https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

Geoscience Communication Discussions
Open Access
EGU

Storming the news media: 5 years of reporting weather hazards and climate change

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: Global heating has increased the risk of weather hazards in recent years. Communication of weather hazard risk by the news media has importance. Newsworthiness affects weather hazards reporting. Here, the methods used to adhere to the open science principles of reproducibility and transparency. Methods used are advanced Google searches of media articles and the emergency disaster database (EM-DAT) that consider the weather hazards floods, heat waves, wildfires, storms and droughts. 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.

Plain Text Summary:

Climate change is increasing the risk of weather hazards (i.e. Storms and Heatwaves). 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.

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

GEOSCIENCE COMMUNICATION Discussions
Open Access
EGU

1. Introduction

Weather hazards are having an increasing impact on our lives. The latest IPCC report demonstrates that storms, flooding, heat waves, wildfires and droughts have been increasing in intensity and frequency with climate change (IPCC,2021). The last 5 years has experienced a number of notable weather hazards, from the costly 2018 Pacific Typhoon season to the Pacific North West heat wave and European flooding in June 2021 and the Mediterranean heat wave and wildfire in August 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 report all aspects of the climate emergency to highlight in this case the risk of extreme weather and what action is being taken (Boykoff and Yulsman, 2013; Kitzinger, 1999).In addition, it has previously been found that the media has often given more attention to outlier views on climate change, instead of the consensus view (Meah, 2019; Petersen et al., 2019).

Previous 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, this is also known as objectifying climate change (Höijer, 2010).

In this study, open science principles (Armeni et al., 2021; Nosek et al., 2015) are adhered to whilst using simple advanced search tools provided by Google and the number of weather disasters as reported by the emergency database (EM-DAT) (CRED, 2020). This, allows for an examination of the English news media articles produced over the last 5 years to answer the key questions: Has there been an overall increase in articles in the last 5 years? What weather hazard had the most attention? And how many articles also discussed climate change?

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

2. Methods and Data

All the methods and data chosen by this study are in keeping with open data and open science. Open science is where the research results are reproducible and transparent (Armeni et al., 2021).

2.1 Advanced Google Search

An advanced Google search was carried out for the period 1st January 2017 to the 1st January 2022. The individual search selection was for all news articles in the period containing the keyword flood, heat wave, wildfire, storm and drought and then the search was carried out again this time including climate change as a keyword (cf. Brimicombe et al., 2021). Each hazard was evaluated separately and their results compared, with duplicated results not included.

Further, to counter any overestimates that might 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. Examples included articles discussing 'Goal droughts', 'NFL Storm' and 'Glass Animals single Heatwave'. 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. Therefore, 21% of the total articles were removed leaving 4.98 million articles.

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.

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

86 **2.2 EM-DAT Hazard Reporting**

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

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

Weather Hazard	*Number of Disasters reported in the last 5 years*
Drought	64
Flood	865
Heat wave	38
Storm	557
Wildfire	66
Total	1590

98

99 Limitations of this method are that there are biases and under-reporting of hazards by this
100 database(Brimicombe et al., 2021a; Gall et al., 2009). In addition, this database only includes
101 hazards that are considered a disaster, where an agency declares a state of emergency, or
102 where it is reported that over 100 people have been affected(CRED, 2020). However, it
103 remains the most comprehensive source of reported weather hazards (Brimicombe et al.,
104 2021a; Gall et al., 2009).

105

106

107

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

3. Results

3.1 Overall number of articles has increased

In total since 2017, over 142 million articles have been written by the English language news media about weather hazards. There has also been an increase in the number of English language news media articles for all weather hazards. Per year storms have the most articles, whilst heat waves have the least number of articles (Figure 1). The ranking of the total number of articles for each weather hazard type is storms, floods, wildfire, drought and heat wave. 28.1 million articles are about storms, whereas 169k articles are about heat waves in 2021 (Figure 1).

