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Reporting on the 2019 European Heatwaves and Climate Change: Journalists' Attitudes, Motivations and Role Perceptions

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ABSTRACT


In summer 2019, several countries in Europe experienced unprecedented heatwaves. Two extreme event attribution (EEA) studies, which assess the role of climate change in extreme weather events, were published at roughly the same time as the heatwaves were taking place (June/August 2019). Building on a prior study of online news media coverage of the heatwaves, this study surveyed journalists from major news outlets in France, Germany, the Netherlands and the UK. Based on the responses of 42 journalists, we found a relative lack of knowledge about EEA studies but a high level of importance assigned to writing about the link between the heatwaves and climate change (e.g., likelihood or intensity); a relatively low number of specialist reporters vs. general reporters covering the heatwaves; a strong reliance on scientific experts as sources; no inclusion of climate change deniers; stronger role perceptions as educators than advocates; relatively little time and resource constraints on their reporting; and an overall tendency for the journalists to report more about climate change. The findings provide new insights into journalism practice and climate journalism in terms of the peculiarities and contextual factors that can influence coverage of extreme weather events and climate change.

KEYWORDS

Climate journalism; extreme weather events; climate change; cross-country; survey; extreme event attribution; heatwave

In summer 2019, several countries in Europe experienced unprecedented heatwaves with record-breaking temperatures, including Belgium, France, Germany, the Netherlands, and the UK (Vautard et al. 2020). France, for example, set an all-time high of 46°C and the UK measured a record-high of 38.7°C in Cambridge in July. The heatwaves were not only exceptional with regard to temperatures; the European heatwave was also identified as the deadliest extreme event in 2019 across the world with a total of approximately

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2,500 deaths in Belgium, France, the Netherlands, and the UK (CRED & USAID 2020). Given this extraordinary weather phenomenon and the increasing social and cultural relevance of heatwaves and their impacts (Mcgregor et al. 2007), the 2019 heatwaves spurred considerable media coverage in European news outlets, particularly in countries where the heat was most strongly felt. This study builds on a prior content analysis study (Painter et al. 2021) examining coverage of the 2019 heatwaves in France, Germany, the Netherlands and the UK among the five most visited online news outlets per country, which showed that more than 2,447 articles dealt with the 2019 heatwaves in the period between 1 June 2019 and 30 September 2019. However, only about 11%, equivalent to 267 articles in total across the four countries, mentioned any link to climate change.

Some experts in the UK criticized reporting about the 2019 heatwaves for paying insufficient attention to climate change, for not highlighting the risks and negative impacts of the heatwave and for the generally positive tone and imagery used in the coverage (Taylor 2019; Watts 2019). Similarly, some commentators in the Netherlands pointed out that there was too much discussion about where and when the next weather record would be broken, and that record-breaking temperatures should have not been “celebrated” in light of the dangers posed by climate change (Clevers 2019). In France, the strong focus of the media coverage on the heatwave was criticized for implying an almost automatic link with climate change, likely to cause collective fear and stress among the population (Fachaux 2019).

The role of journalists in covering climate change and their journalistic practices has been extensively researched in the past (e.g., Boykoff and Boykoff 2004; Brüggemann and Engesser 2017; for an overview, see Schäfer and Painter 2021). More recently, scholars have investigated how extreme weather events have been covered in the news and how journalists deal with such media events in their daily practice (e.g., Anderson, Chubb, and Djerf-Pierre 2018; Burgess et al. 2020; Corder and Schwartz 2019; Hopke 2020; Hovardas 2014; Ungar 2014). The studies imply that mainstream and legacy media have, in general, done a poor job in describing the link between climate change and extreme weather events when it would have been appropriate (Painter and Hassol 2020; Osaka and Bellamy 2020), and in some cases not making the link at all (Hopke 2020). Given that climate change is increasing the frequency and intensity of certain kinds of extreme weather events (Vautard et al. 2020), journalists and the media play a crucial role in informing the public about the implications and impacts of climate change on their daily lives. One way of doing this is by reporting accurately, and explaining, extreme event attribution (EEA) studies.

EEA studies have gained considerable interest among scientists, politicians, the media and the public. These studies sit at the cutting-edge of climate science and provide insights into the extent to which individual weather events have become more/less likely or more/less severe due to anthropogenic climate change. For example, with regard to the 2019 heatwaves, EEA studies have shown that the heatwaves became several times more likely and more intense as a result of anthropogenic climate change (van Oldenborgh et al. 2019; Vautard et al. 2020; Ma et al. 2020). However, media coverage of EEA studies has received little scholarly research so far (with the exceptions of Osaka et al. 2020 and Painter et al. 2020). In general, journalists who report about climate face a number of challenges such as lack of time and resources (Robbins and Wheatley 2021), as well as access to relevant sources (Maibach et al. 2018), and these are

amplified with regard to extreme weather reporting and EEA studies: the science is complicated, the sources for insights are limited, and training for reporting about climate science is often lacking, for example in India (Painter et al. 2020). Hence, this study seeks to explore how journalists reported EEA analyses of the 2019 heatwaves in Europe, what journalistic practices (e.g., use of sources) they followed when writing about the heatwaves, how they perceive their role in covering extreme weather events more generally, as well as how they believe contextual and organizational factors influenced their reporting.

Literature Review

News Media, Extreme Weather Events and EEA Studies

With an increase of certain kinds of extreme weather events such as heatwaves, floods, droughts, and extreme precipitation, the media coverage of such events has correspondingly increased. For example, while news media coverage of climate change in 2020 fell by 23% compared to 2019—largely due to the extensive coverage of the outbreak of Covid-19 across the world—the coverage of climate change was still higher compared to previous years (2015-2018), in part because the media reported more frequently about extreme weather events such as hurricanes in Central America, cyclones in the South Pacific, and flooding in Asia (Boykoff et al. 2021). In fact, recent survey research from 40 countries has shown that news media are the most widely used information source on climate change, particularly when consumed via television or online news sites from major news organizations (Newman et al. 2020). Hence, news media can still be considered one of the most important outlets for citizens to learn about climate change, evaluate it and act upon it (Carvalho 2010; Metag, Füchslin, and Schäfer 2017). A wide array of research has studied how news outlets and journalists report climate change (Schäfer and Painter 2021), and how audiences respond to news coverage about it (e.g., Hansen 2010; Happer and Philo 2016; Olausson 2018).

