Is there a climate change reporting bias? A case study of English language news articles, 2017-2022

Chloe Brimicombe[1]

1 Department of Geography and Environmental Science, University of Reading, Reading, RG6 6AB, UK.

Correspondence to: Chloe Brimicombe c.r.brimicombe@pgr.reading.ac.uk

Abstract: How weather hazards are communicated by the media is important. Which risks are understood, prioritised, and acted upon, can be influenced by the level of attention they receive. The presented work investigates if the number of weather hazard news articles increased since 2017; which weather hazards receive the most attention in the news articles; and how often climate change was discussed in these news articles in relation to weather hazards~~In this paper~~. -T~~t~~he methods used are advanced Google searches of media articles and the emergency disaster database (EM-DAT) that considered the weather hazards floods, heat waves, wildfires, storms and droughts from 2017 - 2022. Results suggest that s~~S~~torms are more likely to be reported than any other climate risk. But wildfires generate more news articles per event. Bias in reporting needs to be addressed and is important because it can exacerbate un-preparedness.

Plain Text Summary:

Climate change is increasing the risk of weather hazards (i.e. Storms and heat waves). Using open science methods it is shown that there is a bias in weather hazard reporting. Storms have had a large number of articles in the last five years. But, wildfires have a large number of articles per individual occurrence. Science and media collaborations could address the bias and improve reporting.

1. Introduction

The Intergovernmental Panel on Climate Change's AR6 report demonstrates that storms, flooding, heat waves, wildfires and droughts have been increasing in intensity and frequency with climate change (IPCC, 2021). Since 2017, there have been a number of notable weather events: Pacific Typhoon season 2018, European floods in 2021, Mediterranean heat wave and wildfires in 2021 (Gao et al., 2020; Kreienkamp et al., 2021; Sjoukje Philip et al., 2021; Sullivan, 2021).

Communication of a risk does not always lead to the risk being understood (Porter and Evans, 2020), however the media is a key actor in communicating climate change and has a moral obligation to highlight the risk of extreme weather and what action is needed(Boykoff and Yulsman, 2013; Kitzinger, 1999).In addition, it has been found that the media gives more attention to sensationalist views on climate change, instead of the consensus view (Meah, 2019; Petersen et al., 2019).

Research demonstrates that the bias in reporting hazards and climate change leads to attention and material resource deficit, not fully recognising or addressing the risk (Brimicombe et al., 2021a; Howarth and Brooks, 2017).In comparison, it has been found that when visual hazards such as floods and storms (Wilby and Vaughan, 2011) are used to demonstrate climate change risk there is an improved understanding of climate risk, also known as objectifying climate change (Höijer, 2010).

Reported here for the first time, this study uses open science principles (Armeni et al. 2021; Nosek et al. 2015) alongside the advanced search tools provided by Google, and the emergency database (EM-DAT) (CRED,2020), to examine how weather hazards are mentioned in news articles, from 2017-22. The aim is to understand: (1) has the number of articles focused on weather hazards increased since 2017; (2) which weather hazards receive the most attention; and (3) how often is climate change discussed in relation to those weather hazards.

2. Methods and Data

All the methods and data chosen by this study are in keeping with open data and open science. Open data is where the research results are reproducible and transparent, whilst open science is a term given for removing the barriers for sharing any kind of output (Armeni et al., 2021).

2.1 Advanced Google Search

An advanced Google search of the news category was carried out for the period 1st January 2017 to the 1st January 2022. Google was chosen as it has the most comprehensive results in comparison to other search engines (i.e. Bing) and tools that assisted with advanced search. The search involved two stages: first, a search for all news articles in the period containing keywords – flood, heat wave, wildfire, storm and drought, was conducted, and second, this search criterion was repeated with the keywords – climate change(cf. Brimicombe et al., 2021).Each term was assessed to consider whether it captured the most articles, for example using heat wave not heatwave and climate change not climate crisis or global warming. Each hazard was evaluated separately and their results compared, with duplicated results not included. Articles that mention more than one weather hazard are counted twice.

