should be conducted.

First, these agendas must be interdisciplinary. As described in Chapter 2, the pro-environmental movement faces unique and multidimensional challenges to building and sustaining engagement from stakeholders at all levels of society. Social media activism has the potential to both mitigate and exacerbate these challenges. Scholars in many fields, including psychology, political science, economics, linguistics, and sociology, among many others, have all independently endeavoured to understand the factors underlying them. Yet, the findings and insights of these separate disciplines are rarely synthesised.

This thesis has demonstrated the value of taking such interdisciplinary approaches to more rigorously understand how these challenges manifest within and affect pro-environmental efforts. While each chapter addressed a unique context within online environmental activism and used different methods, they all bridged disciplines that are not commonly brought into conversation with one another to ask novel questions and fill gaps in the understanding of environmental activism in the social media age. In doing so, they generate novel insights into how stakeholders in environmental activism should evaluate and develop their communications strategies. As such, the thesis chapters collectively demonstrate the need of research on this topic to take more interdisciplinary and holistic approaches to studying the mechanisms and dynamics at play in the pro-environmental movement.

In particular, this means moving beyond studies of social media trace data to, at the minimum, consistently pairing these studies with offline surveys and experiments to determine what social media interactions imply for the spread and engagement/mobilisation potential of a given event, initiative, or campaign offline. Such designs are obviously more time- and cost-intensive, but they yield results with more power to address gaps in our understanding of how activism and communication can have the greatest impact on mobilising the public. While the findings of Chapter 3 and Chapter 6 are meaningful in that they motivate more research attention to dynamics of environmental activism on social media that had not yet been remarked upon in any field – the involvement of commercial entities in the case of Chapter 3 and the divergence between mainstream and social media coverage of COP26 as well as the potential legitimisation tradeoff in

Chapter 6 – they tell us nothing about how the discourses affected the users who participated in them within their offline lives, especially those who only engaged with the discourses passively and therefore left no trace data to inspect. Yet, as laid out in Chapter 2, this has been the approach of most studies of environmental communication and activism on social media to date (as well as in studies of several other social movements).

Instead, future research should aim to combine social media studies with methods that allow scholars to build better comprehension of the interplay between social media engagement and offline outcomes. The work of Chapters 4 and 5 contributes to this initiative for the case of psycholinguistic framing in the communication of environmental activists but much more is needed. In particular, the findings of Chapter 5 demonstrate the need to move beyond investigations of discrete framing components and take more holistic approaches. This includes conceptualising the pathway between communication, cognition, and behaviour as a multivariate system instead of a bivariate linear relation, specifically including higher-order cognitive mechanisms that integrate the many inputs that information framing can impact. Given the complexity of human cognition, it is unlikely that we will ever be able to fully map all the variables in this system, but it would benefit research outcomes in this area to take a more nuanced, networked approach.

Finally, the current bias in the literature towards descriptive, social media-only studies relying on computational analyses of large datasets is likely the result of the ease, convenience, and low monetary cost of big data-style studies relative to surveys and communication experiments, as well as the general excitement around new computational tools. Scholars interested in environmental activism should resist the temptation to follow this trend as strongly as their resources will allow. All of the analyses in this thesis required extensive manual content analysis to complement the quantitative approaches applied to the full datasets, mostly because these computational tools are not yet fully capable of dealing with the nuance, complexity, and abstraction inherent of most environmental issues. As discussed in the limitation sections of Chapters 4 and 6, approaches such as topic modelling and computational linguistic analysis can provide details about the thematic or semantic structure of a discourse at a high level, but are often unreliable and in the best case still fail to deliver the nuance of manual expert coding.

Beyond the explanatory weaknesses of these methods, several also carry significant computational energy costs that cannot be ignored. Strubell, Ganesh, and McCallum (2019)'s landmark paper on this topic found that training a single transformer-based language model can emit the

equivalent of five cars in their lifetime.¹ Several of the data collection processes and analytical computations involved in this thesis required intensive use of remote servers, with some processes taking days of continuous run time. That server usage bears a sizeable carbon footprint that is all too easy to ignore because it is invisible to the end-user. Given the growing prevalence of (significantly larger) language models today, i.e., ChatGPT and the like, in research and beyond, it becomes ever more important that researchers, especially those working on environmental topics, consider these costs in selecting their methodological frameworks. It will be similarly important for the broader research community to recognise this trade-off when evaluating new computational tools in order to encourage more awareness and accountability.

Carbon footprint notwithstanding, targeted tools such as Luo, Card, and Jurafsky (2020)'s for detecting stances on the existence of global warming, Coan et al. (2021)'s for classifying contrarian claims, and Fernandez, Piccolo, Alani, et al. (2017)'s for detecting how committed a user is to the pro-environmental movement from their social media posts are useful for research questions pertaining to these specific domains in large datasets. But research on framing in social media environmental activism, particularly regarding the interaction between psycholinguistic and topic elements, still lacks reliable computational tools that can be applied to large datasets and provide a level of insight comparable to that of manual content analysis. That is not to say that it is not possible to develop tools which could one day get closer to delivering this standard, but that researchers in the near-term should be wary of relying on applications of purely computational methods to vast social media datasets and on every opportunity, endeavour to verify findings from these studies with data capturing offline behaviours and trends.

Before finally concluding, it is necessary to reflect again on the larger limitations of the findings of the thesis. First, the empirical work considered exclusively English-language and internationally-oriented environmental activism. It therefore cannot and does not attempt to make generalisations about environmental activism on social media platforms in other languages or local concerns.

Moreover, the thesis, with the exception of Veganuary, does not investigate the impact of climate change deniers and other obstructionist movements on the selected case studies. The conflict found in the Veganuary study was largely an accidental discovery – the original intention of that work was not to examine the effects of climate obstructionism but rather the structural relations of activists and commercial entities and the backlash that the *commercial engagement* might have

¹A simpler NLP parsing pipeline with training, tuning, and experiments emits less – just 62% of a single car's life time, but still more than the yearly emissions of two American citizens.

received. One could argue that we cannot fully understand the successes and failures of environmental activism on social media without considering how antagonism affects it. While this is a compelling point, it was not within the scope of the thesis' objectives or capacity. Antagonism to climate change and climate action is incredibly diverse and complex (Ekberg et al., 2023). It comprises one side of a multi-dimensional battlefield in the fight for climate action. I chose to focus on the activists in this fight and to better understand them and their use of social media as a mobilisation tool. The same could and should be done for antagonists in future work.

And finally, as stated at several points over the course of the thesis, I rely on traces and measures of social media engagement for most of the analytic work. This is an imperfect proxy for influence and engagement. It can tell us nothing about what this online engagement means for offline outcomes. However, it is the current standard state-of-the-art for measuring audience attention, engagement, and influence. As initially detailed in Chapter 3, numerous have explored its correspondence with external data in various issue contexts and have found encouraging results about how online engagement can reflect offline realities about public opinion and sentiment.

7.3 Final Comments

Over the course of pursuing the research contained in this thesis, many people have asked questions along the lines of *"Why are you so worried about environmental activism when it seems to be doing so well? Don't you think Greta Thunberg is successful?"* Indeed, on the surface of the social media movement, environmental activism has excelled in recent years with respect to activity and the creation of opportunities for influencing and mobilising the public. But what we do not actually know much about is how this activism is succeeding below the surface, beyond what interaction metadata alone can tell us. The work of this thesis sought to showcase these weaknesses in our understanding of the implications of environmental activism on social media by carrying out three mixed-method case studies. Where previous work has been satisfied with applications of sophisticated computational methods to describe large (social) media datasets, the chapters here acknowledge both the strengths and weaknesses of these tools, and offset some of the latter with qualitative methods to provide more context and nuance. In doing so, the work can inform the approaches and considerations of future research, thereby advancing the standard of interdisciplinary investigations of environmental communication and activism in the media.

Appendix A

Approved CUREC Application



14 October 2020

Dear Mary,

Research Ethics Approval

CUREC Ref No: SSH OII CIA 20 072

Title: Expanding Social Data Science: The case of climate change online

The above application has been considered on behalf of the Social Sciences and Humanities Interdivisional Research Ethics Committee (IDREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to the Oxford Internet Institute's Departmental Research Ethics Committee (DREC), the proposed research has been judged as meeting appropriate ethical standards, and accordingly approval has been granted.

In line with current guidance please do not undertake any data collection involving in-person interactions with participants. Once in-person research is permissible again, you will need to notify the SSH IDREC via email *before* undertaking any recruitment for in-person interaction with participants. More detailed guidance is available via <https://researchsupport.admin.ox.ac.uk/governance/ethics/coronavirus>.

Should there be any subsequent changes to the project that raise ethical issues not covered in the original application please should submit details to the DREC for consideration.

Best wishes,

A handwritten signature in black ink, appearing to read 'John Francis'.

Dr John Francis
Research Support Officer
Oxford Internet Institute
University of Oxford
+44 (0)1865 612341
john.francis@oii.ox.ac.uk

CENTRAL UNIVERSITY RESEARCH ETHICS COMMITTEE (CUREC)



Form CUREC 1A Checklist for the Social Sciences and Humanities

The University of Oxford places a high value on the knowledge, expertise, and integrity of its members and their ability to conduct research to high standards of scholarship and ethics. The research ethics clearance procedures have been established to ensure the University is meeting its obligations as a responsible institution. They start from the presumption that all members of the University take their responsibilities and obligations seriously and will ensure that their research involving human participants is conducted according to the established principles and good practice in their fields and in accordance, where appropriate, with legal requirements. Since the requirements of research ethics review will vary from field to field and from project to project, the University accepts that different guidelines and procedures will be appropriate.

- Please check "[Where and how to apply for ethical review](#)" and the [CUREC flowchart](#) first to see if you need ethics approval.
- Please complete this form using a word processor and email it, together with your [supporting documents](#), to your [Departmental Research Ethics Committee \(DREC\)](#) (if applicable). If you don't have a DREC please email this form to ethics@socsci.ox.ac.uk using your official [ox.ac.uk](#) email address. **Only type-written, emailed applications will be accepted.**

SECTION A: Filter for CUREC 2 application

This section determines whether your study raises more complex issues requiring the completion of a full application for ethical review, known as the CUREC 2 application. **(Please mark 'X' in the**

1. Are research participants classed as people whose ability to give free and informed consent is in question ? (This may include under 18s (although see " competent youths "), prisoners, or adults "at risk".) Your attention is drawn to the University's Safeguarding Code of Practice and its implications for researchers involving children or adults at risk. This includes the need for the work to be risk assessed and for researchers to undertake related training. (Note: If any of your participants are aged 16 or under, answer 'Yes' here	Yes <input type="checkbox"/>	No X
2. By taking part in the research, will participants be at risk of criminal prosecution (e.g. by providing information on drug abuse or child abuse)?	Yes <input type="checkbox"/>	No X
3. Does the research involve the deception of participants?	Yes <input type="checkbox"/>	No X
4. Does your research raise issues relevant to the Counter-Terrorism and Security Act (the Prevent duty) , which seeks to prevent people from being drawn into terrorism? Please see advice on this on our Best Practice	Yes <input type="checkbox"/>	No X

If you answered 'No' to all the questions above, go to **Section B**. If you answered 'Yes' to any question above, continue to question 5 below.

5. Is your project covered by a CUREC Approved Procedure (formerly known as "CUREC Protocols")?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---	------------------------------	-----------------------------

If yes, give the specific Approved Procedure number(s):

If you answered 'Yes' to **ANY** of questions **1-4**, and answered 'No' to question **5**, **stop completing this checklist and do not submit it for ethical review**. Instead, complete the [CUREC 2 application form](#) from the CUREC website, then submit that for ethical review.

If you answered 'Yes' to ANY of questions 1-3, and answered 'Yes' to question 5, go on to **Section B**.

SECTION B: Contact details and project description**Contact details:**

1. Principal investigator OR supervisor (if student research) (give title and full name)	Dr Peaks Krafft
2. Name of student (if student research)	Mary Sanford
3. Degree programme (if student research), e.g. BA, BSc, MSc, MPhil, DPhil	DPhil
4. Department or Institute name	Oxford Internet Institute
5. Address for correspondence (if different from above)	41 St Giles, OX1 3LZ
6. University (not private) e-mail address and telephone number	mary.sanford@oii.ox.ac.uk
7. Name and status of others taking part in the project (e.g. third year undergraduate; postdoctoral research assistant)	N/A

Project description:	
8. Title of research project	Applications of social data science to environmental communication on social media
9. List of location(s) where project will be conducted	Oxford, UK
10. If your research involves overseas fieldwork or travel and your department requires a travel risk assessment, will you have completed and returned a risk assessment form beforehand? (This must be approved by your department before you travel. If you are travelling overseas, you are strongly advised to take out <u>University travel insurance</u> .) Please also address any physical or psychological risks for Oxford researchers and local fieldworkers in Section 16 below and discuss with your safety officer.	Yes <input type="checkbox"/> No <input type="checkbox"/> Not required in this instance <input checked="" type="checkbox"/>
11. Anticipated duration of overall research project	2 years and 1.5 month
12.a) Anticipated start and end dates of the part of the research project involving human participants and/or personal data	From: (15/08/20) To: (31/10/22) Note: You will need ethics approval before you start your research. CUREC 1As may take up to 30 days to process. Retrospective ethics approval cannot be granted.
12. b) In the case of international or collaborative research, will you submit or have you submitted this project for ethical review or consideration elsewhere (e.g. collaborator's/local ethics committee, or other local approval)?	Yes <input type="checkbox"/> No <input type="checkbox"/> If 'Yes', please attach ethics or other approvals and give more details below. If 'No', please explain your reasons below. Please also refer to the Best Practice Guidance on Ethical Review of social-sciences based research conducted outside the UK (BPG 16), which includes an Ethics Issues Checklist for International Research (Appendix A)

N/A

13. **External organisation funding the research (if applicable)**

ESRC

14. a) Title and brief description of [research](#) (about 150 words) in lay language. When describing the research, include your methodology, how you are applying professional guidelines, and the use to which results/data will be put. **Please also declare any [conflicts of interest](#) here.**

Expanding social data science: The case of climate change online

This proposal presents a mixed-methods approach to studying climate change communication by synthesising computational studies of information consumption dynamics on Twitter and Reddit, as well as extraction of the belief systems that underlie them using natural language processing techniques and network analysis, with a smaller but more detailed survey designed to probe further into the trends observed in the first study, thereby extracting critical insights on both macro- and micro-levels related to what does and does not work to engage and empower social media users to engage with climate change awareness and action. The research culminates in the development of a new model for the specific opinion dynamics of climate change communication on social media, synthesising the findings of the first two studies and building on the state of the art of the field.

14.b) Description of participants and how you will [obtain informed consent](#) to take part in the research
(about 200 words in total)

1. Description of participants **and** your criteria for inclusion/exclusion

The data of the Twitter and Reddit studies includes posts from the platforms that have been published publicly (i.e. accessible to the public via the standard Twitter and Reddit data collection APIs) and not to date removed by the user.

For the survey component, I will collect a sample of 300-500 participants from three distinct global regions: Europe, South America, and Asia. I target regular users of

2. Your method(s) of recruitment

I consider two approaches for the survey component. Ideally, I will use a platform such as [Prolific](#) to recruit participants and distribute the survey. The platform invites individuals matching the specified inclusion criteria. These criteria include residence in the target regions and regular use of social media.

As the costs for using the platform are quite high, I also consider distributing the survey with a platform such as [Formr](#) or [Qualtrics](#), through social media and contacts in the countries from which I hope to sample. The same inclusion criteria apply.

3. Your processes for obtaining consent from participants

Social media: I will not publish tweets or posts from any account which is not a verified organisation or public figure. Therefore, no opt-out consent will be required, according to the BPG IBR.

Prolific: As stated in the BPG IBR, consent is considered to be *implied* by participants first upon registration with the platform and then again with acceptance to participate.

Formr/Qualtrics: I obtain informed consent from each participant using the form I have adapted from the template provided in the IBR.

Please **attach separate supporting documents (in Word)** if appropriate for your research (English language versions only). Tick those you are submitting below. If appropriate supporting documents are not submitted, you will be asked to provide these separately, which may delay the ethical review process.

Recruitment and advertisement material (e.g. a poster, social media recruitment text, or brief invitation letter/ email)

Information for participants to read (or hear) before they agree to take part (e.g. written information or, if applicable, an outline oral information script).

A document to record informed consent. Templates for written consent forms and/or oral information scripts (in case of an oral consent process) are available from the CUREC website

Questions to be asked of participants (e.g. interview questions, or a preliminary scope of questions, or a sample questionnaire)

(If relevant) debriefing document after participants have taken part

If you feel the above approaches are not appropriate for your study, provide details on how you will obtain consent from participants

Please complete section 15 if you cannot obtain informed consent

Please add any further details here.

15. If you cannot obtain informed consent from participants according to CUREC guidelines and good practice in your discipline, please give a brief explanation and justification of this decision below.

N/A

16. What are the ethical issues connected with your research and what steps have you taken to address them? **Please do not answer 'none'**. We need to see evidence that you have identified potential ethical issues with respect to your research and have taken steps to address them. If applicable, please address:

- Participant burdens and/or risks

For the social media analyses, the primary participant risk pertains to the potential exposition of their posts and profile details. I collect data on users with public profiles, that are thus accessible to anyone with access to Twitter or Reddit. Indeed, the text of user posts could be used to identify the users who published them. However, I will only use the text data for analysis, and I will not make public anything that could be linked to any specific individual, including post text which could be linked to a specific individual. I will also never publish any specific usernames.

For the survey, the primary participant risk is again the potential for deanonymisation and breach of data protection. We plan to collect sensitive data along the lines of city residence, occupation, and political beliefs. Given the sensitivity of the data, we will be extremely careful to ensure anonymization at all stages of the research. We will archive the survey results in a manner that does not allow a link to be made between specific participant identifiers and participant answers. As I discuss further below, the data will be stored securely on my password protected and encrypted Oll server, and destroyed after 3 years. Moreover, we will never publish specific answers or other user information which could lead to potential triangulation of a user's identity.

- Your own physical and psychological safety as a researcher or of fieldworkers you may employ (see the [University's](#) and [Social Science Division's Safety in Fieldwork guidance](#))

As this research is carried out exclusively in a virtual setting, no fieldwork in the traditional sense is required. Therefore, this research requires no action that might risk my physical safety. Moreover, the nature of the topic of the

- Data protection/ confidentiality (also see Section 18).

Of course, none of my anonymisation efforts mean anything unless the data is stored securely. Thus, the data will be collected and stored on a password-protected and encrypted Oll server. The server is further protected by only being available via the Oxford University virtual private network, which is also password-protected. As a backup, I will transfer the data to a password-protected and encrypted external hard drive, to which only I will have access. I will store it at my private residence in a safe.

For more guidance on ethical issues, please see <http://researchsupport.admin.ox.ac.uk/governance/ethics/resources>

Discuss other ethical issues here

17. Will your research involve discussing sensitive issues?

This could be information relating to race or ethnic origin, political opinions, religious beliefs, physical/mental health, trade union membership, sexual life or criminal activities.

Yes

X

No

If you answered 'Yes', make sure you include some supporting information (as directed in Section 14 b.) above, showing the range of questions covering these issues.

18. Management and handling of personal and other research data

For the purpose of completing this section, all information provided by participants is considered **research data**. Any research data from which participants can be identified is known as *personal data*; any personal data which is sensitive is considered *special category data*.

Management of [personal data](#) and [special category data](#) of human participants, either directly or via a third party, must comply with the requirements of the General Data Protection Regulation (GDPR) and the Data Protection Act 2018, as set out in the [University's Guidance on Data Protection and Research](#). In answering the questions below, please also consider the points raised in the [Data Protection Checklist](#). For advice on research data management and security, please consult with the University's Research Data Team (researchdata@ox.ac.uk) and/or your local IT department, and the University's [web pages on research data management](#).

a.) Please mark 'X' against the data you will collect for your research

Consent records (written consent forms, audio-recorded consent, assent forms (for research involving minors) including participant name)	<input type="checkbox"/>
Online consent (may be anonymous)	X
Opt-out forms	<input type="checkbox"/>
Contact details for research purposes only (destroyed when no longer needed for this research)	<input type="checkbox"/>
Contact details kept for future studies	<input type="checkbox"/>
Audio recordings (preferably using PIN-protected audio recorder and stored on device's hard drive)	<input type="checkbox"/>
Video recordings	<input type="checkbox"/>
Transcript of audio/video recordings	<input type="checkbox"/>

Photographs	<input type="checkbox"/>
Task results (e.g. paper/online tasks, diary completion)	<input type="checkbox"/>
Questionnaire answers	X
Field notes	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>
b.) For each of the types of data selected above, state how this will be physically transferred from where it is collected to a local secure storage site (and backed up as necessary). This includes paper records and data captured electronically.	
All of the data will be collected via online platforms. The social media data will be collected directly onto the password-protected and encrypted OII server, to which only I have access. The survey responses will be collected on the platform to my password-protected account and then transferred to the same secure server as the social media data upon completion of collection. I will backup both sets of data on a password-protected and encrypted external hard drive, which I will keep locked up at my private residence. Upon completion of these transfers, the survey response data will be deleted from the platform so as to minimise the risk of it being hacked and exposed by an external agent. The consent forms will also be transferred and stored under these conditions.	
c.) How and where will each type of data be stored during the research (until the end of all participant involvement)? Describe the arrangements for ensuring confidentiality, i.e. location of storage (e.g. Nexus 365 OneDrive for Business , SharePoint), security arrangements and de-identification of such data. Do not store unencrypted data in freely available cloud services or unprotected USB drives.	
The social media data will be stored on the OII server and on my external hard drive during the research. The survey data and consent forms will also be stored on these locations, and only on these locations.	
d.) Will you use a unique participant number on research data instead of a participant name? If yes , state whether or not you will retain a list of participant names against numbers (i.e. pseudonymisation via a linkage list). Where will the list be stored, and when will it be destroyed?	
Yes, I will use a participant number instead of participant names. For the social media data, the usernames and IDs will be stripped from the dataset and deleted once collection is complete. For the survey data, once the data has been transferred to the secure server, I will remove the participant identification numbers from the dataset and destroy them. They will thus not be saved with the response data. I will only transfer the response data onto the external hard drive thereafter, thereby ensuring that the participant numbers can in no way become linked to the individual responses.	
e.) Who will have access to the research data?	
Only I will have access to the research data.	
f.) If research data is to be shared with another organisation, how will it be transferred / disclosed securely?	
The data will not be shared with another organisation.	
g.) When and how will identifiable data (including audio/video recordings & photos) be destroyed or deleted?	
Note: Records of consent should be retained for a minimum of three years after publication or public release . Some funders may require longer periods (see http://www.dcc.ac.uk/resources/policy-and-legal/overview-funders-data-policies). If you wish to retain contact details in order to re-approach participants about future studies, you must detail this in information provided to them and obtain specific consent for this.	
I will maintain the consent forms on the secure OII server and my secure external hard drive for three years after publication or 5 years, and then destroy them. The unique participant identifiers will also be deleted according to this timeline.	

h.) Please confirm that you will store other research data safely for at least 3 years after final publication or public release and adhere to any additional research funder policies . For more information about the University policies, please see the University's web pages on research data management .		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
If 'Yes', please give details of who will store the data and on storage format, location and security. Note that open science is encouraged.			
If 'No', please provide further details below.			
The response data from the survey and the social media data will be abstracted during the analysis, so the abstract representations of the data (e.g. categorisation of responses based on content) and findings of the research will be uploaded to the Open Science Framework, and securely stored there, where it will be accessible to other registered academics. This shared data will not include any of the precise texts from the social media, nor the survey responses. To reiterate, no potentially identifiable data will be released.			
i.) Does your research involve the use of secondary (i.e. previously collected) data? Common sources of secondary data include censuses, information collected by government departments, organisational records and data that was originally collected for other research purposes (If "No", please go to section 19.)		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
j.) Do you have data access agreements for the use of this secondary data? (If so, please attach these.)		Yes <input type="checkbox"/>	No <input type="checkbox"/>
k.) Is your use of this secondary data compatible with what data subjects/ participants agreed that their data should be used for?		Yes <input type="checkbox"/>	No <input type="checkbox"/>
l.) Could this data be linked back to an individual or individuals? If yes, address how securely any personally identifiable data will be transferred to you, and where and for how long it will be stored during or after the research. Who will have access to it?		Yes <input type="checkbox"/>	No <input type="checkbox"/>
19. Publication and dissemination of research data			
How will you disseminate and feedback project outcomes at the end of the research?	I intend to publish the findings of these studies as individual papers via open science platforms (e.g. Arxiv) or in other computational social science journals and conferences.		

SECTION C: Methods and procedures to be used

Method used: Please ensure you have addressed any potential ethical issues related to these methods in Section 14 and in your Participant Information Sheet

Please mark 'X'

- | | |
|--|--------------------------|
| 1. Analysis of existing records | <input type="checkbox"/> |
| 2. Snowball sampling (recruiting through contacts of existing participants) | <input type="checkbox"/> |
| 3. Use of casual or local workers e.g. interpreters | <input type="checkbox"/> |
| 4. Participant observation | <input type="checkbox"/> |
| 5. Covert observation | <input type="checkbox"/> |
| 6. Observation of specific organisational practices | <input type="checkbox"/> |
| 7. Participant completes questionnaire in hard copy | <input type="checkbox"/> |
| 8. Participant completes online questionnaire or other online task | X |
| 9. Using social media | X |
| 10. Participant performs paper and pencil task | <input type="checkbox"/> |
| 11. Participant performs verbal or aural task (e.g. for linguistic study) | <input type="checkbox"/> |
| 12. Focus group | <input type="checkbox"/> |
| 13. Interview | <input type="checkbox"/> |
| 14. Audio recording of participant (you will generally need specific consent from participants for this) | <input type="checkbox"/> |
| 15. Video recording of participant (you will generally need specific consent from participants for this) | <input type="checkbox"/> |
| 16. Photography of participant (you will generally need specific consent from participants for this) | <input type="checkbox"/> |
| 17. Others (please specify below) | <input type="checkbox"/> |

SECTION D: Professional guidelines and training

1. In this section, please mark 'X' against at least one of the following professional guidelines you aim to adhere to. You should use the principles listed in your chosen guideline(s) in conducting your own research. **Note:** this is not an exhaustive list.

Please mark 'X'

Research specialism/ methodology	Association and guidance document	
Anthropology	Association of Social Anthropologists of the UK and Commonwealth	<input type="checkbox"/>
Computer Sciences	ACM Code of Ethics and Professional Conduct	<input type="checkbox"/>
Criminology	http://www.britsoccrim.org/ethics/	<input type="checkbox"/>
Education	British Educational Research Association Ethical Guidelines for Educational Research	<input type="checkbox"/>
Geography	Association of American Geographers Statement on Professional Ethics	<input type="checkbox"/>
History	Oral History Society of the UK Ethical Guidelines	<input type="checkbox"/>
Internet-based Research	British Psychological Society: Conducting Research on the Internet Association of Internet Researchers Ethics Guide ACM Code of Ethics and Professional Conduct Association of Internet Researchers (AoIR) Association of Internet Researchers (AoIR) Best Practice Guidelines on internet-based research	X
Law (Socio-Legal)	Socio-Legal Studies Association: Statement of Principles of Ethical Research	<input type="checkbox"/>
Management	Academy of Management's Professional Code of Ethics	<input type="checkbox"/>
Political Science	American Political Science Association (APSA) Guide to Professional Ethics in Political Science	<input type="checkbox"/>
Politics	Political Studies Association. Guidelines for Good Professional Conduct	<input type="checkbox"/>
Psychology	British Psychological Society Code of Ethics and Conduct	<input type="checkbox"/>
Social Research	Social Research Association: Ethical Guidelines	<input type="checkbox"/>
Sociology	The British Sociological Association: Statement of Ethical Practice	<input type="checkbox"/>
Visual Research	ESRC National Centre for Research Methods Review Paper: Visual Ethics: Ethical Issues in Visual Research	<input type="checkbox"/>
Other professional guidelines. Please specify the other guidelines used here:		<input type="checkbox"/>

2. Please indicate what training in research ethics (or research methodology) the researchers involved with this study have received, e.g. the title of the course and date completed (online training available at <http://researchsupport.admin.ox.ac.uk/support/training/ethics>), or discussions between researchers and supervisors, if applicable.

I took a research ethics and design course as part of my masters degree here at Oxford.

SECTION E: Signatures or email endorsements (The SSH IDREC Secretariat accepts either option below. If you have a [DREC](#), check which signature option it prefers.)

- **Option 1:** Email confirmations from a University of Oxford email address can be accepted. Separate emails should come from each of the relevant signatories as outlined below, indicating acceptance of the relevant responsibilities. **Pasted images of signatures cannot be accepted.**
- **Option 2:** Handwritten (wet-ink) signatures. Please scan them and the rest of the checklist pages to create a single PDF document and email to us.

Please ensure this checklist is signed by:

For staff research:

1. [Principal investigator](#)
2. **Head of Department (or nominee)**

For student research:

1. [Principal investigator](#) (project supervisor)
2. **Head of Department (or nominee)**
3. **Student researcher**

1. Principal Investigator signature/supervisor signature (if student research)

I understand my responsibilities as [principal investigator](#) as outlined in the CUREC glossary and guidance on the CUREC website.

I declare that the answers above accurately describe the research as presently designed, and that a new checklist will be submitted should the research design change in a way which would alter any of the above responses so as to require completion of CUREC 2 (involving full scrutiny by an IDREC). I will inform the relevant IDREC if I cease to be the principal investigator on this project and supply the name and contact details of my successor if appropriate.

Signature (or email endorsement using the above declaration):

Print name (block capitals):

.....

Date:

2. Departmental endorsement signature

I have read the research project application named above. On the basis of the information available to me, I:

- consider the principal investigator to be aware of her/his ethical responsibilities in regard to this research;
- consider that any ethical issues raised have been satisfactorily resolved or are covered by relevant professional guidelines and/or CUREC approved procedures, and that it is appropriate for the research to proceed (noting the principal investigator's obligation to report should the design of the research change in a way which would alter any of the above responses so as to require completion of a CUREC 2 full application);
- am satisfied that: the proposed project design and scientific methodology is sound; the project has been/will be subject to appropriate [peer review](#); and is likely to contribute to existing knowledge and/or to the education and training of the researcher(s) and that it is in the [public interest](#).

Signed by Head of Department or nominee (example nominees for student research include the Director of Graduate Studies/ Director of Undergraduate Studies):

Signature (or email endorsement using the above declaration):

Print name (block capitals):

.....

Date:

3. Student signature (if student research)

I understand the questions and answers that have been entered above describing the research, and I will ensure that my practice in this research complies with these answers, subject to any modifications made by the principal investigator properly authorised by the CUREC system.

Signature by student (or email endorsement using the above declaration):

.....

Print name (block capitals): Mary Sanford

Date: 13 July 2020

RECRUITMENT MATERIALS

Sample text for contacting via email and social media platforms:

“Hello! My name is Mary and I am a researcher at the University of Oxford. If you have a few minutes to spare, I would love to ask you a few questions about your experiences with climate change communication on social media. Click the link below to participate in my survey. All responses are confidential.”

Shorter text option:

“Have a few minutes to spare for science? Click on the link below to take a survey on climate change communication.”

SURVEY QUESTION SCOPE

The first section will collect information related to the participant's demographic background, such as the following:

- Gender (non-binary multiple choice)
- Age (multiple choice with ranges)
- Education level (multiple choice)
- Occupation (fill in)
- Country of birth (fill in)
- City of residence (fill in)

The second section will collect information regarding the participant's social media use for information seeking. Potential examples include:

- How often do you use social media platforms such as Facebook, Twitter, Instagram, YouTube, WeChat, etc.? (multiple choice with frequency ranges)
- Which three platforms do you use most often? (free text)
- Please rank the following activities in order of most to least frequent in your daily use of social media:
 - Keeping up with friends // socialising, relaxation, disconnection
 - Keeping up with current events // information, education
 - Following celebrities // relaxation, disconnection, inspiration
 - Following cultural trends // relaxation, disconnection, inspiration, consumption
 - Finding funny memes // entertainment, disconnection
- As a rough estimate, would you say you follow more people you know personally (i.e. have met offline at least once) or more public figures/influencers/companies?

The third section will ask participants about their political orientation and climate change beliefs. As these questions are arguably the most delicate, they will be modeled after formats used by established international surveys such as the European Social Survey.

The final section will present participants with 3-5 climate change headlines or posts, formatted to appear as they would on a social media platform, with different content and framings. Participants will be asked to record their thoughts and reactions in their language of choice. For each item, we will also ask how the post contributed to the participant's overall conceptualisation of climate change and probability to take some personal action.

PARTICIPANT INFORMATION

Thank you for participating in this survey. Your answers will be recorded anonymously and stored securely for a limited time (three years after completion of this research).

The following survey will ask you questions about your demographic background (age, gender, education, etc.), use of social media, political orientation, and various questions related to climate change and climate change information on social media. We would like to get a better sense of how people around the world process the information they see related to climate change in the media, and as such, we are hoping to collect your candid thoughts and remarks that come to mind as you view select pieces of media. Please feel free to answer in whichever language you feel most comfortable expressing yourself. You may opt out of the survey at any time.

Thank you again for your time and participation!

Expanding social data science: The case of climate change online

Ethics Approval Reference : SSH OII CIA 20 072

General Information

We appreciate your interest in participating in this online survey. You have been invited to participate as you reside in one of our target regions of interest and you have noted that you are a social media user.

Please read through these terms before agreeing to participate by ticking the 'yes' box below. We, the University of Oxford, are investigating climate change communications online. You will be given some questions and examples to read, and then answer questions on your responses to various climate change information samples. It should take about 15 minutes. No background knowledge is required.

The information will be used to construct a model of climate change belief systems and to infer how they are manifested in verbal responses to climate change communication. I, the principal researcher, am the only person who will have access to your responses. No additional third parties will ever have access to it.

How will your data be used?

Your answers will be completely anonymous, and I will use all reasonable endeavours to keep them confidential. Please note that your participation is voluntary. You may withdraw at any point during the survey for any reason, before submitting your answers, by pressing the 'Exit' button / closing the browser. However, we are only able to reimburse participants who complete the full survey.

Your data will be stored in a password-protected file and may be used in academic publications. Your IP address will be stored. All questions are optional / OR we have included a 'Prefer not to say' option for each set of questions if you prefer not to answer a particular question.

The data that we collect from you may be transferred to, and stored or processed at, a destination outside the European Economic Area ("EEA"). By submitting your personal data, you agree to this transfer, storing or processing.

Who will have access to your data?

