

policymakers (politicians, relevant ministers, civil servants, local planners or negotiators), and in what sense it ‘helps’?

There is no silver bullet to achieve more or better coverage of climate risks in an increasingly polarized and fragmented media landscape. But more training for journalists, instigated by management, about how numbers and probabilities can be communicated effectively in text, graphics and images, should be part of the mix.

Another advantage is that if risk is used in other fields such as economics, security and health more commonly than in conventional climate circles, then a risk language could further the urgent need to move climate reporting out of the environment ghetto.

Business sectors were a target audience for a 2014 report called ‘Risky Business’, which used a risk-management perspective to lay out the threat to agriculture, energy and coastal real estate in the United States¹⁷. The report helped to change the nature of the climate change story in the media, making it a business story on the business pages, often written by business reporters¹⁸.

Talking of risk and attempting to quantify it with numbers may not make climate change a gripping story, but part of the role of journalists is to promote societal reflection. Framing the challenge as “risk and how to reduce it” could help in providing a more constructive discourse about climate change than doom and gloom or uncertainty.

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COMMENTARY:

Media power and climate change

Julia B. Corbett

Fingers are often pointed directly at the news media for their powerful influence and ineffective reporting of climate change. But is that the best place to point? And are there more effective ways to conceptualize the power of the media and to consider whom they serve?

Over the past two decades, there has been much critique of news media coverage of climate change, including both subtle and overt suggestions that the media should be more of a watchdog of this issue. At the same time, some research¹ concludes that mass media are powerful agents for the way they frame climate change in news stories.

This prompts several questions: what is the role of news media (watchdog or otherwise) and how much power do they possess? Where in the process of

news — which begins with competing claims-makers who seek to instigate and influence news, culminates with the news product and concludes with media audiences — does the power of media lie? And in whose interest do news media operate — is it in the public's interest as a watchdog or for other interests altogether? I will argue that these questions are best answered when news is conceptualized (and studied) as a complex, interactive societal process rather than as prima facie powerful stories. I also argue that applying theories

of the role of media in society advances our understanding of media coverage of climate change and allows scholars to examine important questions of power and influence.

The majority of mass media research investigates the latter two parts of the news process, news content and news audiences, which can be studied singly or collectively. Research that analyses how news content affects news consumers (such as their knowledge, policy support or opinions) is part of a large body of research called media effects². Audience effects can be found

in long-term studies, but also in a simple correlation of how a person's opinions about climate change correlate with how often they read or watch news.

Overall, the body of media-effects research has demonstrated that media content can influence audiences, but the effects are generally weak, and the circumstances under which media influence occurs are complex and hard to predict³. Media effects are tempered by active audiences who generally seek media viewpoints consistent with their existing beliefs. Effects tend to be more powerful for unobtrusive issues where people have less direct experience (such as climate change).

One of the most tested theories of media-effects research is agenda-setting, which holds that the media doesn't tell us what to think, but are fairly effective in telling us what to think about^{4,5}. To determine whether a media agenda correlates with the public agenda, researchers compare the amount of coverage of a particular topic (such as Ebola or extreme weather events) with survey data ranking how important people believe the topic to be. Agenda-setting research demonstrates the ability of the media to amplify social concern and prime opinions, although usually just for short periods of time. But agenda-setting implies unrealistically that news generation is an autonomous process in which journalists independently set a particular agenda; in reality, they are dependent on powerful, credible social institutions and individuals to alert them to and supply news. The theory also implies that news media drive public concern (linear influence), although evidence has shown that at times the reverse occurs⁶.

Framing theory maintains that how a news story is written (such as emphasizing some details while minimizing others) affects how individuals read and understand it. A story's frame directs readers' attention by defining the problem, stating what or who is responsible, and pointing to a solution⁷. Studies of climate change media coverage have noted frames such as uncertainty, blame and responsibility, as well as how frames differ by country and media type⁸⁻¹⁰. Frame schema often are developed anew by each research team and can include over a dozen categories of frames, making it unlikely that new framing research will use the same categories and test their usefulness.

In my experience as a reviewer and scholar, a great many framing studies analyse media content for the presence or absence of various framing schema but do not test those frames' effects on audiences¹. Thus, it is inaccurate for researchers to claim that media are powerful solely by virtue



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of certain frames' existence on a page or screen and regardless of whether readers actually found them to be powerful. This is an incomplete and inaccurate assessment of the power of media because it excludes audience effects and also ignores how particular news frames materialized. In addition, when framing studies pose general research questions instead of testable hypotheses^{11,12}, they are limited to providing interesting snapshots of what frames are or how they might have changed over time or by country; they are unable to advance our understanding of the power of media in the context of climate change.

Compared with the enormous amount of media-effects research, relatively little research has fully investigated the forces that shape news production. Media content is invariably propelled and manipulated by competing claims-makers with very different degrees of power and different economic and organizational resources at their disposal¹³. Severe economic and organizational pressures within today's newsrooms have significantly changed the balance of power in the relationship between news-shapers and journalists. This has greatly increased public relations efforts and 'spin'¹⁴, and participation by climate change deniers and think-tanks¹⁵. In shrinking newsrooms, journalists are evermore desk-bound and forced to rely on ready-packaged information subsidies. One study of UK broadcast media found that the business world was nearly four times as likely as non-governmental organizations or pressure groups to place its press releases and other materials into news stories¹⁶.