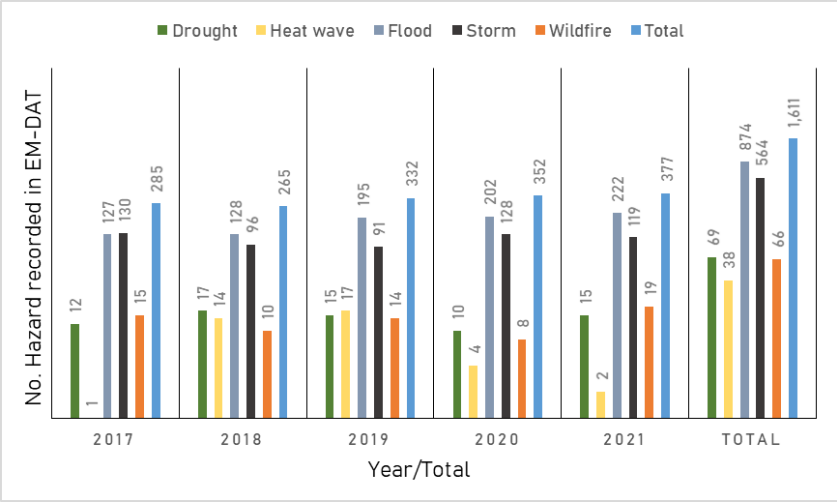
To counter any overestimates that occur where articles are not discussing a weather hazard but are using the term to describe something else, the approach taken is to look at the first 100 articles headlines and remove articles not discussing a weather hazard, to give a better estimate of the true number of news articles. Examples included articles discussing 'Goal droughts', 'NFL Storm' and 'Glass Animals single heat wave'. Then, this proportion of articles was removed from the overall total, giving a new overall count of articles. For example, for Storms in 2017, the initial search returned 6.31 million articles, but 21 out of the first 100 were not about the weather hazard so 4.98 million articles were counted for Storms.

Limitations of this method do remain it can still capture articles not explicitly about the weather hazard, however, this is limited by the proportional approach taken. In addition, it is only likely to capture the English news media and will give a slightly different number of

articles between users. As such it is recommended that further in-depth research should be carried out looking at news media sentiment.

2.2 EM-DAT Hazard Reporting

To supplement the findings of the advanced google search, another source of data is used that is in keeping with open science, the emergency events database (EM-DAT). EM-DAT is the leading international disaster database, it contains details of over 22,000 mass disasters worldwide since 1900 and is compiled from a range of sources including UN agencies and Non-Governmental Organisations (NGOs) (CRED, 2020). This provides an overview of the number of weather hazards that have occurred every year for the last 5 years. This then allows for an assessment on average how many articles have been written about each weather hazard. Figure~~Table~~ -1 shows a count of the weather hazards every year from 2017 to 2021 considered by this study included in EM-DAT (CRED, 2020).



Formatted: Centered

Figure~~Table~~ 1: Displaying the total number of disaster reported per weather hazard for the last 5 years as reported by EM-DAT (CRED, 2020).

Limitations of this method are that there are biases in how hazards in this database are reported and there is under-reporting of hazards by this database (Brimicombe et al., 2021a; Gall et al., 2009). In addition, this database only includes hazards that are considered a disaster, where an agency declares a state of emergency, or where it is reported that over 100 people have been affected(CRED, 2020). However, it remains the most comprehensive source of reported weather hazards (Brimicombe et al., 2021a; Gall et al., 2009).