The University of Oxford is the data controller for the purposes of the Data Protection Act 1998. This questionnaire is for an DPhil project. The principal researcher is Mary Sanford, who is attached to the Oxford Internet Institute at the University of Oxford. This project is being completed under the supervision of Dr Peaks Krafft, Professor Renaud Lambiotte, and Dr Balazs Vedres.

This project has been reviewed by, and received ethics clearance through, the University of Oxford Central Version 3.0 November 2016 12 University Research Ethics Committee [reference number].

What if there is a problem?

If you have a concern about any aspect of this project, please speak to the researcher (Mary Sanford, mary.sanford@oii.ox.ac.uk) or her supervisor (Dr Peaks Krafft, peaks.krafft@oii.ox.ac.uk), who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the relevant Chair of the Research Ethics Committee at the University of Oxford: Chair, Social Sciences & Humanities Inter-Divisional Research Ethics Committee;

Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD. The Chair will seek to resolve the matter in a reasonably expeditious manner.

Please note that you may only participate in this survey if you are 18 years of age or over.

I certify that I am 18 years of age or over.

If you have read the information above and agree to participate with the understanding that the data (including any personal data) you submit will be processed accordingly, please check the relevant box below to get started.

Yes, I agree to take part

Appendix B

Authorship Statements

Statements from each co-author confirming the authorship contributions of the co-authored papers of the thesis and that I was lead author on all of them.

The following statement describes the authorship contributions for Chapter 3:

The work presented in Chapter 3 on Veganuary 2019 was completed in collaboration with Professor Jamie Lorimer (JL) of Oxford's School of Geography and the Environment. The work was published in *Nature Humanities and Social Sciences Communications*. I, Mary Sanford, undertook all of the data parsing, cleaning, and processing. I developed the research question and methodological approach. I executed all of the analysis and drafted the original manuscript. JL aided in refining the conceptual framework with which we interpret the final results and assisted in editing the manuscript for publication.

Name: Mary Sanford
Date: 1 May 2023

Signature: 

I, Jamie Lorimer, certify that the above is an accurate description of the candidate's contribution as lead author of the article for which I am listed as co-author.

Name: Jamie Lorimer
Date: 2 May 2023

Signature: 

The following statement describes the authorship contributions for the material contained in Chapters 4 and 5:

The work presented in Chapters 4 and 5 on the psycholinguistic framing of environmental activism was conducted in collaboration with Dr Magdalena Formanowicz (MF) and Dr Marta Witkowska (MW) of SWPS University in Warsaw, Poland, and Professor Robert Gifford (RG) of the University of Victoria in Canada in British Columbia, Canada. The chapters were combined and published as a single manuscript in *Frontiers in Environmental Psychology*.

I, Mary Sanford, was responsible for the original conceptualisation of the research question and objectives. With regards to the social media end of the project, I collected and cleaned the Twitter data, developed the methodological approach, and executed the analysis. For the experiment, I drafted the experimental materials and designed the analysis, while MF and MW helped me to refine the materials using their previous experience in experimental social psychology. They also ran some of the statistical analyses on the experiment data via their access to the ideal software we needed (MPlus), for which Oxford does not have a licence. I replicated and confirmed all analyses in R. I then drafted the manuscript, while MF and MW contributed to revising and polishing. RG assisted in scoping the literature, provided guidance for how to frame the work, and helped revise the manuscript.

Name: Mary Sanford
Date: 1 May 2023

Signature: 

I, Marta Witkowska, certify that the above is an accurate description of the candidate's contribution as lead author of the article for which I am listed as co-author.

Name: Marta Witkowska
Date: 2 May 2023

Signature: 

The following statement describes the authorship contributions for the material contained in Chapters 4 and 5:

The work presented in Chapters 4 and 5 on the psycholinguistic framing of environmental activism was conducted in collaboration with Dr Magdalena Formanowicz (MF) and Dr Marta Witkowska (MW) of SWPS University in Warsaw, Poland, and Professor Robert Gifford (RG) of the University of Victoria in Canada in British Columbia, Canada. The chapters were combined and published as a single manuscript in *Frontiers in Environmental Psychology*.

I, Mary Sanford, was responsible for the original conceptualisation of the research question and objectives. With regards to the social media end of the project, I collected and cleaned the Twitter data, developed the methodological approach, and executed the analysis. For the experiment, I drafted the experimental materials and designed the analysis, while MF and MW helped me to refine the materials using their previous experience in experimental social psychology. They also ran some of the statistical analyses on the experiment data via their access to the ideal software we needed (MPlus), for which Oxford does not have a licence. I replicated and confirmed all analyses in R. I then drafted the manuscript, while MF and MW contributed to revising and polishing. RG assisted in scoping the literature, provided guidance for how to frame the work, and helped revise the manuscript.

Name: Mary Sanford
Date: 1 May 2023

Signature: 

I, Robert Gifford, certify that the above is an accurate description of the candidate's contribution as lead author of the article for which I am listed as co-author.

Name: Robert Gifford
Date: 1 May 2023


Signature: 

The following statement describes the authorship contributions for the material contained in Chapters 4 and 5:

The work presented in Chapters 4 and 5 on the psycholinguistic framing of environmental activism was conducted in collaboration with Dr Magdalena Formanowicz (MF) and Dr Marta Witkowska (MW) of SWPS University in Warsaw, Poland, and Professor Robert Gifford (RG) of the University of Victoria in Canada in British Columbia, Canada. The chapters were combined and published as a single manuscript in *Frontiers in Environmental Psychology*.

I, Mary Sanford, was responsible for the original conceptualisation of the research question and objectives. With regards to the social media end of the project, I collected and cleaned the Twitter data, developed the methodological approach, and executed the analysis. For the experiment, I drafted the experimental materials and designed the analysis, while MF and MW helped me to refine the materials using their previous experience in experimental social psychology. They also ran some of the statistical analyses on the experiment data via their access to the ideal software we needed (MPlus), for which Oxford does not have a licence. I replicated and confirmed all analyses in R. I then drafted the manuscript, while MF and MW contributed to revising and polishing. RG assisted in scoping the literature, provided guidance for how to frame the work, and helped revise the manuscript.

Name: Mary Sanford
Date: 1 May 2023

Signature: 

I, Magdalena Formanowicz, certify that the above is an accurate description of the candidate's contribution as lead author of the article for which I am listed as co-author.

Name:
Date:

Signature:



The following statement describes the authorship contributions for the material contained in Chapter 6:

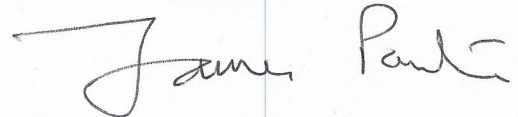
The work presented in Chapter 6 on COP26 was done in collaboration with Dr James Painter (JP) of the Reuters Institute for the Study of Journalism at Oxford. JP and I worked together on the conceptualisation of the project. I conducted all of the social media data collection and analysis, while JP conducted the collection and coding of the mainstream media articles included in the study. I then undertook the comparative statistical analysis of the two arenas. In the manuscript for publication, I drafted all text except portions of the mainstream media method section and results sections of the published version, which JP provided, that I then further expanded upon for the final thesis chapter.

Name: Mary Sanford
Date: 1 May 2023

Signature: 

I, James Painter, certify that the above is an accurate description of the candidate's contribution as lead author of the article for which I am listed as co-author.

Name: JAMES PAINTER
Date: 2 May 2023

Signature: 

Appendix C

Chapter 5 Survey

Print-out of the survey used for the experiment presented in Chapter 5.

Introduction

Please read carefully the description of the study below and decide whether you wish to participate in this study.

Description of the study

We would like to invite you to take part in this research project. Before you decide to continue with this study, you need to understand why this research is being done and what it will require of you. Please take the time to read the following information below. Please contact us, if there is anything that is unclear to you.

What is the purpose of the study?

Our aim is to examine the effectiveness of climate change communication. You will be shown three tweets. We will ask you some follow up questions about your intentions of action related to climate change and finally, ask you to complete a short optional task. We will then ask you some questions about your background, your political beliefs, and your perspective on climate change. There is only one opportunity to participate in this study. The study will take approximately up to 10 minutes to complete.

Information for participants

Participation is voluntary and refusal has no consequences. After giving consent, you can also withdraw without giving any reason during the test. It is also possible to withdraw your consent to the processing of the data obtained after the participation by e-mailing the contact person and providing your prolific ID. The results obtained are confidential, that is, the individual data obtained from the participant will not be disseminated in a manner that could allow personal identification, but only processed for the purpose of scientific research. This document confirming consent to participate in the research will be stored in accordance with the rules of keeping confidential documentation. In case of questions or doubts, please contact the person responsible for the project at every stage of the study, as well as after its completion. This person can also be asked to send the summary of the results of the study.

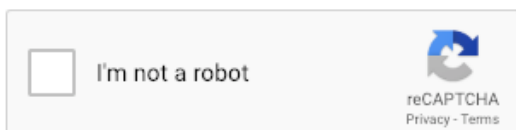
Institution: SWPS University of Social Sciences and Humanities, Poland 03-815 Warsaw, Chodakowska 19/31

Contact person: Magdalena Formanowicz

E-mail: mformanowicz@swps.edu.pl

The project was approved by the Ethical Review Board at SWPS University of Social Sciences and Humanities, Poland; the Faculty of Psychology in Warsaw.

Please verify humanity:



GDPR and consent

Information regarding the processing of personal data pursuant to art. 13 GDPR*

1. The administrator of your personal data is the SWPS University of Social Sciences and Humanities, located at Chodakowska 19/31, 03-815 Warsaw. You can contact the administrator via the following e-mail address: badania@swps.edu.pl.

2. The administrator has appointed a Data Protection Officer supervising the correctness of personal data processing who can be contacted via the following e-mail address: iod@swps.edu.pl.

3. Your personal data will be processed so that you can take part in the study. The basis for the processing of personal data is the consent for data processing (Article 6, paragraph 1 a GDPR). The consent may be withdrawn at any time by sending an e-mail to the following address: mformanowicz@swps.edu.pl.

4. The data will be processed for the duration of the project and in accordance with the law in particular tax and accounting. After this time they will be removed.

5. Personal data will be made available to authorized employees of the SWPS University of Social Sciences and Humanities, they may also be made available to conference partners as well as entities authorized under the law.

6. Based on the terms set out by the GDPR, you have the right to: access your personal data, amend them, rectify them, remove them, limit their processing and withdraw your consent at any time. Furthermore, you have the right to data portability, the right to object to processing of my data and the right to revoke my consent at any time, without any effect on the lawfulness of processing of personal data. Any changes to the personal data should be sent to mformanowicz@swps.edu.pl.

7. You are entitled to submit a complaint with a supervisory authority (iod@swps.edu.pl) that the processing of your personal data is, in your opinion, in violation of the provisions of the GDPR or other regulations on the processing and protection of personal data.

8. Providing data is voluntary, however, if you do not provide data, you will not be able to take part in the study.

* Regulation (EU) 2016/679 of the European Parliament and of The Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

Please indicate whether you agree to participate in this study:

I hereby confirm that I am at least 18 years old and I agree to the processing of my personal data in the scope specified in the above questionnaire by the SWPS University of Social Sciences and Humanities in order to take part in the study . I know that I have the right to withdraw my consent at any time by sending an email to Magdalena Formanowicz. I have read the above information obligation.

Yes

No

Negemo

You will now be shown three tweets. Please read them carefully.

Tweet 1



The inaction of our governments on the climate emergency is a threat to everyone. It is infuriating! 🙄

12:00 PM · Jun 1, 2021

166 Retweets 34 Quote Tweets 1.7K Likes

🗨️ ↻️ ❤️ 📤

Tweet 2



Depression, anxiety, post traumatic stress disorder, domestic & substance abuse all tend to go up in the aftermath of a #ClimateDisaster 😞

1:05 PM · Aug 13, 2021

53.4K Retweets 22.2K Quote Tweets 110.7K Likes

🗨️ ↻️ ❤️ 📤

Tweet 3



[Redacted Name]



#ClimateChange poses a critical national security threat and is amplifying many hazards and dangers for all of us 🌪️ 😞

10:17 AM · Sep 24, 2021

2.5K Retweets **660** Quote Tweets **20.4K** Likes



Posemo

You will now be shown three tweets. Please read them carefully.

Tweet 1



[Redacted Name]



Talking about **#ClimateChange** and **#ClimateAction** as "opportunities" can inspire hope 😊

4:25 PM · Apr 12, 2021

166 Retweets **34** Quote Tweets **1.7K** Likes



Tweet 2



#ClimateAction is a blessing not a burden! More jobs, better jobs; Inclusive, robust economies; Lower healthcare costs; Better security! 😄

5:43 PM · Oct 1, 2021

53.4K Retweets 22.2K Quote Tweets 110.7K Likes



Tweet 3



Transitioning to renewable energy to fight #ClimateChange strengthens national security and is a source of innovation, jobs, and wealth 😊

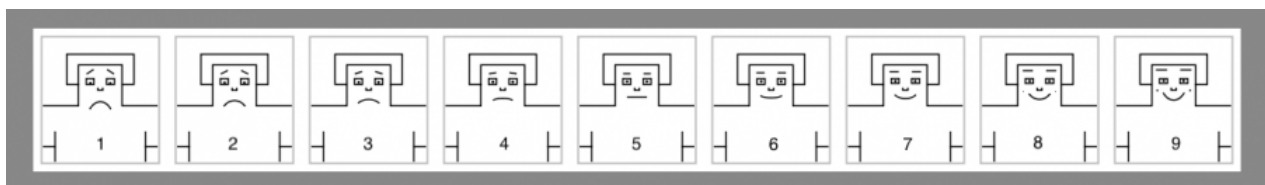
11:56 AM · Nov 15, 2021

2.5K Retweets 660 Quote Tweets 20.4K Likes



Questions

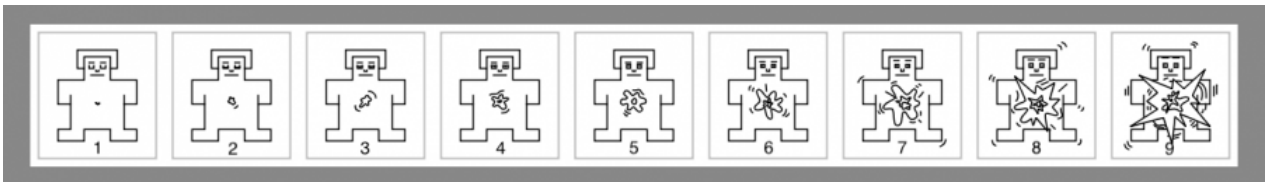
The figure below shows the unhappy-happy scale, which ranges from a frown to a smile. The left side of the scale represents feelings of being completely unhappy, annoyed, unsatisfied, melancholic, despaired, or bored. The other end of the scale represents when you feel happy, pleased, satisfied, contented, hopeful. If you feel completely neutral, neither happy nor sad, choose the figure in the middle (figure 5).



Please indicate in the box below which figure best represents your current emotional state

after reading those tweets.

The figure below shows the calm-excited scale. The left side of the scale represents feelings of being completely relaxed, calm, sluggish, dull, sleepy, or unaroused. The other end of the scale represents when you feel fully stimulated, excited, frenzied, jittery, wide-awake, or aroused. If you are not excited nor at all calm, choose the figure in the middle of the row (figure 5).



Please indicate in the box below which figure best represents your current level of excitement after reading those tweets.

How likely you are to share this type of information with others for example by retweeting it?

Very unlikely Unlikely Somewhat unlikely Neither likely nor unlikely Somewhat likely Likely Very likely

We now ask you to think about human-driven climate change. Regarding this topic, a heated debate is underway.

The authors of these tweets you just saw express the need for climate action to protect the environment. They see human activity as a primary contributor to climate change and therefore advocate individual and systemic action to reduce long-term damage to the environment.

Others do not believe humans are to blame for climate change. As such, they do not think climate action is necessary.

Within this debate, what is your position?

Definitely unnecessary Unnecessary Somewhat unnecessary Neither necessary nor unnecessary Somewhat necessary Necessary Definitely necessary

Climate action to protect the

Definitely unnecessary Unnecessary Somewhat unnecessary Neither necessary nor unnecessary Somewhat necessary Necessary Definitely necessary

environment is...

Please indicate how likely you would be to participate in the following activities after seeing the tweets.

	Very unlikely	Unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Likely	Very likely
I would carry out research to learn more about possible actions I can take to promote my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would sign a petition in favour of my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would attend a rally, a march, or a protest to assert my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would write to institutions and newspapers to promote my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would collaborate in organising an event to promote my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would hand out flyers or post on social media to promote my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would display poster or banners (e.g. on my balcony or front door) to assert my position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Behaviour

Finally, we are interested in learning about the most effective ways of communicating about the climate change debate to encourage people to engage for the cause. To that end, we would like you to write a slogan encouraging participation with your position in the debate. This is completely optional and not required for full study participation.

Info

You will now be asked to answer questions about your demographic background, social media use, political attitude, and climate change perspective. Your anonymity will be preserved and is guaranteed.

Demographic Information

What is your age?

How would you describe your gender?

Male

Female

Prefer not to say

Prefer to self describe as _____ (please specify)

What is your native language?

What is the highest level of school you have completed? If currently enrolled, please select the highest degree received.

No schooling

Elementary to 8th grade

Some high school, no diploma

High school graduate, diploma or the equivalent (for example: GED)

Some college credit, no degree

Trade/technical/vocational training

Associate degree

Bachelor's degree

Master's degree

Professional degree

Doctorate degree

Social Media Use

Have you used a social media platform in the last month? Social media platforms include Facebook, Twitter, Instagram, YouTube, WeChat, among others.

Yes

No

How often do you use social media platforms such as Facebook, Twitter, Instagram, YouTube, WeChat, etc.?

Never	2-3 times per month	2-3 times per week	Once a day	More than once a day	I don't know	Prefer not to say
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Political orientation

Please indicate your political orientation:

Definitely left-wing	Left-wing	Slightly left-wing	Neither right- wing nor left-wing	Slightly right- wing	Right- wing	Definitely right- wing
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End

You have completed the main part of the questionnaire. To continue, click 'No'.

Yes

No

Recall the tweets that you read at the beginning of the study. How would you rate their emotional tone?

Very negative	Negative	Somewhat negative	Neither negative nor positive	Somewhat positive	Positive	Very Positive
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please mark all the tweets that you have seen.

Talking about #ClimateChange and #ClimateAction as "opportunities" can inspire hope 😊

Reasons to love renewable energy! Renewable energy provides: energy freedom, energy choice, greater competition, strengthens National Security, and is a source of innovation creating jobs and wealth! What more could we want? 😊 #KeepItInTheGround #ClimateChange

Depression, anxiety, post traumatic stress disorder, domestic & substance abuse all tend to go up in the aftermath of a #ClimateDisaster 😞

#ClimateAction is a blessing not a burden! More jobs, better jobs; Inclusive, robust economies; Lower healthcare costs; Better security! 🤗

The inaction of our governments on the climate emergency is a threat to everyone. It is infuriating! 😡

Risk = hazard + vulnerability + exposure. Climate change is amplifying many hazards, but our vulnerabilities and exposure are going up, too! 😞

#ClimateChange poses a critical national security threat and is amplifying many hazards and dangers for all of us 🙌 😞

Transitioning to renewable energy to fight #ClimateChange strengthens national security and is a source of innovation, jobs, and wealth 😊

Do you have any comments regarding this questionnaire?

Please enter your Prolific ID

Thank you

Thank you for your participation in our study! We greatly appreciate your time and effort!

Powered by Qualtrics

Appendix D

Chapter 6 Supplementary Materials

D.1 Media profiles for each country and description of news sites

D.1.1 Australia

ABC News is the online news platform for Australia's national broadcaster (Jolly, 2014). In 2020 it became the most widely accessed online news site in Australia, overtaking News.com.au and increasing the gap with other online news providers (N. Newman, 2021). In 2020-2021, the website and app of ABC News had 12.2 million weekly Australian users (or 51% of people aged 2+) (Government, 2022). As of 2021, ABC News remains the most trusted news brand across online and offline platforms in Australia, with 70% of survey respondents considering it trustworthy (N. Newman, 2021). Though funded primarily by the government, the ABC is a publicly-owned and politically independent organisation (Jolly, 2014). The ABC has often been criticised for having a left-wing political bias, but supporters of the network deny claims that the broadcaster is either intentionally or inadvertently biased.

News.com.au is a commercial news website owned by News Corp Australia, one of Australia's largest media conglomerates. It specialises in tabloid-style articles on news, lifestyle, travel, entertainment, technology, finance and sport. In 2021 News.com.au was the second most widely accessed online news site after ABC News; however, it was only the tenth most trusted news brand, with 52% of survey respondents considering it trustworthy (N. Newman, 2021). Online and offline media sources owned by News Corp Australia tend towards the centre-right/right in part due to the conservative tendencies of its owner, Rupert Murdoch. News.com.au says it values accurate and trustworthy reporting and is committed to "open, fair and balanced coverage" (news.com.au, 2023), but tends to use loaded words which favour conservative causes, indicative of a centre-right leaning (*News.com.au - Bias and Credibility* 2023). A softening of News Corp

Australia's conservative attitudes can be seen in its 2021 transition from its long-standing climate-denialist stance to its embarking on a climate change campaign (Mocatta, 2021).

7News.com.au is the online news site for 7News, the news service for the commercial broadcaster the Seven Network. As of 2021, the Seven Network was the leading television network in Australia (N. Newman, 2021). 7News.com.au covers news in tabloid-style format, with focus on local and national news, as well as sport, lifestyle, entertainment, among others. In 2021, 7News.com.au was the third most accessed online news site in Australia (N. Newman, 2021). Its popularity is particularly strong among younger Australians: in November 2020, it was the leading news website among women under 35 and the leading commercial news website among men under 40 (Australia, 2020). Channel 7 News was the fourth most trusted news brand in 2021, with 61% of survey respondents considering it trustworthy (N. Newman, 2021). 7News.com.au publishes articles that, overall, tend towards the centre-right; although it publishes impartial content from credible news wires, it has also been criticised for publishing fake news and sensationalist tabloid-style articles that favour conservative causes (Australia, 2020).

9News.com.au is the online site for 9News, the news service for commercial broadcaster the Nine Network (often referred to as Channel Nine). As of 2021, the Nine Network was the second highest-rating television network in Australia, behind the Seven Network (N. Newman, 2021). Nine.com.au, which features the latest articles from 9News.com.au at the top of its homepage, was the fourth most accessed online site in 2021 (N. Newman, 2021). In 2021, Channel 9 News was the fifth most trusted news brand, with 61% of survey respondents considering it trustworthy (N. Newman, 2021). 9News.com.au publishes articles that tend towards the centre-right (*Nine.com.au - Bias and Credibility 2023*).

The Guardian Australia is the Australian website of the British print and online newspaper. Unlike the British version, the Guardian Australia, founded in 2013, is only available online. Although British content is also available on the website, the Guardian Australia employs a large number of Australian journalists and its homepage is tailored to the Australian reader (Office, 2023). In 2021, the Guardian AU was the fifth most widely accessed online news site in Australia (N. Newman, 2021). It was only the thirteenth most trusted news brand, however, with just under half of survey respondents (49%) considering it trustworthy (N. Newman, 2021). The Guardian has been a left-leaning publication throughout its history; although the Guardian Australia positions itself in the centre of political debate, its opinions and editorials tend to the left (*The Guardian*

- *Bias and Credibility* 2023).

D.1.2 India

India has a distinct, vibrant and diverse media ecosystem in which traditional or legacy media still perform well in print and online, despite the strong usage of television as a source of news and the arrival of several successful digital-born media (N. Newman, 2021). The country has seven of the top ten media organisations with the largest print circulations in the world; these are mostly in Hindi, but include the Times of India, which according to the Audit Bureau of Circulation had the largest daily circulation in English in the world in the first six months of 2022 at 1.59 million (Aneez et al., 2019). Although Hindi language news sources are read or watched by much larger audiences, English-language legacy media still receive a large percentage of the media advertising revenue and exert a considerable influence over national policy and opinion (Aneez et al., 2019).

We chose the five most read English-language news online sites according to the list published in the 2021 Digital News Report and based on English-language surveys (N. Newman, 2021). These were in order, NDTV online, Times of India, Republic TV, News18 and the Hindustan Times. We omitted the BBC as being a foreign media organisation. According to the same survey, The Times of India, NDTV, and the Hindustan Times were three of the top most trusted news brands in 2019; Republic TV came in 9th position. In general, the results of the survey show that legacy media organisations and the online sites of popular television channels remain particularly popular and influential, and are widely shared via social media.

Labelling the political affiliation or leaning of Indian media outlets is particularly challenging, not least because of the close – but often changing - association between leading politicians and media owners (Painter, 2013). Broadcast television channels, like print media, are self-regulated and often have strong political affiliations and corporate ownership. According to N. Newman (2021), the growing and considerable popularity enjoyed by Republic TV's online and offline platforms since 2019 may indicate the growing presence of right-wing ideology propagated by the current ruling party, the Bharatiya Janata Party (BJP) (ibid.). According to Media Bias / Fact Check, News18 is also considered to be pro Prime Minister Narendra Modi. NDTV has historically been left-leaning, but may be changing under new ownership. The Times of India has historically been right-leaning, while the Hindustan Times is regarded as being close to the Indian Congress Party.

D.1.3 UK

The Ofcom 2020 report on News Consumption in the UK shows that the BBC website/app was the most popular website used for news (60% of all those surveyed), Sky News (20%), the Guardian (18%) and the Mail (18%).¹ The BBC in general has a challenge reaching younger audiences, but the online website is widely used by this sector. The Daily Mail website is the only one of the five which has a higher female readership. The Guardian is more read by higher income groups (ABC1), the Mail is equally divided into ABC1 and C2DE, whereas the Sun has a higher representation of C2DE. The BBC has a slightly higher white readership than minority ethnic groups, as does the Mail. Younger people tend to use search engines and YouTube more than older age groups.

The BBC and Sky News has a reasonably uniform spread across all political affiliations and voting choices, although Sky News' readership profile is slightly more right-leaning (Schulz, Levy, and Nielsen, 2019). The Guardian is skewed towards left-leaning and liberal democrat choices, and the Mail and Sun tend more towards right-leaning audiences (ibid.).

Although Mail Online is the online presence of the Daily Mail, a tabloid newspaper with a right-leaning populist orientation, on the website there is often a broader range of coverage. Sky News operates under UK broadcasting regulations which require it to be impartial and unbiased in its news coverage, but its website, news.sky.com does not. BBC online also is not regulated by Ofcom for impartiality and neutrality, whereas its radio and television programs are. BBC online material follows BBC editorial guidelines on impartiality and lack of bias.

Three of the five UK websites chosen for this study are very widely used internationally. According to Majid (2021), the BBC website is the most visited globally (1.3bn in late 2020), but the Guardian (350,000) and the Mail (370,000) websites also feature strongly. The Sky website does not have a strong international reach as it targets a UK audience, and the Sun came in at around 130,000.

D.1.4 US

CNN was the most used news website in the USA in 2021, and the seventh most trusted brand (N. Newman, 2021). It is generally regarded as left-leaning or liberal in the US context (*CNN - Bias and Credibility 2023*).

¹The second most popular source of news is the headline results of Google searches with 30% but this is ignored as it is not a news site but a search platform.

The New York Times' online site was the third most used website in the USA in 2021, and the brand was the second most trusted legacy print media after the Wall Street Journal (N. Newman, 2021). For several years it has based its business strategy on building up its domestic and international digital readers and subscriptions, and reducing its reliance on advertising. It is generally regarded as left-leaning or liberal in the US context (*New York Times - Bias and Credibility 2023*). It has fluctuated in terms of its resources dedicated to climate change, but since 2017 has re-invigorated its coverage with a larger team and in-depth, often visual, reporting (Kristiansen, Painter, and Shea, 2020).

The Washington Post's online site was the seventh most used news website in 2021, and the brand was the third most trusted legacy print media (N. Newman, 2021). It is seen as left-leaning (*Washington Post - Bias and Credibility 2023*). In December 2021 the online site recorded 71.6 million total digital unique visitors (WashPostPR, 2022).

NBC News began regular broadcasting in 1940, the first regularly-scheduled news program in American television history. Industry analysts have rated it as highly accurate and politically close to neutral (though slightly liberal) in its reporting (*NBC News - Bias and Credibility 2023*). According to a survey of US adults in May 2021, NBC was the second most credible news source after ABC with 54% of respondents believing the organisation to be very or somewhat credible (*National Tracking Poll 210530 2021*). NBC/MSNBC news online is the sixth most used news website in the US (N. Newman, 2021).

Fox News entered the market in 1990s and shortly became cable news' prime-time ratings leader and one of the most highly rated cable channels across all genres (Hoewe, Brownell, and Wiemer, 2020). From inception, its business strategy was to provide a conservative perspective that would stand in contrast to the mainstream media (ibid.). According to the 2021 Digital News Report, 44% trusted Fox News (N. Newman, 2021). Just 15% of respondents found Fox News to be very credible, whereas 28% said the opposite (*National Tracking Poll 210530 2021*). Fox News was among the most divisive news sources when it came to perceptions of its credibility rating and respondents' political affiliation. For several years the channel, which is part of the Murdoch stable, has regularly hosted climate sceptics and questioned mainstream climate science (Hoewe, Brownell, and Wiemer, 2020).

D.2 Examples of NGO messaging

As part of the media coding, we monitored the presence of quotes from international and national NGOs in our sample of articles at the end of the COP. Based on these results, we chose the five most quoted international NGOs: Greenpeace International, Action Aid, Oxfam International, Climate Action Network (CAN), and the Global Strategic Communications Council (GSCC),² and examined their press releases or briefings at the end of the COP and/or quotes from their representatives in the four areas we were most interested in (the 1.5C target, change in language, finance to developing countries, and overall sentiment). We then assessed the content of these press releases to ensure we captured the full range of discourses and sentiments. The following is an illustrative list giving two relevant quotes from each of the five NGOs, taken from their press releases or briefings:

Action Aid:³

- ‘The US government is poised to get what it wanted out of COP26: namely, no new obligations on climate finance or loss & damage, two of the major priority areas for developing countries’
- ‘[But] the United States framed this as India trying to block text on fossil fuels in the COP26 outcome. Knowing that many will not examine the claims critically, the United States is publicly claiming credit for getting fossil fuel language into the text while painting developing countries as the blockers’

Climate Action Network (CAN):⁴

- ‘COP26: Rich nations betray vulnerable people of the world’
- ‘The failure by rich countries like the US, the EU and the UK to support a funding facility for loss and damage is a betrayal to the millions of people suffering from the climate crisis in developing countries’

Greenpeace International:⁵

²Their sister organisation, the European Climate Foundation (ECF), was also included in the number of quotes by GSCC.

³<https://www.actionaidusa.org/news/fossil-fuels-in-the-cop-decision-text-why-the-u-s-not-india-is-the-problem/>

⁴<https://climatenetwork.org/2021/11/13/cop26-rich-nations-betray-vulnerable-people-of-the-world/>

⁵<https://www.greenpeace.org/international/press-release/50751/cop26-ends-in-glasgow-greenpeace-response/>

- ‘It’s meek, it’s weak and the 1.5C goal is only just alive, but a signal has been sent that the era of coal is ending. And that matters.’
- ‘There was a recognition that vulnerable countries are suffering real loss and damage from the climate crisis now, but what was promised was nothing close to what’s needed on the ground.’

Global Strategic Communications Council (GSCC):⁶

- ‘COP26: China, India, EU, US undermine global fossil-fuel phase out pledge, as rich nations refuse climate crisis support for poorest’
- ‘But despite progress on future emissions reductions, COP26 failed those most impacted by the climate crisis now. The EU and US refused to create a fund that the poorest countries could draw on for crisis response - outraging small islands and many climate vulnerable nations’

Oxfam International:⁷

- ‘It’s painful that diplomatic efforts have once more failed to meet the scale of this crisis’
- ‘Developing countries [...] put forward a loss and damage finance facility to build back in the aftermath of extreme weather events linked to climate change. Not only did rich countries block this, all they would agree to is limited funding for technical assistance and a “dialogue”. This derisory outcome is tone deaf to the suffering of millions of people both now and in the future.’

As can be seen, there was a broad range of responses from these representatives of the NGO community to the four areas we focused on. It is worth stressing that firstly, few NGOs saw the COP as an outright failure or an outright success; secondly, there was very little criticism of India and China - some NGOs such as Action Aid blamed the USA instead, and others included the EU and US in the blame for watering down the language of the final agreement (see also the Energy and Climate Intelligence Unit);⁸ and thirdly, most of the overall NGO assessment of the COP was in line with ‘some progress, but a long way to go’.

⁶Press briefing distributed to selected journalists, 13 November 2021.