Methods such as time-series analysis and social network analysis are useful for examining all parts of the complex, interactive news process. One study found that attention of the medical community to breast cancer (numbers of journal articles and grant funding amounts) preceded media coverage of it¹⁷. In a time-series analysis of external factors influencing US opinions about climate change¹⁸, media coverage was found to be largely a function of economic factors and elite cues (Congressional press releases, policy votes and Congressional hearings on climate).

In addition to examining all components of the news process to understand the power of media, it is also important to ask in whose interest the news media operate. The idea of 'watchdog media' was articulated by Edmund Burke³ as satire in Great Britain in the 1700s. The watchdog concept holds that the press serve as a Fourth Estate to provide checks and balances to the power of the first two estates (the church and nobility), and after the French Revolution, to the power of the third estate, the common masses. This gives the illusion of the press as separate, autonomous and independent from government and business — a watchdog looking out for the public's interests (which is not a singular interest). Journalists themselves most often describe their role as disseminators and interpreters of news and information¹⁹, not as watchdogs, and media research has found little support for a pure media watchdog role.

Yet many citizens and scientists believe (or hope) that mainstream media will (or should) perform this watchdog function for climate change, even though mainstream media are businesses that sell audiences to advertisers and are dependent on the cooperation of the power structure to stay in business. Researchers have found that half or more of news content is instigated by non-journalists, meaning that news content is often less the product of a journalist (watchdog or otherwise) than it is the agenda of an interested party^{20,21}.

A different theory for the role of the press suggests that mass media operate in the interests of the larger power structure, not the public interest. One research team coined the term 'guard dog' to describe this media role²², based on sociological literature of conflict, social change and social control. Other researchers refer to this theorization as the social control function of the media²³.

A guard dog's job is to protect its owners and their interests. Thus, guard dog media are highly attentive to the dominant power structure on which they are dependent

for news; they do not offer equal support to all institutions or authorities and may switch allegiances when power shifts. In reporting climate change, guard dog media report selected climate science findings and international meetings but overall defer to the mainstream values of a dominant fossil-fuel culture and the status quo. According to this theory, media are not liberal champions of progressive social change but fairly conservative institutions that support those in the social system with the most power and legitimacy. If those in power call for significant social change regarding fossil-fuel use, the media may follow — not lead — the call. Guard dog theory predicts that proponents of social change (scientists, environmental groups, politicians) will have an uphill battle — both with the dominant power structure and with the media — if the desired change differs from the status quo. In that sense, the media act as agents of social control. They will dutifully report conflicts so that powers in the social structure may better accommodate them (which may not be the same thing as taking action).

Questions about the power of media and in whose interest they operate are crucial ones for media scholars. If news media operate in the interests of status quo powers and not in the public interest, the media will never lead the call for social change regarding climate change. Instead, they will follow the lead of powerful, legitimate others who are making (and disputing) claims about climate change. The broad questions that I have raised deserve more attention and research. I urge media scholars to move beyond traditional micro-level snapshots of media texts (or audiences) and address communicative power and inequality at a macro-level across the broader news production and consumption process. It is in the complex interactions among news-shapers, journalists and audiences that evidence of power, social control, and inaction on climate change lies. □

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COMMENTARY:

No emergency argument for climate engineering

Jana Sillmann, Timothy M. Lenton, Anders Levermann, Konrad Ott, Mike Hulme, François Benduhn and Joshua B. Horton

Current climate engineering proposals do not come close to addressing the complex and contested nature of conceivable ‘climate emergencies’ resulting from unabated greenhouse-gas emissions.

Continuing business-as-usual with regards to greenhouse-gas emissions will increase the likelihood of ‘dangerous’ climate changes. In response to this risk, Crutzen¹ argued in 2006 that a 5 °C warmer world will probably have catastrophic consequences and that the only way out may be to engineer the Earth’s climate by injecting aerosols into the stratosphere. The possibility of a future ‘climate emergency’ has subsequently been used to justify research on climate engineering² — the deliberate modification of the Earth’s climate. Over time, the emergency framing has evolved to become a central argument for why we should

consider investigating solar radiation management (SRM) techniques, which reduce the amount of sunlight absorbed at the Earth’s surface. But whether SRM can possibly prevent or counteract a climate emergency raises the more fundamental question of what a climate emergency actually is.

Tipping points

Crossing a tipping point in the Earth system has often been used as an example of a potential climate emergency². Several ‘policy-relevant’ tipping elements have been identified that could conceivably be tipped by anthropogenic activities this

century³. Among these are the Atlantic thermohaline circulation, the West Antarctic ice sheet, the Amazon rainforest and the West African monsoon⁴. But whether SRM intervention could actually prevent these elements from tipping, or counteract tipping that was underway, depends on: (1) their predictability, (2) their timescale of tipping and (3) their reversibility.

A proactive ‘emergency’ response is only conceivable if a tipping point can be convincingly forecast in advance. Although early warning signals have been found for some tipping points⁴, the methods do not precisely forecast the time of tipping, and only work if a system is forced slowly relative