3. Results

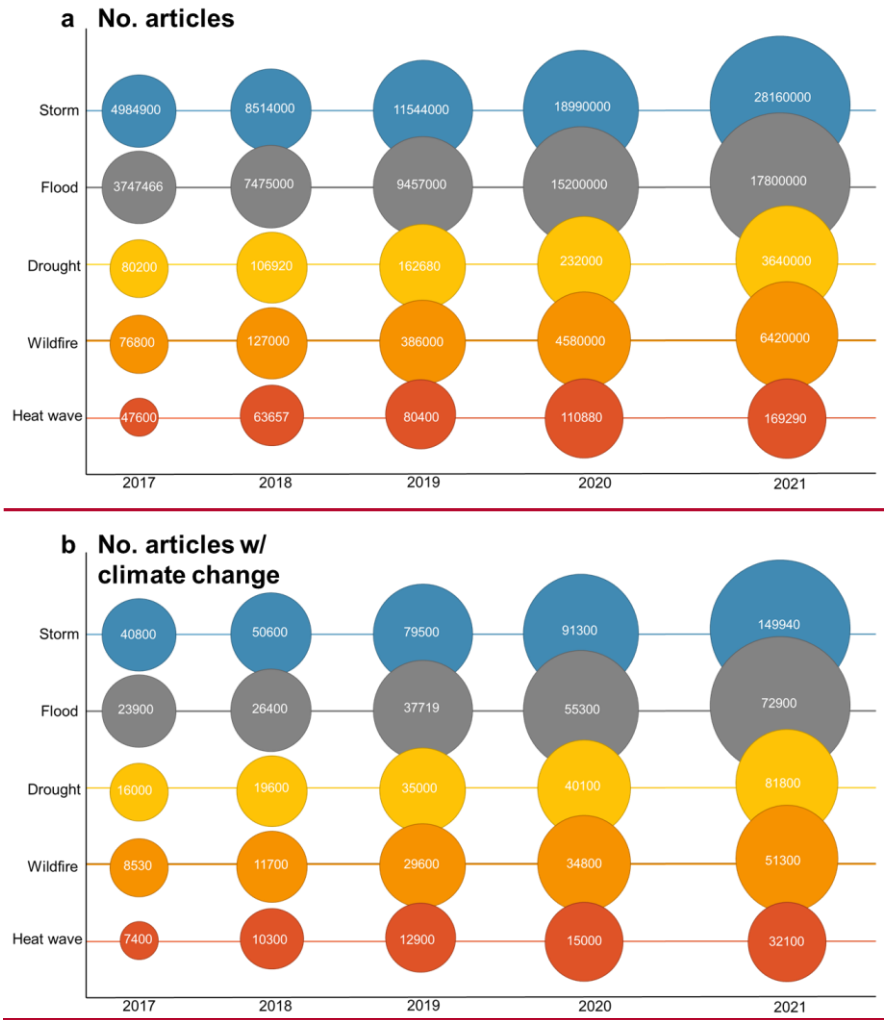
3.1 have the number of weather hazards news article increased since 2017?

There has been an increase in the number of English language news media articles for all weather hazards from 2017 to 2022, amounting to more than 142 million articles over the 5 years. In 2021, 28.1 million articles are about storms, whereas 169,000 articles are about heat waves (Figure 1). Of interest, only 0.7% of all news articles mentioned climate change and the weather hazard together. The results for number of articles mirror those for overall news articles written.

3.2 Which weather hazards receive the most attention in news articles?

The results in section 3.1 change when the number of articles is considered as a proportion of the number of weather hazards reported in EM-DAT in table 1. The approach taken here is to aggregate the totals for the 5 years per hazard to reduce the influence of the under-reporting bias in EM-DAT. Figure 3~~Table 2~~ is another representation of the reporting bias introduced by EM-DAT where total costs for each hazard each year are show, no losses are attributed to heat waves, the results for total damages mirror those for total number of article written. It can therefore be suggested that articles are more likely to be written for hazards that have the biggest financial loss reported for them.

134


a No. articles
Storm
Flood
Drought
Wildfire
Heat wave
4984900
8514000
11544000
18990000
28160000
3747466
7475000
9457000
15200000
17800000
80200
106920
162680
232000
3640000
76800
127000
386000
4580000
6420000
47600
63657
80400
110880
169290
2017
2018
2019
2020
2021
b No. articles w/ climate change
Storm
Flood
Drought
Wildfire
Heat wave
40800
50600
79500
91300
149940
23900
26400
37719
55300
72900
16000
19600
35000
40100
81800
8530
11700
29600
34800
51300
7400
10300
12900
15000
32100
2017
2018
2019
2020
2021