⁷<https://www.oxfam.org/en/press-releases/oxfams-verdict-cop26-outcome>

⁸<https://eciu.net/media/press-releases/2021/comment-close-of-cop26>

D.3 Examples of accounts of each type

TABLE D.1: Account type listed with examples of accounts in Facebook and Instagram samples

Account Type	Example Accounts
Activist	Greta Thunberg, Chris Packham, Al Gore
Celebrity	Emma Watson, Thich Nhat Hanh, Jack Harries
eNGO	Greenpeace International, Greenpeace Philippines, Greenpeace UK
NGO	World Economic Forum, UNICEF, Amnesty International
IGO	UN, UN Climate Change, COP 26
Government	European Commission, USAID Bangladesh, Fijian Government
Mainstream news	CNN, CBS News, ITV News
Business news	Financial Review, Marketing Motivation, Bloomberg
Other News	Rappler, Firstpost, Reuters
Other media	Mother Jones, The Varistarian, Vogue
Environmental nonprofit	The Climate Council, Scottish Wildcat Haven, Climate Live
Other nonprofit	Hisaar Foundation, Coalition of Concerned Manufacturers & Businesses of Canada, WWF UK
Political - left leaning	Jeremy Corbyn, Australian Young Greens, Sarah Hanson-Young
Political - central	End London Rule
Political - right leaning	Boris Johnson, Craig R. Brittain, Bhupender Yadav BJP
Community - Right	The Reclaim Party, Get Britain Out, Tony Abbott's Support Page
Community - Left	The People for Bernie Sanders, Open Britain, United States of Dystopia
Journalist	Spencer Fernando, Owen Jones, Kate Quilton
Artist	Richard Bowler Wildlife Photography, Mir Suhail, Fabio Magnasciutti
Science	IFL Science, World Meteorological Organisation, European Space Agency
Individual	Ben Crump
Business	Oatly, Nando's UK & Ireland, Himalayan Rocket Stove
Other	Studyholic
Labor union	Australian Unions, Landworkers' Alliance

D.4 Example posts for each codebook categories from the social media dataset

Coal - reference to language of deal being weakened without specific blame: *'I got back from COP last Friday and wrote an op ed for the Express on the way home. The directors cut is below. They took this pic while we were there. Overall I thought the outcome good - the new annual focus on 1.5 degrees and everyone's plans to hit it, is a real ratcheting up of focus. And of course the ending of coal, even if it morphed into "phasing down" instead of "out" - it's a real historical achievement. Which is quite mad I feel as I write this. We know, the whole world knows, we have to end coal - and end fossil fuels. But this is the first COP in which it's been possible to include some words in that direction.'* (Dale Vince)

Coal - reference to language of deal being weakened specifically by China and India: *'However, in supporting the final outcome, Fiji also expressed disappointment in a last minute effort by China and India to water down language on the use of coal power — a major driver of emissions. The AG called out the hypocrisy of denying the call for the Glasgow loss and damage financing facility, citing its proposal over a week ago as last minute, while on the other hand allowing edits to fundamental text in the final moments of the COP.'* (Fijian Government)

Coal - reference to language of deal being weakened by China, India, US, and/or EU: *'What has been agreed at #COP26 ? - More than 100 world leaders promised to end and reverse deforestation by 2030, including Brazil, home to the Amazon rainforest. - The US and the EU announced a global partnership to cut emissions of the greenhouse gas methane by 2030 - reducing methane in the atmosphere is seen as one of the best ways to quickly reduce global warming. The big emitters China, Russia and India haven't joined. - More than 40 countries committed to move away from coal - but the world's biggest users like China, India and the US did not sign up.'* (Angry Earth)

Emissions deal - praise: *'The Glasgow Climate Pact has been confirmed and #COP26 is officially completed. The pact calls for more ambitious climate commitments from countries to meet the 1.5C goal; the phase out of fossil fuel subsidies for the first time; a phase down of coal (would have been "phase out" as well, but for the last-minute intervention of some coal-heavy countries); and increased support for low-income countries coping with climate impacts.'* (Katharine Hayhoe)

Emissions deal - criticism: *'While I welcome any progress, this agreement simply doesn't meet the scale of the challenge. Countries on the frontline of the climate crisis deserve to have the urgent issue of loss and damage addressed and there is much still to be done to keep the hope of 1.5C alive. We need coal to be phased out – not phased down. So, as leaders return home from COP26, it is vital those nations who have*

it in their power to help reverse our planet's decline join those of us committed to doing so to give our world its best chance of survival.' (Sadiq Khan)

Financial deal - praise: *#COP26 is a step in the right direction. Limiting global warming to 1.5 degrees Celsius remains within reach, but the work is far from done. After two weeks of negotiations at COP26, over 190 countries reached a consensus. We have made progress on the three objectives we set at the start of COP26: 1) Keeping within reach the global warming limit of 1.5 degrees, 2) Reaching the target of \$100 billion per year of climate finance to support developing and vulnerable countries, and 3) Agreeing on the Paris rulebook. There is still hard work ahead. We need to work further that next year's climate conference in Egypt puts us firmly on track for 1.5 degrees. And everyone must take responsibility. #EUatCOP26 #EUGreenDeal'* (European Commission)

Financial deal - criticism: *'Final #COP26 text leaves 1.5 degrees on life support & fails the Global South \$100bn still not delivered, no \$\$ mechanism for #LossAndDamage. Global leaders have failed. But it doesn't end here- we'll mobilise like never before to put #ClimateJustice at heart of future process'* (Caroline Lucas)

D.5 Distribution of topics across account types for Facebook and Instagram samples

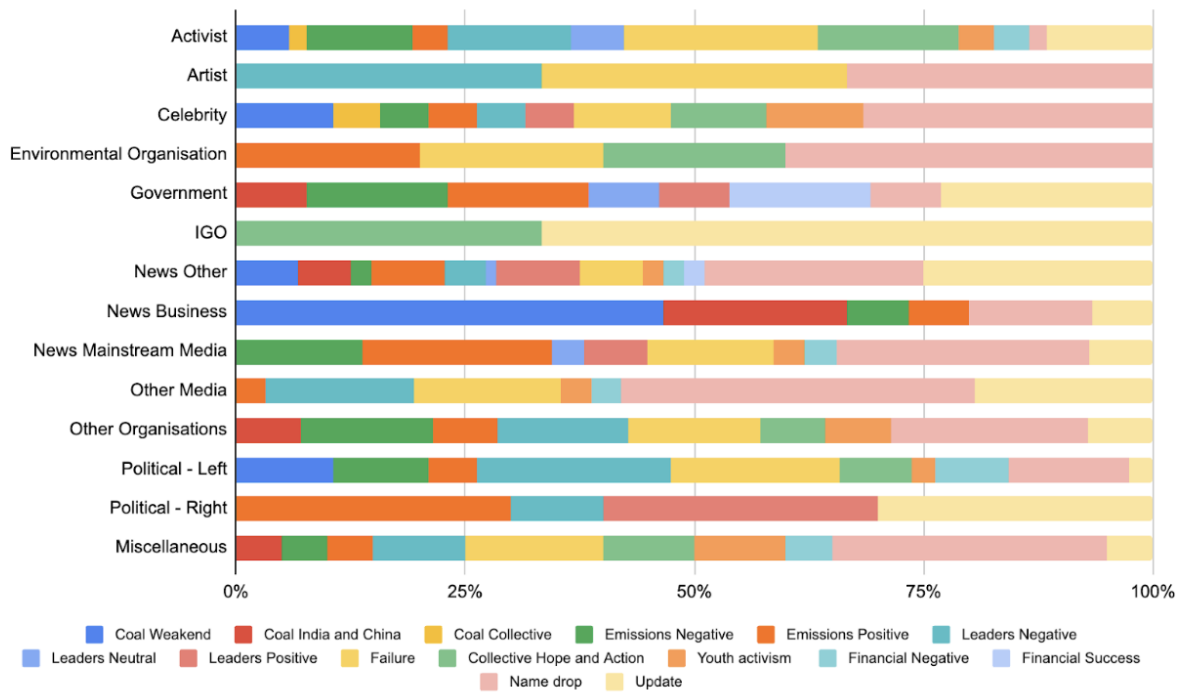


FIGURE D.1: Topics discussed by account type in Facebook sample. χ^2 (df = 182, n = 340) = 260.14, $p = .0016$, Cramer's V = .243, $p = .000$

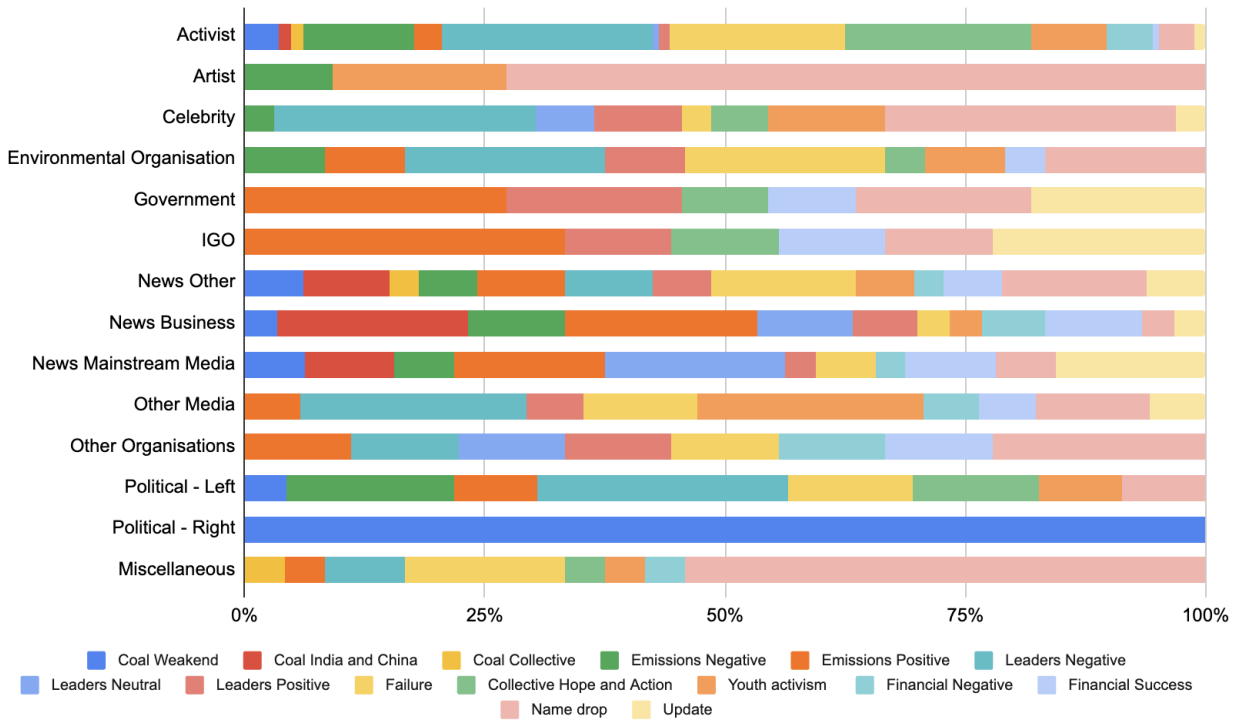


FIGURE D.2: Topics discussed by account type in Instagram sample. χ^2 (df = 182, n = 422) = 412.01, $p = .000$, Cramer's V = .274, $p = .000$

D.6 Boxplots for each comparative analysis

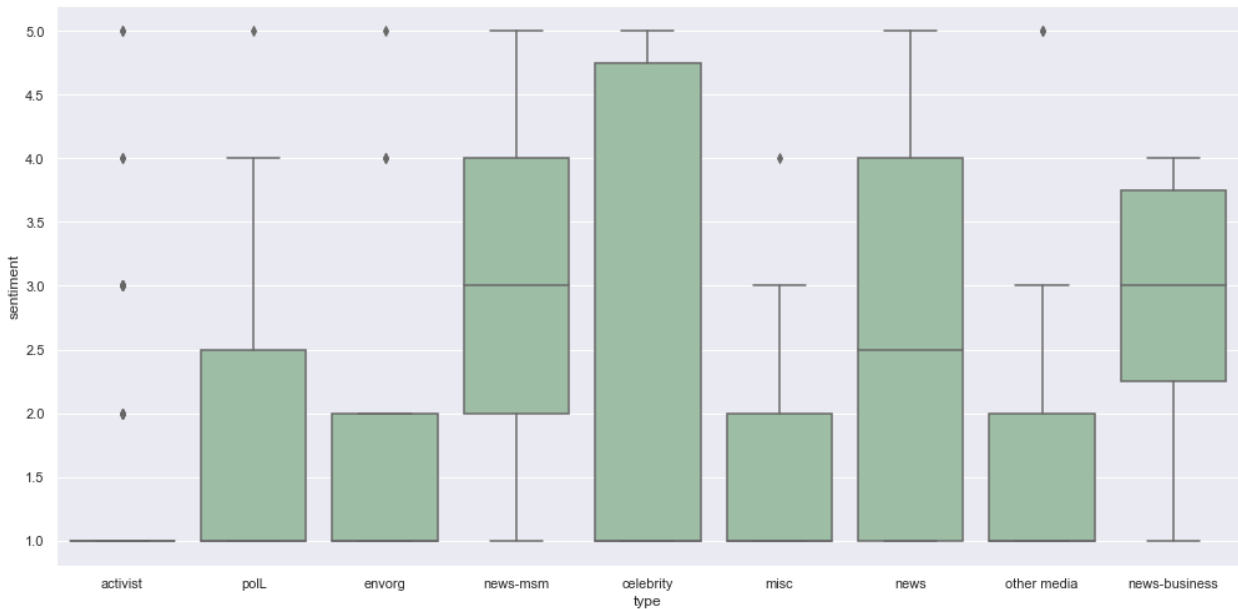


FIGURE D.3: Sentiment distributions across account types, aggregated over platforms. DF = 8, N = 226, F = 5.63, $p = .000$. Excludes: Artist, political right-leaning, other organisations, IGO, government. Legend for abbreviated account types: *polL* = political - left, *envorg* = environmental organisation, *news-msm* = news - mainstream media, *misc* = miscellaneous, *news* = other news.

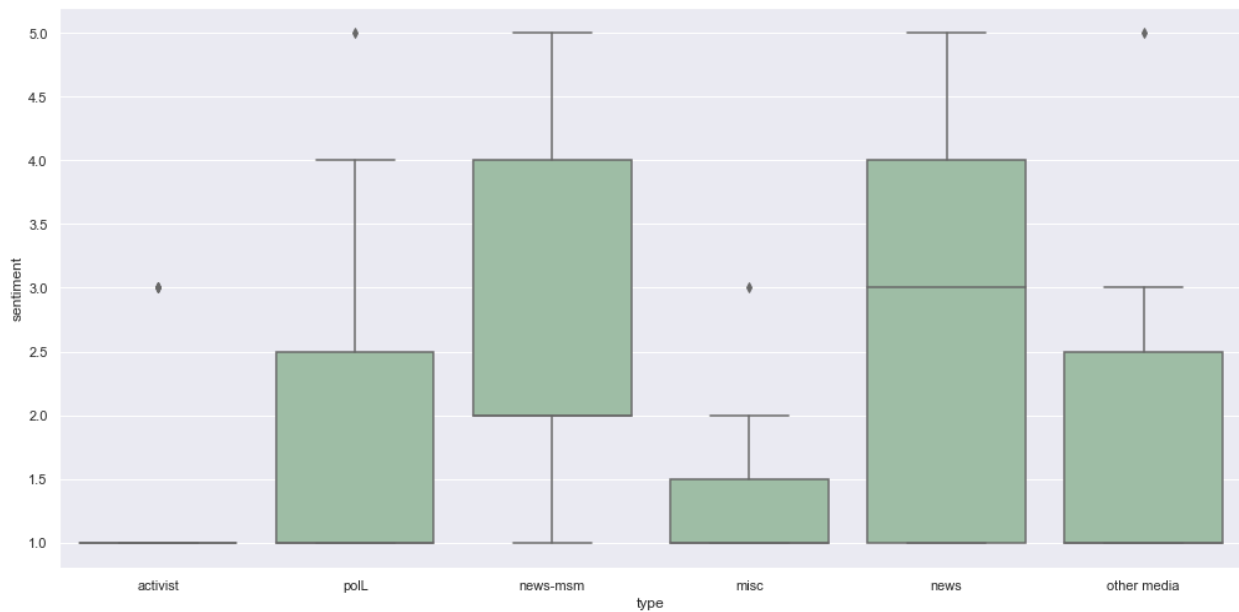


FIGURE D.4: Sentiment distributions across account types, Facebook sample. $DF = 4$, $N = 88$, $F = 3.81$, $p = .004$. Excludes: Artist, political right-leaning, other organisations, IGO, government, business news, celebrity, environmental organisation. Legend for abbreviated account types: *poll* = political - left, *news-msm* = news - mainstream media, *misc* = miscellaneous, *news* = other news.

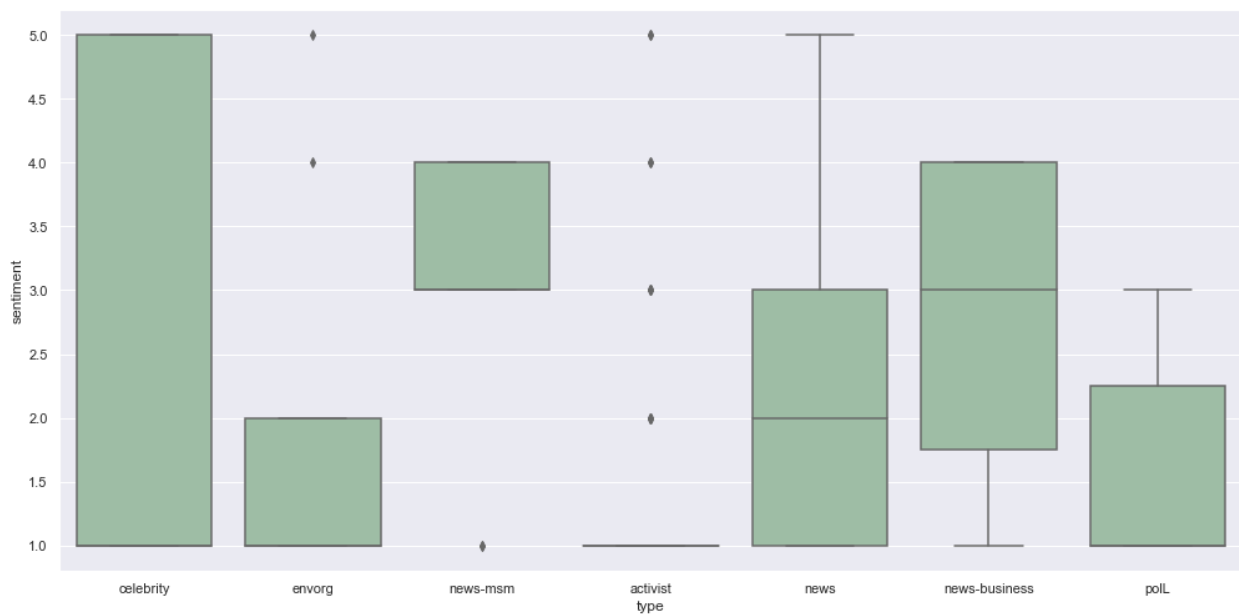


FIGURE D.5: Sentiment distributions across account types, Instagram sample. $DF = 6$, $N = 123$, $F = 4.21$, $p = .001$. Excludes: Artist, political right-leaning, other organisations, IGO, government, other media, miscellaneous. Legend for abbreviated account types: *envorg* = environmental organisation, *news-msm* = news - mainstream media, *misc* = miscellaneous, *news* = other news, *poll* = political - left.

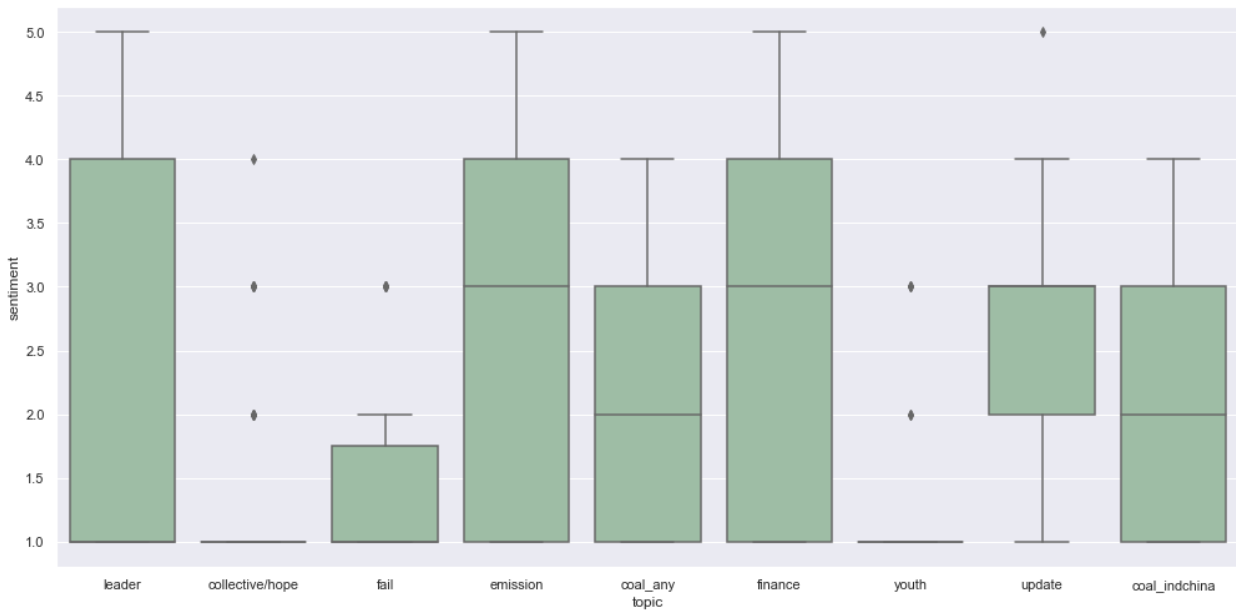


FIGURE D.6: Sentiment distributions across topics, aggregated over platforms, with finance, leader, and emissions categories collapsed. $DF = 8$, $N = 526$, $F = 12.06$, $p = .000$. Excludes: Name drop, coal (all). Legend for abbreviated topics: *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

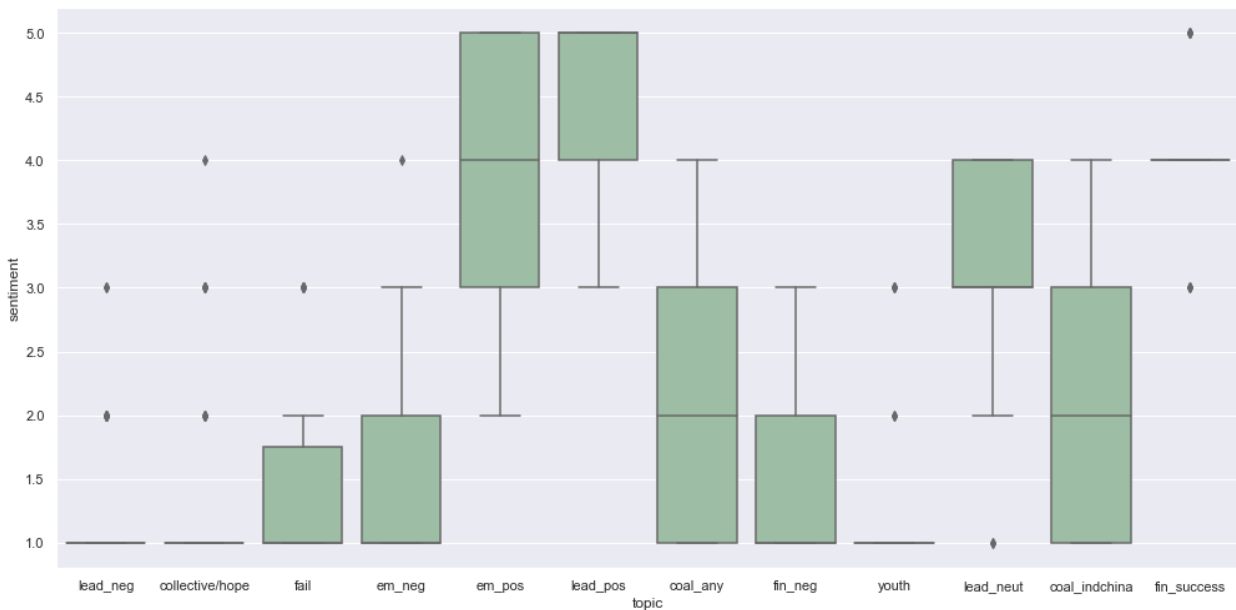


FIGURE D.7: Sentiment distributions across topics, aggregated over platforms, with finance, leader, and emissions not collapsed. $DF = 11$, $N = 513$, $F = 113.83$, $p = .000$. Excludes: Name drop, coal (all), update. Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *em_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *fin_neg* = negative sentiment about the financial deal, *lead_neut* = neutral sentiment about world leaders, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal, *fin_success* = positive sentiment about financial deal.

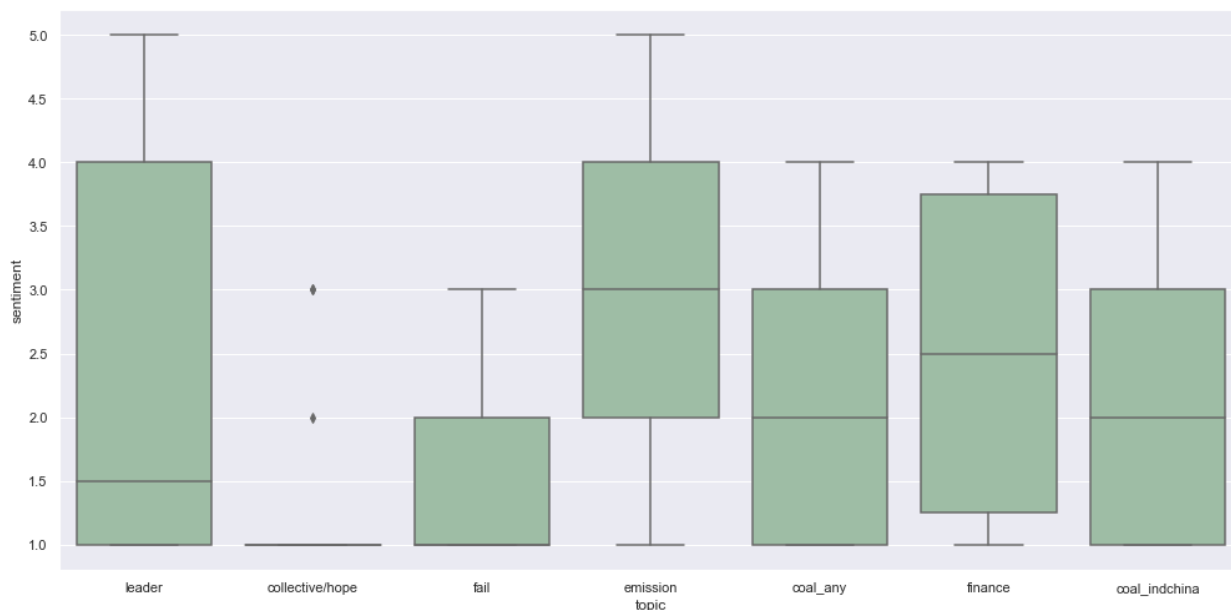


FIGURE D.8: Sentiment distributions across topics, Facebook sample, with finance, leader, and emissions categories collapsed. $DF = 6$, $N = 190$, $F = 7.32$, $p = .000$. Excludes: Name drop, coal (all), update, youth activism. Legend for abbreviated topics: *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

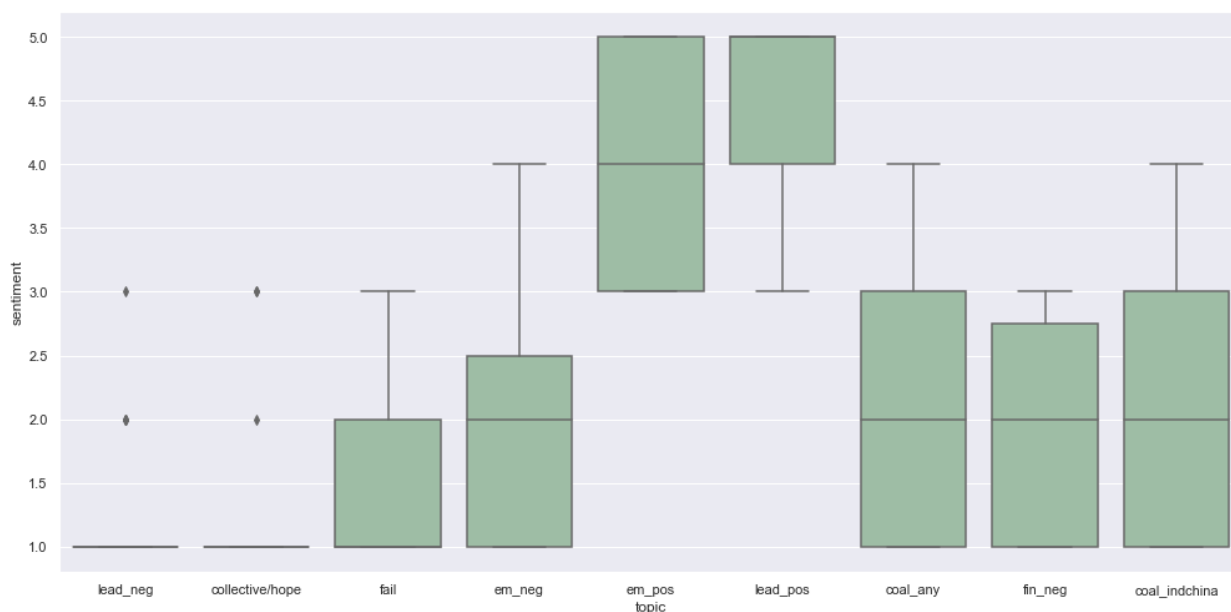


FIGURE D.9: Sentiment distributions across topics, Facebook sample, with finance, leader, and emissions categories not collapsed. $DF = 8$, $N = 181$, $F = 45.40$, $p = .000$. Excludes: Name drop, update, coal (all), neutral mentions of world leaders, praise of financial deal, youth activism. Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *em_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *fin_neg* = negative sentiment about the financial deal, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

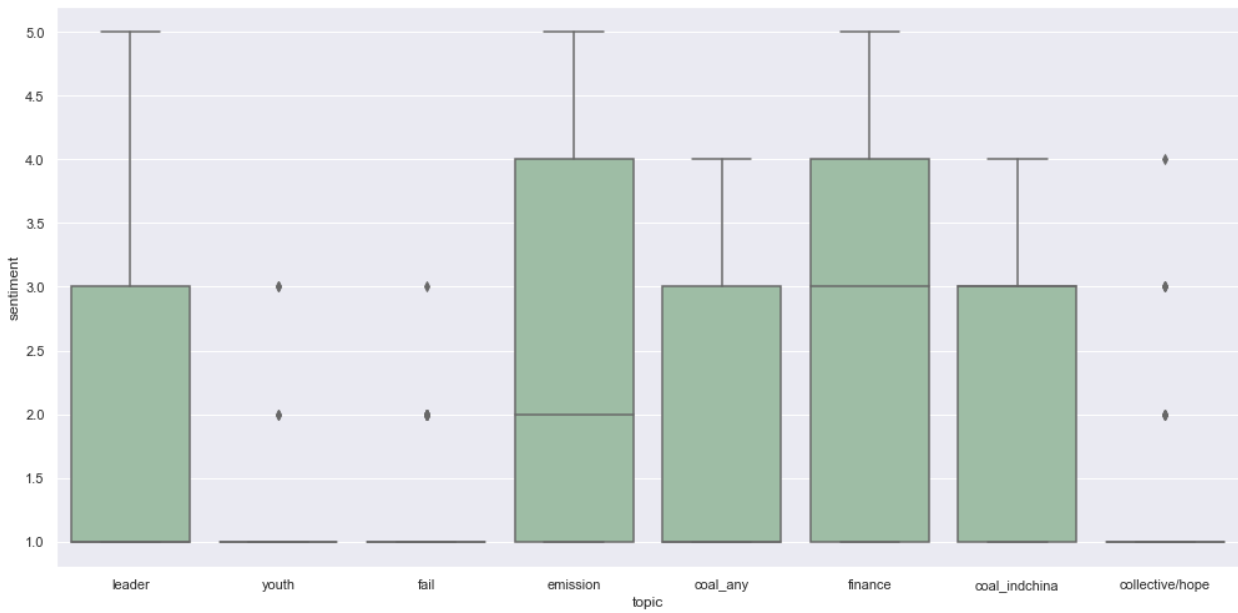


FIGURE D.10: Sentiment distributions across topics, Instagram sample, with finance, leader, and emissions categories collapsed. $DF = 7$, $N = 317$, $F = 6.95$, $p = .000$. Excludes: Name drop, coal (all), update. Legend for abbreviated topics: *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

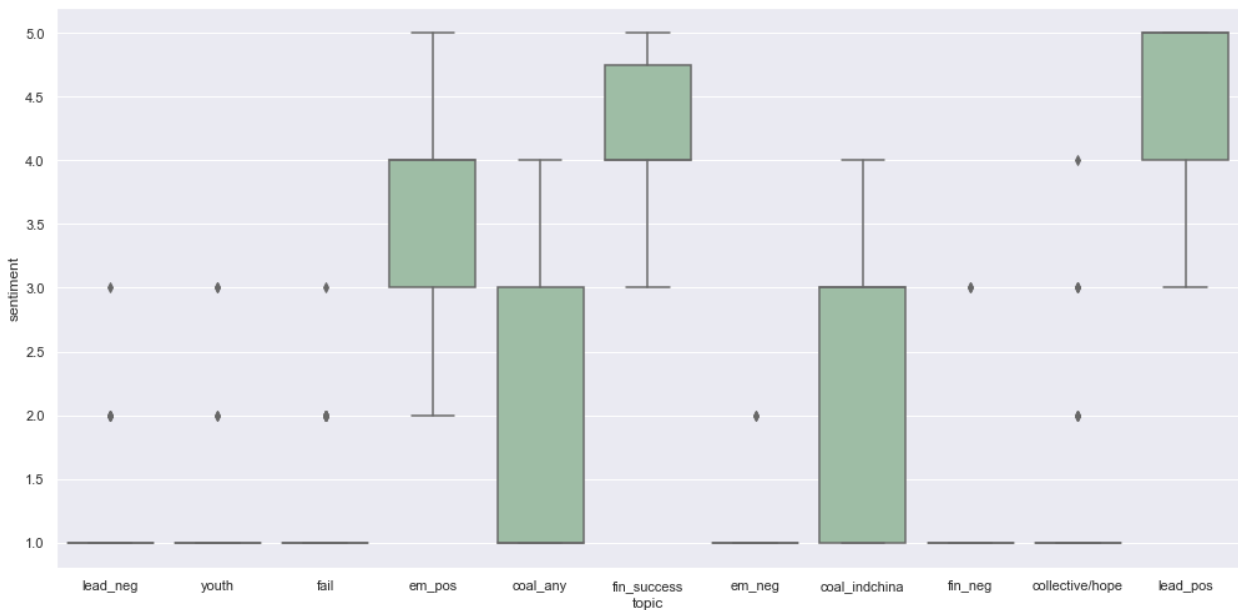


FIGURE D.11: Sentiment distributions across topics, Instagram sample, with finance, leader, and emissions categories not collapsed. $DF = 10$, $N = 308$, $F = 94.53$, $p = .000$. Excludes: Name drop, update, coal (all), neutral mentions of world leaders. Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *em_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *fin_neg* = negative sentiment about the financial deal, *lead_neut* = neutral sentiment about world leaders, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal, *fin_success* = positive sentiment about financial deal.