However, the link between extreme weather events and anthropogenic climate change has often been contested in the news media, particularly in countries where climate deniers are given stronger media presence, such as in the US, Australia, and the UK (Bacon and Nash 2012; Boykoff and Boykoff 2004; Painter 2016). For example, in 2019-2020, a heated political debate took place in Australia about whether climate change was to blame for the devastating bushfires, despite scientific evidence that provided clear links between the increased frequency and severity of the fires and anthropogenic climate change (Jones et al. 2020). Another challenge of reporting about extreme weather events and climate change is that the wrong questions are often asked. Rather than inquiring “was this event caused or not caused by climate change,” many climate scientists argue that the more important and scientifically accurate question is: “to what extent has climate change made this event more extreme or more likely?” (Carrington 2018). Implying direct causality belies the many factors involved in complex weather systems, not to mention the roles of adaptation and disaster risk reduction in ultimately determining the impacts of an event.

As described earlier, extreme event attribution (EEA) studies compare a world without human-induced climate change created using computer modeling simulations, against

the world we have today using observational data. The results of this comparison help us to measure how much more/less likely or more/less severe a particular weather event became due to anthropogenic climate change (Clarke, Otto, and Jones 2021). Two such studies were published by the umbrella science organization World Weather Attribution (WWA) in June and August of 2019 that offered insights into the extent to which the 2019 heatwaves were impacted by climate change. The study in June was carried out in near real-time, that is, as the event was unfolding, whilst the August study was conducted once the event had concluded. Heatwaves in these studies were defined as cases where temperatures exceeded the observed values of daily mean temperatures averaged over three days. As with any EEA analysis, there will be differences in the results across a study region showing discrepancies in changes in likelihood and intensity, although using the same methods and event definitions. The first EEA study about the 2019 heatwaves assessed the heatwave first occurring in the last week of June 2019 in France, and the second at the end of July 2019 covering Western Europe. The results from the two studies showed that in France and the Netherlands, the record-breaking temperatures were made about 100 times more likely and in the UK and Germany, the heatwaves were made about ten times more likely (Vautard et al. 2019).

Heatwaves as an extreme weather event will continue to make headlines and be of interest to journalists as they are considered one of the deadliest natural hazards to humans by the World Health Organization (WHO 2020). The WHO states that between 2000 and 2016 approximately 125 million more people were exposed to the effects of heatwaves. In an assessment of the emergency events database, Harrington and Otto (2020) note that in Europe alone between 1980 and 2019 there were 83 heatwaves, resulting in over 140,000 deaths and more than US \$ 12 billion of damages. In Australia, the 2009 heatwave led to direct financial losses estimated at US \$ 800 million from impacts on transport and energy infrastructure, as well as loss of labor productivity (Steffen et al. 2019). These statistics underscore the relevance of research into how journalists cover extreme weather events, such as the 2019 European heatwaves, and potential links to climate change based on EEA studies.

News Coverage of Extreme Weather Events and EEA Studies

In recent years, a number of studies have investigated how extreme weather events can affect individuals' understanding of climate change, their concerns about the risks of climate change (Bergquist and Warshaw 2019; Cutler et al. 2020), their perceived experiences of climate change (Howe et al. 2019), and the potential to trigger community discussions and collective action (Boudet et al. 2020) as well as engagement (Dixon, Bullock, and Adams 2019). In general, media coverage about climate change has the potential to shape public attitudes, understanding and awareness for climate change (Carvalho 2010). Similarly, reporting about extreme weather events offers the opportunity to make the public aware of how climate change is affecting their daily lives. However, when Osaka and Bellamy (2020) investigated how EEA studies of the 2011–2017 California drought were perceived by key stakeholders (e.g., journalists, policymakers, NGOs, citizens), they found that the diverging results of EEA studies can lead stakeholders to entrench their pre-existing views and even question the efficiency and utility of EEA studies.

In fact, previous research has criticized mainstream and legacy media for their reporting on extreme weather events. Painter and Hassol (2020) asserted that journalists can be too slow in making the link between the event and climate change or fail to make the link at all (e.g., Anderson, Chubb, and Djerf-Pierre 2018; Hopke 2020). A recent study about the adaptation of European cities to heatwaves (Jiménez-Gómez and Martín-Sosa-Rodríguez 2021) found strong country variations in the degree to which the news media provided rigorous or in-depth reporting about the topic. Similarly, Hopke (2020) concluded that the description of the link between extreme weather events and climate change is most prevalent in elite, climate-specialist news outlets such as *The Guardian* and *The New York Times*. However, reporting about extreme weather events is not just about making the link to climate change. Increasingly, these weather developments also have implications for societies, infrastructures and economies, such as rising mortality rates due to heat waves (McKie 2021), risks of power outages, water shortages or transportation disruption, or more generally impacts on the ecosystem, industries, and social cohesion (Mcgregor et al. 2007). In this vein, making sense of extreme weather events by referring to scientific findings that explain the severity and extremity of such events in light of climate change (e.g., EEA studies) are of paramount interest to support the publics' understanding of climate change and its impacts.

One of the few studies investigating EEA studies and its news coverage was conducted by Osaka et al. (2020). By studying the media coverage of the California drought in five U.S. media outlets in 2014 and 2015, the authors found that the drought was widely reported with a link to climate change in both local and national news. In contrast, Painter et al. (2020) investigated the coverage of two extreme weather events in 2015 in Andhra Pradesh and Chennai in India and the journalistic use of EEA studies, concluding that EEA studies were quoted only rarely and that journalists tend to use generic phrases when describing the link between the events and climate change. Furthermore, politicians and NGOs in that study often "blamed" climate change for the extreme weather event but did not make the reference to the relevant science.

The studies mentioned above have only focused on the USA and India when analyzing the news coverage of extreme weather events and EEA studies, so more research in other parts of the world is needed. Therefore, this study adopts a cross-national approach in studying the 2019 heatwaves in France, Germany, the Netherlands and the UK. Based on previous research findings and given the unique opportunity to study the coverage of the heatwaves and the publication of two corresponding EEA studies during the time they occurred, the following research question is posed in two parts:

(RQ1) (a) *To what extent were journalists aware of EEA studies and (b) how did they report about them in relation to the 2019 European heatwaves and heatwaves in general?*

Climate Journalism: Journalistic Practices, Role Perceptions, Contextual Factors

Journalists covering climate change have been subject to a plethora of research in recent years, ranging from role and self-perception studies (e.g., Brüggemann and Engesser 2014) to source use investigations (e.g., Hansen 2010) and influences of individual, economic, technological and organizational factors (e.g., Boykoff and Boykoff 2007; Gibson 2016). Most significant is the finding that the reporting of climate journalists is largely

dependent and influenced by the availability of, and access to, a variety of sources, including NGOs, corporations, researchers and politicians (for an overview, see: Schäfer and Painter 2021). In recent years, the communication of institutions such as corporations, foundations, universities, research institutions (e.g., the IPCC) and NGOs has professionalized vastly, with special public relations efforts such as pre-packaged press material, press releases and press conferences, aimed at forming news coverage about environmental topics (Hansen 2010; Williams 2015). Similarly, active interaction with sources and audiences (e.g., reciprocal journalism: Gutsche et al. 2017) to gain first-hand insights for climate change coverage has become a common journalistic method in environmental journalism.