135

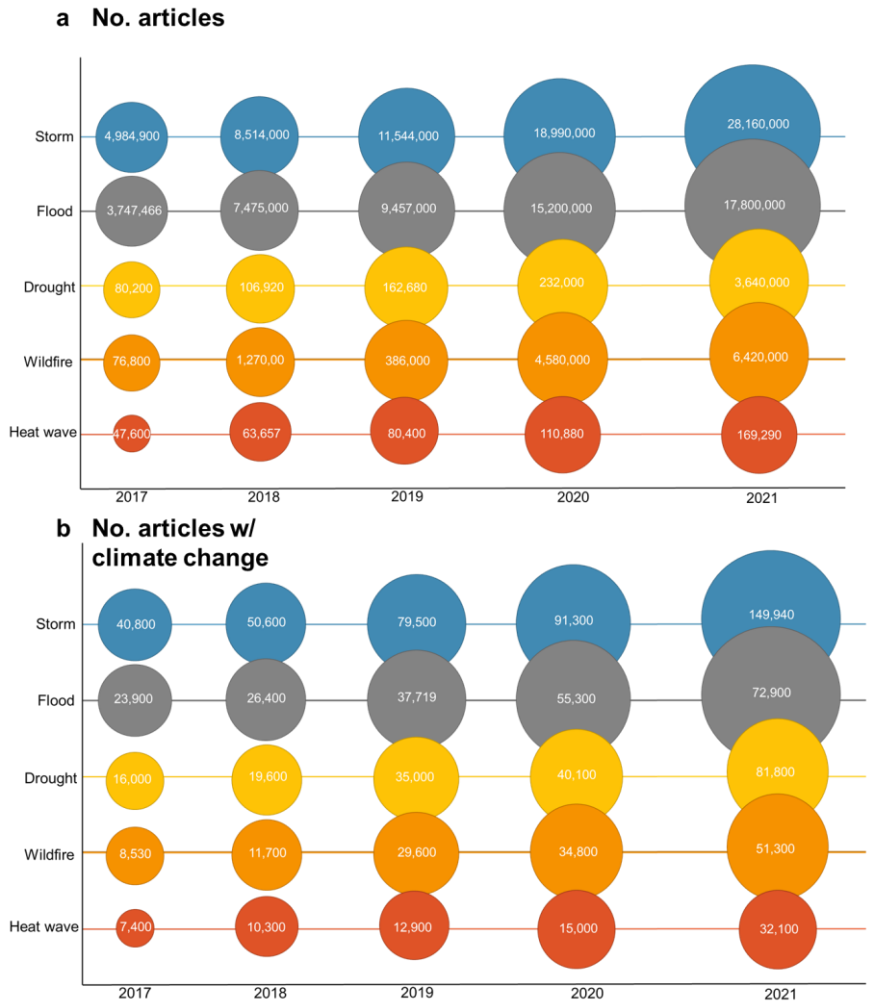
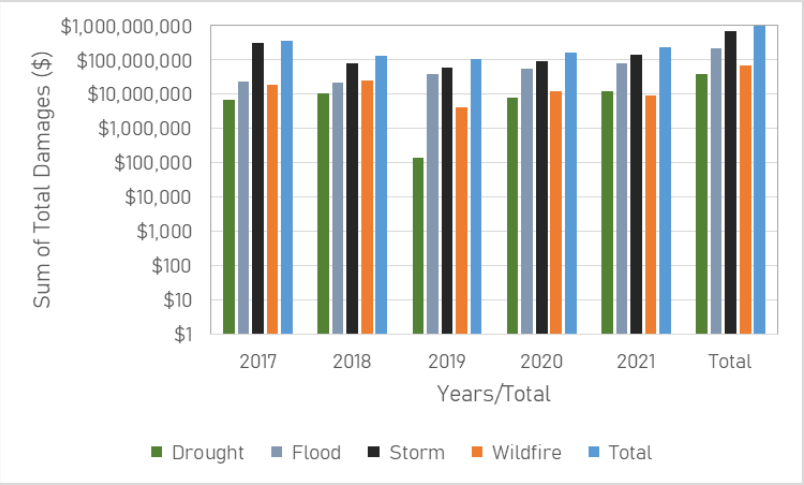


Figure 2~~1~~: number of articles per hazard per year for 2017 to 2022 a) indicates overall article numbers whilst b) indicates only articles that contain the weather hazard and climate change as its subject.



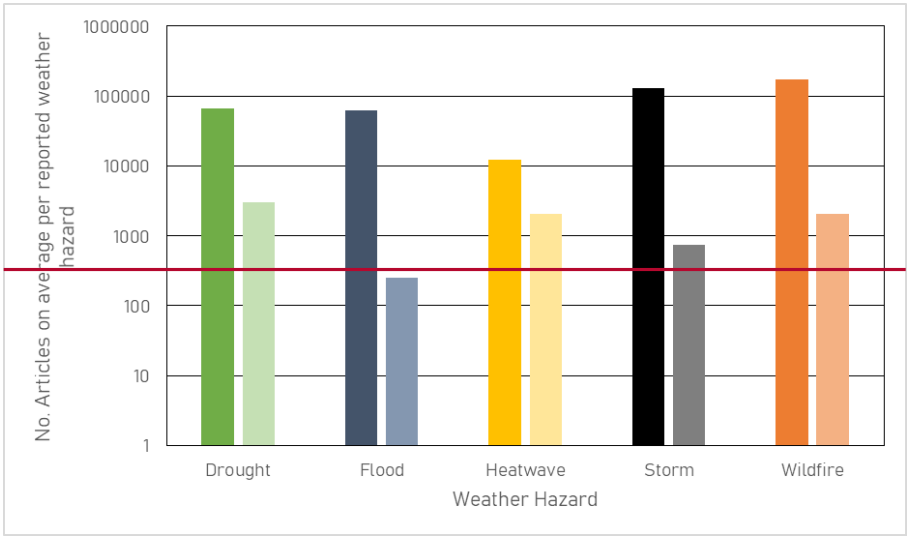
Figure~~Table~~ ~~3~~2: Sum of Total Damages for each hazard per year as reported by EM-DAT, heat wave cannot be seen as no damages are recorded (CRED, 2020)