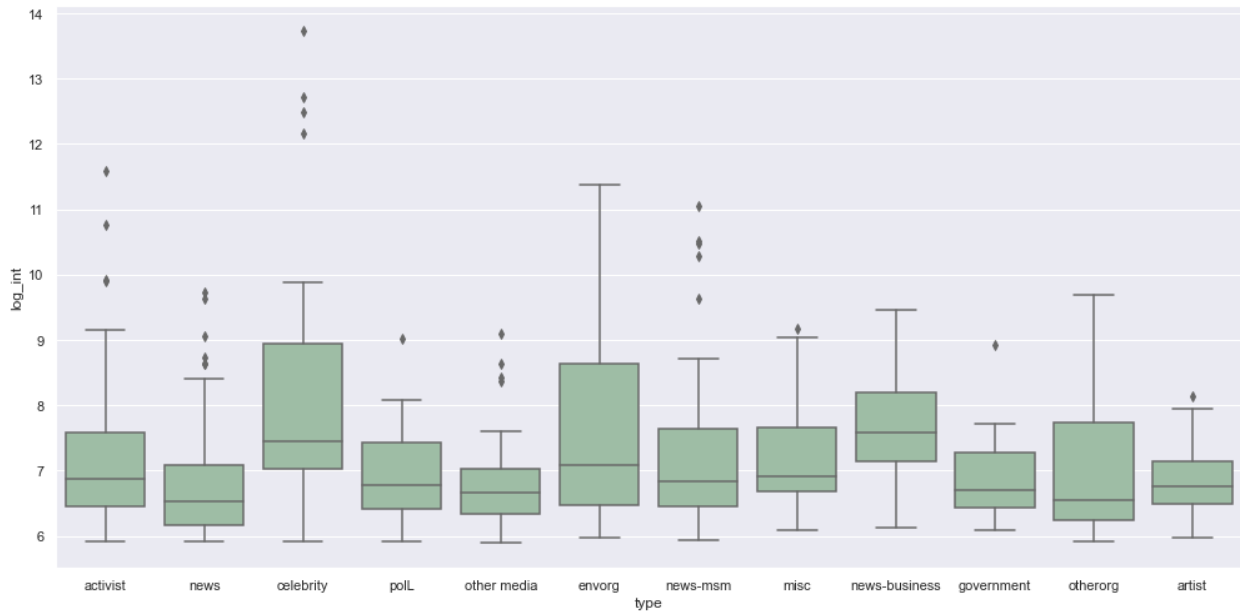


FIGURE D.12: Log interactions across types, aggregated over platforms. $DF = 11$, $N = 431$, $F = 4.77$, $p = .000$. Excludes: Political right-leaning, IGO, environmental organisations, artists, business news, government. Legend for abbreviated account types: *news* = other news, *polL* = political - left, *envorg* = environmental organisation, *news-msm* = news mainstream media, *misc* = miscellaneous, *otherorg* = other organisation.

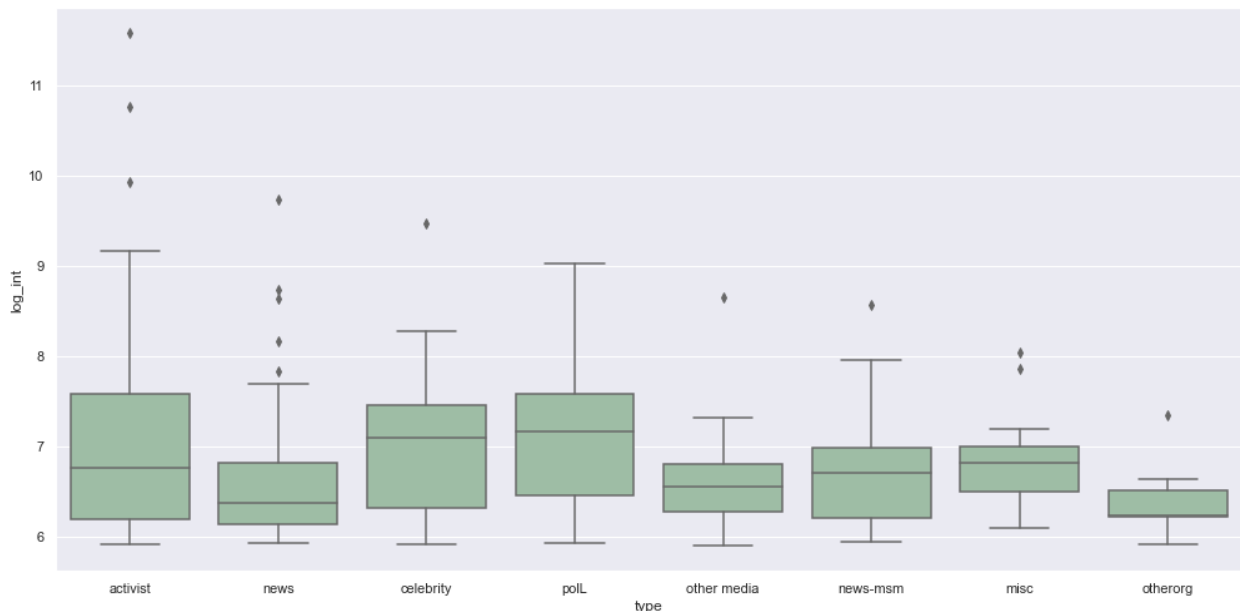


FIGURE D.13: Log interactions across types, Facebook sample. $DF = 7$, $N = 201$, $F = 2.98$, $p = .005$. Excludes: Political right-leaning, IGO, environmental organisations, artists, business news, government. Legend for abbreviated account types: *news* = other news, *polL* = political - left, *news-msm* = news mainstream media, *misc* = miscellaneous, *otherorg* = other organisation.

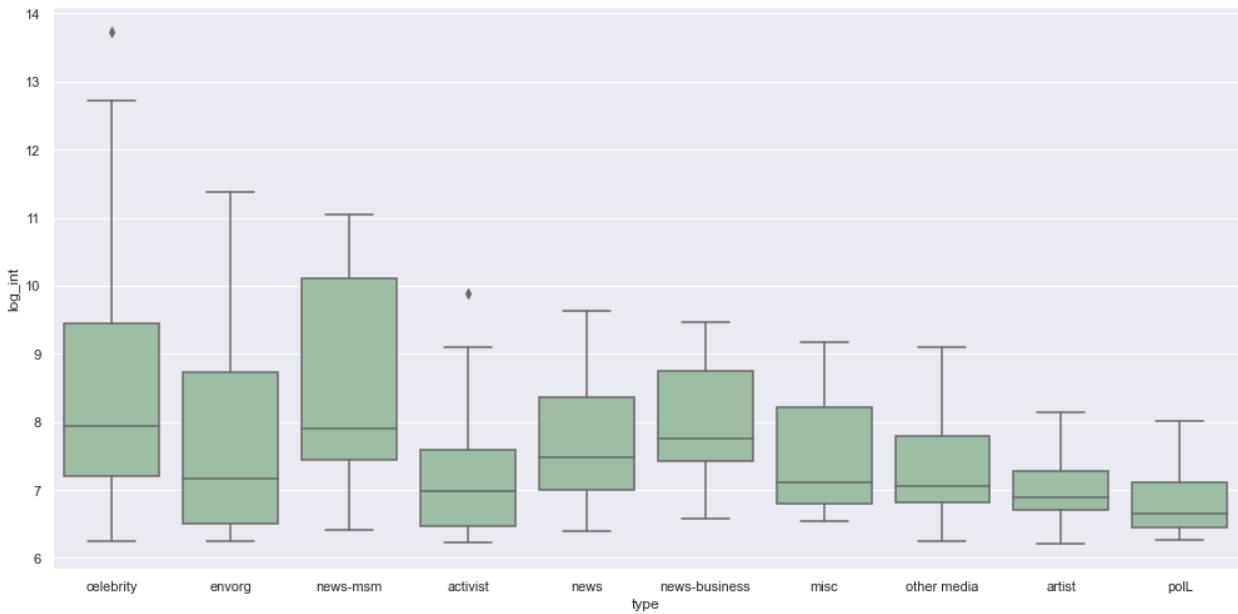


FIGURE D.14: Log interactions across types, Instagram sample. $DF = 9, N = 198, F = 5.07, p = .000$. Excludes: Political right-leaning, IGO, other organisations, government. Legend for abbreviated account types: *news* = other news, *polL* = political - left, *envorg* = environmental organisation, *news-msm* = news mainstream media, *misc* = miscellaneous, *otherorg* = other organisation.

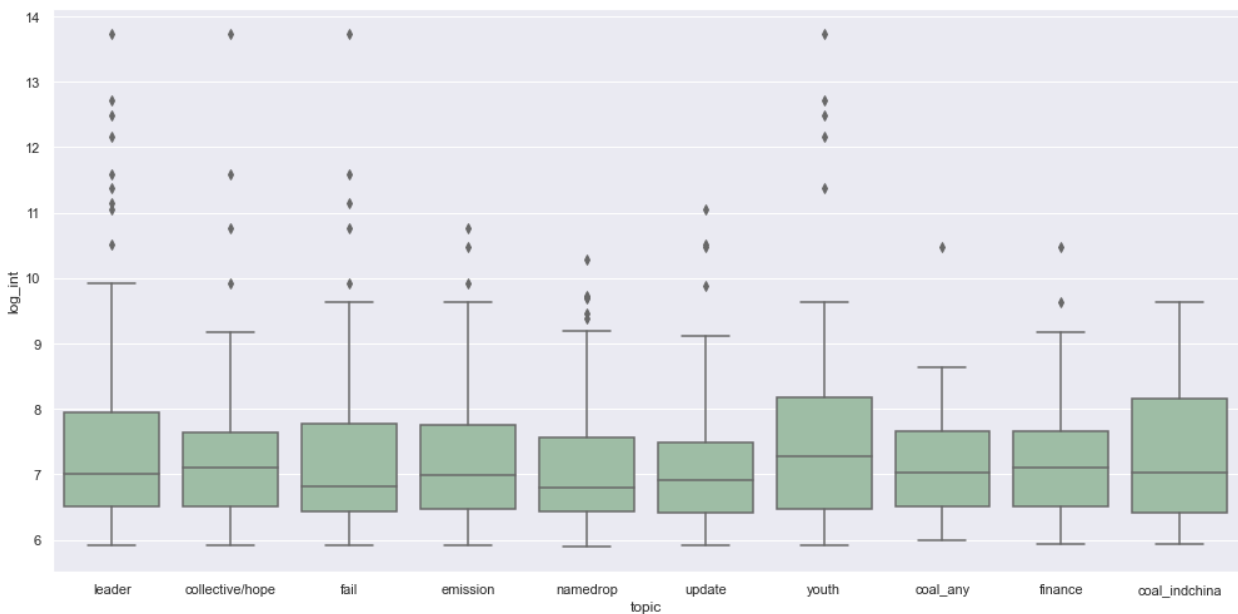


FIGURE D.15: Log interactions across topics, aggregated over platforms, with finance, leader, and emissions categories collapsed. $DF = 9, N = 756, F = 1.65, p = .098$. Excludes: Coal (all). Legend for abbreviated topics: *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

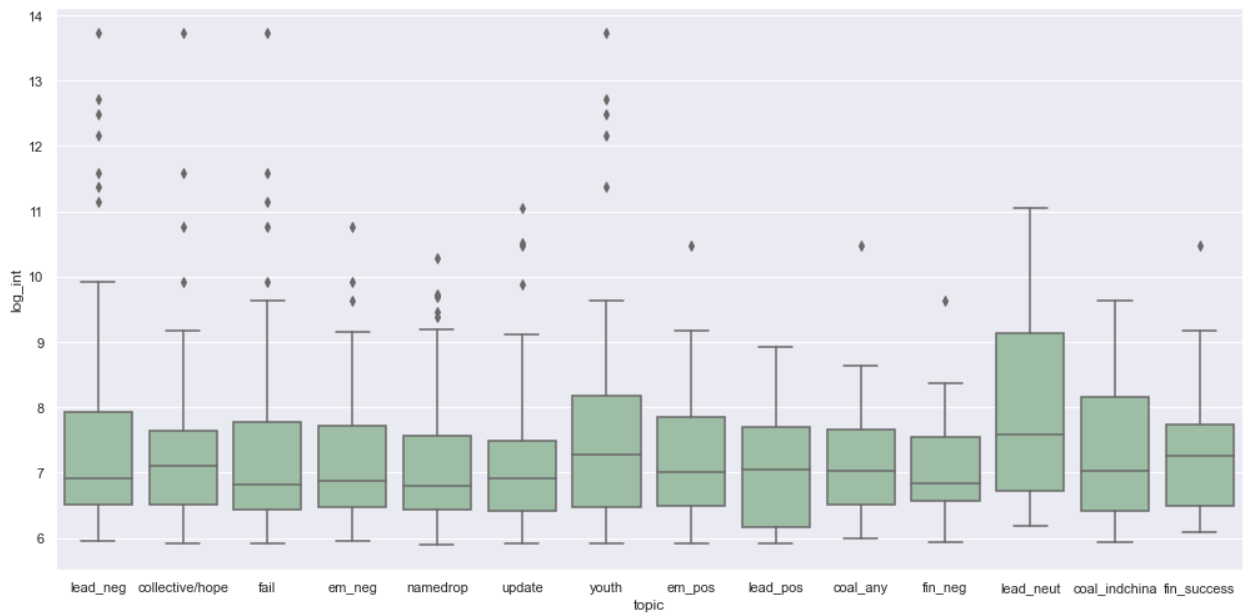


FIGURE D.16: Log interactions across topics, aggregated over platforms, with finance, leader, and emissions categories not collapsed. $DF = 13$, $N = 756$, $F = 1.71$, $p = .055$. Excludes: Coal (all). Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *em_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *fin_neg* = negative sentiment about the financial deal, *lead_neut* = neutral sentiment about world leaders, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal, *fin_success* = positive sentiment about financial deal.

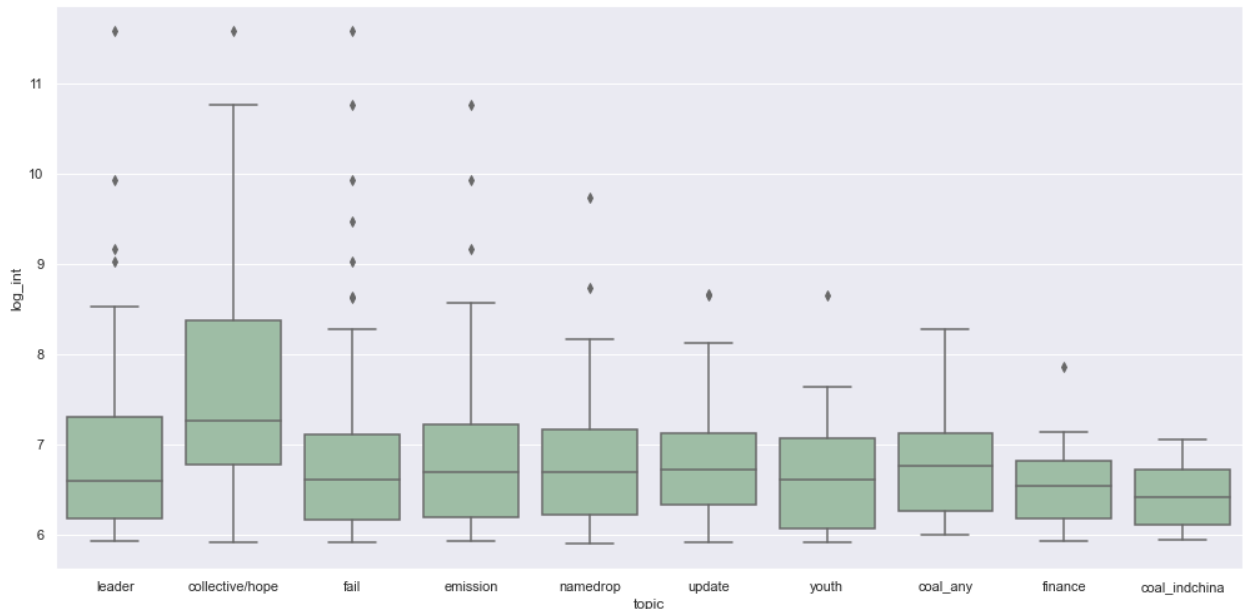


FIGURE D.17: Log interactions across topics, Facebook sample, with finance, leader, and emissions categories collapsed. $DF = 9$, $N = 338$, $F = 2.41$, $p = .011$. Excludes: Coal (all). Legend for abbreviated topics: *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

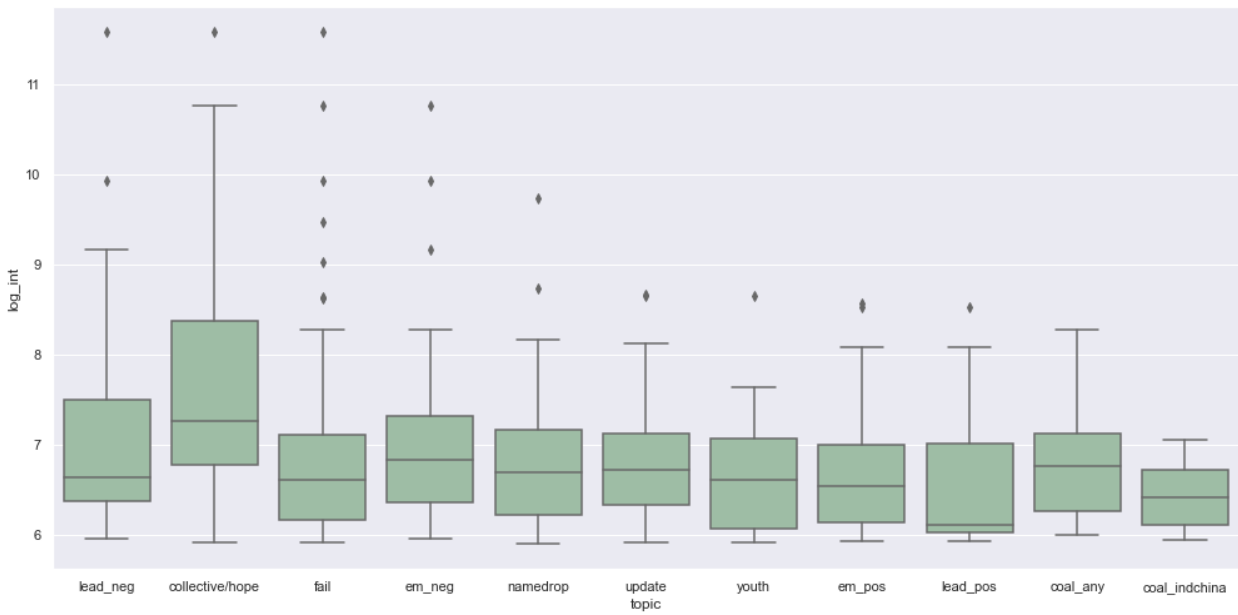


FIGURE D.18: Log interactions across topics, Facebook sample, with finance, leader, and emissions categories not collapsed. $DF = 10$, $N = 307$, $F = 2.53$, $p = .0061$. Excludes: Neutral mentions of world leaders, praise of financial deal, criticism of financial deal. Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *em_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

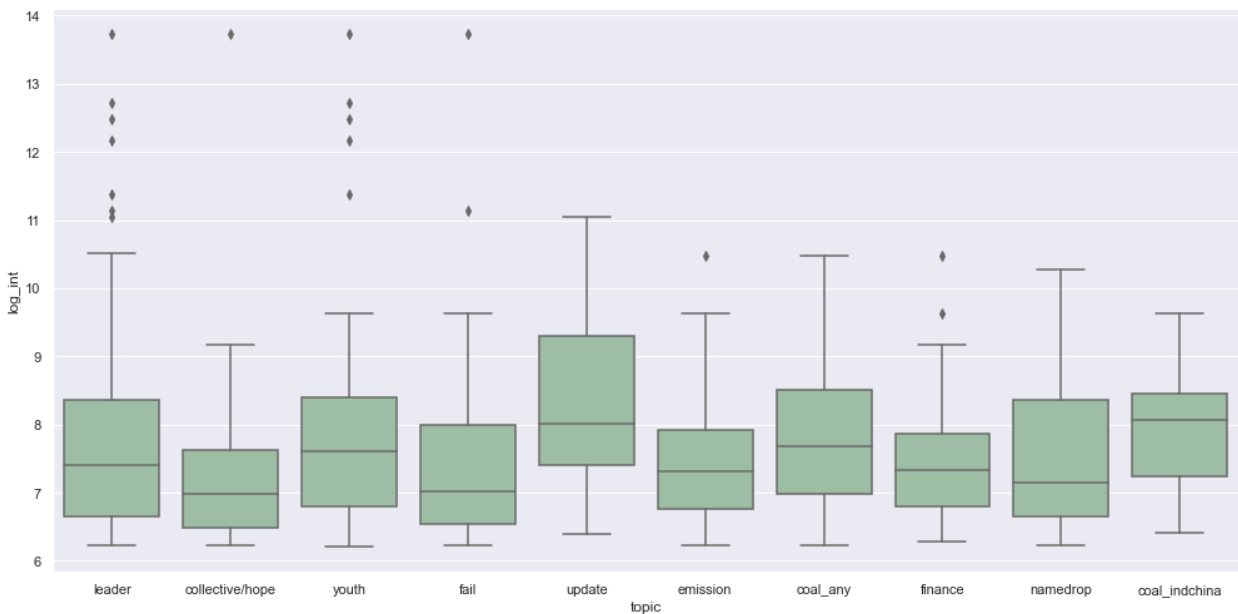


FIGURE D.19: Log interactions across topics, Instagram sample, with finance, leader, emissions categories collapsed. $DF = 9$, $N = 418$, $F = 2.08$, $p = .03$. Excludes: coal (any). Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

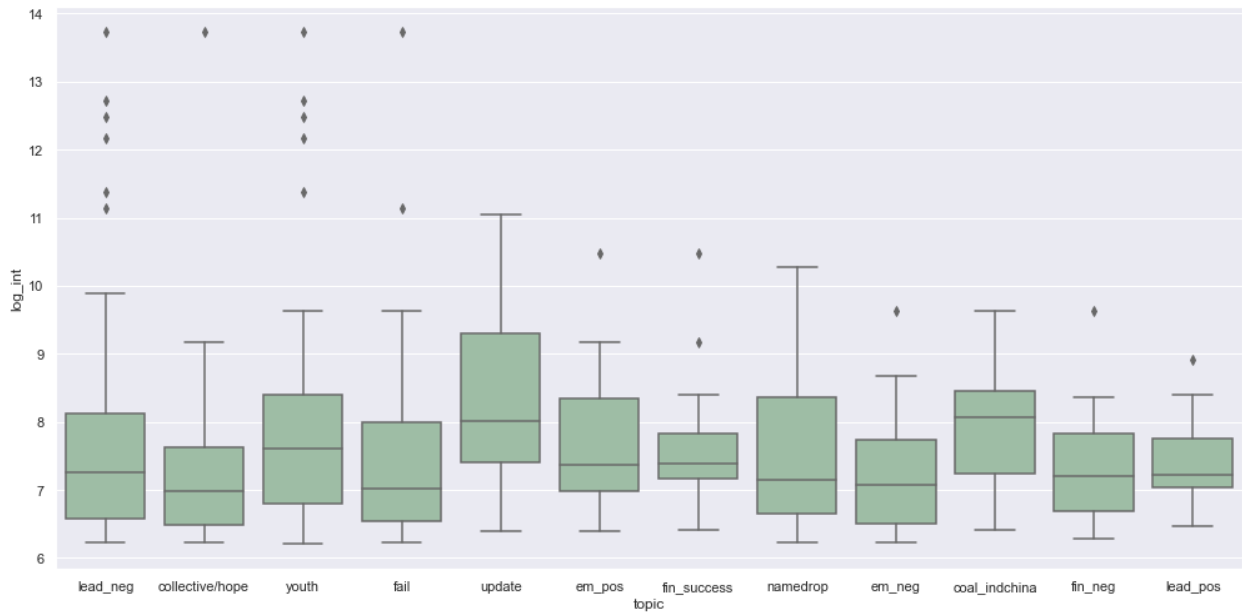


FIGURE D.20: Log interactions across topics, Instagram sample, with finance, leader, and emissions categories not collapsed. $DF = 11$, $N = 392$, $F = 1.86$, $p = .04$. Excludes: Neutral mentions of world leaders, coal (any). Legend for abbreviated topics: *lead_neg* = negative sentiment about world leaders, *textitem_neg* = negative sentiment about the emissions deal, *em_pos* = positive sentiment about emissions deal, *lead_pos* = positive sentiment about world leaders, *coal-any* = any mention of the coal deal being weakened, *coal_indchina* = specific targeting of India and China as responsible for weakening the coal deal.

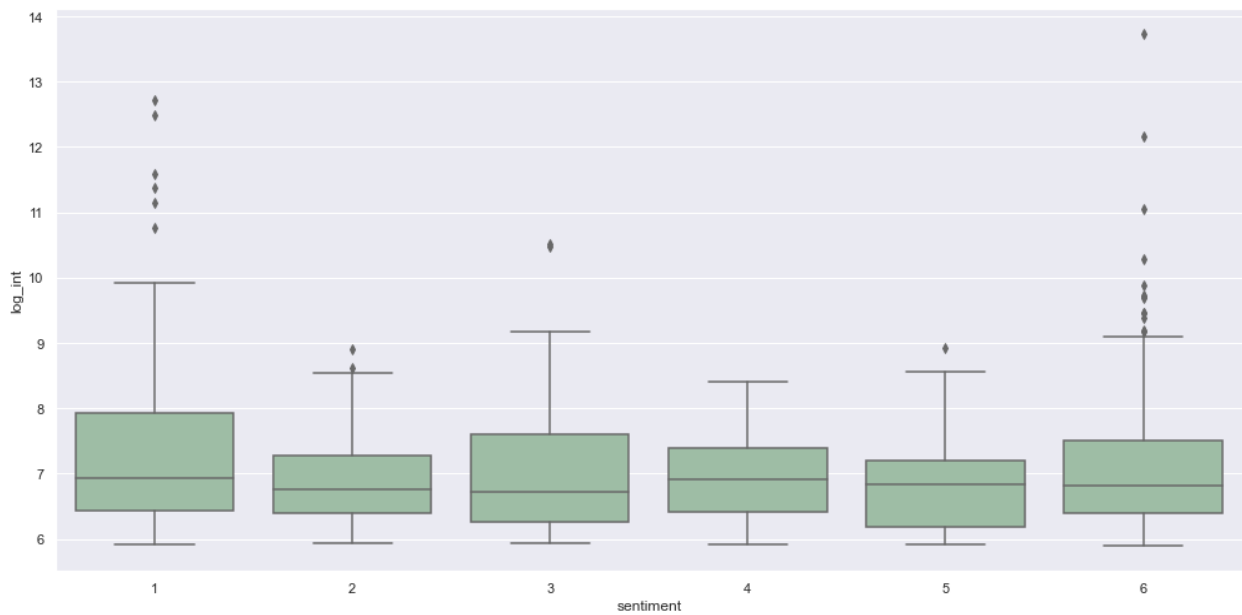


FIGURE D.21: Log interactions across sentiment levels, aggregated over platforms. $DF = 5$, $N = 431$, $F = 1.34$, $p = .25$.

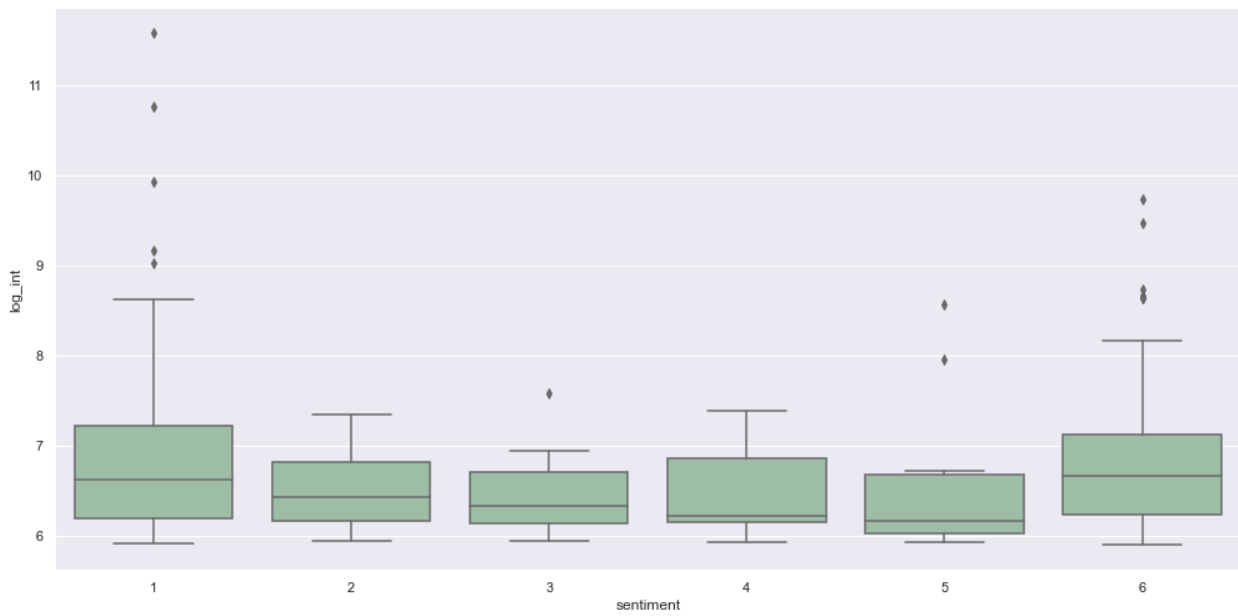


FIGURE D.22: Log interactions across sentiment levels, Facebook sample. $DF = 5$, $N = 220$, $F = 2.21$, $p = .054$.

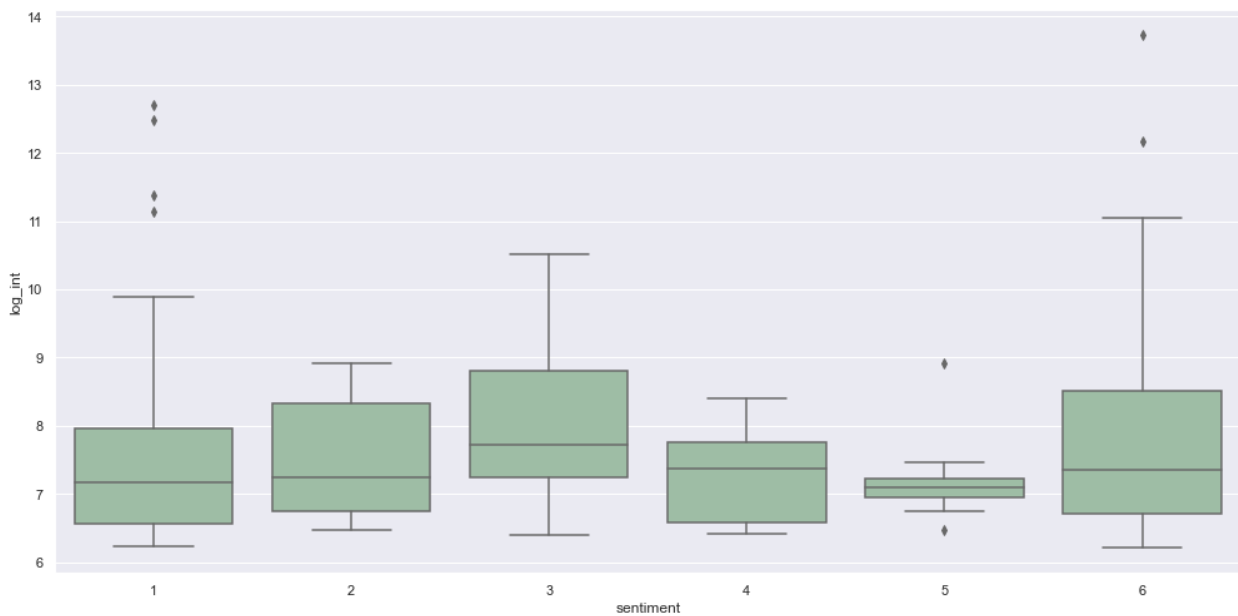


FIGURE D.23: Log interactions across sentiment levels, Instagram sample. $DF = 5$, $N = 211$, $F = .99$, $p = .43$.

Bibliography

- Abdullah, Nor Athiyah et al. (2017). *Why I Retweet? Exploring User's Perspective on Decision-Making of Information Spreading during Disasters*. URL: <http://hdl.handle.net/10125/41202>.
- Abele, Andrea E. et al. (2008). "Fundamental dimensions of social judgment". In: *European Journal of Social Psychology* 38.7, pp. 1063–1065. DOI: [10.1037/0022-3514.89.6.899](https://doi.org/10.1037/0022-3514.89.6.899).
- ACIA (2005). *Arctic Climate Impact Assessment*. Tech. rep. Tromsø, Norway: Arctic Council. URL: <https://oaarchive.arctic-council.org/handle/11374/2453>.
- Albarracín, Dolores and William Hart (2011). "Positive mood + action = negative mood + inaction: effects of general action and inaction concepts on decisions and performance as a function of affect". In: *Emotion* 11.4, pp. 951–957. DOI: [10.1037/a0024130](https://doi.org/10.1037/a0024130).
- Andersen, Kim et al. (2020). *Generational Gaps in Political Media Use and Civic Engagement: From Baby Boomers to Generation Z*. London: Routledge. ISBN: 978-1-00-311149-8. DOI: [10.4324/9781003111498](https://doi.org/10.4324/9781003111498).
- Anderson, Ashley A. (2017). "Effects of Social Media Use on Climate Change Opinion, Knowledge, and Behavior". In: *Oxford Research Encyclopedia of Climate Science*. Oxford University Press. URL: <http://climatescience.oxfordre.com/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-369>.
- Aneez, Zeenab et al. (2019). *India Digital News Report*. Tech. rep. Oxford: Reuters Institute for the Study of Journalism. URL: https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2019-03/India_DNR_FINAL.pdf.
- Australia, 7News (2020). *Media Release*. Tech. rep. 7News Australia. URL: <https://www.sevenwestmedia.com.au/assets/pdfs/151220-7NEWS.com.au-1-with-young-Australians.pdf>.
- Ayers, John W. et al. (2016). "News and Internet Searches About Human Immunodeficiency Virus After Charlie Sheen's Disclosure". In: *JAMA Internal Medicine* 176.4, pp. 552–554. DOI: [10.1001/jamainternmed.2016.0003](https://doi.org/10.1001/jamainternmed.2016.0003).