However, a common criticism that climate journalism faces is the persistent use of climate skeptics as a source, which in the past was partly explained by the journalistic norm of balanced reporting (for an overview, see: Brüggemann and Engesser 2017). In Anglosphere countries (Australia, USA, UK) in particular, the presence of skeptic sources, climate change deniers or counter-movements continued throughout the 2000s and gained particular prominence in the Trump administration 2016–2020 (Boykoff and Boykoff 2007; Boykoff and Farrell 2019). In contrast, one wide-ranging study of the media in five countries (Germany, India, UK, USA, and Switzerland) found that many climate journalists did not perceive climate skeptics as trustworthy sources (Brüggemann and Engesser 2014). Indeed, over the past years and partly due to increasing pressures from NGOs and scientists, some news outlets have decided not to give any space at all to climate skeptics in their reporting or reduce the amount of space to certain types of skeptics (e.g., Associated Press, BBC, The Conversation in Australia; Schäfer and Painter 2021).

However, since the era of President Trump and Putin, environmental journalists have increasingly been faced with a strong political partisanship and propaganda campaigns associated with climate change, particularly in the US context (McNair 2017). Similarly, research has shown a surge of disinformation campaigns on climate change on social media (e.g., on Facebook: Gillam 2020), which is also reflected in an escalation of accusations and threats that journalists are receiving from people who discredit their reporting (Schleifstein 2020). Faced with this hostile reporting environment, journalists in the UK, Ireland and the US have also reported that environmental issues are becoming more difficult to explain. As climate science becomes more complex, journalists often require help from academics and external sources (Robbins and Wheatley 2021).

While these findings refer to general environmental news reporting, less is known about what sources or practices journalists employ when writing about extreme weather events or EEA studies, which pose additional challenges to journalists. For example, the science of EEA is advancing rapidly, which makes it difficult for some scientists to adequately reflect upon these developments (Hassol et al. 2016), and for journalists to keep up with the newest climate models and techniques. Osaka et al. (2020) found that journalists in the US included a link to climate change and statements about attribution in their coverage of the Californian drought between 2014 and 2015, but most of the phrases were rather general and focused on the long-term (e.g., “climate change makes droughts more likely or intense in the future”) rather than intensity or likelihood statements for the specific drought. Furthermore, the authors concluded that the different results of attribution studies often resulted in frames of scientific uncertainty or coverage

of the disagreements about the results. Painter et al.'s study (2020) of two extreme weather events in 2015 in India concluded that EEA findings were only cited sparsely, probably due to the fact that the EEA studies were published months after the events occurred. Given the unique opportunity offered by the publication of two EEA studies during the 2019 European heatwaves, this study builds on previous research to inquire:

(RQ2) *What common practices did journalists follow in reporting about the 2019 European heatwaves, including their use of different sources?*

The role perceptions of journalists have also been found to play a crucial role in climate change and environmental reporting (Brüggemann and Engesser 2014; Friedman 2015). A seminal study by Fahy and Nisbet (2011) showed that science journalists have transformed from a gatekeeping role (e.g., selecting topics, informing, disseminating) to a curating role, meaning that they have a more active role in identifying content, re-composing and evaluating it and presenting it with a strong focus on the particular audience. Other researchers have identified similar role descriptions of climate journalists such as “pathfinders” or “scouts” (Brüggemann 2017). Although, the traditional gatekeeping role seems to have disappeared over time (Fahy and Nisbet 2011), some forms of gatekeeping are still present among environmental journalists today, ranging from “neutral informer” to “translating” roles (Dunwoody 2014) or “explainers” of complex topics such as climate change (Brüggemann and Engesser 2014).

Furthermore, with increasing climate change awareness and activism amongst the public, some scholars have identified a shift towards “soft” (e.g., pressing for more climate action) or “hard” (e.g., supporting NGO campaigns) advocacy roles in climate and environmental journalism (e.g., Lester 2013; Sachsman, Simon, and Valenti 2010; Strauß 2021). This is also reflected in a positive attitude among environmental journalists towards advocacy groups, as found in previous research (Brüggemann and Engesser 2014). The advocacy role was found to be particularly present among online journalists and digital-born news media in the USA (Tandoc and Takahashi 2014). However, environmental journalists from the UK, Ireland and the US who were interviewed by Robbins and Wheatley (2021) took a strong stance against an advocacy role, arguing that “reporting evidence and scientific reality does not equate to advocacy” (12). Thus, considering the various manifestations of role perceptions among climate/environmental journalists, we were interested in how journalists perceive their role specifically with regard to extreme weather event reporting. The third research question, therefore, reads:

(RQ3) *Which role perceptions do journalists follow when reporting about extreme weather events?*

Organizational contexts and the editorial line of news outlets might play a crucial role in explaining the prevalence of distinct role perceptions, including when reporting about extreme weather events. For example, *The Guardian* has expanded its environmental beat and announced a “climate emergency,” making climate change reporting one of its top priorities. Similarly, France experienced a trend of professionalization in environmental journalism in the 2000s where journalists switched from a political motivation to report about climate change to following more professional norms (Aykut, Comby, and Guillemot 2012). Furthermore, the recent global journalism initiative “Covering Climate Now” which was founded in 2019 brings together more than 400 news outlets,

reaching 2 billion people worldwide with them aim of doing more and better coverage of climate change (CCNow 2021). Such developments have prompted some commentators to question whether a drive to do more coverage could push journalists into a form of activism (Nisbet 2019).

Besides such editorial decisions, the resources available in a news outlet might also play a crucial role in influencing coverage about extreme weather events. Previous research has found that journalists covering topics related to climate change are not necessarily correspondents or reporters tied to a science or environmental beat; rather, climate journalism “cuts across beats” and can include reporters from a wide variety of specialty areas including energy, health, economics or sport (Brüggemann and Engesser 2014, 400), and ranging between the intersection of local and national reporting (cf. Gutsche Jr and Shumow 2019). In a similar vein, journalists covering heatwaves might not be specialist environmental journalists but general reporters, who are not as versed in climate science. For example, past research into journalists in Germany, India, Switzerland, the UK, and the USA, has shown a clear distinction between a core of “prolific” writers on climate change and a larger circle of “occasional” writers: the first group most clearly opposes the idea that climate skeptics should be provided with equal voice in climate coverage (Brüggemann and Engesser 2014, 416). Thus, when investigating journalists who have covered the 2019 European heatwaves, it is clear that the contextual and organizational factors behind climate journalism have to be taken into account.