~~Hazard/Year~~	~~2017~~	~~2018~~	~~2019~~	~~2020~~	~~2021~~	~~Total~~
~~Drought~~	~~$ 6,767,619~~	~~$ 10,093,560~~	~~$ 143,086~~	~~$ 7,852,337~~	~~$ 12,500,000~~	~~$ 37,356,602~~
~~Heat wave~~						~~$ -~~
~~Flood~~	~~$ 22,484,1~~	~~$ 21,273,576~~	~~$ 39,033,864~~	~~$ 53,874,005~~	~~$ 75,957,000~~	~~$212,622,545~~
~~Storm~~	~~$301,722,795~~	~~$ 78,567,020~~	~~$ 61,089,189~~	~~$ 92,336,036~~	~~$137,675,753~~	~~$671,390,793~~
~~Wildfire~~	~~$ 18,706,572~~	~~$ 24,605,677~~	~~$ 3,954,463~~	~~$ 11,696,841~~	~~$ 9,253,912~~	~~$ 68,217,465~~
~~Total~~	~~**$349,681,086**~~	~~**$134,539,833**~~	~~**$104,220,602**~~	~~**$165,759,219**~~	~~**$235,386,665**~~	~~**$989,587,405**~~

Formatted Table

Overall, on average for each individual weather hazard (Total number of articles for all hazards in Figure 2/Total number of reported hazards in figure 1), 89,000 articles were written, however, the picture for each hazard varies widely, for example one storm can have 10 times more articles written about it than another, and a future study on this would be

beneficial. On average per wildfire (total number of articles about wildfire/total number of reported wildfires), there have been in total 175,000 articles written in the last 5 years (Figure 42). The weather hazard with on average the least number of articles per weather hazard occurrence over the last 5 years are heat waves with 12,000 articles (Figure 42).



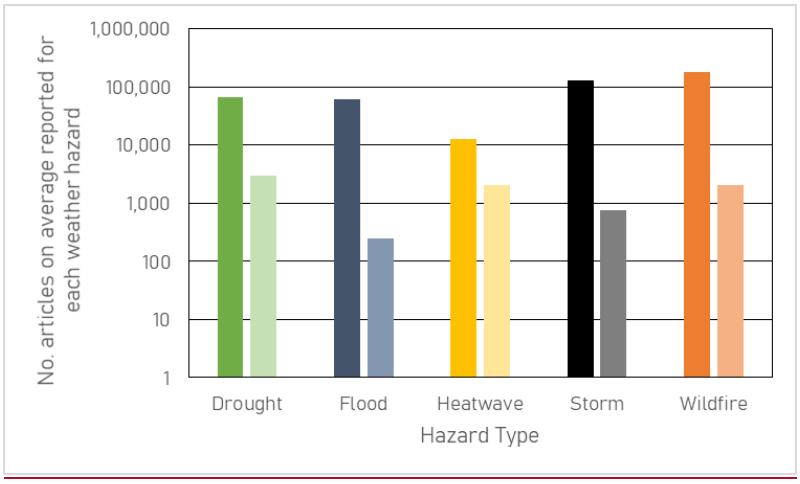


Figure 42: The average number of articles per individual hazard category for the last 5 years. Dark colour is total number of articles and light colour is articles including climate change. (Number of articles in figure 2a or b/total recorded hazards for each hazard type in figure 1)

3.3 how often is climate change discussed in these news articles in relation to weather hazards?

Overall, on average for each individual weather hazard, 650 articles were written that also consider climate change (total number of articles including climate change in figure 2/total number of hazards reported in figure 1). The hazard with the most articles written is drought, on average per drought, there have been 3,000~~k~~ articles in the last 5 years (Figure 4~~2~~). The weather hazard with on average the least number of articles per weather hazard occurrence over the last 5 years are floods with 200 articles (Figure 4~~2~~).