- Bamberg, Sebastian and Guido Möser (2007). "Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour". In: *Journal of Environmental Psychology* 27.1, pp. 14–25. DOI: [10.1016/j.jenvp.2006.12.002](https://doi.org/10.1016/j.jenvp.2006.12.002).
- Bamberg, Sebastian, Jonas Rees, and Sebastian Seebauer (2015). "Collective climate action: Determinants of participation intention in community-based pro-environmental initiatives". In: *Journal of Environmental Psychology* 43, pp. 155–165.
- Bandura, Albert (1977). "Self-efficacy: Toward a unifying theory of behavioral change". In: *Psychological Review* 84.2, pp. 191–215. DOI: [10.1037/0033-295X.84.2.191](https://doi.org/10.1037/0033-295X.84.2.191).
- (1982). "Self-efficacy mechanism in human agency". In: *American Psychologist* 37.2, pp. 122–147. DOI: [10.1037/0003-066X.37.2.122](https://doi.org/10.1037/0003-066X.37.2.122).
- (2000). "Exercise of Human Agency Through Collective Efficacy". In: *Current Directions in Psychological Science* 9.3, pp. 75–78. DOI: [10.1111/1467-8721.00064](https://doi.org/10.1111/1467-8721.00064).
- Bandura, Albert and Daniel Cervone (1983). "Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems". In: *Journal of Personality and Social Psychology* 45.5, pp. 1017–1028.
- Barbeau, Kheana et al. (2019). "Path analysis in Mplus: A tutorial using a conceptual model of psychological and behavioral antecedents of bulimic symptoms in young adults". In: *The Quantitative Methods for Psychology* 15, pp. 38–53. DOI: [10.20982/tqmp.15.1.p038](https://doi.org/10.20982/tqmp.15.1.p038).
- Barrios-O'Neill, Daniel (2021). "Focus and social contagion of environmental organization advocacy on Twitter". In: *Conservation Biology* 35.1, pp. 307–315. DOI: [10.1111/cobi.13564](https://doi.org/10.1111/cobi.13564).
- Barsade, Sigal G., Constantinos G. V. Coutifaris, and Julianna Pillemer (2018). "Emotional contagion in organizational life". In: *Research in Organizational Behavior* 38, pp. 137–151. DOI: [10.1016/j.riob.2018.11.005](https://doi.org/10.1016/j.riob.2018.11.005).
- Baumann, Fabian et al. (2020). "Modeling Echo Chambers and Polarization Dynamics in Social Networks". In: *Physical Review Letters* 124.4. DOI: <https://doi.org/10.1103/PhysRevLett.124.048301>.
- Baumeister, Roy F. et al. (2001). "Bad is Stronger than Good". In: *Review of General Psychology* 5.4, pp. 323–370. DOI: [10.1037/1089-2680.5.4.323](https://doi.org/10.1037/1089-2680.5.4.323).
- Becatti, Carolina et al. (2019). "Extracting significant signal of news consumption from social networks: the case of Twitter in Italian political elections". In: *Palgrave Communications* 5.1, pp. 1–16. DOI: [10.1057/s41599-019-0300-3](https://doi.org/10.1057/s41599-019-0300-3).

- Bechtel, Robert B., Victor Corral Verdugo, and Jose de Queiroz Pinheiro (1999). "Environmental Belief Systems: United States, Brazil, and Mexico". In: *Journal of Cross-Cultural Psychology* 30.1, pp. 122–128. DOI: [10.1177/0022022199030001008](https://doi.org/10.1177/0022022199030001008).
- Beedie, Christopher, Peter Terry, and Andrew Lane (2005). "Distinctions between emotion and mood". In: *Cognition and Emotion* 19.6, pp. 847–878. DOI: [10.1080/02699930541000057](https://doi.org/10.1080/02699930541000057).
- Bennett, W. Lance and Shanto Iyengar (2008). "A New Era of Minimal Effects? the Changing Foundations of Political Communication". In: *Journal of Communication* 58.4, pp. 707–731. DOI: [10.1111/j.1460-2466.2008.00410.x](https://doi.org/10.1111/j.1460-2466.2008.00410.x).
- Bennett, W. Lance and Alexandra Segerberg (2012). "The Logic of Connective Action". In: *Information, Communication & Society* 15.5, pp. 739–768. DOI: [10.1080/1369118X.2012.670661](https://doi.org/10.1080/1369118X.2012.670661).
- Benzon, Nadia von (2019). "Informed consent and secondary data: Reflections on the use of mothers' blogs in social media research". In: *Area* 51.1. DOI: [10.1111/area.12445](https://doi.org/10.1111/area.12445).
- Bessi, Alessandro et al. (2015). "Science vs Conspiracy: Collective Narratives in the Age of Misinformation". In: *PLOS ONE* 10.2. DOI: <https://doi.org/10.1371/journal.pone.0118093>.
- Betz, Hans-Georg and Carol Johnson (2004). "Against the current—stemming the tide: the nostalgic ideology of the contemporary radical populist right". In: *Journal of Political Ideologies* 9.3, pp. 311–327. DOI: [10.1080/1356931042000263546](https://doi.org/10.1080/1356931042000263546).
- Birkland, Thomas A. (1998). "Focusing Events, Mobilization, and Agenda Setting". In: *Journal of Public Policy* 18.1, pp. 53–74. DOI: [10.1017/S0143814X98000038](https://doi.org/10.1017/S0143814X98000038).
- Blex, Chris and Taha Yasseri (2022). "Positive algorithmic bias cannot stop fragmentation in homophilic networks". In: *The Journal of Mathematical Sociology* 46.1, pp. 80–97. DOI: <https://doi.org/10.1080/0022250X.2020.1818078>.
- Blondel, Vincent D et al. (2008). "Fast unfolding of communities in large networks". In: *Journal of Statistical Mechanics: Theory and Experiment* 2008.10, P10008. DOI: [10.1088/1742-5468/2008/10/P10008](https://doi.org/10.1088/1742-5468/2008/10/P10008).
- Boatwright, Brandon C. (2022). "Exploring online opinion leadership in the network paradigm: An analysis of influential users on Twitter shaping conversations around anthem protests by prominent athletes". In: *Public Relations Review* 48.4. DOI: [10.1016/j.pubrev.2022.102229](https://doi.org/10.1016/j.pubrev.2022.102229).
- Bollen, Johan, Huina Mao, and Xiaojun Zeng (2011). "Twitter mood predicts the stock market". In: *Journal of computational science* 2.1, pp. 1–8. DOI: [10.1016/j.jocs.2010.12.007](https://doi.org/10.1016/j.jocs.2010.12.007).

- Borchardt, Alexandra, Katherine Dunn, and Felix Simon (2023). *Climate Journalism That Works: Between Knowledge and Impact*. Tech. rep. European Broadcast Union. URL: https://www.ebu.ch/files/live/sites/ebu/files/Publications/strategic/open/News_report_2023_Climate_Journalism.pdf.
- Bostrom, Ann, Adam L. Hayes, and Katherine M. Crosman (2019). "Efficacy, Action, and Support for Reducing Climate Change Risks". In: *Risk Analysis* 39.4, pp. 805–828. DOI: [10.1111/risa.13210](https://doi.org/10.1111/risa.13210).
- Boulianne, Shelley (2015). "Social media use and participation: a meta-analysis of current research". In: *Information, Communication & Society* 18.5, pp. 524–538. DOI: [10.1080/1369118X.2015.1008542](https://doi.org/10.1080/1369118X.2015.1008542).
- Boulianne, Shelley, Mireille Lalancette, and David Ilkiw (2020). "'School Strike 4 Climate': Social Media and the International Youth Protest on Climate Change". In: *Media and Communication* 8.2, pp. 208–218. DOI: [10.17645/mac.v8i2.2768](https://doi.org/10.17645/mac.v8i2.2768).
- Boulianne, Shelley and Yannis Theocharis (2020). "Young People, Digital Media, and Engagement: A Meta-Analysis of Research". In: *Social Science Computer Review* 38.2, pp. 111–127. ISSN: 0894-4393. DOI: [10.1177/0894439318814190](https://doi.org/10.1177/0894439318814190).
- Bouman, Thijs et al. (2020). "When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions". In: *Global Environmental Change* 62, p. 102061. DOI: [10.1016/j.gloenvcha.2020.102061](https://doi.org/10.1016/j.gloenvcha.2020.102061).
- Bourdieu, Pierre (1990). *The Logic of Practice*. Trans. by Richard Nice. Stanford: Stanford University Press.
- (1998). *Practical Reason: On the Theory of Action*. Trans. by Randall Johnson. Stanford: Stanford University Press.
- Bovet, Alexandre and Hernán A. Makse (2019). "Influence of fake news in Twitter during the 2016 US presidential election". In: *Nature Communications* 10.1, pp. 1–14. DOI: <https://doi.org/10.1038/s41467-018-07761-2>.
- Bowman, Shayne and Chris Willis (2003). *We Media: How audiences are shaping the future of news and information*. Tech. rep. The Media Center at The American Press Institute, p. 66.
- Boyd, Danah and Kate Crawford (2012). "Critical Questions for Big Data". In: *Information, Communication & Society* 15.5, pp. 662–679. DOI: [10.1080/1369118X.2012.678878](https://doi.org/10.1080/1369118X.2012.678878).

- boyd, Danah, Scott Golder, and Gilad Lotan (2010). "Tweet, Tweet, Retweet: Conversational Aspects of Retweeting on Twitter". In: *2010 43rd Hawaii International Conference on System Sciences*, pp. 1–10. DOI: [10.1109/HICSS.2010.412](https://doi.org/10.1109/HICSS.2010.412).
- Boykoff, Jules (2012). "US Media Coverage of the Cancún Climate Change Conference". In: *PS: Political Science & Politics* 45.2, pp. 251–258. DOI: [10.1017/S104909651100206X](https://doi.org/10.1017/S104909651100206X).
- Bozarth, Lia and Ceren Budak (2017). "Is Slacktivism Underrated? Measuring the Value of Slacktivists for Online Social Movements". In: *Proceedings of the Eleventh International AAI Conference on Web and Social Media*. Montréal, Canada: Association for the Advancement of Artificial Intelligence, pp. 484–487. DOI: [10.1609/icwsm.v11i1.14908](https://doi.org/10.1609/icwsm.v11i1.14908).
- Bradley, Margaret and Peter Lang (1994). "Measuring emotion: The self-assessment manikin and the semantic differential". In: *Journal of Behavior Therapy and Experimental Psychiatry* 25.1, pp. 49–59. DOI: [10.1016/0005-7916\(94\)90063-9](https://doi.org/10.1016/0005-7916(94)90063-9).
- Brandes, Ulrik et al. (2008). "On Modularity Clustering". In: *IEEE Transactions on Knowledge and Data Engineering* 20.2, pp. 172–188. DOI: <https://doi.org/10.1109/TKDE.2007.190689>.
- Bruno, Matteo, Renaud Lambiotte, and Fabio Saracco (2022). "Brexit and bots: characterizing the behaviour of automated accounts on Twitter during the UK election". In: *EPJ Data Science* 11.1, pp. 1–24. DOI: <https://doi.org/10.1140/epjds/s13688-022-00330-0>.
- Brunswik, Egon (1940). "Thing constancy as measured by correlation coefficients". In: *Psychological Review* 47, pp. 69–78. DOI: [10.1037/h0057921](https://doi.org/10.1037/h0057921).
- (1952). *The conceptual framework of psychology*. (Int. Encycl. unified Sci., v. 1, no. 10.) The conceptual framework of psychology. (Int. Encycl. unified Sci., v. 1, no. 10.) Oxford, England: Univ. Chicago Press.
- Bucy, Erik P et al. (2020). "Performing populism: Trump's transgressive debate style and the dynamics of Twitter response". In: *New Media & Society* 22.4, pp. 634–658. DOI: <https://doi.org/10.1177/1461444819893984>.
- Butcher, Ryan (2018). *Vegans warned about choosing products linked to companies that also trade on 'animal exploitation'*. URL: <https://www.independent.co.uk/news/business/news/vegan-products-meat-dairy-companies-links-warning-a8163091.html>.
- Caraher, M. and J. Landon (2006). "The impact of advertising on food choice: the social context of advertising." In: *The psychology of food choice*. CABI Books, pp. 227–245. DOI: [10.1079/9780851990323.0227](https://doi.org/10.1079/9780851990323.0227).

- Cardenal, Ana S, Carol Galais, and Sílvia Majó-Vázquez (2019). "Is Facebook Eroding the Public Agenda? Evidence From Survey and Web-Tracking Data". In: *International Journal of Public Opinion Research* 31.4, pp. 589–608. DOI: [10.1093/ijpor/edy025](https://doi.org/10.1093/ijpor/edy025).
- Carroll, Archie B. (1979). "A Three-Dimensional Conceptual Model of Corporate Performance". In: *Academy of Management Review* 4.4, pp. 497–505. DOI: [10.5465/amr.1979.4498296](https://doi.org/10.5465/amr.1979.4498296).
- Carvalho, Anabela (2010). "Media(ted)discourses and climate change: a focus on political subjectivity and (dis)engagement". In: *WIREs Climate Change* 1.2, pp. 172–179. DOI: [10.1002/wcc.13](https://doi.org/10.1002/wcc.13).
- Castells, Manuel (2009). *The Rise of the Network Society*. 2nd ed. Vol. 1. Wiley.
- Castillo Esparcia, Antonio and Sara López Gómez (2021). "Public Opinion about Climate Change in United States, Partisan View and Media Coverage of the 2019 United Nations Climate Change Conference (COP 25) in Madrid". In: *Sustainability* 13.7. DOI: [10.3390/su13073926](https://doi.org/10.3390/su13073926).
- Cervone, Carmen et al. (2023). "An impartial measure of collective action: Development and validation of the Belief-Aligned Collective Action Scale". In: *European Journal of Psychological Assessment*. DOI: [10.1027/1015-5759/a000762](https://doi.org/10.1027/1015-5759/a000762).
- Cha, Meeyoung et al. (2010). "Measuring user influence in Twitter: The million follower fallacy". In: *in ICWSM '10: Proceedings of international AAAI Conference on Weblogs and Social*.
- Cha, Moon-Kyung, Youjae Yi, and Richard P. Bagozzi (2016). "Effects of Customer Participation in Corporate Social Responsibility (CSR) Programs on the CSR-Brand Fit and Brand Loyalty". In: *Cornell Hospitality Quarterly* 57.3, pp. 235–249. DOI: [10.1177/1938965515620679](https://doi.org/10.1177/1938965515620679).
- Chadwick, Amy (2014). "Toward a Theory of Persuasive Hope: Effects of Cognitive Appraisals, Hope Appeals, and Hope in the Context of Climate Change". In: *Health Communication* 30.6, pp. 598–611. DOI: [10.1080/10410236.2014.916777](https://doi.org/10.1080/10410236.2014.916777).
- Chadwick, Andrew (2013). *The Hybrid Media System: Politics and Power*. Oxford Studies in Digital Politics. Oxford University Press. DOI: [10.1093/acprof:oso/9780199759477.001.0001](https://doi.org/10.1093/acprof:oso/9780199759477.001.0001).
- Chapin, F. Stuart et al. (2022). "Earth stewardship: Shaping a sustainable future through interacting policy and norm shifts". In: *Ambio* 51.9, pp. 1907–1920. DOI: [10.1007/s13280-022-01721-3](https://doi.org/10.1007/s13280-022-01721-3).
- Chapman, Daniel A., Brian Lickel, and Ezra M. Markowitz (2017). "Reassessing emotion in climate change communication". In: *Nature Climate Change* 7.12, pp. 850–852. DOI: [10.1038/s41558-017-0021-9](https://doi.org/10.1038/s41558-017-0021-9).

- Chen, Kaiping et al. (2022). "How Climate Movement Actors and News Media Frame Climate Change and Strike: Evidence from Analyzing Twitter and News Media Discourse from 2018 to 2021:" in: *The International Journal of Press/Politics*. DOI: [10.1177/19401612221106405](https://doi.org/10.1177/19401612221106405).
- Cherepnalkoski, Darko and Igor Mozetic (2015). "A Retweet Network Analysis of the European Parliament". In: *2015 11th International Conference on Signal-Image Technology Internet-Based Systems (SITIS)*, pp. 350–357. DOI: [10.1109/SITIS.2015.8](https://doi.org/10.1109/SITIS.2015.8).
- Cherepnalkoski, Darko and Igor Mozetič (2016). "Retweet networks of the European Parliament: evaluation of the community structure". In: *Applied Network Science* 1.1, pp. 1–20. DOI: [10.1007/s41109-016-0001-4](https://doi.org/10.1007/s41109-016-0001-4).
- Chong, Dennis and James N. Druckman (2007). "Framing Theory". In: *Annual Review of Political Science* 10.1, pp. 103–126. DOI: [10.1146/annurev.polisci.10.072805.103054](https://doi.org/10.1146/annurev.polisci.10.072805.103054).
- Chowdhury, Rumman (n.d.). *I Watched Elon Musk Kill Twitter's Culture From the Inside*. URL: <https://www.theatlantic.com/technology/archive/2023/02/elon-musk-twitter-ethics-algorithm-biases/673110/>.
- Cinelli, Matteo et al. (2021). "The echo chamber effect on social media". In: *Proceedings of the National Academy of Sciences* 118.9. DOI: <https://doi.org/10.1073/pnas.2023301118>.
- Clay, Nathan et al. (2020). "Palatable disruption: the politics of plant milk". In: *Agriculture and Human Values* 37.4, pp. 945–962. DOI: [10.1007/s10460-020-10022-y](https://doi.org/10.1007/s10460-020-10022-y).
- CNN - Bias and Credibility (2023). URL: <https://mediabiasfactcheck.com/left/cnn-bias/>.
- Coan, Travis G. et al. (2021). "Computer-assisted classification of contrarian claims about climate change". In: *Scientific Reports* 11.1. DOI: [10.1038/s41598-021-01714-4](https://doi.org/10.1038/s41598-021-01714-4).
- Cole, Matthew and Karen Morgan (2011). "Vegaphobia: derogatory discourses of veganism and the reproduction of speciesism in UK national newspapers1". In: *The British Journal of Sociology* 62.1, pp. 134–153. DOI: [10.1111/j.1468-4446.2010.01348.x](https://doi.org/10.1111/j.1468-4446.2010.01348.x).
- Comfort, Suzannah Evans and Joe Bob Hester (2019). "Three Dimensions of Social Media Messaging Success by Environmental NGOs". In: *Environmental Communication* 13.3, pp. 281–286. DOI: [10.1080/17524032.2019.1579746](https://doi.org/10.1080/17524032.2019.1579746).
- Conover, Michael et al. (2011). "Political Polarization on Twitter". In: *Proceedings of the International AAAI Conference on Web and Social Media* 5.1, pp. 89–96. URL: <https://ojs.aaai.org/index.php/ICWSM/article/view/14126>.

- Cornia, Alessio et al. (2018). *Private Sector News, Social Media Distribution, and Algorithm Change*. Tech. rep. Reuters Institute for the Study of Journalism: University of Oxford. URL: https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2018-10/Cornia_Private_Sector_News_FINAL.pdf.
- Crosby, Faye (1976). "A model of egoistical relative deprivation". In: *Psychological Review* 83.2, pp. 85–113. DOI: [10.1037/0033-295X.83.2.85](https://doi.org/10.1037/0033-295X.83.2.85).
- Crosby, Faye and A. Miren Gonzalez-Intal (1984). "Relative Deprivation and Equity Theories". In: *The Sense of Injustice: Social Psychological Perspectives*. Ed. by Robert Folger. Critical Issues in Social Justice. Boston, MA: Springer US, pp. 141–166. DOI: [10.1007/978-1-4613-2683-0_5](https://doi.org/10.1007/978-1-4613-2683-0_5).
- CrowdTangle (2023). *About Us*. URL: <http://help.crowdtangle.com/en/articles/4201940-about-us>.
- Cruz, Shannon M. (2017). "The relationships of political ideology and party affiliation with environmental concern: A meta-analysis". In: *Journal of Environmental Psychology* 53, pp. 81–91. DOI: [10.1016/j.jenvp.2017.06.010](https://doi.org/10.1016/j.jenvp.2017.06.010).
- Cusworth, George et al. (2022). "Green rebranding: Regenerative agriculture, future-pasts, and the naturalisation of livestock". In: *Transactions of the Institute of British Geographers* 00.n/a, pp. 1–19. DOI: [10.1111/tran.12555](https://doi.org/10.1111/tran.12555).
- Dahal, Biraj, Sathish A. P. Kumar, and Zhenlong Li (2019). "Topic modeling and sentiment analysis of global climate change tweets". In: *Social Network Analysis and Mining* 9.1, p. 24. DOI: [10.1007/s13278-019-0568-8](https://doi.org/10.1007/s13278-019-0568-8).
- Dahlberg, Lincoln (2001). "The Internet and Democratic Discourse: Exploring The Prospects of Online Deliberative Forums Extending the Public Sphere". In: *Information, Communication & Society* 4.4, pp. 615–633. DOI: [10.1080/13691180110097030](https://doi.org/10.1080/13691180110097030).
- Daly, Meaghan et al. (2022). *World Newspaper Coverage of Climate Change or Global Warming, 2004–2022*. Cooperative Institute for Research in Environmental Sciences.
- Dechezleprêtre, Antoine et al. (2022). *Fighting climate change: International attitudes toward climate policies*. Tech. rep. Paris: OECD. DOI: [10.1787/3406f29a-en](https://doi.org/10.1787/3406f29a-en).
- Dekoninck, Heleen and Desiree Schmuck (2022). "The Mobilizing Power of Influencers for Pro-Environmental Behavior Intentions and Political Participation". In: *Environmental Communication* 16.4, pp. 458–472. DOI: [10.1080/17524032.2022.2027801](https://doi.org/10.1080/17524032.2022.2027801).

- Del Vicario, Michela, Alessandro Bessi, et al. (2016). "The spreading of misinformation online". In: *Proceedings of the National Academy of Sciences* 113.3, pp. 554–559. URL: <http://www.pnas.org/lookup/doi/10.1073/pnas.1517441113>.
- Del Vicario, Michela, Gianna Vivaldo, et al. (2016). "Echo Chambers: Emotional Contagion and Group Polarization on Facebook". In: *Scientific Reports* 6.1, p. 37825. DOI: [10.1038/srep37825](https://doi.org/10.1038/srep37825).
- Diamond, Emily and Kaitlin Urbanski (2022). "The Impact of Message Valence on Climate Change Attitudes: A Longitudinal Experiment". In: *Environmental Communication*. DOI: [10.1080/17524032.2022.2151486](https://doi.org/10.1080/17524032.2022.2151486).
- Dickinson, David (2015). *The case for a 'deficit model' of science communication*. URL: <https://www.scidev.net/global/editorials/the-case-for-a-deficit-model-of-science-communic/>.
- DiMaggio, Paul, Manish Nag, and David Blei (2013). "Exploiting affinities between topic modeling and the sociological perspective on culture: Application to newspaper coverage of U.S. government arts funding". In: *Poetics. Topic Models and the Cultural Sciences* 41.6, pp. 570–606. DOI: [10.1016/j.poetic.2013.08.004](https://doi.org/10.1016/j.poetic.2013.08.004).
- Dirikx, Astrid and Dave Gelders (2010). "To frame is to explain: A deductive frame-analysis of Dutch and French climate change coverage during the annual UN Conferences of the Parties". In: *Public Understanding of Science* 19.6, pp. 732–742. DOI: [10.1177/0963662509352044](https://doi.org/10.1177/0963662509352044).
- DiRusso, Carlina and Jessica Gall Myrick (2021). "Sustainability in CSR Messages on Social Media: How Emotional Framing and Efficacy Affect Emotional Response, Memory and Persuasion". In: *Environmental Communication* 15.8, pp. 1045–1060. DOI: [10.1080/17524032.2021.1933120](https://doi.org/10.1080/17524032.2021.1933120).
- Dominick, B (2015). "Anarcho-Veganism Revisited". In: *Anarchism and Animal Liberation: Essays on Complementary Elements of Total Liberation*. Ed. by A.J. Nocella, RJ White, and E Cudworth, pp. 23–39.
- Downs, A. (1972). "Up and down with Ecology-the Issue-Attention Cycle". In: *The Public Interest* 28, pp. 38–50.
- Doyle, Julie (2016). "Celebrity vegans and the lifestyling of ethical consumption". In: *Environmental Communication* 10.6, pp. 777–790. DOI: [10.1080/17524032.2016.1205643](https://doi.org/10.1080/17524032.2016.1205643).
- Du, Shuili and Edward T. Vieira (2012). "Striving for Legitimacy Through Corporate Social Responsibility: Insights from Oil Companies". In: *Journal of Business Ethics* 110.4, pp. 413–427. DOI: [10.1007/s10551-012-1490-4](https://doi.org/10.1007/s10551-012-1490-4).

- Dunaway, Johanna et al. (2018). "News Attention in a Mobile Era". In: *Journal of Computer-Mediated Communication* 23.2, pp. 107–124. DOI: [10.1093/jcmc/zmy004](https://doi.org/10.1093/jcmc/zmy004).
- Duranti, Alessandro (2005). "Agency in Language". In: *A Companion to Linguistic Anthropology*. John Wiley & Sons, Ltd, pp. 449–473. DOI: [10.1002/9780470996522.ch20](https://doi.org/10.1002/9780470996522.ch20).
- Dutkiewicz, Jan and Jonathan Dickstein (2021). "The Ism in Veganism: The Case for a Minimal Practice-based Definition". In: *Food Ethics* 6.1, p. 2. DOI: [10.1007/s41055-020-00081-6](https://doi.org/10.1007/s41055-020-00081-6).
- Dyer, Joel and Blas Kolic (2020). "Public risk perception and emotion on Twitter during the Covid-19 pandemic". In: *Applied Network Science* 5.1, pp. 1–32. DOI: [10.1007/s41109-020-00334-7](https://doi.org/10.1007/s41109-020-00334-7).
- Earl, Jennifer, Thomas V. Maher, and Thomas Elliott (2017). "Youth, activism, and social movements". In: *Sociology Compass* 11.4, e12465. DOI: [10.1111/soc4.12465](https://doi.org/10.1111/soc4.12465).
- Eide, Elisabeth and Risto Kunelius (2010). "Domesticating global moments. A transnational study on the coverage of the Bali and Copenhagen climate summits". In: *Global climate – Local journalism*. Ed. by Elisabeth Eide, Risto Kunelius, and Ville Kumpu. Global Journalism Research 3. Bochum: Projekt Verlag, pp. 11–50.
- (2021). "Voices of a generation the communicative power of youth activism". In: *Climatic Change* 169.1, p. 6. DOI: [10.1007/s10584-021-03211-z](https://doi.org/10.1007/s10584-021-03211-z).
- Ekberg, Kristoffer et al. (2023). *Climate Obstruction: How Denial, Delay and Inaction are Heating the Planet*. Routledge. URL: <https://www.routledge.com/Climate-Obstruction-How-Denial-Delay-and-Inaction-are-Heating-the-Planet/Ekberg-Forchtner-Hultman-Jylha/p/book/9781032019475>.
- Ekman, Paul and Richard J. Davidson (1994). *The nature of emotion: fundamental questions*. Series in affective science. New York ; Oxford: Oxford University Press.
- Ellemers, Naomi, Paulien Kortekaas, and Jaap W. Ouwerkerk (1999). "Self-categorisation, commitment to the group and group self-esteem as related but distinct aspects of social identity". In: *European Journal of Social Psychology* 29.2-3, pp. 371–389.
- Emirbayer, Mustafa and Ann Mische (1998). "What is agency?" In: *American journal of sociology* 103.4, pp. 962–1023.
- Entman, Robert M. (1993). "Framing: Toward Clarification of a Fractured Paradigm". In: *Journal of Communication* 43.4. DOI: [10.1111/j.1460-2466.1993.tb01304.x](https://doi.org/10.1111/j.1460-2466.1993.tb01304.x).

- Ettinger, Joshua et al. (2021). "Climate of hope or doom and gloom? Testing the climate change hope vs. fear communications debate through online videos". In: *Climatic Change* 164.1, p. 19. DOI: [10.1007/s10584-021-02975-8](https://doi.org/10.1007/s10584-021-02975-8).
- Evans, D. Gareth et al. (2015). "Longer term effects of the Angelina Jolie effect: increased risk-reducing mastectomy rates in BRCA carriers and other high-risk women". In: *Breast Cancer Research* 17.1, p. 143. DOI: [10.1186/s13058-015-0650-8](https://doi.org/10.1186/s13058-015-0650-8).
- Evensen, Darrick (2019). "The rhetorical limitations of the #FridaysForFuture movement". In: *Nature Climate Change* 9.6, pp. 428–430. DOI: [10.1038/s41558-019-0481-1](https://doi.org/10.1038/s41558-019-0481-1).
- Evkoski, Bojan et al. (2020). *A Slovenian Retweet Network 2018-2020*. Complex Networks 2020.
- Facebook (2023). *About verified Pages and profiles | Facebook Help Center*. URL: <https://www.facebook.com/help/196050490547892>.
- Fairlie, Simon (2010). *Meat: A Benign Extravagance*. Chelsea Green Publishing.
- Falkenberg, Max et al. (2022). "Growing polarization around climate change on social media". In: *Nature Climate Change*, pp. 1–8. DOI: [10.1038/s41558-022-01527-x](https://doi.org/10.1038/s41558-022-01527-x).
- Fan, Rui et al. (2014). "Anger Is More Influential than Joy: Sentiment Correlation in Weibo". In: *PLOS ONE* 9.10. DOI: [10.1371/journal.pone.0110184](https://doi.org/10.1371/journal.pone.0110184).
- Fausey, Caitlin et al. (2010). "Constructing Agency: The Role of Language". In: *Frontiers in Psychology* 1. URL: <https://www.frontiersin.org/article/10.3389/fpsyg.2010.00162>.
- Faverio, Michelle (2023). *Majority of U.S. Twitter users say they've taken a break from the platform in the past year*. URL: <https://www.pewresearch.org/short-reads/2023/05/17/majority-of-us-twitter-users-say-theyve-taken-a-break-from-the-platform-in-the-past-year/>.
- Fayant, Marie-Pierre et al. (2017). "On the Limitations of Manipulation Checks: An Obstacle Toward Cumulative Science". In: *International Review of Social Psychology* 30.1, pp. 125–130. DOI: [10.5334/irsp.102](https://doi.org/10.5334/irsp.102).
- Feinberg, Matthew and Robb Willer (2011). "Apocalypse Soon?: Dire Messages Reduce Belief in Global Warming by Contradicting Just-World Beliefs". In: *Psychological Science* 22.1, pp. 34–38. DOI: [10.1177/0956797610391911](https://doi.org/10.1177/0956797610391911).
- Feldman, L. and P. Hart (2016). "Using Political Efficacy Messages to Increase Climate Activism: The Mediating Role of Emotions". In: *Science Communication* 38.1, pp. 99–127. DOI: [10.1177/1075547015617941](https://doi.org/10.1177/1075547015617941).

- Fernandez, Miriam, Lara Piccolo, Harith Alani, et al. (2017). "Pro-Environmental Campaigns via Social Media: Analysing Awareness and Behaviour Patterns". In: *The Journal of Web Science* 3. DOI: [10.34962/jws-44](https://doi.org/10.34962/jws-44).
- Fernandez, Miriam, Lara Piccolo, Diana Maynard, et al. (2016). "Talking Climate Change via Social Media: Communication, Engagement and Behaviour". In: New York, USA: ACM Press, pp. 85–94. URL: <http://oro.open.ac.uk/46530/>.
- Fernández, Miriam et al. (2015). "Analysing engagement towards the 2014 Earth Hour Campaign in Twitter". In: *EnviroInfo & ICT4S 2015: Building the Knowledge Base for Environmental Action and Sustainability*. Copenhagen, Denmark. URL: <http://oro.open.ac.uk/43621/>.
- Ferrara, Emilio and Zeyao Yang (2015). "Measuring Emotional Contagion in Social Media". In: *PLOS ONE* 10.11. DOI: [10.1371/journal.pone.0142390](https://doi.org/10.1371/journal.pone.0142390).
- Fetterman, Adam K., Ryan L. Boyd, and Michael D. Robinson (2015). "Power Versus Affiliation in Political Ideology: Robust Linguistic Evidence for Distinct Motivation-Related Signatures". In: *Personality and Social Psychology Bulletin* 41.9, pp. 1195–1206. DOI: [10.1177/0146167215591960](https://doi.org/10.1177/0146167215591960).
- Field, Anjalie and Yulia Tsvetkov (2019). "Entity-Centric Contextual Affective Analysis". In: *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics*. Florence, Italy: Association for Computational Linguistics, pp. 2550–2560. DOI: [10.18653/v1/P19-1243](https://doi.org/10.18653/v1/P19-1243).
- Flake, Jessica K., Jolynn Pek, and Eric Hehman (2017). "Construct Validation in Social and Personality Research: Current Practice and Recommendations". In: *Social Psychological and Personality Science* 8.4, pp. 370–378. DOI: [10.1177/1948550617693063](https://doi.org/10.1177/1948550617693063).
- Fletcher, Richard, Alessio Cornia, and Rasmus Kleis Nielsen (2020). "How Polarized Are Online and Offline News Audiences? A Comparative Analysis of Twelve Countries". In: *The International Journal of Press/Politics* 25.2, pp. 169–195. DOI: [10.1177/1940161219892768](https://doi.org/10.1177/1940161219892768).
- Folger, Robert (1987). "Reformulating the preconditions of resentment: A referent cognitions model". In: *Social comparison, social justice, and relative deprivation: Theoretical, empirical, and policy perspectives*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc, pp. 183–215.
- Folger, Robert and Chris Martin (1986). "Relative deprivation and referent cognitions: Distributive and procedural justice effects". In: *Journal of Experimental Social Psychology* 22.6, pp. 531–546. DOI: [10.1016/0022-1031\(86\)90049-1](https://doi.org/10.1016/0022-1031(86)90049-1).

- Fond, Guillaume et al. (2015). "Google Trends®: Ready for real-time suicide prevention or just a Zeta-Jones effect? An exploratory study". In: *Psychiatry Research* 228.3, pp. 913–917. DOI: [10.1016/j.psychres.2015.04.022](https://doi.org/10.1016/j.psychres.2015.04.022).
- Foschi, Martha (2014). "Hypotheses, Operationalizations, and Manipulation Checks". In: *Laboratory Experiments in the Social Sciences (Second Edition)*. Ed. by Murray Webster and Jane Sell. San Diego: Academic Press, pp. 247–268. DOI: [10.1016/B978-0-12-404681-8.00011-X](https://doi.org/10.1016/B978-0-12-404681-8.00011-X).
- Fowler, James and Nicholas Christakis (2008). "Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study". In: *BMJ* 337. DOI: [10.1136/bmj.a2338](https://doi.org/10.1136/bmj.a2338).
- Frijda, Nico H. (1986). *The emotions*. The emotions. Paris, France: Editions de la Maison des Sciences de l'Homme.
- Fusaroli, Riccardo and Kristian Tylén (2012). "Carving language for social coordination: A dynamical approach". In: *Interaction Studies. Social Behaviour and Communication in Biological and Artificial Systems* 13.1, pp. 103–124. DOI: [10.1075/is.13.1.07fus](https://doi.org/10.1075/is.13.1.07fus).
- Gaisbauer, Felix et al. (2021). "Ideological differences in engagement in public debate on Twitter". In: *PLOS ONE* 16.3, e0249241. DOI: [10.1371/journal.pone.0249241](https://doi.org/10.1371/journal.pone.0249241).
- Gamson, William A. and David Stuart (1992). "Media discourse as a symbolic contest: The bomb in political cartoons". In: *Sociological Forum* 7.1, pp. 55–86. DOI: [10.1007/BF01124756](https://doi.org/10.1007/BF01124756).
- Gamson, William A. and Gadi Wolfsfeld (1993). "Movements and Media as Interacting Systems". In: *The Annals of the American Academy of Political and Social Science* 528, pp. 114–125. URL: <https://www.jstor.org/stable/1047795>.
- Garcia, David, Victor Galaz, and Stefan Daume (2019). "EATLancet vs yes2meat: the digital backlash to the planetary health diet". In: *The Lancet* 394.10215, pp. 2153–2154. DOI: [10.1016/S0140-6736\(19\)32526-7](https://doi.org/10.1016/S0140-6736(19)32526-7).
- Garimella, Venkata Rama Kiran and Ingmar Weber (2017). "A Long-Term Analysis of Polarization on Twitter". In: *AAAI Conference on Web and Social Media*.
- Gaumont, Noé, Maziyar Panahi, and David Chavalarias (2018). "Reconstruction of the socio-semantic dynamics of political activist Twitter networks—Method and application to the 2017 French presidential election". In: *PLOS ONE* 13.9. DOI: [10.1371/journal.pone.0201879](https://doi.org/10.1371/journal.pone.0201879).
- Gavin, Neil T. (2009). "Addressing climate change: a media perspective". In: *Environmental Politics* 18.5, pp. 765–780. DOI: [10.1080/09644010903157081](https://doi.org/10.1080/09644010903157081).