Climate journalism, as with journalism more broadly, has been suffering from a cutback in resources in many countries. Due to declining revenues, the number of environmental and science reporters declined overall (and particularly in the USA: Boykoff and Yulsman 2013; Robbins and Wheatley 2021) and showed a trend towards more generalist than specialist reporters, more freelance reporters, and increased pressure on journalists to produce a greater volume of output in the same time, but for various platforms and media forms (Boykoff and Yulsman 2013; Friedman 2015; Gibson 2016). In contrast, a different trend can be observed at large media organizations or net-native outlets (Robbins and Wheatley 2021) and in the UK where public broadcasters such as the *BBC* have maintained a large team of science and environmental reporters (Painter 2013). Thus, the extent to which climate change, or heatwaves and EEA studies, gets covered can very much depend on the country, the national media context and distinct organizational and editorial priorities in each media outlet. Hence, the fourth research question reads:

(RQ4) To what extent do journalists cite organizational and contextual factors as influences upon their reporting about the 2019 European heatwaves?

Method

Survey Design

This survey study builds on a content analysis of the news coverage of the 2019 European heatwaves in France, Germany, the Netherlands and the UK (Painter et al. 2021), of which a short summary of the methodological approach and the results can be found in the Appendix. In this study, we opted for a survey, since we had specific questions with

various categories that emerged from the content analysis regarding the reporting practices of journalists covering the heatwaves in the four countries mentioned above. Based on the categories from the content analysis, we were able to derive clear questions with distinct, exhaustive and precise answer categories. We also wanted to conduct interviews, but due to time and resource constraints were not able to do so. Based on the results of the content analysis, we prepared a survey to better understand what factors influenced journalists in their reporting about the 2019 European heatwaves and the respective EEA studies. After agreeing to participate in the survey, the journalists were first asked for basic demographic information, followed by questions about their coverage of the 2019 heatwaves, including organizational factors influencing the coverage; their familiarity with EEA studies; the sources they used; how they described the extreme weather and climate change link; and their role perceptions. At the end of the survey, we provided an open-ended question for additional remarks where journalists could write comments regarding their coverage of heatwaves, and particularly the 2019 heatwave. We used 5-point Likert scales for survey questions wherever applicable (e.g., 1 = none at all; 5 = a great deal).

Survey Procedure and Method of Analysis

Making use of the previous content analysis study (Painter et al. 2021), we first identified the journalists who covered the 2019 heatwaves and mentioned a link to climate change based on the coding of the authors of the 267 articles. Because we also wanted to know how and why journalists did *not* cover the link between the heatwaves and climate change, we likewise sought journalists in each country who covered the heatwaves more generally, beyond the sample of the content analysis study. In total, we were able to find contact details (email addresses, LinkedIn profiles, Twitter accounts) for 237 journalists (France: 96; Germany: 34; the Netherlands: 41; the UK: 66) whom we contacted at the beginning of February 2021, resulting in a total of 42 participants who completed the survey (average time for completion: 10 min). As per the ethics guidelines, we did not oblige participants to answer each question, which resulted in some missing answers. Because we had no pre-defined hypotheses regarding country differences or news outlets, and given the small sample, we only conducted basic statistical analysis (showing mean, standard deviation, and percentages).

Sample Description

The 42 responses were almost equally spread across the four countries (France: 11; Germany: 12; Netherlands: 11; UK: 8). In each country, we also had a reasonable presence of various news outlets (see [Table 1](#)), with a slight over-representation of center-left-leaning news outlets in Germany (*Der Spiegel*) and the Netherlands (*De Volkskrant*). Some of the journalists said they worked for multiple news outlets at the same time, and three journalists did not indicate any news outlet. The majority of journalists were between 25 and 45 years old (62%), and there was a considerable over-representation of male journalists (male 69%; female: 29%; other: 2%). The majority of journalists had more than 10 years of experience (40%), followed by 3–10 years (36%), 1–3 years (19%) and less than one year (5%).

Table 1. Overview of Represented News Outlets in the Survey per Country (if indicated).

Country	News Outlet
France	<i>Le Monde/LeMonde.fr</i> (2)
	<i>Ouest-France</i> (2)
	<i>Le Figaro</i> (2)
	<i>20 Minutes</i> (1)
Germany	<i>Der Spiegel</i> (7)
	<i>Die Welt</i> (2)
	<i>n-tv</i> (1)
	<i>De Telegraaf</i> (3)
Netherlands	<i>Weerplaza</i> (1)
	<i>De Volkskrant</i> (5)
	<i>Eindhoven's Dagblad</i> (1)
	<i>DPG Media</i> (1)
	<i>NU.nl</i> (1)
	<i>Algemeen Dagblad</i> (2)
United Kingdom	<i>Sky News</i> (3)
	<i>The Observer</i> (1)
	<i>The Guardian</i> (3)
	<i>BBC</i> (1)
	<i>The Daily/Sunday Telegraph</i> (2)
	<i>Mail Online</i> (1)

Note: Please note that some journalists did not indicate the news outlet(s) they work for, while others mentioned multiple news outlets.

19 journalists described their professional role as a “general reporter” (45%), followed by “other” with 13 (31%, e.g., data journalist, politics editor, technology writer, correspondent, energy reporter, columnist), only three described their role as science or environment editor (7%), three as science or environment correspondent (7%), two as science or environment reporter (5%), and two as freelancer (5%). See [Figure 1](#) for an overview. The most general reporters were present in the Netherlands (8 journalists), followed by Germany (5 journalists) and France and the UK (3 journalists each).

Six journalists of the total sample said they were assigned to a science or environment beat or section (France: 1; Germany: 4; Netherlands: 0; UK: 1). Seven journalists had a relevant degree or diploma in a discipline related to climate science and the majority of respondents had between one and ten years of experience in covering climate change or related topics (France: 55%; Germany: 80%; Netherlands: 60%; UK: 63%). Overall, our survey sample showed a relatively good distribution of journalists who covered the

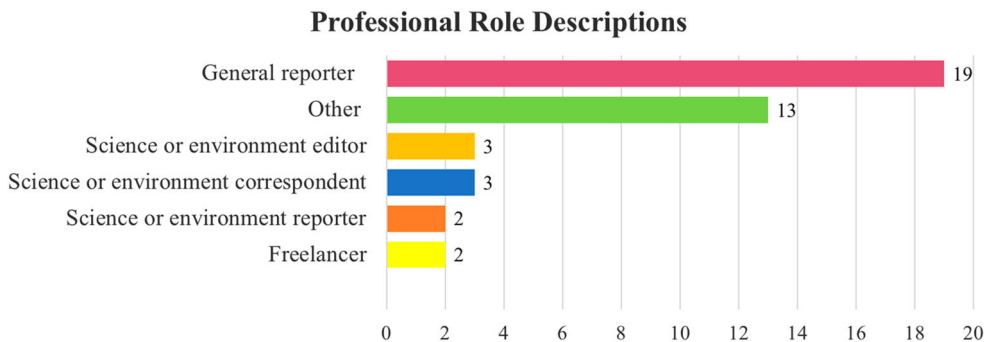


Figure 1. Distribution of the professional role descriptions ($N = 42$).