4. Discussion

4.1 Why are some hazards discussed by the English Language News media more?

Heat waves have the least amount of news media articles. This should not be of surprise given other research demonstrating the consistent underreporting of this weather hazard (Harrington and Otto, 2020; Vogel et al., 2019). It however, may be of surprise given the number of record-breaking heat waves during recent years such as the June 2021 Pacific North-West heat wave which was attributed to climate change (Sjoukje Philip et al., 2021).

How notable events or weather hazards get attention and are reported is subject to 'newsworthiness', which can also be known as the political economy between society and the media (Boykoff and Yulsman, 2013; Kitzinger, 1999). This is made up of 4 main factors: *the availability effect/heuristic which is if a hazard is presented as risk before it is more likely to be remembered in this manner, stories from impacted groups, geographically bound and are*

189 *visually impactful* (Kitzinger, 1999; Tomlinson et al., 2011). The results of this study show that
190 the hazards that fit the criteria the most were storms which have the most articles by quantity
191 and wildfires that have the most articles per individual occurrence.

192 **4.2 How does the English Language News Media discuss climate change and hazards?**

193 The number of articles on average per individual weather hazard that also considers climate
194 change is not following the 'newsworthiness' criteria and therefore drought, wildfire and heat
195 waves have the most articles. Instead, the media can be suggested to follow the science
196 where it is seen these hazards are easier to attribute to climate change than floods or storms
197 (Ciavarella et al., 2020; Kreienkamp et al., 2021). Whilst the media does have a moral
198 obligation and plays a key role in communicating climate risk, how science, the public and
199 those in position of power communicates climate change has influence on what is portrayed
200 by the media (Boykoff and Yulsman, 2013; van der Hel et al., 2018; Howarth and Anderson,
201 2019).

202 Therefore, it could be suggested that this reporting of climate change has come about by the
203 increasing collaboration between science (across career stages) and the media examples
204 include Science Media Centre, The Conversation and Voice of Young Science. This comes in
205 spite of the discourse around the role of science in both communication and policy spaces
206 (Boykoff and Yulsman, 2013; Pielke, 2007).

207 **4.3 Why is consistent reporting important?**

208 Attention deficit in the English Language News Media leads to a lack of investment in
209 adaptation for some hazards, making us unprepared. In addition, this pushes us towards more
210 precarious tipping points where adaptation becomes more of a challenge for society
211 (Howarth and Brooks, 2017). This study's results highlight a huge reporting bias in favour of
212 storms and wildfire in the news media. This has a material cost where storms receive more
213 research, funding and policy than other hazards (Brimicombe et al., 2021b; Harrington and
214 Otto, 2020; Howarth and Brooks, 2017; Vogel et al., 2019).

215 However, despite ranking second in terms of the overall number of articles, per individual
216 occurrence floods have the least number of articles. This could be an indication that there are
217 a bigger range of number of articles written per flood (i.e. one flood has 1 million articles but

another only has 1,000 articles) and this is something that should be explored further in a news media sentiment study, with particular focus given to geographical bias.

4.4 What does using an open science approach demonstrate?

This study uses advance google search trends to show the bias that is apparent in the English Language News Media surrounding weather hazards and climate change. This is not the most robust method to carry out a study of this kind, however it is the most accessible. For example, long-scale newspaper databases are not free to access.

Using an open science approach highlights the transparency surrounding the reporting bias (Armeni et al., 2021). This is a positive because it means that it is easy to track improvements and changes in reporting. Bias reduces the ability of reporting as a tool to reduce hazard risk and highlighting it is the first step in changing the narrative (Brimicombe, et al., 2021a,b).

5. Conclusion

There is a bias in terms of which weather hazards English language news media report on, and a bias in terms of which weather hazards are linked to climate change. This is important because in terms of material cost some hazards have more investment than others. This leads to hazards being subject to under preparedness as a result of underreporting of their impacts. Reporting is a key way that we can improve communication and plays a part in avoiding societal tipping points. This study suggests greater collaboration between scientists (across career stages) with the English news media is key to improve reporting overall and continue to grow the reporting of the risk of weather hazards and their intrinsic links with climate change.

Disclosure Statement:

The author reports there are no competing interests to declare.

Data availability:

All data is available via advance Google searches and the EM-DAT database.

Acknowledgments:

I would like to acknowledge the useful feedback from reviewers and editors on this manuscript which have helped to improve the quality.