- George, Jordana J. and Dorothy E. Leidner (2019). "From clicktivism to hacktivism: Understanding digital activism". In: *Information and Organization* 29.3, p. 100249. DOI: [10.1016/j.infoandorg.2019.04.001](https://doi.org/10.1016/j.infoandorg.2019.04.001).
- Gifford, Robert (2011). "The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation". In: *American Psychologist - AMER PSYCHOL* 66, pp. 290–302.
- Gifford, Robert and Louise A. Comeau (2011). "Message framing influences perceived climate change competence, engagement, and behavioral intentions". In: *Global Environmental Change* 21.4, pp. 1301–1307. DOI: [10.1016/j.gloenvcha.2011.06.004](https://doi.org/10.1016/j.gloenvcha.2011.06.004).
- Giller, Ken E et al. (2021). "Regenerative Agriculture: An agronomic perspective". In: *Outlook on Agriculture* 50.1, pp. 13–25. DOI: [10.1177/0030727021998063](https://doi.org/10.1177/0030727021998063).
- Giraud, Eva (2021). *Veganism: Politics, Practice, and Theory*. 1st ed. Bloomsbury Publishing Plc. DOI: [10.5040/9781350124950](https://doi.org/10.5040/9781350124950). URL: <https://www.bloomsburycollections.com/book/veganism-politics-practice-and-theory>.
- Gladwell, Malcolm (2011). "Does Egypt Need Twitter?" In: *The New Yorker*. URL: <https://www.newyorker.com/news/news-desk/does-egypt-need-twitter>.
- Godfray, H. Charles J., Paul Aveyard, et al. (2018). "Meat consumption, health, and the environment". In: *Science* 361.6399. DOI: [10.1126/science.aam5324](https://doi.org/10.1126/science.aam5324).
- Godfray, H. Charles J. and Tara Garnett (2014). "Food security and sustainable intensification". In: *Philosophical Transactions of the Royal Society B: Biological Sciences* 369.1639. DOI: [10.1098/rstb.2012.0273](https://doi.org/10.1098/rstb.2012.0273).
- Goldberg, Greg (2011). "Rethinking the public/virtual sphere: The problem with participation". In: *New Media & Society* 13.5, pp. 739–754. DOI: [10.1177/1461444810379862](https://doi.org/10.1177/1461444810379862).
- Goldenberg, Amit and James J. Gross (2020). "Digital Emotion Contagion". In: *Trends in Cognitive Sciences* 24.4, pp. 316–328. DOI: [10.1016/j.tics.2020.01.009](https://doi.org/10.1016/j.tics.2020.01.009).
- González-Bailón, Sandra et al. (2011). "The Dynamics of Protest Recruitment through an Online Network". In: *Scientific Reports* 1.1, p. 197. DOI: [10.1038/srep00197](https://doi.org/10.1038/srep00197).
- Goodman, Michael K. and Sylvia Jaworska (2020). "Mapping digital foodscapes: Digital food influencers and the grammars of good food". In: *Geoforum* 117, pp. 183–193. DOI: [10.1016/j.geoforum.2020.09.020](https://doi.org/10.1016/j.geoforum.2020.09.020).
- Government, Australian (2022). *Audience reach*. Text. URL: <https://www.transparency.gov.au/annual-reports/australian-broadcasting-corporation/reporting-year/2020-21-58>.

- Granovetter, Mark S. (1973). "The Strength of Weak Ties". In: *American Journal of Sociology* 78.6, pp. 1360–1380.
- Grčar, Miha et al. (2017). "Stance and influence of Twitter users regarding the Brexit referendum". In: *Computational Social Networks* 4.1, p. 6. DOI: [10.1186/s40649-017-0042-6](https://doi.org/10.1186/s40649-017-0042-6).
- Greenebaum, Jessica (2012). "Veganism, Identity and the Quest for Authenticity". In: *Food, Culture & Society* 15.1, pp. 129–144. DOI: [10.2752/175174412X13190510222101](https://doi.org/10.2752/175174412X13190510222101).
- Grundmann, Reiner and Mike Scott (2014). "Disputed climate science in the media: Do countries matter?" In: *Public Understanding of Science* 23.2, pp. 220–235. DOI: [10.1177/0963662512467732](https://doi.org/10.1177/0963662512467732).
- Gruzd, Anatoliy and Jeffrey Roy (2014). "Investigating Political Polarization on Twitter: A Canadian Perspective". In: *Policy & Internet* 6.1, pp. 28–45. DOI: [10.1002/1944-2866.P0I354](https://doi.org/10.1002/1944-2866.P0I354).
- Guerra, Pedro et al. (2013). "A Measure of Polarization on Social Media Networks Based on Community Boundaries". In: *Proceedings of the International AAAI Conference on Web and Social Media* 7.1, pp. 215–224. DOI: [10.1609/icwsm.v7i1.14421](https://doi.org/10.1609/icwsm.v7i1.14421).
- Guimond, Serge and Lise Dubé-Simard (1983). "Relative deprivation theory and the Quebec nationalist movement: The cognition–emotion distinction and the personal–group deprivation issue". In: *Journal of Personality and Social Psychology* 44.3, pp. 526–535. DOI: [10.1037/0022-3514.44.3.526](https://doi.org/10.1037/0022-3514.44.3.526).
- Gunnarsson, Andreas and Mark Elam (2012). "Food Fight! The Swedish Low-Carb/High Fat (LCHF) Movement and the Turning of Science Popularisation Against the Scientists". In: *Science as Culture* 21.3, pp. 315–334. DOI: [10.1080/09505431.2011.632000](https://doi.org/10.1080/09505431.2011.632000).
- Gurwitt, Sonya, Kari Malkki, and Mili Mitra (2017). "Global issue, developed country bias: the Paris climate conference as covered by daily print news organizations in 13 nations". In: *Climatic Change* 143.3, pp. 281–296. DOI: [10.1007/s10584-017-2004-2](https://doi.org/10.1007/s10584-017-2004-2).
- Gurwitt, Sonya and Roberts Timmons (2015). *The Paris climate talks according to U.S. print media: Plenty of heat, but not so much light*. URL: <https://www.brookings.edu/blog/planetpolicy/2015/12/18/the-paris-climate-talks-according-to-u-s-print-media-plenty-of-heat-but-not-so-much-light/>.
- Guthman, Julie (2008). "Neoliberalism and the making of food politics in California". In: *Geoforum. Rethinking Economy* 39.3, pp. 1171–1183. DOI: [10.1016/j.geoforum.2006.09.002](https://doi.org/10.1016/j.geoforum.2006.09.002).
- Haile, Tony (2014). *What You Get Wrong about the Internet*. URL: <https://time.com/12933/what-you-think-you-know-about-the-web-is-wrong/>.

- Han, Heejin and Sang Wuk Ahn (2020). "Youth Mobilization to Stop Global Climate Change: Narratives and Impact". In: *Sustainability* 12.10, p. 4127. DOI: [10.3390/su12104127](https://doi.org/10.3390/su12104127).
- Harding, Emma J., Elizabeth S. Paul, and Michael Mendl (2004). "Cognitive bias and affective state". In: *Nature* 427.6972, pp. 312–312. DOI: [10.1038/427312a](https://doi.org/10.1038/427312a).
- Harper, Breeze (2010). "Race as a "feeble matter" in Veganism: Interrogating whiteness, geopolitical privilege, and consumption philosophy of "cruelty-free" products". In: *Journal for Critical Animal Studies* 8.3, pp. 5–27.
- Hart, P. and L. Feldman (2016). "The Influence of Climate Change Efficacy Messages and Efficacy Beliefs on Intended Political Participation". In: *PLOS ONE* 11.8. URL: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157658>.
- Haßler, Jörg et al. (2021). "Influence of the pandemic lockdown on Fridays for Future's hashtag activism". In: *New Media & Society*. DOI: [10.1177/14614448211026575](https://doi.org/10.1177/14614448211026575).
- Hatfield, Elaine, John T. Cacioppo, and Richard L. Rapson (1993). "Emotional Contagion". In: *Current Directions in Psychological Science* 2.3, pp. 96–100. DOI: [10.1111/1467-8721.ep10770953](https://doi.org/10.1111/1467-8721.ep10770953).
- Hauser, David J., Phoebe C. Ellsworth, and Richard Gonzalez (2018). "Are Manipulation Checks Necessary?" In: *Frontiers in Psychology* 9. DOI: [10.3389/fpsyg.2018.00998](https://doi.org/10.3389/fpsyg.2018.00998).
- Hautea, Samantha et al. (2021). "Showing They Care (Or Don't): Affective Publics and Ambivalent Climate Activism on TikTok". In: *Social Media + Society* 7.2, p. 20563051211012344. DOI: [10.1177/20563051211012344](https://doi.org/10.1177/20563051211012344).
- Hayashi, Elaine C. S. et al. (2016). "Exploring new formats of the Self-Assessment Manikin in the design with children". In: *Proceedings of the 15th Brazilian Symposium on Human Factors in Computing Systems*. IHC '16. New York, NY, USA: Association for Computing Machinery, pp. 1–10. DOI: [10.1145/3033701.3033728](https://doi.org/10.1145/3033701.3033728).
- Hayes, Andrew F. (2005). *Statistical Methods for Communication Science*. 1st. Routledge Communication Series. Routledge.
- Heiberger, Raphael et al. (2022). "Do Not Blame the Media! The Role of Politicians and Parties in Fragmenting Online Political Debate". In: *The International Journal of Press/Politics* 27.4, pp. 910–941. DOI: [10.1177/19401612211015122](https://doi.org/10.1177/19401612211015122).
- Hendrickx, Laurie and Sietske Nicolaij (2004). "Temporal discounting and environmental risks: The role of ethical and loss-related concerns". In: *Journal of Environmental Psychology* 24.4, pp. 409–422.

- Hernandez, Marco (2020). *This is the effect coronavirus has had on air pollution all across the world*. URL: <https://www.weforum.org/agenda/2020/04/coronavirus-covid19-air-pollution-environment-nature-lockdown/>.
- Herrmann, Christoph, Sebastian Rhein, and Isabelle Dorsch (2022). “#fridaysforfuture – What does Instagram tell us about a social movement?” In: *Journal of Information Science*. DOI: [10.1177/01655515211063620](https://doi.org/10.1177/01655515211063620).
- Hestres, Luis E. and Jill E. Hopke (2017). “Internet-Enabled Activism and Climate Change”. In: *Oxford Research Encyclopedia of Climate Science*. DOI: [10.1093/acrefore/9780190228620.013.404](https://doi.org/10.1093/acrefore/9780190228620.013.404).
- Hilbert, Martin et al. (2017). “One Step, Two Step, Network Step? Complementary Perspectives on Communication Flows in Twittered Citizen Protests”. In: *Social Science Computer Review* 35.4, pp. 444–461. DOI: [10.1177/0894439316639561](https://doi.org/10.1177/0894439316639561). URL: <https://doi.org/10.1177/0894439316639561>.
- Hine, Donald W. et al. (2016). “Preaching to different choirs: How to motivate dismissive, uncommitted, and alarmed audiences to adapt to climate change?” In: *Global Environmental Change* 36, pp. 1–11. DOI: [10.1016/j.gloenvcha.2015.11.002](https://doi.org/10.1016/j.gloenvcha.2015.11.002).
- Hines, Jody M, Harold R Hungerford, and Audrey N Tomera (1987). “Analysis and synthesis of research on responsible environmental behavior: A meta-analysis”. In: *The Journal of environmental education* 18.2, pp. 1–8.
- Hmielowski, Jay D. et al. (2013). “An attack on science? Media use, trust in scientists, and perceptions of global warming:” in: *Public Understanding of Science*. DOI: [10.1177/0963662513480091](https://doi.org/10.1177/0963662513480091).
- Hobson, K. (2002). “Competing Discourses of Sustainable Consumption: Does the ‘Rationalisation of Lifestyles’ Make Sense?” In: *Environmental Politics* 11.2, pp. 95–120. DOI: [10.1080/714000601](https://doi.org/10.1080/714000601).
- Hodges, Heather E. and Galen Stocking (2016). “A pipeline of tweets: environmental movements’ use of Twitter in response to the Keystone XL pipeline”. In: *Environmental Politics* 25.2, pp. 223–247. DOI: [10.1080/09644016.2015.1105177](https://doi.org/10.1080/09644016.2015.1105177).
- Hoewe, Jennifer (2017). “Manipulation Check”. In: *The International Encyclopedia of Communication Research Methods*. John Wiley & Sons, Ltd, pp. 1–5. DOI: [10.1002/9781118901731.iecrm0135](https://doi.org/10.1002/9781118901731.iecrm0135).
- Hoewe, Jennifer, Kathryn Cramer Brownell, and Eric C. Wiemer (2020). “The Role and Impact of Fox News”. In: *The Forum* 18.3, pp. 367–388. DOI: [10.1515/for-2020-2014](https://doi.org/10.1515/for-2020-2014). URL: <https://www.foxnews.com>.

degruyter.com/document/doi/10.1515/for-2020-2014/html?lang%3Den=&casa_token=f0dMNz36ps4AAAAA%3ASZ8L-ZxLmIEAlh8mvoSVPXcI0R00NePYsrV2y7A6r6VL0otVneHRnnHPMiwPGIa5I7StxeHW.

- Hoffman, Andrew J. (2011). "Talking Past Each Other? Cultural Framing of Skeptical and Convinced Logics in the Climate Change Debate". In: *Organization & Environment* 24.1, pp. 3–33. DOI: [10.1177/1086026611404336](https://doi.org/10.1177/1086026611404336).
- Holmberg, Kim and Iina Hellsten (2016). "Integrating and differentiating meanings in tweeting about the fifth Intergovernmental Panel on Climate Change (IPCC) report". In: *First Monday* 21.9. DOI: [10.5210/fm.v21i9.6603](https://doi.org/10.5210/fm.v21i9.6603).
- Hootsuite (2022). *The Global State of Digital 2022*. URL: <https://www.hootsuite.com>.
- Hopke, Jill E. and Luis E. Hestres (2018). "Visualizing the Paris Climate Talks on Twitter: Media and Climate Stakeholder Visual Social Media During COP21". In: *Social Media + Society* 4.3. DOI: [10.1177/2056305118782687](https://doi.org/10.1177/2056305118782687).
- Hornsey, Matthew J. and Kelly S. Fielding (2016). "A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation". In: *Global Environmental Change* 39, pp. 26–34. DOI: [10.1016/j.gloenvcha.2016.04.003](https://doi.org/10.1016/j.gloenvcha.2016.04.003).
- Hsu, M-H et al. (2015). "Determinants of continued use of social media: the perspectives of uses and gratifications theory and perceived interactivity". In: *Information Research* 20.2. URL: <https://informationr.net/ir/20-2/paper671.html>.
- Hunt, Kate and Mike Gruszczynski (2023). "'Horizontal' Two-Step Flow: The Role of Opinion Leaders in Directing Attention to Social Movements in Decentralized Information Environments". In: *Mass Communication and Society* 0.0, pp. 1–24. DOI: [10.1080/15205436.2023.2167663](https://doi.org/10.1080/15205436.2023.2167663). URL: <https://doi.org/10.1080/15205436.2023.2167663>.
- Huszár, Ferenc et al. (2022). "Algorithmic amplification of politics on Twitter". In: *Proceedings of the National Academy of Sciences* 119.1. DOI: [10.1073/pnas.2025334119](https://doi.org/10.1073/pnas.2025334119).
- Hutter, Katharina, Stefan Hoffmann, and Robert Mai (2016). "Carrotmob: A Win-Win-Win Approach to Creating Benefits for Consumers, Business, and Society at Large". In: *Business & Society* 55.7. DOI: [10.1177/0007650315576367](https://doi.org/10.1177/0007650315576367).
- Hwang, Hyesun and Kee-Ok Kim (2015). "Social media as a tool for social movements: the effect of social media use and social capital on intention to participate in social movements". In: *International Journal of Consumer Studies* 39.5, pp. 478–488. DOI: [10.1111/ijcs.12221](https://doi.org/10.1111/ijcs.12221).

- IPCC (2007). *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Tech. rep. Geneva, Switzerland: IPCC. URL: <https://www.ipcc.ch/report/ar4/syr/>.
- (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Tech. rep. Geneva, Switzerland: IPCC. URL: <https://www.ipcc.ch/report/ar5/wg3/>.
- (2019). *Special Report on Climate Change and Land*. URL: <https://www.ipcc.ch/srccl/>.
- Irwin, Alan and Brian Wynne, eds. (1996). *Misunderstanding Science?: The Public Reconstruction of Science and Technology*. Cambridge: Cambridge University Press. DOI: [10.1017/CB09780511563737](https://doi.org/10.1017/CB09780511563737).
- Iyengar, Shanto (1991). *Is Anyone Responsible?: How Television Frames Political Issues*. University of Chicago Press.
- (1996). “Framing Responsibility for Political Issues”. In: *The Annals of the American Academy of Political and Social Science* 546. DOI: [10.1177/0002716296546001006](https://doi.org/10.1177/0002716296546001006).
- Iyengar, Shanto and Donald R. Kinder (1987). *News That Matters: Television and American Opinion*. University of Chicago Press.
- Jacobson, Susan K. et al. (2019). “Love or Loss: Effective message framing to promote environmental conservation”. In: *Applied Environmental Education & Communication* 18.3, pp. 252–265. DOI: [10.1080/1533015X.2018.1456380](https://doi.org/10.1080/1533015X.2018.1456380).
- Jallinoja, Piia, Markus Vinnari, and Mari Niva (2018). “Veganism and Plant-Based Eating: Analysis of Interplay Between Discursive Strategies and Lifestyle Political Consumerism”. In: *The Oxford Handbook of Political Consumerism*. Ed. by Magnus Boström, Michele Micheletti, and Peter Oosterveer. Oxford Handbooks. Oxford: Oxford University Press.
- Jang, S. and P. Hart (2015). “Polarized frames on “climate change” and “global warming” across countries and states: Evidence from Twitter big data”. In: *Global Environmental Change* 32, pp. 11–17. DOI: [10.1016/j.gloenvcha.2015.02.010](https://doi.org/10.1016/j.gloenvcha.2015.02.010).
- Joa, Claire Youngnyo and Gi Woong Yun (2022). “Who Sets Social Media Sentiment?: Sentiment Contagion in the 2016 U.S. Presidential Election Media Tweet Network”. In: *Journalism Practice* 16.7, pp. 1449–1472. DOI: [10.1080/17512786.2020.1856708](https://doi.org/10.1080/17512786.2020.1856708).

- Joireman, Jeffrey A., Terell P. Lasane, et al. (2001). "Integrating social value orientation and the consideration of future consequences within the extended norm activation model of proenvironmental behaviour". In: *British Journal of Social Psychology* 40.1, pp. 133–155. DOI: [10.1348/014466601164731](https://doi.org/10.1348/014466601164731).
- Joireman, Jeffrey A., Paul A. M. Van Lange, and Mark Van Vugt (2004). "Who Cares about the Environmental Impact of Cars?: Those with an Eye toward the Future". In: *Environment and Behavior* 36.2, pp. 187–206. DOI: [10.1177/0013916503251476](https://doi.org/10.1177/0013916503251476).
- Jolly, Ronda (2014). *The ABC: an overview*. URL: https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1415/ABCoverview.
- Jones, Charlotte A. and Aidan Davison (2021). "Disempowering emotions: The role of educational experiences in social responses to climate change". In: *Geoforum* 118, pp. 190–200. DOI: [10.1016/j.geoforum.2020.11.006](https://doi.org/10.1016/j.geoforum.2020.11.006).
- Kahan, Dan (2012). "Why we are poles apart on climate change". In: *Nature* 488.7411, pp. 255–255. DOI: [10.1038/488255a](https://doi.org/10.1038/488255a).
- Kahneman, Daniel and Amos Tversky (1979). "Prospect Theory: An Analysis of Decision under Risk". In: *Econometrica* 47.2, pp. 263–291. URL: <https://www.jstor.org/stable/1914185>.
- (1984). "Choices, values, and frames". In: *American Psychologist* 39.4, pp. 341–350.
- Kaiser, Jonas and Cornelius Puschmann (2017). "Alliance of antagonism: Counterpublics and polarization in online climate change communication". In: *Communication and the Public* 2.4, pp. 371–387. DOI: [10.1177/2057047317732350](https://doi.org/10.1177/2057047317732350).
- Kampf, Constance E. (2018). "Connecting Corporate and Consumer Social Responsibility Through Social Media Activism". In: *Social Media + Society* 4.1, p. 2056305117746357. DOI: [10.1177/2056305117746357](https://doi.org/10.1177/2056305117746357).
- Kang, Jiyeon (2012). "A Volatile Public: The 2009 Whole Foods Boycott on Facebook". In: *Journal of Broadcasting & Electronic Media* 56.4, pp. 562–577. DOI: [10.1080/08838151.2012.732142](https://doi.org/10.1080/08838151.2012.732142).
- Karimi, Fariba et al. (2018). "Homophily influences ranking of minorities in social networks". In: *Scientific reports* 8.1, pp. 1–12. DOI: <https://doi.org/10.1038/s41598-018-29405-7>.
- Katz, Elihu and Paul F. Lazarsfeld (1955). *Personal Influence: The Part Played by People in the Flow of Mass Communications*. 1st ed. London: Collier-Macmillan.

- Kavakli, Baris (2021). *Council Post: Transparency Is No Longer An Option; It's A Must*. URL: <https://www.forbes.com/sites/forbesbusinesscouncil/2021/05/04/transparency-is-no-longer-an-option-its-a-must/>.
- Kawakami, Kerry and Kenneth L. Dion (1993). "The impact of salient self-identities on relative deprivation and action intentions". In: *European Journal of Social Psychology* 23.5, pp. 525–540. DOI: [10.1002/ejsp.2420230509](https://doi.org/10.1002/ejsp.2420230509).
- Kenny, Michael (2017). "Back to the populist future?: understanding nostalgia in contemporary ideological discourse". In: *Journal of Political Ideologies* 22.3, pp. 256–273. DOI: [10.1080/13569317.2017.1346773](https://doi.org/10.1080/13569317.2017.1346773).
- Kim, JooHo, Juhee Bae, and Makarand Hastak (2018). "Emergency information diffusion on online social media during storm Cindy in U.S." In: *International Journal of Information Management* 40, pp. 153–165. DOI: [10.1016/j.ijinfomgt.2018.02.003](https://doi.org/10.1016/j.ijinfomgt.2018.02.003).
- King, Andrew A. and Michael J. Lenox (2000). "Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program". In: *Academy of Management Journal* 43.4, pp. 698–716. DOI: [10.5465/1556362](https://doi.org/10.5465/1556362).
- King, Gary, Benjamin Schneer, and Ariel White (2017). "How the news media activate public expression and influence national agendas". In: *Science* 358.6364, pp. 776–780. DOI: [10.1126/science.aao1100](https://doi.org/10.1126/science.aao1100).
- Kirilenko, Andrei P., Tatiana Molodtsova, and Svetlana O. Stepchenkova (2015). "People as sensors: Mass media and local temperature influence climate change discussion on Twitter". In: *Global Environmental Change* 30, pp. 92–100. DOI: [10.1016/j.gloenvcha.2014.11.003](https://doi.org/10.1016/j.gloenvcha.2014.11.003).
- Kirilenko, Andrei P. and Svetlana O. Stepchenkova (2014). "Public microblogging on climate change: One year of Twitter worldwide". In: *Global Environmental Change* 26, pp. 171–182. DOI: [10.1016/j.gloenvcha.2014.02.008](https://doi.org/10.1016/j.gloenvcha.2014.02.008).
- Klapper, Joseph T (1960). "The effects of mass communication." In.
- Kline, Rex B. (2005). *Principles and practice of structural equation modeling, 2nd ed.* Principles and practice of structural equation modeling, 2nd ed. New York, NY, US: Guilford Press.
- Kormos, Christine and Robert Gifford (2014). "The validity of self-report measures of proenvironmental behavior: A meta-analytic review". In: *Journal of Environmental Psychology* 40, pp. 359–371. DOI: [10.1016/j.jenvp.2014.09.003](https://doi.org/10.1016/j.jenvp.2014.09.003).

- Koteyko, Nelya, Brigitte Nerlich, and Iina Hellsten (2015). "Climate Change Communication and the Internet: Challenges and Opportunities for Research". In: *Environmental Communication* 9.2, pp. 149–152. DOI: [10.1080/17524032.2015.1029297](https://doi.org/10.1080/17524032.2015.1029297).
- Kramer, Adam D. I., Jamie E. Guillory, and Jeffrey T. Hancock (2014). "Experimental evidence of massive-scale emotional contagion through social networks". In: *Proceedings of the National Academy of Sciences* 111.24, pp. 8788–8790. DOI: [10.1073/pnas.1320040111](https://doi.org/10.1073/pnas.1320040111).
- Krange, Olve, Bjørn P. Kaltenborn, and Martin Hultman (Oct. 29, 2021). "'Don't confuse me with facts'—how right wing populism affects trust in agencies advocating anthropogenic climate change as a reality". In: *Humanities and Social Sciences Communications* 8.1, pp. 1–9. DOI: [10.1057/s41599-021-00930-7](https://doi.org/10.1057/s41599-021-00930-7).
- Kristiansen, Silje, James Painter, and Meghan Shea (2020). "Animal Agriculture and Climate Change in the US and UK Elite Media: Volume, Responsibilities, Causes and Solutions". In: *Environmental Communication* 0.0, pp. 1–20. DOI: [10.1080/17524032.2020.1805344](https://doi.org/10.1080/17524032.2020.1805344).
- Krumpal, Ivar (2013). "Determinants of social desirability bias in sensitive surveys: a literature review". In: *Quality & Quantity* 47.4, pp. 2025–2047. DOI: [10.1007/s11135-011-9640-9](https://doi.org/10.1007/s11135-011-9640-9).
- Kunelius, Risto (2020). "On the Overlap of Systemic Events: Covid-19, Climate, and Journalism". In: *Social Media + Society* 6.3, p. 2056305120948197. DOI: [10.1177/2056305120948197](https://doi.org/10.1177/2056305120948197).
- Kunelius, Risto and Elisabeth Eide (2012). "Moment of Hope, Mode of Realism: On the Dynamics of a Transnational Journalistic Field During UN Climate Change Summits". In: *International Journal of Communication* 6.0, p. 25. URL: <https://ijoc.org/index.php/ijoc/article/view/1405>.
- Kunelius, Risto, Matthew Tegelberg, and Matti Pohjonen (2022). "A Social Climate Sphere: Analysing the 2021 Glasgow Climate Summit (COP26) on Twitter A Work-in-Progress Report". In: *Environmental Communication* 0.0, pp. 1–21. DOI: [10.1080/09644008.2022.2056596](https://doi.org/10.1080/09644008.2022.2056596).
- Kwak, Haewoon et al. (2010). "What is Twitter, a social network or a news media?" In: *Proceedings of the 19th international conference on World wide web. WWW '10*. New York, NY, USA: Association for Computing Machinery, pp. 591–600. DOI: [10.1145/1772690.1772751](https://doi.org/10.1145/1772690.1772751).

- Laflin, Peter et al. (2013). "Discovering and validating influence in a dynamic online social network". In: *Social Network Analysis and Mining* 3.4, pp. 1311–1323. DOI: <https://doi.org/10.1007/s13278-013-0143-7>.
- Lakoff, George (2010). *Moral Politics: How Liberals and Conservatives Think, Second Edition*. University of Chicago Press.
- Lang, Peter (1980). "Behavioral treatment and bio-behavioral assessment: Computer applications". In: *Technology in mental health care delivery systems*. Ed. by J Sidowski, J Johnson, and T Williams. Norwood: Ablex, pp. 119–137.
- Lange, Florian, Alexander Steinke, and Siegfried Dewitte (2018). "The Pro-Environmental Behavior Task: A laboratory measure of actual pro-environmental behavior". In: *Journal of Environmental Psychology* 56, pp. 46–54. DOI: [10.1016/j.jenvp.2018.02.007](https://doi.org/10.1016/j.jenvp.2018.02.007).
- De-Lara, Alicia, María-Carmen Erviti, and Bienvenido León (2022). "Communication strategies in the climate change debate on Facebook. Discourse on the Madrid Climate Summit (COP 25)". In: *Profesional de la Información* 31.2. DOI: [10.3145/epi.2022.mar.02](https://doi.org/10.3145/epi.2022.mar.02).
- Lazarsfeld, Paul F., Bernard Berelson, and Hazel Gaudet (1944). *The People's Choice: How the Voter Makes Up His Mind in a Presidential Campaign*. Columbia University Press. DOI: [10.7312/laza93930](https://doi.org/10.7312/laza93930).
- Lazarus, Richard (1991). *Emotion and Adaptation*. Oxford University Press.
- (1993). "Coping theory and research: Past, present, and future". In: *Fifty Years of the Research and Theory of RS Lazarus: An Analysis of Historical and Perennial Issues*, pp. 366–388.
- Lee, Eun et al. (2019). "Homophily and minority size explain perception biases in social networks". In: *Nature human behaviour* 3.10, pp. 1078–1087. DOI: [10.1038/s41562-019-0677-4](https://doi.org/10.1038/s41562-019-0677-4).
- Lee, Myunghee and Amanda Murdie (2020). "The Global Diffusion of the #MeToo Movement". In: *Politics & Gender*, pp. 1–29. URL: <https://www.cambridge.org/core/journals/politics-and-gender/article/abs/global-diffusion-of-the-metoo-movement/9408DE70B7612976E38F77BE2D6E>
- Leiserowitz, Anthony (2007). "Communicating the risks of global warming: American risk perceptions, affective images, and interpretive communities". In: *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Ed. by Lisa Dilling and Susanne C. Moser. Cambridge: Cambridge University Press, pp. 44–63. DOI: [10.1017/CB09780511535871.005](https://doi.org/10.1017/CB09780511535871.005).

- Leiserowitz, Anthony et al. (2022). *Climate Change in the American Mind, April 2022*. Tech. rep. New Haven, CT: Yale Program on Climate Change Communication.: Yale University and George Mason University. URL: <https://climatecommunication.yale.edu/publications/climate-change-in-the-american-mind-april-2022/>.
- Lench, Heather C., Aaron B. Taylor, and Shane W. Bench (2014). "An alternative approach to analysis of mental states in experimental social cognition research". In: *Behavior Research Methods* 46.1, pp. 215–228. DOI: [10.3758/s13428-013-0351-0](https://doi.org/10.3758/s13428-013-0351-0).
- Li, Yevgeniya, Jean-Grégoire Bernard, and Markus Luczak-Roesch (2021). "Beyond Clicktivism: What Makes Digitally Native Activism Effective? An Exploration of the Sleeping Giants Movement". In: *Social Media + Society* 7.3, p. 20563051211035357. DOI: [10.1177/20563051211035357](https://doi.org/10.1177/20563051211035357). URL: <https://doi.org/10.1177/20563051211035357>.
- Lindsay, James J. and Alan Strathman (1997). "Predictors of Recycling Behavior: An Application of a Modified Health Belief Model1". In: *Journal of Applied Social Psychology* 27.20, pp. 1799–1823. DOI: [10.1111/j.1559-1816.1997.tb01626.x](https://doi.org/10.1111/j.1559-1816.1997.tb01626.x).
- Lipsman, Andrew et al. (2012). "The Power of "Like": How Brands Reach (and Influence) Fans Through Social-Media Marketing". In: *Journal of Advertising Research* 52.1, pp. 40–52. DOI: [10.2501/JAR-52-1-040-052](https://doi.org/10.2501/JAR-52-1-040-052).
- Liu, Xincheng, Eric Lindquist, and Arnold Vedlitz (2011). "Explaining Media and Congressional Attention to Global Climate Change, 1969-2005: An Empirical Test of Agenda-Setting Theory". In: *Political Research Quarterly* 64.2, pp. 405–419. DOI: [10.1177/1065912909346744](https://doi.org/10.1177/1065912909346744).
- Loewenstein, G. F. et al. (2001). "Risk as feelings". In: *Psychological Bulletin* 127.2, pp. 267–286. DOI: [10.1037/0033-2909.127.2.267](https://doi.org/10.1037/0033-2909.127.2.267).
- Lörcher, Ines and Monika Taddicken (2017). "Discussing climate change online. Topics and perceptions in online climate change communication in different online public arenas". In: *Journal of Science Communication* 16.2, A03. DOI: [10.22323/2.16020203](https://doi.org/10.22323/2.16020203).
- Lorenzoni, Irene, Sophie Nicholson-Cole, and Lorraine Whitmarsh (2007). "Barriers perceived to engaging with climate change among the UK public and their policy implications". In: *Global Environmental Change* 17, pp. 445–459.
- Loureiro, Maria L. and Maria Alló (2020). "Sensing climate change and energy issues: Sentiment and emotion analysis with social media in the U.K. and Spain". In: *Energy Policy* 143. DOI: [10.1016/j.enpol.2020.111490](https://doi.org/10.1016/j.enpol.2020.111490).