2019 heatwaves: 23% covered it only once, compared to 64% who wrote up to five articles, 5% up to ten articles, and 8% more than ten articles.

Results

Reporting About the 2019 European Heatwaves and EEA Studies

In answer to RQ1 (a) about awareness of EEA studies, we found that there was only little to moderate knowledge about EEA studies ($M = 2.49$; $SD = 1.33$). Journalists in the UK were most aware of EEA studies ($M = 3.00$; $SD = 1.66$) and journalists in the Netherlands the least ($M = 1.89$, $SD = 0.74$). When asked about the two WWA studies published during the 2019 heatwaves, 14 journalists said they knew of both, one journalist said he/she only knew the WWA study about France, and 22 journalists said they knew neither of them. Overall, France had the most journalists who were aware of both WWA studies (6), followed by the UK (4), Germany (3), and the Netherlands (1).

For those journalists who were aware of the WWA studies, we also inquired how they found out about them (see [Figure 2](#)). The most mentioned initial source was a press release from the WWA sent directly to the journalists or the news organization, followed by news agency coverage, then other coverage by mainstream media or social media. One journalist each in the UK and Germany mentioned that they had had personal contact with an author of the report(s). Across the four countries a common answer for “other” was that they had heard or read about the WWA reports from their colleagues.

In answer to RQ1 (b), 77% of journalists across the four countries indicated that they think it is very important or extremely important ($M = 4.06$; $SD = 0.95$) to highlight that climate change had made heatwaves more likely or more severe (see [Figure 3](#)). Dutch journalists scored the lowest and journalists in the UK the highest (see [Figure 4](#)). The answers to this question tailored specifically to the 2019 heatwaves did not deviate much, and journalists in the UK again scored the highest and journalists in the Netherlands the lowest (see [Figure 1](#) in the Appendix). Journalists considered it slightly less important to write about any direct causal link or some link (other than causation) between heatwaves in general and the 2019 heatwaves in particular and climate change (see [Figure 3](#)).

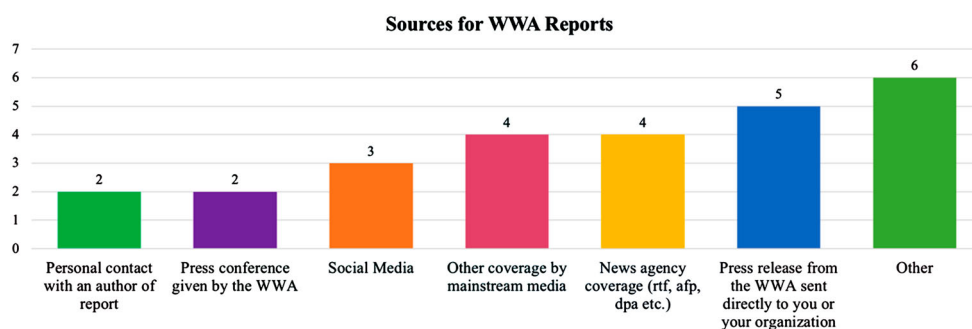


Figure 2. Answers to the question: “How did you find out about the WWA reports (France, Europe)? You can choose more than one option.” ($n = 15$).

Reporting about the Link between Heatwaves and Climate Change

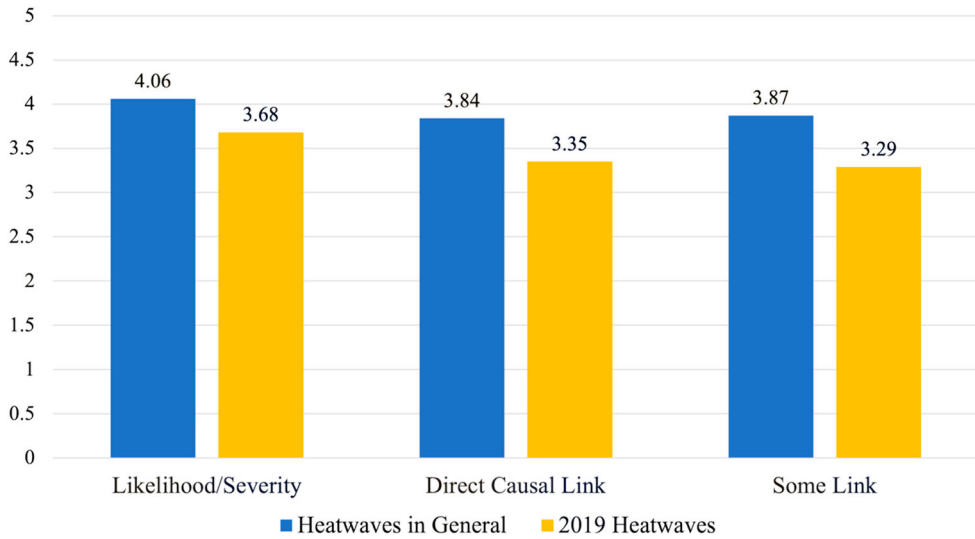


Figure 3. Reporting about the link between heatwaves and climate change—difference between general heatwaves and 2019 heatwaves across countries ($n=31$); means are reported (1 = not at all important, 5 = extremely important).

In terms of the timing when journalists found it appropriate to talk about the link between the heatwave(s) and climate change, the most common answer was that they had to have a quote from a respected source which made a comment about the link

Reporting about the Link between Heatwaves in General and Climate Change - Country Differences

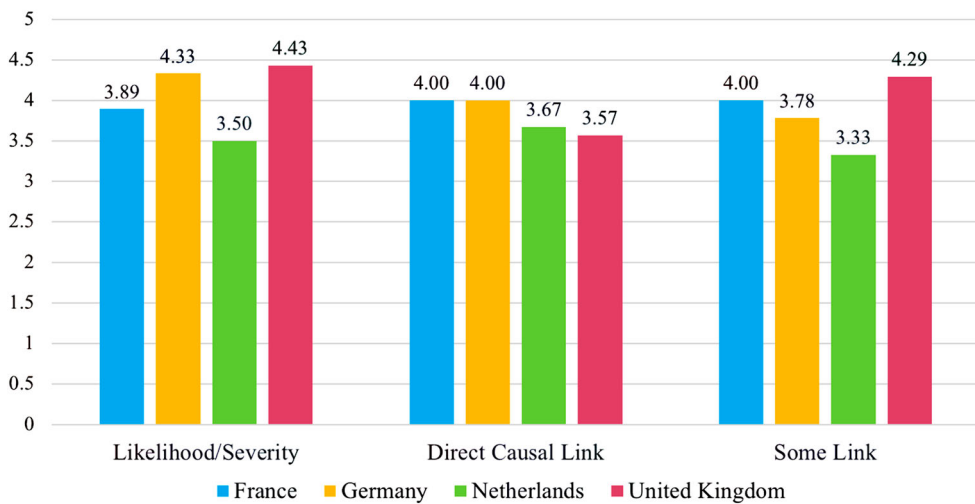


Figure 4. Reporting about the link between heatwaves and climate change in general—differences across countries ($n=31$); means are reported (1 = not at all important, 5 = extremely important).