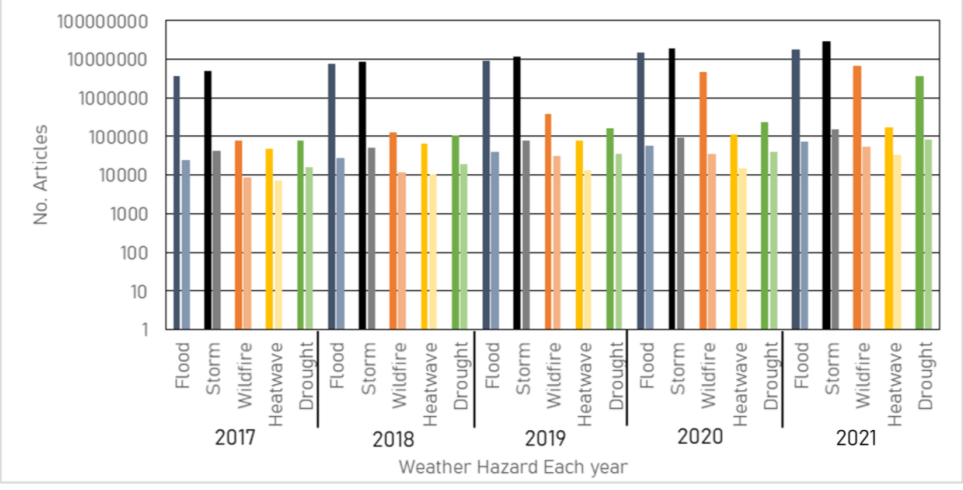

Figure 1: Displays number of articles (on a logarithmic scale) per hazard per year for 2017 to 2021.The darker colour indicates overall article numbers whilst the lighter colour indicates only articles that contain the weather hazard and climate change as its subject.

Fewer articles are about weather hazards and climate change at over 1.03 million. The number of articles about weather hazards and climate change has increased (Figure 1). Per year storms have the most articles, whilst heat waves have the least number of articles for weather hazards and climate change. In addition, the ranking of the number of articles for each weather hazard type is storms, floods, wildfire, drought and heat wave. In 2021, 149k articles include storms and climate change whereas 32k mention heat waves and climate change (Figure 1).

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

GEOSCIENCE COMMUNICATION Discussions
Open Access
EGU

3.2 Per hazard occurrence wildfire has the greatest number of 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. Overall, on average for each individual weather hazard, 89k articles were written, however, the picture for each hazard varies widely. On average per wildfire, there have been 175k articles in the last 5 years (Figure 2). The weather hazard with on average the least number of articles per weather hazard occurrence over the last 5 years are heat waves with 12k articles (Figure 2). The ranking of the number of articles on average per weather hazard occurrence is wildfire, storm, drought, flood and then heat wave.