- Lovejoy, Kristen and Gregory D. Saxton (2012). "Information, Community, and Action: How Non-profit Organizations Use Social Media". In: *Journal of Computer-Mediated Communication* 17.3, pp. 337–353. DOI: [10.1111/j.1083-6101.2012.01576.x](https://doi.org/10.1111/j.1083-6101.2012.01576.x).
- Lowe, Thomas (2006). "Is this climate porn? How does climate change communication affect our perceptions and behaviour?" In: *Tyndall Centre for Climate Change Research Working Paper* 98. URL: https://kipdf.com/how-does-climate-change-communication-affect-our-perceptions-and-behaviour_5ac855d31723dd7c32229054.html.
- Lück, Julia, Antal Wozniak, and Hartmut Wessler (2016). "Networks of Coproduction: How Journalists and Environmental NGOs Create Common Interpretations of the UN Climate Change Conferences". In: *The International Journal of Press/Politics* 21.1, pp. 25–47. DOI: [10.1177/1940161215612204](https://doi.org/10.1177/1940161215612204).
- Luo, Yiwei, Dallas Card, and Dan Jurafsky (2020). "DeSMOG: Detecting Stance in Media On Global Warming". In: *Findings of the Association for Computational Linguistics: EMNLP 2020*. Online: Association for Computational Linguistics, pp. 3296–3315. DOI: [10.18653/v1/2020.findings-emnlp.296](https://doi.org/10.18653/v1/2020.findings-emnlp.296).
- Lyytimäki, Jari et al. (2020). "Muted by a Crisis? COVID-19 and the Long-Term Evolution of Climate Change Newspaper Coverage". In: *Sustainability* 12.20, p. 8575. DOI: [10.3390/su12208575](https://doi.org/10.3390/su12208575).
- MacKinnon, David P., Jennifer L. Krull, and Chondra M. Lockwood (2000). "Equivalence of the Mediation, Confounding and Suppression Effect". In: *Prevention Science* 1.4, pp. 173–181. DOI: [10.1023/A:1026595011371](https://doi.org/10.1023/A:1026595011371).
- Maher, Thomas V. and Jennifer Earl (2019). "Barrier or Booster? Digital Media, Social Networks, and Youth Micromobilization". In: *Sociological Perspectives* 62.6, pp. 865–883. DOI: [10.1177/0731121419867697](https://doi.org/10.1177/0731121419867697).
- Majid, Aisha (2021). *Top 50 largest news websites in the world: Surge in traffic to Epoch Times and other right-wing sites*. URL: <https://pressgazette.co.uk/media-audience-and-business-data/top-50-largest-news-websites-in-the-world-right-wing-outlets-see-biggest-growth/>.
- Majmundar, Anuja et al. (2018). "The Why We Retweet scale". In: *PLoS ONE* 13.10. DOI: [10.1371/journal.pone.0206076](https://doi.org/10.1371/journal.pone.0206076).
- Majó-Vázquez, Sílvia, Jun Zhao, and Rasmus Kleis Nielsen (2017). *The Digital-Born and Legacy News Media on Twitter during the French Presidential Elections*. Tech. rep. Oxford, UK: Reuters Institute for the Study of Journalism.

- Makarem, Suzanne C. and Haeran Jae (2016). "Consumer Boycott Behavior: An Exploratory Analysis of Twitter Feeds". In: *Journal of Consumer Affairs* 50.1. DOI: [10.1111/joca.12080](https://doi.org/10.1111/joca.12080).
- Maniates, Michael F. (2001). "Individualization: Plant a Tree, Buy a Bike, Save the World?" In: *Global Environmental Politics* 1.3, pp. 31–52. ISSN: 1526-3800. DOI: [10.1162/152638001316881395](https://doi.org/10.1162/152638001316881395).
- Manning, Louise (2013). "Corporate and consumer social responsibility in the food supply chain". In: *British Food Journal* 115.1, pp. 9–29. DOI: <https://doi.org/10.1108/00070701311289858>.
- Margetts, Helen (2017). "Why Social Media May Have Won the 2017 General Election". In: *The Political Quarterly* 88.3, pp. 386–390. DOI: [10.1111/1467-923X.12408](https://doi.org/10.1111/1467-923X.12408).
- Martin, Nicole (2018). *How Social Media Has Changed How We Consume News*. URL: <https://www.forbes.com/sites/nicolemartin1/2018/11/30/how-social-media-has-changed-how-we-consume-news/>.
- Mastroeni, Loretta, Maurizio Naldi, and Pierluigi Vellucci (2020). "Calibration of an agent-based model for opinion formation through a retweet social network". In: *CEUR Workshop Proceedings*, pp. 161–173.
- Mavrodieva, Aleksandrina V. et al. (2019). "Role of Social Media as a Soft Power Tool in Raising Public Awareness and Engagement in Addressing Climate Change". In: *Climate* 7.10. DOI: [10.3390/cli7100122](https://doi.org/10.3390/cli7100122).
- McClelland, David C (1987). *Human motivation*. CUP Archive.
- McGregor, Andrew and Donna Houston (2018). "Cattle in the Anthropocene: Four propositions". In: *Transactions of the Institute of British Geographers* 43.1, pp. 3–16. DOI: [10.1111/tran.12193](https://doi.org/10.1111/tran.12193).
- McKinnon, Merryn et al. (2016). "Science, Twitter and election campaigns: tracking #auspol in the Australian federal elections". In: *Journal of Science Communication* 15.6. DOI: [10.22323/2.15060204](https://doi.org/10.22323/2.15060204).
- McPherson, Miller, Lynn Smith-Lovin, and James M Cook (2001). "Birds of a Feather: Homophily in Social Networks". In: *Annual Review of Sociology* 27.1, pp. 415–444. DOI: <https://doi.org/10.1146/annurev.soc.27.1.415>.
- Medhat, Walaa, Ahmed Hassan, and Hoda Korashy (2014). "Sentiment analysis algorithms and applications: A survey". In: *Ain Shams Engineering Journal* 5.4, pp. 1093–1113. DOI: [10.1016/j.asej.2014.04.011](https://doi.org/10.1016/j.asej.2014.04.011).
- Meijnders, Anneloes L., Cees J. H. Midden, and Henk A. M. Wilke (2001a). "Communications About Environmental Risks and Risk-Reducing Behavior: The Impact of Fear on Information

- Processing1". In: *Journal of Applied Social Psychology* 31.4, pp. 754–777. DOI: [10.1111/j.1559-1816.2001.tb01412.x](https://doi.org/10.1111/j.1559-1816.2001.tb01412.x).
- (2001b). "Role of Negative Emotion in Communication about CO2 Risks". In: *Risk Analysis* 21.5, pp. 955–955. DOI: [10.1111/0272-4332.215164](https://doi.org/10.1111/0272-4332.215164).
- Mellor, Sophie (2022). *Companies flooded Twitter with International Women's Day platitudes. Then a bot began replying with their gender pay gap figures*. URL: <https://fortune.com/2022/03/09/twitter-paygapapp-bot-international-womens-day-gender-pay-gap-figure-shaming/>.
- Menke, Manuel and Tim Wulf (2021). "The Dark Side of Inspirational Past: An Investigation of Nostalgia in Right-Wing Populist Communication". In: *Media and Communication* 9.2, pp. 237–249. DOI: [10.17645/mac.v9i2.3803](https://doi.org/10.17645/mac.v9i2.3803).
- Merica, Dan (2017). *Trump tweets that 'cold' East Coast 'could use a little bit of' global warming*. URL: <https://www.cnn.com/2017/12/28/politics/trump-global-warming-tweet/index.html>.
- Merry, Melissa K. (2014). "Broadcast Versus Interaction: Environmental Groups' Use of Twitter". In: *Journal of Information Technology & Politics* 11.3, pp. 329–344. DOI: [10.1080/19331681.2014.933723](https://doi.org/10.1080/19331681.2014.933723).
- Metaxas, Panagiotis T et al. (2015). "What do Retweets indicate? Results from User Survey and Meta-Review of Research". In: *Proceedings of the Ninth International AAAI Conference on Web and Social Media*. Palo Alto, CA: AAAI Press.
- Milfont, Taciano L. (2009). "The effects of social desirability on self-reported environmental attitudes and ecological behaviour". In: *The Environmentalist* 29.3, pp. 263–269. DOI: [10.1007/s10669-008-9192-2](https://doi.org/10.1007/s10669-008-9192-2).
- Miller Gaither, Barbara and T. Kenn Gaither (2016). "Marketplace Advocacy by the U.S. Fossil Fuel Industries: Issues of Representation and Environmental Discourse". In: *Mass Communication and Society* 19.5, pp. 585–603. DOI: [10.1080/15205436.2016.1203953](https://doi.org/10.1080/15205436.2016.1203953).
- Mocatta, Gabi (2021). *What's behind News Corp's new spin on climate change?* URL: <http://theconversation.com/whats-behind-news-corps-new-spin-on-climate-change-169733>.
- Molder, Amanda L. et al. (2022). "Framing the Global Youth Climate Movement: A Qualitative Content Analysis of Greta Thunberg's Moral, Hopeful, and Motivational Framing on Instagram". In: *The International Journal of Press/Politics* 27.3, pp. 668–695. DOI: [10.1177/19401612211055691](https://doi.org/10.1177/19401612211055691).
- Moloney, Susie, Ralph E. Horne, and John Fien (2010). "Transitioning to low carbon communities—from behaviour change to systemic change: Lessons from Australia". In: *Energy Policy*.

- Special Section: Carbon Reduction at Community Scale 38.12, pp. 7614–7623. ISSN: 0301-4215. DOI: [10.1016/j.enpol.2009.06.058](https://doi.org/10.1016/j.enpol.2009.06.058).
- Monbiot, George (2022). *Regenesis: Feeding the World without Devouring the Planet*. London: Allen Lane.
- Morone, Flaviano and Hernán A. Makse (2015). “Influence maximization in complex networks through optimal percolation”. In: *Nature* 524.7563, pp. 65–68. DOI: [10.1038/nature14604](https://doi.org/10.1038/nature14604).
- Morozov, Evgeny (2019). *The brave new world of slacktivism*. URL: <https://foreignpolicy.com/2009/05/19/the-brave-new-world-of-slacktivism/>.
- Morris, Carol (2018). “‘Taking the Politics out of Broccoli’: Debating (De)meatification in UK National and Regional Newspaper Coverage of the Meat Free Mondays Campaign”. In: *Sociologia Ruralis* 58.2, pp. 433–452. DOI: [10.1111/soru.12163](https://doi.org/10.1111/soru.12163).
- Morstatter, Fred, Jürgen Pfeffer, and Huan Liu (Jan. 2014). *When is it Biased? Assessing the Representativeness of Twitter’s Streaming API*. DOI: [10.48550/arXiv.1401.7909](https://doi.org/10.48550/arXiv.1401.7909). URL: <http://arxiv.org/abs/1401.7909>.
- Morstatter, Fred, Jürgen Pfeffer, Huan Liu, and Kathleen M. Carley (2013). “Is the sample good enough? Comparing data from twitter’s streaming API with Twitter’s firehose”. In: *Proceedings of the 7th International Conference on Weblogs and Social Media, ICWSM 2013*, pp. 400–408. URL: <http://www.scopus.com/inward/record.url?scp=84892704954&partnerID=8YFLogxK>.
- Moser, Susanne C. (2010). “Communicating climate change: history, challenges, process and future directions”. In: *WIREs Climate Change* 1.1, pp. 31–53. DOI: [10.1002/wcc.11](https://doi.org/10.1002/wcc.11).
- (2016). “Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say?” In: *WIREs Climate Change* 7.3, pp. 345–369. DOI: [10.1002/wcc.403](https://doi.org/10.1002/wcc.403).
- Moser, Susanne C. and Lisa Dilling, eds. (2007). *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge: Cambridge University Press. DOI: [10.1017/CB09780511535871](https://doi.org/10.1017/CB09780511535871).
- Mukerjee, Subhayan, Sílvia Majó-Vázquez, and Sandra González-Bailón (2018). “Networks of Audience Overlap in the Consumption of Digital News”. In: *Journal of Communication* 68.1, pp. 26–50. DOI: [10.1093/joc/jqx007](https://doi.org/10.1093/joc/jqx007).

- Murphy, Patrick D. (2021). "Speaking for the youth, speaking for the planet: Greta Thunberg and the representational politics of eco-celebrity". In: *Popular Communication* 19.3, pp. 193–206. DOI: [10.1080/15405702.2021.1913493](https://doi.org/10.1080/15405702.2021.1913493).
- Murthy, Dhiraj (2016). *The SAGE Handbook of Social Media Research Methods*. SAGE Publications Ltd. ISBN: 978-1-4739-8384-7. DOI: [10.4135/9781473983847](https://doi.org/10.4135/9781473983847).
- Nabi, Robin L. (2002). "Discrete Emotions and Persuasion". In: *The Persuasion Handbook: Developments in Theory and Practice*. SAGE Publications, Inc., pp. 289–308. DOI: [10.4135/9781412976046](https://doi.org/10.4135/9781412976046).
- (2015). "Emotional Flow in Persuasive Health Messages". In: *Health Communication* 30.2, pp. 114–124. DOI: [10.1080/10410236.2014.974129](https://doi.org/10.1080/10410236.2014.974129).
- Nabi, Robin L., Abel Gustafson, and Risa Jensen (2018). "Framing Climate Change: Exploring the Role of Emotion in Generating Advocacy Behavior". In: *Science Communication* 40.4, pp. 442–468. DOI: [10.1177/1075547018776019](https://doi.org/10.1177/1075547018776019).
- National Tracking Poll 210530 (2021). Tech. rep. Morning Consult and The Hollywood Reporter. URL: https://assets.morningconsult.com/wp-uploads/2021/05/18093706/210530_crosstabs_HOLLYWOOD_Adults_v1_AUTO.pdf.
- NBC News - Bias and Credibility (2023). URL: <https://mediabiasfactcheck.com/nbc-news/>.
- Neff, Roni A., Iris L. Chan, and Katherine Clegg Smith (2009). "Yesterday's dinner, tomorrow's weather, today's news? US newspaper coverage of food system contributions to climate change". In: *Public Health Nutrition* 12.7, pp. 1006–1014. DOI: [10.1017/S1368980008003480](https://doi.org/10.1017/S1368980008003480).
- Neslen, Arthur (2017). "Donald Trump 'taking steps to abolish Environmental Protection Agency'". In: *The Guardian*. URL: <https://www.theguardian.com/us-news/2017/feb/02/donald-trump-plans-to-abolish-environmental-protection-agency>.
- Neuman, Nicklas (2020). "Social Conventions and Boundary Work in an Online Q&A: The Example of Vegetarianism and Veganism". In: *Sociological Research Online* 25.4, pp. 609–625. DOI: [10.1177/1360780419898201](https://doi.org/10.1177/1360780419898201).
- New York Times - Bias and Credibility (2023). URL: <https://mediabiasfactcheck.com/new-york-times/>.
- Newman, M. E. J. (2002). "Assortative Mixing in Networks". In: *Physical Review Letters* 89.20. DOI: <https://doi.org/10.1103/PhysRevLett.89.208701>.
- (2003). "Mixing patterns in networks". In: *Physical Review E* 67.2. DOI: <https://doi.org/10.1103/PhysRevE.67.026126>.

- Newman, M. E. J. (2006). "Modularity and community structure in networks." In: *Proceedings of the National Academy of Sciences* 103.23.
- Newman, Nic (2021). *Digital News Report 2021*. Tech. rep. Oxford: Reuters Institute for the Study of Journalism.
- Newman, Nic et al. (2022). *Reuters Institute Digital News Report 2022*. Tech. rep. Oxford: Reuters Institute for the Study of Journalism.
- Newman, Todd P. (2017). "Tracking the release of IPCC AR5 on Twitter: Users, comments, and sources following the release of the Working Group I Summary for Policymakers". In: *Public Understanding of Science* 26.7, pp. 815–825. DOI: [10.1177/0963662516628477](https://doi.org/10.1177/0963662516628477).
- Newman, Todd P., Erik C. Nisbet, and Matthew C. Nisbet (2018). "Climate change, cultural cognition, and media effects: Worldviews drive news selectivity, biased processing, and polarized attitudes". In: *Public Understanding of Science* 27.8, pp. 985–1002. DOI: [10.1177/0963662518801170](https://doi.org/10.1177/0963662518801170).
- news.com.au (2023). *Our values*. URL: <https://www.news.com.au/help#our-values>.
- News.com.au - Bias and Credibility (2023). URL: <https://mediabiasfactcheck.com/news-com-au/>.
- Nguyen, C. Thi (2020). "Echo chambers and epistemic bubbles". In: *Episteme* 17.2, pp. 141–161. DOI: [10.1017/epi.2018.32](https://doi.org/10.1017/epi.2018.32).
- Nguyen, Sophia (2017). *The Rise of Vegan Culture*. URL: <https://www.harvardmagazine.com/2017/07/the-rise-of-vegan-culture>.
- Nine.com.au - Bias and Credibility (2023). URL: <https://mediabiasfactcheck.com/nine-com-au-bias/>.
- Nisbet, Matthew C. and John E. Kotcher (2009). "A Two-Step Flow of Influence?: Opinion-Leader Campaigns on Climate Change". In: *Science Communication* 30.3. DOI: [10.1177/1075547008328797](https://doi.org/10.1177/1075547008328797).
- Noar, Seth M. et al. (2015). "Cancer Information Seeking in the Digital Age: Effects of Angelina Jolie's Prophylactic Mastectomy Announcement". In: *Medical Decision Making* 35.1, pp. 16–21. DOI: [10.1177/0272989X14556130](https://doi.org/10.1177/0272989X14556130).
- Norton, Andrew and John Leaman (2004). *The Day After Tomorrow: Public Opinion on Climate Change*. Tech. rep. London: MORI Social Research Institute. URL: https://climateprediction.net/wp-content/schools/mori_poll.pdf.

- O'Neill, Saffron and Sophie Nicholson-Cole (2009). "'Fear Won't Do It': Promoting Positive Engagement With Climate Change Through Visual and Iconic Representations". In: *Science Communication* 30.3, pp. 355–379. DOI: [10.1177/1075547008329201](https://doi.org/10.1177/1075547008329201). URL: <https://doi.org/10.1177/1075547008329201>.
- O'Neill, Saffron and Maxwell Boykoff (2011). "The Role of New Media in Engaging the Public with Climate Change". In: *Engaging the Public with Climate Change*. Routledge.
- O'Neill, Saffron and Mike Hulme (2009). "An iconic approach for representing climate change". In: *Global Environmental Change* 19.4, pp. 402–410. DOI: [10.1016/j.gloenvcha.2009.07.004](https://doi.org/10.1016/j.gloenvcha.2009.07.004).
- O'Neill, Saffron, Hywel Williams, et al. (2015). "Dominant frames in legacy and social media coverage of the IPCC Fifth Assessment Report". In: *Nature Climate Change* 5.4, pp. 380–385. DOI: [10.1038/nclimate2535](https://doi.org/10.1038/nclimate2535).
- Obar, Jonathan A. and Anne Oeldorf-Hirsch (2020). "The biggest lie on the Internet: ignoring the privacy policies and terms of service policies of social networking services". In: *Information, Communication & Society* 23.1, pp. 128–147. DOI: [10.1080/1369118X.2018.1486870](https://doi.org/10.1080/1369118X.2018.1486870).
- Office, Guardian Australia Press (2023). "The Guardian celebrates 10 years in Australia". In: *The Guardian*. URL: <https://www.theguardian.com/guardian-australia-press-office/2023/may/03/the-guardian-celebrates-10-years-in-australia>.
- Olausson, Ulrika (2018). "'Stop Blaming the Cows!': How Livestock Production is Legitimized in Everyday Discourse on Facebook". In: *Environmental Communication* 12.1, pp. 28–43. DOI: [10.1080/17524032.2017.1406385](https://doi.org/10.1080/17524032.2017.1406385).
- (2019). "Meat as a matter of fact(s): the role of science in everyday representations of livestock production on social media". In: *Journal of Science Communication* 18.6, A01. DOI: [10.22323/2.18060201](https://doi.org/10.22323/2.18060201).
- Oliver, Catherine (2021). "Mock meat, masculinity, and redemption narratives: vegan men's negotiations and performances of gender and eating". In: *Social Movement Studies* 0.0, pp. 1–18. DOI: [10.1080/14742837.2021.1989293](https://doi.org/10.1080/14742837.2021.1989293).
- Ortony, Andrew, Gerald L. Clore, and Allan Collins (1988). *The Cognitive Structure of Emotions*. Cambridge: Cambridge University Press. URL: <https://www.cambridge.org/core/books/cognitive-structure-of-emotions/33FBA9FA0A8A86143DD86D84088F289B>.
- Painter, James (2010). *Summoned by science: reporting climate change at Copenhagen and beyond*. RISJ challenges. Oxford: Reuters Institute for the Study of Journalism, University of Oxford.

- India's Media Boom: The Good News and the Bad* (2013). Tech. rep. Oxford: Reuters Institute for the Study of Journalism. URL: <https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2017-12/India%E2%80%99s%20Media%20Boom%20the%20good%20news%20and%20the%20bad.pdf>.
- Painter, James and Teresa Ashe (2012). "Cross-national comparison of the presence of climate scepticism in the print media in six countries, 2007–10". In: *Environmental Research Letters* 7.4. DOI: [10.1088/1748-9326/7/4/044005](https://doi.org/10.1088/1748-9326/7/4/044005).
- Painter, James, Joshua Ettinger, et al. (2023). "Climate delay discourses present in global mainstream television coverage of the IPCC's 2021 report". In: *Communications Earth & Environment* 4.1, pp. 1–12. DOI: [10.1038/s43247-023-00760-2](https://doi.org/10.1038/s43247-023-00760-2).
- Painter, James, Silje Kristiansen, and Mike Schäfer (2018). "How 'Digital-born' media cover climate change in comparison to legacy media: A case study of the COP 21 summit in Paris". In: *Global Environmental Change* 48, pp. 1–10. DOI: [10.1016/j.gloenvcha.2017.11.003](https://doi.org/10.1016/j.gloenvcha.2017.11.003).
- Painter, James, Rachel Wetts, and Loredana Loy (n.d.). "The IPCC in the hybrid public sphere: divergent responses to climate mitigation solutions in mainstream and social media". In: (), forthcoming.
- Palan, Stefan and Christian Schitter (2018). "Prolific.ac—A subject pool for online experiments". In: *Journal of Behavioral and Experimental Finance* 17, pp. 22–27. DOI: [10.1016/j.jbef.2017.12.004](https://doi.org/10.1016/j.jbef.2017.12.004).
- Pang, Bo and Lillian Lee (2008). "Opinion Mining and Sentiment Analysis". In: *Foundations and Trends in Information Retrieval* 2.1-2, pp. 1–135. DOI: [10.1561/1500000011](https://doi.org/10.1561/1500000011).
- Papacharissi, Zizi (2002). "The virtual sphere: The internet as a public sphere". In: *New Media & Society* 4.1, pp. 9–27. DOI: [10.1177/14614440222226244](https://doi.org/10.1177/14614440222226244).
- (2014). *Affective Publics: Sentiment, Technology, and Politics*. Oxford Studies in Digital Politics. New York: Oxford University Press. DOI: [10.1093/acprof:oso/9780199999736.001.0001](https://doi.org/10.1093/acprof:oso/9780199999736.001.0001).
- Park, Chang Sup (2013). "Does Twitter motivate involvement in politics? Tweeting, opinion leadership, and political engagement". In: *Computers in Human Behavior* 29.4, pp. 1641–1648. DOI: [10.1016/j.chb.2013.01.044](https://doi.org/10.1016/j.chb.2013.01.044).
- Park, Chang Sup and Barbara K. Kaye (Apr. 1, 2019). "Expanding Visibility on Twitter: Author and Message Characteristics and Retweeting". In: *Social Media + Society* 5.2. DOI: [10.1177/2056305119834595](https://doi.org/10.1177/2056305119834595).

- Park, Eunil, Ki Joon Kim, and Sang Jib Kwon (2017). "Corporate social responsibility as a determinant of consumer loyalty: An examination of ethical standard, satisfaction, and trust". In: *Journal of Business Research* 76, pp. 8–13. DOI: [10.1016/j.jbusres.2017.02.017](https://doi.org/10.1016/j.jbusres.2017.02.017).
- Patterson, P. and L. Wilkins (1991). "Science as Symbol: The Media Chills the Greenhouse Effect". In: *Risky Business: Communicating Issues of Science, Risk and Public Policy*. Ed. by P. Patterson and L. Wilkins. New York: Greenwood Press, pp. 159–176.
- Pearce, Warren, Brian Brown, et al. (2015). "Communicating climate change: conduits, content, and consensus". In: *WIREs Climate Change* 6.6, pp. 613–626. DOI: [10.1002/wcc.366](https://doi.org/10.1002/wcc.366).
- Pearce, Warren, Kim Holmberg, et al. (2014). "Climate Change on Twitter: Topics, Communities and Conversations about the 2013 IPCC Working Group 1 Report". In: *PLOS ONE* 9.4. DOI: [10.1371/journal.pone.0094785](https://doi.org/10.1371/journal.pone.0094785).
- Pearce, Warren, Sabine Niederer, et al. (2019). "The social media life of climate change: Platforms, publics, and future imaginaries". In: *WIREs Climate Change* 10.2. DOI: [10.1002/wcc.569](https://doi.org/10.1002/wcc.569).
- Peer, Eyal, Laura Brandimarte, et al. (2017). "Beyond the Turk: Alternative platforms for crowdsourcing behavioral research". In: *Journal of Experimental Social Psychology* 70, pp. 153–163. DOI: [10.1016/j.jesp.2017.01.006](https://doi.org/10.1016/j.jesp.2017.01.006).
- Peer, Eyal, David Rothschild, et al. (2022). "Data quality of platforms and panels for online behavioral research". In: *Behavior Research Methods* 54.4. DOI: [10.3758/s13428-021-01694-3](https://doi.org/10.3758/s13428-021-01694-3).
- Pendergrast, Nick (2016). "Environmental Concerns and the Mainstreaming of Veganism". In: *Impact of Meat Consumption on Health and Environmental Sustainability*. Ed. by Talia Raphaely and Dora Marinova. IGI Global. URL: <https://www.igi-global.com/gateway/chapter/www.igi-global.com/gateway/chapter/139621>.
- Pennebaker, James et al. (2015). "The Development and Psychometric Properties of LIWC2015". In: p. 26.
- Pepermans, Yves and Pieter Maesele (2016). "The politicization of climate change: problem or solution?" In: *WIREs Climate Change* 7.4, pp. 478–485. DOI: [10.1002/wcc.405](https://doi.org/10.1002/wcc.405). URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/wcc.405>.
- Percival, Rob (2022). *The meat paradox: eating, empathy, and the future of meat*. London: Little Brown Book Group.

- Perry, Patsy and Neil Towers (2013). "Conceptual framework development: CSR implementation in fashion supply chains". In: *International Journal of Physical Distribution & Logistics Management* 43.5/6. Ed. by Chad W. Autry and Judith M. Whipple, pp. 478–501. DOI: [10.1108/IJPDLM-03-2012-0107](https://doi.org/10.1108/IJPDLM-03-2012-0107).
- Petersen, Alexander Michael, Emmanuel M. Vincent, and Anthony LeRoy Westerling (2019). "Discrepancy in scientific authority and media visibility of climate change scientists and contrarians". In: *Nature Communications* 10.1. DOI: [10.1038/s41467-019-09959-4](https://doi.org/10.1038/s41467-019-09959-4).
- Pettigrew, Thomas F. (1967). "Social evaluation theory: Convergences and applications". In: *Nebraska Symposium on Motivation* 15, pp. 241–311.
- Pfeffer, Jürgen, Katja Mayer, and Fred Morstatter (2018). "Tampering with Twitter's Sample API". In: *EPJ Data Science* 7.1, pp. 1–21. DOI: [10.1140/epjds/s13688-018-0178-0](https://doi.org/10.1140/epjds/s13688-018-0178-0).
- Pietraszkiewicz, Agnieszka et al. (2019). "The big two dictionaries: Capturing agency and communion in natural language". In: *European Journal of Social Psychology* 49.5, pp. 871–887. URL: <https://onlinelibrary.wiley.com/doi/abs/10.1002/ejsp.2561>.
- Pigors, Mark and Bettina Rockenbach (2016). "Consumer Social Responsibility". In: *Management Science* 62.11, pp. 3123–3137. DOI: [10.1287/mnsc.2015.2279](https://doi.org/10.1287/mnsc.2015.2279).
- Pizzi, Simone et al. (2021). "Social media as stakeholder engagement tool: CSR communication failure in the oil and gas sector". In: *Corporate Social Responsibility and Environmental Management* 28.2, pp. 849–859. DOI: [10.1002/csr.2094](https://doi.org/10.1002/csr.2094).
- Plumer, Brad (2020). "Emissions Declines Will Set Records This Year. But It's Not Good News." In: *The New York Times*. URL: <https://www.nytimes.com/2020/04/30/climate/global-emissions-decline.html>.
- Podnar, Klement (2008). "Guest Editorial: Communicating Corporate Social Responsibility". In: *Journal of Marketing Communications* 14.2, pp. 75–81. DOI: [10.1080/13527260701856350](https://doi.org/10.1080/13527260701856350).
- Poore, Joseph and Thomas Nemecek (2018). "Reducing food's environmental impacts through producers and consumers". In: *Science* 360.6392, pp. 987–992. DOI: [10.1126/science.aag0216](https://doi.org/10.1126/science.aag0216).
- Poortinga, Wouter and Nick Pidgeon (2003). *Public Perceptions of Risk, Science and Governance: Main Findings of a British Survey of Five Risk Cases*. Tech. rep. Norwich: University of East Anglia and MORI.
- Porter, Mason A., Jukka-Pekka Onnela, and Peter J. Mucha (2009). "Communities in Networks". In: *arXiv:0902.3788 [cond-mat, physics:nlin, physics:physics, stat]*.

- Rees, Jonas H. and Sebastian Bamberg (2014). "Climate protection needs societal change: Determinants of intention to participate in collective climate action". In: *European Journal of Social Psychology* 44.5, pp. 466–473. DOI: [10.1002/ejsp.2032](https://doi.org/10.1002/ejsp.2032).
- Reese, Jacy (2020). "Institutional change and the limitations of consumer activism". In: *Palgrave Communications* 6.1, pp. 1–8. DOI: [10.1057/s41599-020-0405-8](https://doi.org/10.1057/s41599-020-0405-8).
- Rinscheid, Adrian, Silvia Pianta, and Elke U. Weber (2021). "What shapes public support for climate change mitigation policies? The role of descriptive social norms and elite cues". In: *Behavioural Public Policy* 5.4, pp. 503–527. DOI: [10.1017/bpp.2020.43](https://doi.org/10.1017/bpp.2020.43).
- Risbey, James (2008). "The new climate discourse: Alarmist or alarming?" In: *Global Environmental Change* 18.1, pp. 26–37. DOI: [10.1016/j.gloenvcha.2007.06.003](https://doi.org/10.1016/j.gloenvcha.2007.06.003).
- Rosenquist, James, James Fowler, and Nicholas Christakis (2011). "Social network determinants of depression". In: *Molecular psychiatry* 16.3, 10.1038/mp.2010.13. DOI: [10.1038/mp.2010.13](https://doi.org/10.1038/mp.2010.13).
- Rothgerber, Hank (2014). "Efforts to overcome vegetarian-induced dissonance among meat eaters". In: *Appetite* 79, pp. 32–41. DOI: [10.1016/j.appet.2014.04.003](https://doi.org/10.1016/j.appet.2014.04.003).
- (2020). "Meat-related cognitive dissonance: A conceptual framework for understanding how meat eaters reduce negative arousal from eating animals". In: *Appetite* 146, p. 104511. DOI: [10.1016/j.appet.2019.104511](https://doi.org/10.1016/j.appet.2019.104511).
- Rozin, Paul and Edward B. Royzman (2001). "Negativity Bias, Negativity Dominance, and Contagion". In: *Personality and Social Psychology Review* 5.4, pp. 296–320. DOI: [10.1207/S15327957PSPR0504_2](https://doi.org/10.1207/S15327957PSPR0504_2).
- Rubin, Alan (2008). "The uses and gratifications perspective on media effects". In: *Media Effects: Advances in theory and research*. Ed. by J Bryant and M. B. Oliver. 3rd ed. New York, NY: Routledge.
- Rucker, Derek D. and Richard E. Petty (2004). "Emotion specificity and consumer behavior: Anger, sadness, and preference for activity". In: *Motivation and Emotion* 28, pp. 3–21. DOI: [10.1023/B:MOEM.0000027275.95071.82](https://doi.org/10.1023/B:MOEM.0000027275.95071.82).
- Runciman, W.G. (1966). *Relative Deprivation and Social Justice*. Berkeley and Los Angeles: University of California Press.
- Russell, James and Lisa Barrett (1996). "Core Affect, Prototypical Emotional Episodes, and Other Things Called Emotion: Dissecting the Elephant". In: *Journal of Personality and Social Psychology* 76.5, pp. 805–819. DOI: [0022-3514/99/\\$3.00](https://doi.org/10.1037/0022-3514.76.5.805).

- Russell, James and Albert Mehrabian (1977). "Evidence for a three-factor theory of emotions". In: *Journal of Research in Personality* 11.3, pp. 273–294. DOI: [10.1016/0092-6566\(77\)90037-X](https://doi.org/10.1016/0092-6566(77)90037-X).
- Russell, James, Anna Weiss, and Gerald Mendelsohn (1989). "Affect Grid: A single-item scale of pleasure and arousal". In: *Journal of Personality and Social Psychology* 57, pp. 493–502. DOI: [10.1037/0022-3514.57.3.493](https://doi.org/10.1037/0022-3514.57.3.493).
- Russell, Martha G. et al. (2014). "Semantic Analysis of Energy-Related Conversations in Social Media: A Twitter Case Study". In: *Communicating Sustainability for the Green Economy*. Routledge.
- Sabherwal, Anandita et al. (2021). "The Greta Thunberg Effect: Familiarity with Greta Thunberg predicts intentions to engage in climate activism in the United States". In: *Journal of Applied Social Psychology* 51.4, pp. 321–333. DOI: [10.1111/jasp.12737](https://doi.org/10.1111/jasp.12737).
- Sacharin, Vera, Katja Schlegel, and Klaus R. Scherer (2012). "Geneva Emotion Wheel Rating Study". In: URL: <https://archive-ouverte.unige.ch/unige:97849>.
- Saffer, Adam J., Aimei Yang, and Yan Qu (2019). "Talking Politics and Engaging in Activism: The Influence of Publics' Social Networks on Corporations in the Public Sphere". In: *Journal of Broadcasting & Electronic Media* 63.3, pp. 534–565. DOI: [10.1080/08838151.2019.1660130](https://doi.org/10.1080/08838151.2019.1660130).
- Salganik, Matthew J. (2017). *Bit by Bit: Social Research in the Digital Age*. Open Review Edition. Princeton, NJ: Princeton University Press.
- Sanford, Mary et al. (2021). "Controversy around climate change reports: a case study of Twitter responses to the 2019 IPCC report on land". In: *Climatic Change* 167.3, p. 59. DOI: [10.1007/s10584-021-03182-1](https://doi.org/10.1007/s10584-021-03182-1).
- Santo, Raychel E. et al. (2020). "Considering Plant-Based Meat Substitutes and Cell-Based Meats: A Public Health and Food Systems Perspective". In: *Frontiers in Sustainable Food Systems* 4. DOI: [10.3389/fsufs.2020.00134](https://doi.org/10.3389/fsufs.2020.00134).
- Saracco, Fabio, Riccardo Di Clemente, et al. (2015). "Randomizing bipartite networks: the case of the World Trade Web". In: *Scientific Reports* 5.1, pp. 1–18. DOI: [10.1038/srep10595](https://doi.org/10.1038/srep10595).
- Saracco, Fabio, Mika J. Straka, et al. (2017). "Inferring monopartite projections of bipartite networks: an entropy-based approach". In: *New Journal of Physics* 19.5. DOI: [10.1088/1367-2630/aa6b38](https://doi.org/10.1088/1367-2630/aa6b38).
- Sayama, Hiroki (2020). "Extreme Ideas Emerging from Social Conformity and Homophily: An Adaptive Social Network Model". In: MIT Press, pp. 113–120. DOI: https://doi.org/10.1162/isal_a_00349.