(49%). Only four chose the answer option “never.” In addition, the majority of journalists indicated that they considered it “somewhat important” (35%) or “very important” (29%) to highlight scientific uncertainty related to studies about heatwaves and climate change ($M = 3.29$; $SD = 1.02$).

Journalistic Practices

In RQ2, we first wanted to find out about the sources journalists used when writing about the link between the 2019 heatwaves and climate change (see Figure 5). Across all four countries, the six most chosen sources were meteorologists whose main association was with a Met Office (50%), followed by authors of a scientific report (42%) and press agency statements (e.g., AFP, DPA) (42%), scientists whose main association was with an academic institution (39%), scientific reports (36%) and individuals/citizens (31%). Politicians and NGOs featured lower down the list, and none of the journalists indicated to use any source that questioned the connection between the heatwave and climate change.

When asked about the aspects considered important to include in the coverage of the 2019 heatwaves, the most important aspect across all journalists was the record-breaking temperatures, followed by the impact of the heatwave on everyday life (e.g., transport, energy) and scientific reports or quotes from scientists explaining the link with climate change (see Figure 6). There were only few notable country differences: 75% of journalists in the UK indicated that they considered it “extremely important” to include the record-breaking temperatures in their coverage, while this answer option was only chosen between 20-30% among journalists from the other countries. Furthermore, to include the impact of the heatwave on older generations in the heatwave coverage was perceived as most important among UK journalists ($M = 4.00$; $SD = 1.00$) and least among Dutch journalists ($M = 3.00$; $SD = 1.00$).

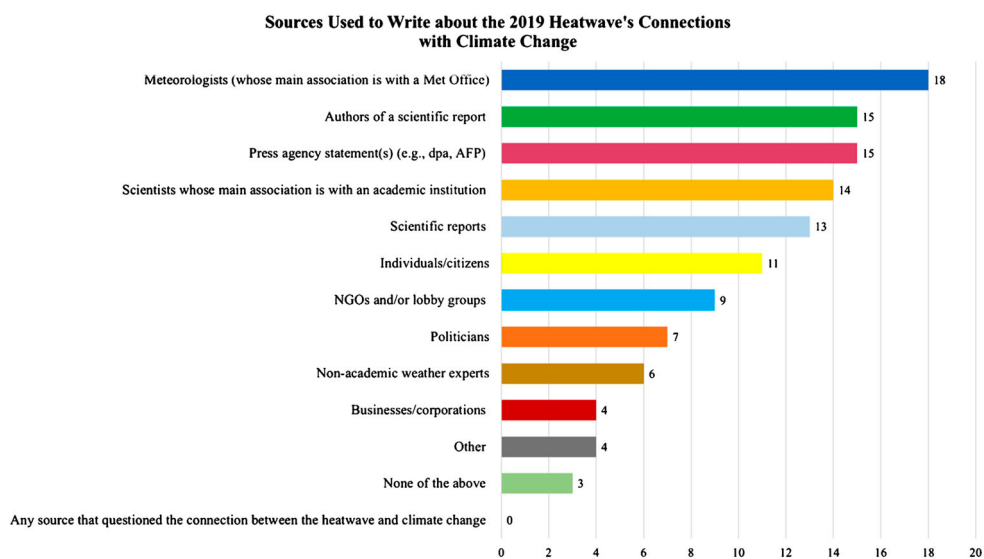


Figure 5. Sources journalists use to write about the 2019 heatwave's connections with climate change ($n = 36$); multiple answers were possible.

Aspects Considered Important to Include in the 2019 Heatwave Coverage

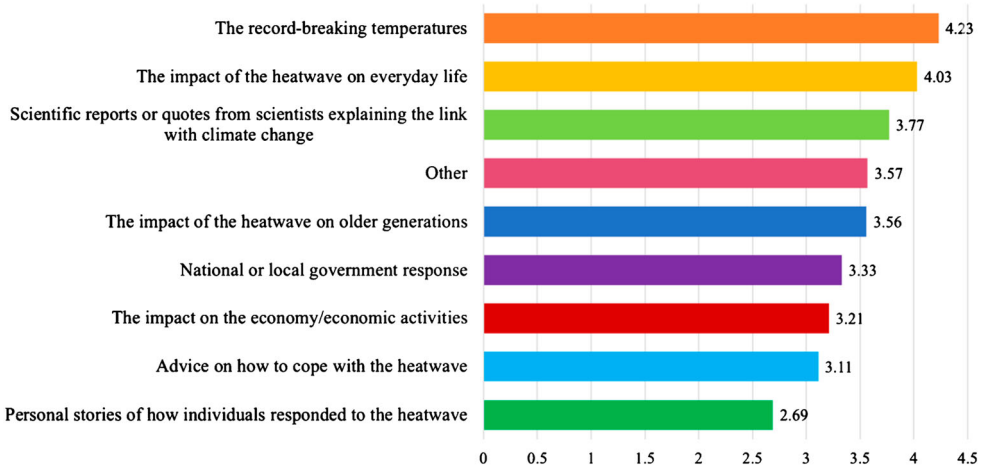


Figure 6. Aspects considered important to include in the 2019 heatwave coverage ($n = 39$); means are reported.

Finally, we wanted to know how important it was for journalists to include climate change solutions (e.g., reducing greenhouse gas emissions) in their coverage. Across all four countries, journalists considered the inclusion of climate change solutions in their coverage as somewhat to very important ($M = 3.35$; $SD = 0.93$). The most salient country difference here was that two journalists in the UK were the only ones that considered writing about solutions as “extremely important.”