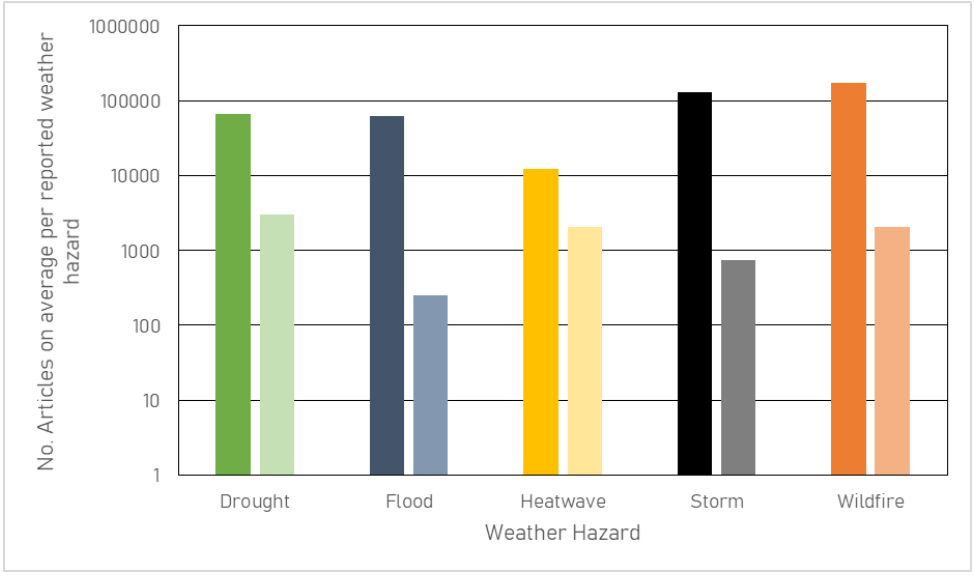

Figure 2: displaying on average the total number of articles per reported weather hazard in EM-DAT for the last 5 years (Logarithmic scale). Dark colours are all weather hazard articles, whilst lighter colours are articles also including climate change.

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

GEOSCIENCE COMMUNICATION Discussions
Open Access
EGU

3.3 Individual droughts have the most articles discussing climate change

Overall, on average for each individual weather hazard, 650 articles were written that also consider climate change, however as with all weather hazard articles the picture for each hazard varies widely. On average per drought, there have been 3k articles in the last 5 years (Figure 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 2). The ranking of the number of articles that also consider climate change on average per weather hazard occurrence is drought, wildfire, heat wave, storm, floods.

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

GEOSCIENCE COMMUNICATION Discussions
Open Access
EGU

4. Discussion

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 found likely to of been impossible without 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 visually impactful* (Kitzinger, 1999; Tomlinson et al., 2011). The results of this study show that the hazards that fit the criteria the most were storms which have the most articles by quantity and wildfires that have the most articles per individual occurrence.

In addition, this study's results highlight a huge reporting bias in favour of storms and wildfire in the news media. This attention bias in the overall number of reports has a material cost where storms receive more research, funding and policy than other hazards (Brimicombe et al., 2021b; Harrington and Otto, 2020; Howarth and Brooks, 2017; Vogel et al., 2019). However, despite ranking second in terms of the overall number of articles, per individual occurrence floods have the least number of articles. This is something that should be explored further in a news media sentiment study.

In addition, the number of articles on average per individual weather hazard that also considers climate change is not following the 'newsworthiness' criteria and therefore drought, wildfire and heat waves have the most articles. Instead, the media can be suggested to follow the science where it is seen these hazards are easier to attribute to climate change than floods or storms (Ciavarella et al., 2020; Kreienkamp et al., 2021). Whilst the media does have a moral obligation and plays a key role in communicating climate risk, how science, the public and those in position of power communicates climate change has influence on what is

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

portrayed by the media (Boykoff and Yulsman, 2013; van der Hel et al., 2018; Howarth and Anderson, 2019).

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

5. Conclusion

The English News Media has a bias for weather hazards and climate change. Storm articles have the largest total for the last five years, whilst wildfires have the most article per individual hazard occurrence.

In comparison, storms have the most articles that also consider climate change. But, per individual occurrence, drought articles is highest. Heat waves remain under-reported by the English news media. Interestingly the number of flood articles is high. However, they are the least reported per individual hazard. Exploring this along with the sentiment of news reporting about weather hazards would be beneficial.

Weather hazards reporting remains subject to the newsworthiness factor and the political economy of the media and society. The relationship between the media and science is changing with climate change. Overall, the media should report the risk of climate change and weather hazards. Science has a supporting role to play through collaborations with the media.

Disclosure Statement:

The authors report there are no competing interests to declare.

Data availability:

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

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

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.

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,

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

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.

https://doi.org/10.5194/gc-2022-8
Preprint. Discussion started: 11 April 2022

GEOSCIENCE COMMUNICATION Discussions
Open Access
EGU

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

311 Vogel, M. M., Zscheischler, J., Wartenburger, R., Dee, D. and Seneviratne, S. I.: Concurrent
312 2018 Hot Extremes Across Northern Hemisphere Due to Human-Induced Climate Change,
313 Earth's Futur., 7(7), 692–703, doi:10.1029/2019EF001189, 2019.

314 Voice of Young Science: Voice of Young Science – Sense About Science, Voice Young Sci.
315 [online] Available from: https://senseaboutscience.org/what-we-are-doing/voys/ (Accessed
316 23 January 2022), 2022.

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

319