- Scannell, Leila and Robert Gifford (2013). "Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement". In: *Environment and Behavior* 45.1, pp. 60–85. DOI: [10.1177/0013916511421196](https://doi.org/10.1177/0013916511421196). URL: <https://doi.org/10.1177/0013916511421196>.
- Schäfer, Mike (2012). "Online communication on climate change and climate politics: a literature review". In: *WIREs Climate Change* 3.6, pp. 527–543. DOI: [10.1002/wcc.191](https://doi.org/10.1002/wcc.191).
- Schäfer, Mike and Peter North (2019). "Are social media making constructive climate policymaking harder?" In: *Contemporary Climate Change Debates: A Student Primer*. Ed. by Mike Hulme. 1st. Routledge. DOI: [10.4324/9780429446252-16](https://doi.org/10.4324/9780429446252-16).
- Schäfer, Mike and Inga Schlichting (2014). "Media Representations of Climate Change: A Meta-Analysis of the Research Field". In: *Environmental Communication* 8.2, pp. 142–160. DOI: [10.1080/17524032.2014.914050](https://doi.org/10.1080/17524032.2014.914050).
- Scherer, Klaus R. (2005). "What are emotions? And how can they be measured?" In: *Social Science Information* 44.4, pp. 695–729. DOI: [10.1177/0539018405058216](https://doi.org/10.1177/0539018405058216).
- Scherr, Sebastian and Kexin Wang (2021). "Explaining the success of social media with gratification niches: Motivations behind daytime, nighttime, and active use of TikTok in China". In: *Computers in Human Behavior* 124. DOI: [10.1016/j.chb.2021.106893](https://doi.org/10.1016/j.chb.2021.106893).
- Schiffer, Zoë (2023). *Yes, Elon Musk created a special system for showing you all his tweets first*. URL: <https://www.platformer.news/p/yes-elon-musk-created-a-special-system>.
- Schmidt, Andreas, Ana Ivanova, and Mike Schäfer (2013). "Media attention for climate change around the world: A comparative analysis of newspaper coverage in 27 countries". In: *Global Environmental Change* 23.5, pp. 1233–1248. DOI: [10.1016/j.gloenvcha.2013.07.020](https://doi.org/10.1016/j.gloenvcha.2013.07.020).
- Schmitt, Michael T. et al. (2019). "What predicts environmental activism? The roles of identification with nature and politicized environmental identity". In: *Journal of Environmental Psychology* 61, pp. 20–29. DOI: [10.1016/j.jenvp.2018.11.003](https://doi.org/10.1016/j.jenvp.2018.11.003).
- Schulz, Anne, David A L Levy, and Rasmus Kleis Nielsen (2019). *Old, Educated, and Politically Diverse: The Audience of Public Service News*. Tech. rep. Oxford: Reuters Institute for the Study of Journalism.

- Schwartz, Shalom H. (1977). "Normative Influences on Altruism". This work was supported by NSF Grant SOC 72-05417. I am indebted to L. Berkowitz, R. Dienstbier, H. Schuman, R. Simons, and R. Tessler for their thoughtful comments on an early draft of this chapter." In: *Advances in Experimental Social Psychology*. Ed. by Leonard Berkowitz. Vol. 10. Academic Press, pp. 221–279. DOI: [10.1016/S0065-2601\(08\)60358-5](https://doi.org/10.1016/S0065-2601(08)60358-5).
- Seegerberg, Alexandra and W. Lance Bennett (2011). "Social Media and the Organization of Collective Action: Using Twitter to Explore the Ecologies of Two Climate Change Protests". In: *The Communication Review* 14.3, pp. 197–215. DOI: [10.1080/10714421.2011.597250](https://doi.org/10.1080/10714421.2011.597250).
- Seligman, Martin EP et al. (2013). "Navigating into the future or driven by the past". In: *Perspectives on psychological science* 8.2, pp. 119–141. DOI: [10.1177/1745691612474317](https://doi.org/10.1177/1745691612474317).
- Senge, Peter M et al. (2007). "Collaborating For Systemic Change". In: *MIT Sloan Management Review* 48.
- Serrano-Puche, Javier (2016). "Internet y emociones: nuevas tendencias en un campo de investigación emergente". In: *Comunicar: Revista Científica de Comunicación y Educación* 24.46, pp. 19–26. DOI: [10.3916/C46-2016-02](https://doi.org/10.3916/C46-2016-02).
- Sexton, Alexandra E, Tara Garnett, and Jamie Lorimer (2019). "Framing the future of food: The contested promises of alternative proteins". In: *Environment and Planning E: Nature and Space* 2.1, pp. 47–72. DOI: [10.1177/2514848619827009](https://doi.org/10.1177/2514848619827009).
- Sexton, Alexandra E. (2018). "Eating for the post-Anthropocene: Alternative proteins and the biopolitics of edibility". In: *Transactions of the Institute of British Geographers* 43.4, pp. 586–600. DOI: [10.1111/tran.12253](https://doi.org/10.1111/tran.12253).
- Sexton, Alexandra E., Tara Garnett, and Jamie Lorimer (2022). "Vegan food geographies and the rise of Big Veganism". In: *Progress in Human Geography* 46.2, pp. 605–628. DOI: [10.1177/03091325211051021](https://doi.org/10.1177/03091325211051021).
- Sharma, Eva et al. (2017). "Analyzing Ideological Discourse on Social Media: A Case Study of the Abortion Debate". In: *Proceedings of the 2017 International Conference of The Computational Social Science Society of the Americas on - CSS 2017*. ACM Press, pp. 1–8. URL: <http://dl.acm.org/citation.cfm?doid=3145574.3145577>.
- Shearer, Elisa and Amy Mitchell (2021). *News Use Across Social Media Platforms in 2020*. URL: <https://www.pewresearch.org/journalism/2021/01/12/news-use-across-social-media-platforms-in-2020/>.

- Shizuka, Daizaburo and Damien R. Farine (2016). "Measuring the robustness of network community structure using assortativity". In: *Animal Behaviour* 112, pp. 237–246. DOI: <https://doi.org/10.1016/j.anbehav.2015.12.007>.
- Shoup, Mary Ellen (2019). *Euromonitor: What's the driving force behind plant-based eating?* URL: <https://www.foodnavigator-usa.com/Article/2019/05/17/Euromonitor-What-s-the-driving-force-behind-plant-based-eating>.
- Shrout, Patrick E. and Niall Bolger (2002). "Mediation in experimental and nonexperimental studies: new procedures and recommendations". In: *Psychological Methods* 7.4, pp. 422–445.
- Shukla, Roopam et al. (2019). "Climate change perception: an analysis of climate change and risk perceptions among farmer types of Indian Western Himalayas". In: *Climatic Change* 152.1, pp. 103–119. DOI: [10.1007/s10584-018-2314-z](https://doi.org/10.1007/s10584-018-2314-z).
- Sigall, Harold and Judson Mills (1998). "Measures of independent variables and mediators are useful in social psychology experiments: But are they necessary?" In: *Personality and Social Psychology Review* 2, pp. 218–226. DOI: [10.1207/s15327957pspr0203_5](https://doi.org/10.1207/s15327957pspr0203_5).
- Simon, Bernd et al. (1998). "Collective identification and social movement participation". In: *Journal of Personality and Social Psychology* 74.3, pp. 646–658.
- Singh, P. et al. (2012). "Accelerating consensus on coevolving networks: The effect of committed individuals". In: *Physical Review E* 85.4. DOI: <https://doi.org/10.1103/PhysRevE.85.046104>.
- Smith, Jackie et al. (2001). "From Protest to Agenda Building: Description Bias in Media Coverage of Protest Events in Washington, D.C.*". In: *Social Forces* 79.4, pp. 1397–1423. DOI: [10.1353/sof.2001.0053](https://doi.org/10.1353/sof.2001.0053).
- Snyder, C. R. (2002). "Hope Theory: Rainbows in the Mind". In: *Psychological Inquiry* 13.4, pp. 249–275. DOI: [10.1207/S15327965PLI1304_01](https://doi.org/10.1207/S15327965PLI1304_01).
- Song, Baobao and Jing (Taylor) Wen (2020). "Online corporate social responsibility communication strategies and stakeholder engagements: A comparison of controversial versus noncontroversial industries". In: *Corporate Social Responsibility and Environmental Management* 27.2, pp. 881–896. DOI: [10.1002/csr.1852](https://doi.org/10.1002/csr.1852).
- Sonzogni, Barbara (2022). "'Personal Influence' and Influencer Logic: A Theoretical and Methodological Comparison". In: *What People Leave Behind: Marks, Traces, Footprints and their Relevance*

- to *Knowledge Society*. Ed. by Francesca Comunello, Fabrizio Martire, and Lorenzo Sabetta. *Frontiers in Sociology and Social Research*. Springer International Publishing, pp. 293–310. DOI: [10.1007/978-3-031-11756-5_19](https://doi.org/10.1007/978-3-031-11756-5_19). URL: https://doi.org/10.1007/978-3-031-11756-5_19.
- Spence, Alexa and Nick Pidgeon (2010). “Framing and communicating climate change: The effects of distance and outcome frame manipulations”. In: *Global Environmental Change*. 20th Anniversary Special Issue 20.4, pp. 656–667. DOI: [10.1016/j.gloenvcha.2010.07.002](https://doi.org/10.1016/j.gloenvcha.2010.07.002).
- Starostinetskaya, Anna (2019). *Vegan Sausage Rolls Propel Greggs Profits by 58 Percent*. URL: <https://vegnews.com/2019/7/vegan-sausage-rolls-propel-greggs-profits-by-58-percent>.
- Statista (2021). *Global Twitter user age distribution 2021*. URL: <https://www.statista.com/statistics/283119/age-distribution-of-global-twitter-users/>.
- (2022a). *Biggest social media platforms 2022*. URL: <https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>.
- (2022b). *Facebook MAU worldwide 2022*. URL: <https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/>.
- (2022c). *Twitter: number of users worldwide 2024*. URL: <https://www.statista.com/statistics/303681/twitter-users-worldwide/>.
- (2023). *Facebook*. URL: <https://www.statista.com/topics/751/facebook/>.
- Stecula, Dominik A. and Eric Merkley (2019). “Framing Climate Change: Economics, Ideology, and Uncertainty in American News Media Content From 1988 to 2014”. In: *Frontiers in Communication* 4. DOI: [10.3389/fcomm.2019.00006](https://doi.org/10.3389/fcomm.2019.00006).
- Stehr, Paula et al. (2015). “Opinion Leadership | Parasocial Opinion Leadership Media Personalities’ Influence within Parasocial Relations: Theoretical Conceptualization and Preliminary Results”. In: *International Journal of Communication* 9.0, p. 20. URL: <https://ijoc.org/index.php/ijoc/article/view/2717>.
- Stella, Massimo, Emilio Ferrara, and Manlio De Domenico (2018). “Bots increase exposure to negative and inflammatory content in online social systems”. In: *Proceedings of the National Academy of Sciences* 115.49, pp. 12435–12440. DOI: [10.1073/pnas.1803470115](https://doi.org/10.1073/pnas.1803470115).
- Stella, Massimo, Valerio Restocchi, and Simon De Deyne (2020). “#lockdown: Network-Enhanced Emotional Profiling in the Time of COVID-19”. In: *Big Data and Cognitive Computing* 4.2.

- Sterling, Joanna, John T. Jost, and Richard Bonneau (2020). "Political psycholinguistics: A comprehensive analysis of the language habits of liberal and conservative social media users". In: *Journal of Personality and Social Psychology* 118.4, pp. 805–834. DOI: [10.1037/pspp0000275](https://doi.org/10.1037/pspp0000275).
- Stern, Nicholas (2007). *The Economics of Climate Change: The Stern Review*. Cambridge University Press. DOI: [10.1017/CB09780511817434](https://doi.org/10.1017/CB09780511817434).
- Stern, Paul C. (2000). "New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior". In: *Journal of Social Issues* 56.3, pp. 407–424. DOI: [10.1111/0022-4537.00175](https://doi.org/10.1111/0022-4537.00175).
- Stern, Paul C., Thomas Dietz, and Gregory A. Guagnano (1995). "The New Ecological Paradigm in Social-Psychological Context". In: *Environment and Behavior* 27.6, pp. 723–743. DOI: [10.1177/0013916595276001](https://doi.org/10.1177/0013916595276001).
- Stewart, Leo G, Ahmer Arif, and Kate Starbird (2018). "Examining Trolls and Polarization with a Retweet Network". In: p. 6.
- Stoddart, Mark C. J. et al. (2023). "Conference of the Parties Meetings as Regularly Scheduled Critical Events for Global Climate Governance: Reflecting on COP 26 and the Glasgow Climate Pact". In: *Society & Natural Resources* 36.4, pp. 442–450. DOI: [10.1080/08941920.2023.2175284](https://doi.org/10.1080/08941920.2023.2175284).
- Stoeckl, Verena E. (2014). "Lonely Rebel Or Pioneer of the Future? Towards an Understanding of Moral Stakeholder Framing of Activist Brands". In: *ACR North American Advances* NA-42. URL: <https://www.acrwebsite.org/volumes/1017782/volumes/v42/NA-42>.
- Stolle, Dietlind and Michele Micheletti (2013). "Discursive Political Consumerism". In: *Political Consumerism: Global Responsibility in Action*. Cambridge University Press, pp. 170–203. DOI: [10.1017/CB09780511844553.006](https://doi.org/10.1017/CB09780511844553.006).
- Stouffer, Samuel A. et al. (1949). *The American soldier: Adjustment during army life. (Studies in social psychology in World War II), Vol. 1*. The American soldier: Adjustment during army life. (Studies in social psychology in World War II), Vol. 1. Oxford, England: Princeton Univ. Press.
- Strijbos, Sytse (2006). "A normative systems approach for managing technology and collective human action". In: *User Behavior and Technology Development: Shaping Sustainable Relations Between Consumers and Technol.* Ed. by Peter-Paul Verbeek and Adriaan Slob. Dordrecht: Springer Netherlands, pp. 365–373. DOI: [10.1007/978-1-4020-5196-8_34](https://doi.org/10.1007/978-1-4020-5196-8_34).
- Strubell, Emma, Ananya Ganesh, and Andrew McCallum (2019). "Energy and Policy Considerations for Deep Learning in NLP". In: *Proceedings of the 57th Annual Meeting of the Association for*

- Computational Linguistics*. Florence, Italy: Association for Computational Linguistics, pp. 3645–3650. DOI: [10.18653/v1/P19-1355](https://doi.org/10.18653/v1/P19-1355).
- Su, Yan and Porismita Borah (2019). “Who is the agenda setter? Examining the intermedia agenda-setting effect between Twitter and newspapers”. In: *Journal of Information Technology & Politics* 16.3, pp. 236–249. DOI: [10.1080/19331681.2019.1641451](https://doi.org/10.1080/19331681.2019.1641451).
- Suárez-Rico, Yuli Marcela, M^a Antonia García-Benau, and Mauricio Gómez-Villegas (2019). “CSR communication through Facebook in the Latin American integrated market (MILA): Disclosure, interactivity and legitimacy”. In: *Meditari Accountancy Research* 27.5, pp. 741–760. DOI: [10.1108/MEDAR-03-2018-0313](https://doi.org/10.1108/MEDAR-03-2018-0313).
- Suitner, Caterina et al. (2022). “The rise of #climateaction in the time of the FridaysForFuture movement: A semantic network analysis”. In: *Social Networks*. DOI: [10.1016/j.socnet.2022.06.003](https://doi.org/10.1016/j.socnet.2022.06.003).
- Sundar, S. Shyam and Anthony M. Limperos (2013). “Uses and Grats 2.0: New Gratifications for New Media”. In: *Journal of Broadcasting & Electronic Media* 57.4, pp. 504–525. DOI: [10.1080/08838151.2013.845827](https://doi.org/10.1080/08838151.2013.845827).
- Taffel, Sy (2019). *Digital Media Ecologies: Entanglements of Content, Code and Hardware*. New York: Bloomsbury Academic.
- Tajfel, Henri (1974). “Social identity and intergroup behaviour”. In: *Social Science Information* 13.2, pp. 65–93. DOI: [10.1177/053901847401300204](https://doi.org/10.1177/053901847401300204).
- Tausczik, Yla and James Pennebaker (2010). “The Psychological Meaning of Words: LIWC and Computerized Text Analysis Methods”. In: *Journal of Language and Social Psychology* 29.1, pp. 24–54.
- Tay, Dennis (2021). “Automated lexical and time series modelling for critical discourse research: A case study of Hong Kong protest editorials”. In: *Lingua* 255. URL: <https://www.sciencedirect.com/science/article/pii/S0024384121000280>.
- Taylor, Sean J. et al. (2022). “Identity effects in social media”. In: *Nature Human Behaviour*, pp. 1–11. DOI: [10.1038/s41562-022-01459-8](https://doi.org/10.1038/s41562-022-01459-8).
- Teng, Xian et al. (2016). “Collective Influence of Multiple Spreaders Evaluated by Tracing Real Information Flow in Large-Scale Social Networks”. In: *Scientific Reports* 6.1, p. 36043. DOI: [10.1038/srep36043](https://doi.org/10.1038/srep36043).
- The Guardian - Bias and Credibility* (2023). URL: <https://mediabiasfactcheck.com/the-guardian/>.

- Thurman, Neil (2014). "Newspaper Consumption in the Digital Age". In: *Digital Journalism* 2.2, pp. 156–178. DOI: [10.1080/21670811.2013.818365](https://doi.org/10.1080/21670811.2013.818365).
- Tollefson, Jeff (2021). "COVID curbed carbon emissions in 2020 — but not by much". In: *Nature* 589.7842, pp. 343–343. DOI: [10.1038/d41586-021-00090-3](https://doi.org/10.1038/d41586-021-00090-3).
- Törnberg, Petter (2022). "How digital media drive affective polarization through partisan sorting". In: *Proceedings of the National Academy of Sciences* 119.42. DOI: [10.1073/pnas.2207159119](https://doi.org/10.1073/pnas.2207159119).
- Trumbo, Craig (1996). "Constructing climate change: claims and frames in US news coverage of an environmental issue". In: *Public Understanding of Science* 5.3, pp. 269–283. DOI: [10.1088/0963-6625/5/3/006](https://doi.org/10.1088/0963-6625/5/3/006).
- Tucker, Joshua A. et al. (2017). "From Liberation to Turmoil: Social Media And Democracy". In: *Journal of Democracy* 28.4. Publisher: Johns Hopkins University Press, pp. 46–59.
- Tufekci, Zeynep (2013). "'Not This One': Social Movements, the Attention Economy, and Micro-celebrity Networked Activism". In: *American Behavioral Scientist* 57.7, pp. 848–870. DOI: [10.1177/0002764213479369](https://doi.org/10.1177/0002764213479369).
- Tufekci, Zeynep and Christopher Wilson (2012). "Social Media and the Decision to Participate in Political Protest: Observations From Tahrir Square". In: *Journal of Communication* 62.2, pp. 363–379. DOI: [10.1111/j.1460-2466.2012.01629.x](https://doi.org/10.1111/j.1460-2466.2012.01629.x). URL: <https://doi.org/10.1111/j.1460-2466.2012.01629.x>.
- Tukey, John W. (1949). "Comparing Individual Means in the Analysis of Variance". In: *Biometrics* 5.2, pp. 99–114. DOI: [10.2307/3001913](https://doi.org/10.2307/3001913).
- Tumasjan, Andranik et al. (2010). "Predicting Elections with Twitter: What 140 Characters Reveal about Political Sentiment". In: *Proceedings of the International AAAI Conference on Web and Social Media* 4.1. URL: <https://ojs.aaai.org/index.php/ICWSM/article/view/14009>.
- Twine, Richard (2012). "Revealing the 'Animal-Industrial Complex' – A Concept & Method for Critical Animal Studies?" In: *Journal for Critical Animal Studies*, 10.1, pp. 12–39.
- Twitter (2023a). *How to Retweet*. URL: <https://help.twitter.com/en/using-twitter/how-to-retweet>.
- (2023b). *Standard v1.1 | Docs | Twitter Developer Platform*. URL: <https://developer.twitter.com/en/docs/twitter-api/v1>.
- Tyagi, Aman, Joshua Uyheng, and Kathleen M. Carley (2020). "Affective Polarization in Online Climate Change Discourse on Twitter". In: *2020 IEEE/ACM International Conference on Advances*

- in *Social Networks Analysis and Mining (ASONAM)*, pp. 443–447. DOI: [10.1109/ASONAM49781.2020.9381419](https://doi.org/10.1109/ASONAM49781.2020.9381419).
- Tyler, Tom R and Heather J Smith (1998). “Social Justice and Social Movements”. In: *Handbook of social psychology*. Ed. by D Gilbert, S.T. Fiske, and G Lindzey. New York: McGraw-Hill.
- Tyson, Alec, Brian Kennedy, and Cary Funk (2021). *Gen Z, Millennials Stand Out for Climate Change Activism, Social Media Engagement With Issue*. URL: <https://www.pewresearch.org/science/2021/05/26/gen-z-millennials-stand-out-for-climate-change-activism-social-media-engagement-with-issue/>.
- UN (2021). *COP26: Thousands of young people take over Glasgow streets demanding climate action*. URL: <https://news.un.org/en/story/2021/11/1105042>.
- (2022). ‘Our futures are being stolen!’ Youth activists tell COP27 negotiators it’s past time to tackle ‘loss and damage’. URL: <https://news.un.org/en/story/2022/11/1130422>.
- (2023). “Secretary-General Calls on States to Tackle Climate Change ‘Time Bomb’ through New Solidarity Pact, Acceleration Agenda, at Launch of Intergovernmental Panel Report”. In: *Meetings Coverage and Press Releases*. URL: <https://press.un.org/en/2023/sgsm21730.doc.htm>.
- UNFCCC (2021). *The Glasgow Climate Pact – Key Outcomes from COP26*. URL: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact-key-outcomes-from-cop26>.
- USGCRP (2009). *Global climate change impacts in the United States: a state of knowledge report*. Tech. rep. U.S. Global Change Research Program. URL: <https://www.globalchange.gov/browse/reports/global-climate-change-impacts-united-states>.
- Veganuary (2022a). *Increasing Participation In Veganuary*. URL: <https://veganuary.com/about/increasing-participation/>.
- (2022b). *Veganuary 5-Year Strategy*. URL: <https://veganuary.com/wp-content/uploads/2022/06/5-Year-Strategy-Document-June-6.pdf>.
- Verhoef, T., E. Walker, and T. Marghetis (2016). “Cognitive biases and social coordination in the emergence of temporal language”. In: *CogSci*.
- Vissers, Sara and Dietlind Stolle (2014). “The Internet and new modes of political participation: online versus offline participation”. In: *Information, Communication & Society* 17.8, pp. 937–955. DOI: [10.1080/1369118X.2013.867356](https://doi.org/10.1080/1369118X.2013.867356).

- Vo, Tam Thien, Xinning Xiao, and Shuk Ying Ho (2019). "How Does Corporate Social Responsibility Engagement Influence Word of Mouth on Twitter? Evidence from the Airline Industry". In: *Journal of Business Ethics* 157.2, pp. 525–542. DOI: [10.1007/s10551-017-3679-z](https://doi.org/10.1007/s10551-017-3679-z).
- Vredenburg, Jessica et al. (2020). "Brands Taking a Stand: Authentic Brand Activism or Woke Washing?" In: *Journal of Public Policy & Marketing* 39.4, pp. 444–460. DOI: [10.1177/0743915620947359](https://doi.org/10.1177/0743915620947359).
- Vu, Hong Tien et al. (2021). "Social Media and Environmental Activism: Framing Climate Change on Facebook by Global NGOs". In: *Science Communication* 43.1, pp. 91–115. DOI: [10.1177/1075547020971644](https://doi.org/10.1177/1075547020971644).
- Walker, Iain and Heather J. Smith (2002). *Relative Deprivation: Specification, Development, and Integration*. Cambridge University Press.
- Walker, Mason and Katerina Eva Matsa (2021). *News Consumption Across Social Media in 2021*. URL: <https://www.pewresearch.org/journalism/2021/09/20/news-consumption-across-social-media-in-2021/>.
- Wang, Chih-Chuan (2018). "Corporate social responsibility on customer behaviour: the mediating role of corporate image and customer satisfaction". In: *Total Quality Management & Business Excellence* 31.7-8, pp. 742–760. DOI: [10.1080/14783363.2018.1444985](https://doi.org/10.1080/14783363.2018.1444985).
- Washington Post - Bias and Credibility* (2023). URL: <https://mediabiasfactcheck.com/washington-post/>.
- WashPostPR (2022). "The Washington Post records more than 71 million unique digital visitors in December 2021". In: *Washington Post*. URL: <https://www.washingtonpost.com/pr/2022/01/25/washington-post-records-more-than-71-million-unique-digital-visitors-december-2021/>.
- Waugh, Andrew Scott et al. (2009). *Party Polarization in Congress: A Network Science Approach*. SSRN Scholarly Paper. Rochester, NY: Social Science Research Network.
- Weele, Cor van der et al. (2019). "Meat alternatives: an integrative comparison". In: *Trends in Food Science & Technology* 88, pp. 505–512. DOI: [10.1016/j.tifs.2019.04.018](https://doi.org/10.1016/j.tifs.2019.04.018).
- Weimann, Gabriel (1982). "On the Importance of Marginality: One more step into the two-step flow of communication". In: *American Sociological Review* 47, pp. 764–773.
- Wessler, Hartmut et al. (2016). "Global Multimodal News Frames on Climate Change: A Comparison of Five Democracies around the World". In: *The International Journal of Press/Politics* 21.4, pp. 423–445. DOI: [10.1177/1940161216661848](https://doi.org/10.1177/1940161216661848).

- Wetts, Rachel (2020a). "In climate news, statements from large businesses and opponents of climate action receive heightened visibility". In: *Proceedings of the National Academy of Sciences* 117.32, pp. 19054–19060. DOI: [10.1073/pnas.1921526117](https://doi.org/10.1073/pnas.1921526117).
- (2020b). "Models and Morals: Elite-Oriented and Value-Neutral Discourse Dominates American Organizations' Framings of Climate Change". In: *Social Forces* 98.3, pp. 1339–1369. DOI: [10.1093/sf/soz027](https://doi.org/10.1093/sf/soz027).
- White, Richard (2018). "Looking backward/ moving forward. Articulating a "Yes, BUT...!" response to lifestyle veganism, and outlining post-capitalist futures in critical veganic agriculture". In: *EuropeNow* 20. URL: <https://www.europenowjournal.org/2018/09/04/looking-backward-moving-forward-articulating-a-yes-but-response-to-lifestyle-veganism/>.
- Whitmarsh, Lorraine, Saffron O'Neill, and Irene Lorenzoni (2011). *Engaging the public with climate change: behaviour change and communication*. London ; Washington, DC: Earthscan.
- Wiernik, Brenton, Deniz Ones, and Stephan Dilchert (2013). "Age and environmental sustainability: a meta-analysis". In: *Journal of Managerial Psychology* 28.7/8, pp. 826–856. DOI: [10.1108/JMP-07-2013-0221](https://doi.org/10.1108/JMP-07-2013-0221).
- Wiest, Sara L., Leigh Raymond, and Rosalee A. Clawson (2015). "Framing, partisan predispositions, and public opinion on climate change". In: *Global Environmental Change* 31, pp. 187–198. DOI: [10.1016/j.gloenvcha.2014.12.006](https://doi.org/10.1016/j.gloenvcha.2014.12.006).
- Willett, Walter et al. (2019). "Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems". In: *The Lancet* 393.10170, pp. 447–492. DOI: [10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).
- Williams, Hywel et al. (2015). "Network analysis reveals open forums and echo chambers in social media discussions of climate change". In: *Global Environmental Change* 32, pp. 126–138. DOI: [10.1016/j.gloenvcha.2015.03.006](https://doi.org/10.1016/j.gloenvcha.2015.03.006).
- Williams, Matthew, Pete Burnap, and Luke Sloan (2017). "Towards an Ethical Framework for Publishing Twitter Data in Social Research: Taking into Account Users' Views, Online Context and Algorithmic Estimation". In: *Sociology* 51.6, pp. 1149–1168. DOI: [10.1177/0038038517708140](https://doi.org/10.1177/0038038517708140).
- Wodak, Ruth (2021). *The politics of fear: the shameless normalization of far-right discourse*. 2nd ed. London: Sage.

- Wodak, Ruth, Jonathan Culpeper, and Elena Semino (2021). "Shameless normalisation of impoliteness: Berlusconi's and Trump's press conferences". In: *Discourse & Society* 32.3, pp. 369–393. DOI: [10.1177/0957926520977217](https://doi.org/10.1177/0957926520977217).
- Wolling, Jens and Dorothee Arlt (2017). "Media Coverage of International Climate Summits and Negotiations". In: *Oxford Research Encyclopedia of Climate Science*.
- Wozniak, Antal et al. (2021). "The Event-Centered Nature of Global Public Spheres: The UN Climate Change Conferences, Fridays for Future, and the (Limited) Transnationalization of Media Debates". In: *International Journal of Communication* 15.0, p. 27. URL: <https://ijoc.org/index.php/ijoc/article/view/14843>.
- Wrenn, Corey Lee (2011). "Resisting the Globalization of Speciesism: Vegan Abolitionism as a Site for Consumer-Based Social Change". In: *Journal for Critical Animal Studies* 9.3, pp. 9–27.
- Wundt (1896). "Grundriss der Psychologie (Outlines of Psychology)". In: *Nature* 53.1383, pp. 604–604. DOI: [10.1038/053604a0](https://doi.org/10.1038/053604a0).
- WWF (2008). *Weathercocks and signposts: the environment movement at a crossroads*. Tech. rep. World Wide Fund for Nature. URL: https://wwf.panda.org/wwf_news/?140621/Weathercocks-and-signposts-the-environment-movement-at-a-crossroads.
- Yang, Aimei and Adam J. Saffer (2019). "Embracing a network perspective in the network society: The dawn of a new paradigm in strategic public relations". In: *Public Relations Review* 45.4. DOI: [10.1016/j.pubrev.2019.101843](https://doi.org/10.1016/j.pubrev.2019.101843).
- Yasseri, Taha and Jonathan Bright (2016). "Wikipedia traffic data and electoral prediction: towards theoretically informed models". In: *EPJ Data Science* 5.1, pp. 1–15. DOI: [10.1140/epjds/s13688-016-0083-3](https://doi.org/10.1140/epjds/s13688-016-0083-3).
- Yuan, Elaine J (2013). "A culturalist critique of 'online community' in new media studies". In: *New Media & Society* 15.5, pp. 665–679. DOI: [10.1177/1461444812462847](https://doi.org/10.1177/1461444812462847).
- Zaller, John (1992). *The Nature and Origins of Mass Opinion*. Cambridge University Press.
- Zarling, Patti (2018). *Consumers prefer the term 'plant-based' to 'vegan'*. URL: <https://www.fooddive.com/news/consumers-prefer-the-term-plant-based-to-vegan/521807/>.
- Zelezny, Lynnette C., Poh-Pheng Chua, and Christina Aldrich (2000). "New Ways of Thinking about Environmentalism: Elaborating on Gender Differences in Environmentalism". In: *Journal of Social Issues* 56.3, pp. 443–457. DOI: [10.1111/0022-4537.00177](https://doi.org/10.1111/0022-4537.00177).

- Zheng, Pei and Saif Shahin (2020). "Live tweeting live debates: How Twitter reflects and refracts the US political climate in a campaign season". In: *Information, Communication & Society* 23.3, pp. 337–357. DOI: [10.1080/1369118X.2018.1503697](https://doi.org/10.1080/1369118X.2018.1503697).
- Zhou, Alvin (2019). "Bring publics back into networked public relations research: A dual-projection approach for network ecology". In: *Public Relations Review* 45.4, p. 101772. DOI: [10.1016/j.pubrev.2019.03.004](https://doi.org/10.1016/j.pubrev.2019.03.004).
- Zhou, Zicong et al. (July 25, 2010). "Information resonance on Twitter: watching Iran". In: *Proceedings of the First Workshop on Social Media Analytics*. SOMA '10. New York, NY, USA: Association for Computing Machinery, pp. 123–131. DOI: [10.1145/1964858.1964875](https://doi.org/10.1145/1964858.1964875).
- Zhu, Xun, Youllee Kim, and Haseon Park (2020). "Do messages spread widely also diffuse fast? Examining the effects of message characteristics on information diffusion". In: *Computers in Human Behavior* 103, pp. 37–47. DOI: [10.1016/j.chb.2019.09.006](https://doi.org/10.1016/j.chb.2019.09.006).
- Zomeren, Martijn van, Maja Kutlaca, and Felicity Turner-Zwinkels (2018). "Integrating who "we" are with what "we"(will not) stand for: A further extension of the Social Identity Model of Collective Action". In: *European Review of Social Psychology* 29.1, pp. 122–160.
- Zomeren, Martijn van, Inga L. Pauls, and Smadar Cohen-Chen (2019). "Is hope good for motivating collective action in the context of climate change? Differentiating hope's emotion- and problem-focused coping functions". In: *Global Environmental Change* 58, p. 101915. DOI: [10.1016/j.gloenvcha.2019.04.003](https://doi.org/10.1016/j.gloenvcha.2019.04.003).
- Zomeren, Martijn van, Tom Postmes, and Russell Spears (2008). "Toward an integrative social identity model of collective action: a quantitative research synthesis of three socio-psychological perspectives". In: *Psychological Bulletin* 134.4, pp. 504–535. DOI: [10.1037/0033-2909.134.4.504](https://doi.org/10.1037/0033-2909.134.4.504).