Journalistic Role Perceptions

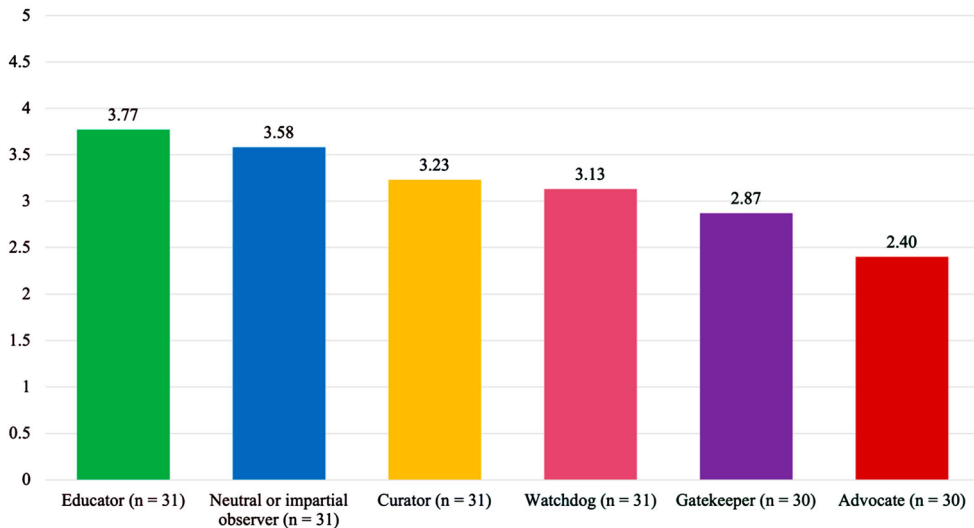


Figure 7. Journalistic role perceptions when writing about extreme weather events; mean values are shown (1= not at all, 5 = extremely).

Journalistic Role Perceptions

RQ3 dealt with the role perceptions that journalists follow when reporting about extreme weather events more generally. Figure 7 gives an overview of the responses. The role that journalists across all four countries associated with the most was that of an educator, followed by a neutral or impartial observer, other (e.g., opinion writer), curator, watchdog and gatekeeper. The role that journalists associated the least with was that of an advocate. For slight country differences, see Figure 2 in the Appendix.

With regard to the extent to which their role perception has changed in the last few years (multiple answers possible), the majority indicated that this was not the case (41%). However, some answered that they now give less space to contrarians/denialists/skeptics (31%), they publish information about climate change more often (28%), and they are more inclined to hold to account governments for their (lack of) action on climate change (24%). Again, the option of seeing themselves as more of an advocate in the sense of highlighting the need for action (10%) or covering the views of campaigning NGOs or organizations more frequently (7%) was chosen the least. We also inquired from the journalists what journalistic norms they observe when covering heatwaves in general. The most important norm to follow across all journalists was accuracy ($M = 4.44$; $SD = 0.78$), followed by independence ($M = 4.31$; $SD = 0.99$), objectivity ($M = 4.21$; $SD = 1.00$), neutrality ($M = 4.08$; $SD = 1.09$), and a balance of various sources ($M = 3.76$; $SD = 1.22$).

Organizational and Contextual Factors

In answer to (RQ4), the journalists implied that the coverage of the 2019 heatwaves and/or heatwaves in general was only marginally influenced by the editorial policy of the media organization ($M = 1.90$; $SD = 1.01$), with French journalists indicating the strongest influence ($M = 2.45$; $SD = 0.99$) compared to other countries. Only one journalist from France (*Le Figaro*) and one from Germany (*Der Spiegel*) indicated that they had been influenced “a lot” by the editorial policy of their media organization.

More specifically, we asked journalists whether they made use of regularly repeated phrases (e.g., “What caused the heatwave?”) or standard sections in their reporting about the 2019 heatwaves. 77% responded that they did not, whereas three journalists in France, three in Germany as well as one in the Netherlands and one in the UK reported that they did so. Three journalists in France and two in the UK answered that their media organizations had a policy towards using regularly repeated phrases or standard sections about climate change.

Journalists in the UK ($M = 3.25$; $SD = 1.09$) and in Germany ($M = 3.20$; $SD = 0.98$) reported that they had suffered the most from time constraints when reporting about the 2019 heatwaves, whereas journalists in the Netherlands suffered the least ($M = 2.30$; $SD = 1.00$). Similarly, regarding resource constraints (e.g., staff support, access to data), German journalists reported encountering the most ($M = 2.80$; $SD = 1.08$) when writing about the 2019 heatwaves, whereas journalists in the Netherlands reported the least ($M = 1.50$; $SD = 0.81$).

Discussion

This study sought to explore attitudes, motivations and role perceptions among journalists in France, Germany, the Netherlands and the UK concerning their coverage of the

2019 European heatwaves and the extent to which they referenced climate change and EEA studies in their reporting. The findings of the survey showed that there is limited knowledge about EEA studies. Journalists in the UK seemed to be more familiar with them, perhaps due to the fact that the science of EEA studies was largely developed there. Similarly, awareness of the two specific WWA studies published in summer 2019 was only moderate among the journalists, with journalists in France and the UK scoring higher than German or Dutch journalists. The finding for Dutch journalists is consistent with the results of the prior content analysis where the WWA studies were found to be mentioned the least in Dutch news outlets compared to the other countries, with two out of five news sites not covering the WWA studies at all.

In the case of France, awareness of WWA studies may have been influenced by the first WWA report that solely dealt with the heatwave in France, thus presenting a local, recent and newsworthy story for the French news media. Moreover, the sources that journalists said they used seemed to be largely dependent on media engagement by the WWA, followed by reporting from news agencies and other news media, social media and colleagues. Hence, there is some indication of an intermedia agenda-setting trend (Sweetser, Golan, and Wanta 2008), meaning that some news media are influenced by the agenda of other news media. Furthermore, the successful press work by the WWA seems to be in line with the professionalization of NGO communication as found in previous research (Hansen 2010; Williams 2015).

Despite the relative lack of awareness of the specific WWA studies, nearly 80% of all the surveyed journalists across the four countries considered it very important to mention the link between heatwaves and climate change in the coverage of the 2019 heatwaves. Even though there was not much difference in the results between the three descriptions (likelihood/ severity, causation and some climate link—see Figure 3), the majority of journalists in this survey considered the description of the severity/likelihood link between climate change and the heatwaves to be more important than any other descriptions. However, more than 74% of the journalists still considered the description of “any direct causal link” between heatwaves in general and climate change as “very important” or “extremely important,” although many climate scientists have argued that (direct) causation is not the best way to frame the link. Rather they say it is more accurate to explain the extent to which climate change has contributed to a particular weather event in terms of increased or decreased severity or likelihood (Carrington 2018).

A very important finding from the survey responses is that the availability of expert sources was important in shaping whether journalists made a link to climate change in their heatwave reporting, which is important for scientists to know when communicating about EEA studies in the future. It was also noteworthy that the journalists considered it important to highlight scientific uncertainty related to the EEA studies. While it is important to be transparent about limitations of climate models, an overemphasis on scientific uncertainty could also give space to climate change skeptics and deniers (Painter 2013). However, none of the journalists in the survey said they had used sources that would question the link between the heatwave and climate change in their reporting. This aligns with the results of the previous content analysis study, which found that only two articles about the heatwaves included climate skeptical views, both in German right-leaning news outlets (Painter et al. 2021). Likewise, our survey results indicated that 31% of journalists said they had given less space to contrarians/denialists/skeptics

in recent years. This finding is rather surprising for the UK considering the strong historical prevalence of climate skeptics and deniers in the media (Ruiu 2021). When combined with the result showing that journalists are covering climate change more often, this survey may be another indication of a recent shift among UK and US news outlets, including right-wing ones, to offer less space to climate change skeptics who deny the science (Merkley and Stecula 2018; Tobitt 2021).