References

Armeni, K., Brinkman, L., Carlsson, R., Eerland, A., Fijten, R., Fondberg, R., Heininga, V. E., Heunis, S., Koh, W. Q., Masselink, M., Moran, N., Baoill, A., Sarafoglou, A., Schettino, A., Schwamm, H., Sjoerds, Z., Teperek, M., van den Akker, O. R., van't Veer, A. and Zurita-Milla, R.: Towards wide-scale adoption of open science practices: The role of open science communities, Sci. Public Policy, 48(5), 605–611, doi:10.1093/SCIPOL/SCAB039, 2021.

Boykoff, M. T. and Yulsman, T.: Political economy, media, and climate change: Sinews of modern life, Wiley Interdiscip. Rev. Clim. Chang., 4(5), 359–371, doi:10.1002/WCC.233, 2013.

Brimicombe, C., Napoli, C. Di, Cornforth, R., Pappenberger, F., Petty, C. and Cloke, H. L.: Borderless Heat Hazards With Bordered Impacts, Earth's Futur., 9(9), e2021EF002064, doi:10.1029/2021EF002064, 2021a.

Brimicombe, C., Porter, J. J., Di Napoli, C., Pappenberger, F., Cornforth, R., Petty, C. and Cloke, H. L.: Heatwaves: An invisible risk in UK policy and research, Environ. Sci. Policy, 116, 1–7, doi:10.1016/j.envsci.2020.10.021, 2021b.

Ciavarella, A., Cotterill, D., Stott, P., Kew, S., Philip, S., van Oldenborgh, G. J., Skålevåg, A., Robin, Y., Otto, F., Hauser, M., Seneviratne, S. I., Lehner, F. and Zolina, O.: Siberian heatwave of 2020 almost impossible without climate change, 2020.

CRED: EM-DAT | The international disasters database, EM-DAT [online] Available from: https://www.emdat.be/ (Accessed 15 June 2020), 2020.

Gall, M., Borden, K. A. and Cutter, S. L.: When do losses count?, Bull. Am. Meteorol. Soc., 90(6), 799–809, doi:10.1175/2008BAMS2721.1, 2009.

Gao, S., Zhu, L., Zhang, W. and Shen, X.: Western North Pacific Tropical Cyclone Activity in 2018: A Season of Extremes, Sci. Reports 2020 101, 10(1), 1–9, doi:10.1038/s41598-020-62632-5, 2020.

Harrington, L. J. and Otto, F. E. L.: Reconciling theory with the reality of African heatwaves, Nat. Clim. Chang., 1–3, doi:10.1038/s41558-020-0851-8, 2020.

van der Hel, S., Hellsten, I. and Steen, G.: Tipping Points and Climate Change: Metaphor Between Science and the Media, https://doi.org/10.1080/17524032.2017.1410198, 12(5), 605–620, doi:10.1080/17524032.2017.1410198, 2018.

Formatted: Font: Bold

Höijer, B.: Emotional anchoring and objectification in the media reporting on climate change, Public Underst. Sci., 19(6), 717–731, doi:10.1177/0963662509348863, 2010.

Howarth, C. and Anderson, A.: Increasing Local Salience of Climate Change: The Un-tapped Impact of the Media-science Interface, Environ. Commun., 13(6), 713–722, doi:10.1080/17524032.2019.1611615/SUPPL_FILE/RENC_A_1611615_SM7853.PDF, 2019.

Howarth, C. and Brooks, K.: Decision-Making and Building Resilience to Nexus Shocks Locally: Exploring Flooding and Heatwaves in the UK, Sustain. 2017, Vol. 9, Page 838, 9(5), 838, doi:10.3390/SU9050838, 2017.

Kitzinger, J.: Researching risk and the media, Heal. Risk Soc., 1(1), 55–69, doi:10.1080/13698579908407007, 1999.

Kreienkamp, F., Philip, S. Y., Tradowsky, J. S., Kew, S. F., Lorenz, P., Arrighi, J., Belleflamme, A., Bettmann, T., Caluwaerts, S., Chan, S. C., Ciavarella, A., De Cruz, L., de Vries, H., Demuth, N., Ferrone, A., Fischer, E. M., Fowler, H. J., Goergen, K., Heinrich, D., Henrichs, Y., Lenderink, G., Kaspar, F., Nilson, E. and L Otto, F. E.: Rapid attribution of heavy rainfall events leading to the severe flooding in Western Europe during July 2021, World Weather Attrib., 13, 18 [online] Available from: https://www.meteo.be/fr/infos/actualite/ce-que-lon-sait-sur-les-pluies- (Accessed 26 August 2021), 2021.