In line with previous research (overview: Schäfer and Painter 2021), this survey also found that journalists were strongly reliant on elite and expert sources when covering the 2019 heatwaves, re-affirming the existence of an “information elite” (Robinson and Wang 2018) that also seems to be present in environmental reporting. Particularly with regard to making the link between the heatwaves and climate change, journalists most often quoted meteorologists (at Met Offices), the authors of scientific reports, scientists and scientific reports. To a much lesser extent, journalists also made use of NGOs, politicians and individuals/citizens when discussing the link. These results are not only aligned with the content analysis of the 2019 European heatwave coverage (Painter et al. 2021); they also suggest that compared to previous research where NGOs and politicians were given more prominence in extreme weather event reporting (Painter et al. 2020) and broader climate coverage (Gutsche et al. 2017; Lück, Wozniak, and Wessler 2016; Painter 2011), climate scientists are now being given more room to express their expertise with regard to climate models and EEA studies.

However, when asked about the importance of including particular aspects of the heatwave, the majority of journalists chose “record-breaking temperatures,” followed by “impact on daily life”, and only third “scientific reports or quotes from scientists explaining the link with climate change.” The strong focus on record-breaking temperatures and the impact of the heatwaves on older generations in the UK compared to other countries could be partly explained by a historically strong tabloid press in the country and a personalized angle in climate change reporting (cf. Boykoff and Mansfield 2008). Clearly, not all articles about the heatwave necessarily deal with aspects that would have strongly suggested the need to mention the link with climate change. In fact, considering that the majority of the survey respondents described themselves as general reporters (45%), this finding corresponds with more generalist reporting, such as human-interest stories that highlight the soft parts of the story.

Furthermore, choosing to focus on record-breaking temperatures or the impacts of the heatwaves are in line with news values that previous research has shown to influence news media reporting (Galtung and Ruge 1965). For example, the value of “superlativeness” corresponds with the record-breaking temperatures; the (negative) impacts of the heatwaves on daily lives is in line with the value “negativity”; and the link with climate change based on scientific reports implies the value of “proximity” or “meaningfulness.” Furthermore, in line with constructive and solution-oriented journalism (Hermans and Drok 2018), the description of solutions to climate change in the 2019 heatwave reporting was considered to be important by most of the journalists across the countries, and particularly among journalists in the UK.

The finding that the most prevalent self-reported role among journalists when covering extreme weather events was that of an educator, followed by neutral and impartial observer, and curator is broadly aligned with previous research mentioned above (Dunwoody 2014; Brüggemann and Engesser 2014; Brüggemann 2017). Although the

role of an advocate was the least favored among the journalists in this survey, the fact that the answers had an overall mean of 2.40 (not so much/somewhat important) implies that the role of an advocate is not entirely rejected. In fact, a trend towards advocacy roles in climate journalism has been observed in recent research (Lester 2013; Sachsman, Simon, and Valenti 2010; Strauß 2021; Tandoc and Takahashi 2014), in part prompted by the media-wide trend of expanding and intensifying coverage about climate change. Yet, the relatively low ranking of the advocacy role in our survey was matched by the high ranking of traditional journalistic norms (e.g., independence, neutrality, accuracy, objectivity) which stand in direct contrast with advocacy journalism.

Finally, the results about organizational and contextual influences on the 2019 heatwave coverage could be interpreted positively. Across all journalists the time and resource constraints were only estimated to be little to moderate when writing about the 2019 heatwaves. Therefore, the findings do not suggest a structural problem across the heatwave reporting as a whole. It seems more likely that journalists had different experiences due to diverse business models and work cultures in their respective countries, news outlets and editorial teams.

Limitations

Some of the findings reported above should be considered with a degree of caution. First, there was a slight under-representation of journalists from the UK, and an over-representation of journalists from left-leaning news outlets in Germany and the Netherlands. The limited responses from various news outlets also did not allow us to conduct more advanced analysis and comparisons. Our limited sample size is also not generalizable to specific media outlets or countries. However, given that the coverage about extreme weather events, and the 2019 European heatwaves in particular, can be considered niche topics, the survey sample ($N=42$) is sufficiently robust. Another limitation is that journalists reported that they had difficulties recalling how they reported about the heatwaves in 2019. Future research should therefore administer surveys about the reporting of extreme weather events more immediately after events have occurred.

Another limitation of the study is that we did not distinguish between type of reporters (e.g., specialist, general, other) and what topics and aspects they covered when reporting about the heatwaves. This could have been useful, as some journalists in the commentary section informed us that their reporting (e.g., human-interest) did not necessarily suggest a link to climate change. Other journalists only wrote one story and others only covered the heatwave based on news agency reports. Future studies could therefore include in-depth interviews, ethnographies or observation studies in editorial offices to gain deeper insights into the reasoning and contingencies of extreme weather event reporting and how the description of the link between such events and climate change is approached (cf. for financial journalism: Usher 2017).

Conclusion

Despite the growing salience of EEA studies, which help quantify potential relationships between specific extreme weather events and climate change, our study shows that over

half of our surveyed journalists were not aware or only a little aware of EEA studies. This suggests a pressing need to find ways to educate and inform more journalists in the four countries about the science behind EEA studies and extreme weather events more generally. Although our survey results did not break down the responses by type of journalist, general reporters would likely benefit most from greater awareness of, and exposure to, EEA science and scientists. For example, many journalists in this survey still found it very important to speak of direct causation when describing the link between the heatwaves and climate change, which is not the most accurate scientific phrasing of the link. Hence, more outreach work (e.g., workshops) with journalists in which the strengths and limitations of climate models are explained could be useful to raise greater familiarity with EEA studies, and hence increase the likelihood that journalists will (correctly) report about them. The increased popularity of EEA studies in climate science (Carbon Brief 2021) might also signal to journalists that such studies are valuable in explaining extreme weather events and making the impact of the climate crisis on people's daily lives more tangible (Ettinger et al. 2021).

2020 once again broke temperature records from the Antarctic to the Arctic (Watts 2020) and extreme weather events worldwide caused billions of dollars in damages (Kramer and Ware 2020). The role of journalists in drawing scientifically accurate links to climate change amid extreme weather is therefore vital in contributing to public understanding and engagement with climate change. This study has provided meaningful insights into the attitudes, perceptions and motivations of journalists in Europe when covering extreme weather events such as the 2019 European heatwaves, thereby offering crucial information for journalism practice on how to improve climate change reporting and better align it with scientific explanations.

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