Meah, N.: Climate uncertainty and policy making—what do policy makers want to know?, Reg. Environ. Chang., 19(6), 1611–1621, doi:10.1007/s10113-019-01492-w, 2019.

Nosek, B. A., Alter, G., Banks, G. C., Borsboom, D., Bowman, S. D., Breckler, S. J., Buck, S., Chambers, C. D., Chin, G., Christensen, G., Contestabile, M., Dafoe, A., Eich, E., Freese, J., Glennerster, R., Goroff, D., Green, D. P., Hesse, B., Humphreys, M., Ishiyama, J., Karlan, D., Kraut, A., Lupia, A., Mabry, P., Madon, T. A., Malhotra, N., Mayo-Wilson, E., McNutt, M., Miguel, E., Paluck, E. L., Simonsohn, U., Soderberg, C., Spellman, B. A., Turitto, J., VandenBos, G., Vazire, S., Wagenmakers, E. J., Wilson, R. and Yarkoni, T.: Promoting an open research culture, Science (80-.)., 348(6242), doi:10.1126/science.aab2374, 2015.

Petersen, A. M., Vincent, E. M. and Westerling, A. L. R.: Discrepancy in scientific authority and media visibility of climate change scientists and contrarians, Nat. Commun. 2019 101, 10(1), 1–14, doi:10.1038/s41467-019-09959-4, 2019.

Pielke, R. A.: The honest broker : making sense of science in policy and politics, 1st ed., Cambridge University Press, Cambridge., 2007.

Porter, J. J. and Evans, G.: Unreported world: A critical analysis of UK newspaper coverage of post-disaster events, Geogr. J., 186(3), 327–338, doi:10.1111/GEOJ.12353, 2020.

Science Media Centre: Science Media Centre, Sci. Media Cent. [online] Available from: https://www.sciencemediacentre.org/ (Accessed 23 January 2022), 2022.

Sjoukje Philip, Y., Kew, S. F., Jan van Oldenborgh, G., Yang, W., Vecchi, G. A., Anslow, F. S., Li, S., Seneviratne, S. I., Luu, L. N., Arrighi, J., Singh, R., van Aalst, M., Hauser, M., Schumacher, D. L., Pereira Marghidan, C., Ebi, K. L., Bonnet, R., Vautard, R., Tradowsky, J., Coumou, D., Lehner, F., Wehner, M., Rodell, C., Stull, R., Howard, R., Gillett, N. and L Otto, F. E.: Rapid attribution analysis of the extraordinary heatwave on the Pacific Coast of the US and Canada June 2021, World Weather Attrib. [online] Available from:

https://public.wmo.int/en/media/news/june-ends-exceptional-heat (Accessed 26 August 2021), 2021.

Sullivan, H.: Summer of fire: blazes burn across Mediterranean with more extreme weather forecast , Guard. [online] Available from: https://www.theguardian.com/environment/2021/aug/13/summer-of-fire-blazes-mediterranean-more-extreme-weather-forecast (Accessed 26 August 2021), 2021.

The Conversation: The Conversation: In-depth analysis, research, news and ideas from leading academics and researchers., Conversat. [online] Available from: https://theconversation.com/uk (Accessed 23 January 2022), 2022.

Tomlinson, C. J., Chapman, L., Thornes, J. E. and Baker, C. J.: Including the urban heat island in spatial heat health risk assessment strategies: A case study for Birmingham, UK, Int. J. Health Geogr., 10, doi:10.1186/1476-072X-10-42, 2011.

Vogel, M. M., Zscheischler, J., Wartenburger, R., Dee, D. and Seneviratne, S. I.: Concurrent 2018 Hot Extremes Across Northern Hemisphere Due to Human-Induced Climate Change, Earth's Futur., 7(7), 692–703, doi:10.1029/2019EF001189, 2019.

Voice of Young Science: Voice of Young Science – Sense About Science, Voice Young Sci. [online] Available from: https://senseaboutscience.org/what-we-are-doing/voys/ (Accessed 23 January 2022), 2022.

Wilby, R. L. and Vaughan, K.: Hallmarks of organisations that are adapting to climate change, Water Environ. J., 25(2), 271–281, doi:10.1111/J.1747-6593.2010.00220.X, 2011.