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Acknowledgements

We dedicate this paper to the memory of Professor Ulrich Beck (1944–2015), the pioneer of cosmopolitan social science in a world of global climate risks.

COMMENTARY:

Local science and media engagement on climate change

Candice Howarth and Richard Black

Climate scientists can do a better job of communicating their work to local communities and reignite interest in the issue. Local media outlets provide a unique opportunity to build a platform for scientists to tell their stories and engage in a dialogue with people currently outside the 'climate bubble'.

Surveys, including those carried out regularly by the UK's Department of Energy and Climate Change (DECC), show that a majority of the British public accept that climate change is happening, are concerned about it, and favour action to reduce greenhouse-gas emissions¹. However, public acceptance of climate change has reduced over the past five years. This may be connected with a lack of appreciation of the scientific consensus, which by several measures exceeds 90% (ref. 2). In 2014, a ComRes survey of 2,000 members of the British public, commissioned by the Energy and Climate Intelligence Unit, found that only 11% of respondents appreciated the extent of the scientific consensus on climate change; nearly half (47%) did not think there was a consensus at all³. Although the DECC (and other) surveys regularly show high levels of support for renewable energy technologies such as wind and solar power, the ComRes survey found that only 5% of the population knows that support is this high; more than

half of the population (63%) thinks that the public is opposed.

The methods by which people receive, interpret and understand information on climate change is important as it affects their resulting actions⁴. The importance and relevance of place attachments in understanding human responses to climate change is known⁵, and by incorporating elements of 'daily life' (which by definition is lived at a local level), media portrayals can enable climate science and governance to be interpreted through a local, everyday lens⁶.

Yet the communication of climate change historically has been generic, untailed and untargeted. A transition to a situation in which public engagement on climate change goes beyond information provision and instead adopts a more active approach underpinned by constructive dialogue between scientists and the media could therefore be fruitful. Increasing engagement on the local dimensions of climate change could facilitate this and enable a stronger connection to the issue.

The 2013–2014 winter saw a sequence of serious flooding events across much of the UK. Both a survey commissioned by Avaaz at the height of the floods⁷ and the ComRes survey six months later, suggested that these events affected public opinion on climate change. In the first, nearly half of respondents said they believed the floods were linked to climate change. In the second, half said that the floods had increased their belief in climate change, and a quarter said it increased their belief in human agency. The flooding was a major story on national and regional media for weeks and the subject of intense political discourse, and these studies could not untangle the question of whether local or national factors were involved in people making the weather-climate link. However, a study on the 2012 floods in Wales⁸ indicated that local experience is important; people directly exposed to flooding were more likely to accept evidence for climate change, and to believe that their own actions could have an impact by reducing carbon emissions.

If local experience of weather events that may be linked to climate change, such as flooding, increases acceptance and awareness of climate change — and if media reporting has the capacity to increase salience of climate science by linking national and global phenomena to people's 'everyday experience' at local level — this raises an important question: would increasing engagement of climate scientists in their local communities also increase people's engagement in the issue? Can an increasingly local and relevant voice for climate science, using appropriate framings and context, increase engagement in an analogous manner to local events?

A proactive role for local media

Local newspapers and radio stations are an important avenue of communication with people who do not use national media. Thus, local media outlets provide an unrivalled opportunity to build a platform for scientists to tell their stories and engage in a dialogue with people outside the climate bubble, indeed outside the orbit of national media. In time this could strengthen the relationship between researchers and the public — who, after all, fund much of the research — enabling them to build a better understanding of the issue.

Local media engagement with climate change issues varies widely, which may in large part reflect the interest of readers, listeners and viewers. The importance of local 'news angles' was demonstrated in reporting of the ComRes survey in August 2014. Results were included in a number of local papers across the UK, but especially in the southwest, a region particularly affected by the winter's floods. The Western Morning News carried the story as its front-page lead under a headline that referred specifically to flooding in its target region. Thus through a high-quality regional paper, local experience and interest interact with national and global phenomena, the latter interpreted through the lens of the former.

This is reinforced by findings from the US, where communication of climate science by local TV meteorologists has been shown to improve viewers' understanding⁹. Also, an analysis of 10 UK regional newspapers found that over a quarter of climate change articles focused either on local impacts or local responses¹⁰.

In the UK — as in many countries — local media is changing rapidly¹¹, driven by a combination of declining interest in traditional print, acquisitions, mergers and cost-cutting at the corporate level, and increasing use of the Internet. As a result, circulation figures are fluid; but some local papers have a total circulation

comparable to the lowest-selling national titles. For example, the West Midlands *Express and Star* has a circulation of 65,000 copies¹², which compares favourably with circulation of the poorest-selling national newspaper, the *Independent*, at 64,000¹³. Overall, circulation data suggest that some local titles occupy a dominant position in their target region and provide a good opportunity for developing constructive dialogue between scientists and local communities. Additionally, the combined reach of BBC local radio stations exceeds seven million listeners¹⁴; and in some regions, the internet is reviving local media, either through offering a new model for existing providers or by facilitating the entrance of new practitioners, often building from a community-based non-profit starting point.

There are numerous opportunities and avenues for scientists to engage with local publics via local media outlets. Social media, for example, can increase engagement with a community during the research process prior to publication, and respond to queries following its dissemination. Two-way live dialogue, where local publics and media interact directly and openly with scientists, can be established. Here local communities can pose their queries about science and their experience of climate change, the weather-climate link and impacts of local weather extremes. Scientists' credibility as local experts of the science therefore sits naturally at the centre of constructive dialogue with communities about the application and place of science in everyday lives.

The case for local engagement

Climate scientists play important roles as producers and assessors of evidence and are perceived as a trusted source¹⁵. Thus there are potential gains for trust in, and understanding of, climate science if its practitioners can reach beyond their peers and engage with wider audiences. However, their skill in explaining issues to a mainstream audience varies widely¹⁶. Climate scientists want to remain impartial and objective when engaging with the public. Shying away from dialogue with the public does not engender trust and can increase perceived remoteness of the issue and of those involved in its study. Climate change is a risk issue with different levels of uncertainty, and conveying this in an engaging way is a challenge in itself. But local publics engage with climate change precisely as a risk issue, which helps frame the way in which they react to it. Engaging with local media could thus enable climate scientists to help communicate the

urgency of the issue by better emphasising their personal and professional opinions when appropriate.

Furthermore, the conventional channels of science are national and supranational: journals, conferences, and reports that assemble expertise irrespective of origin and thus, as a side-effect, remove individual researchers from their local milieu. Academics generally have little capacity to incorporate engagement with media or the public in their work. What is a time-consuming and at times arduous activity is undertaken by some scientists who understand the importance of wider engagement, but the university culture in which the majority of climate scientists sit often does little to reward engagement beyond the academic community. In addition, relationships between scientists and university press offices may not always encourage and equip researchers to seek communication opportunities proactively.

When opportunities for local engagement with the media do arise, scientists sometimes approach them with scepticism and/or suspicion. The media's oversimplification of scientific findings, its lack of explanation and context, its assumptions, occasional distortions, the use of false balance — all these may conflict with the scientist's instincts and reduce trust.

Making the connection

Media reporting certainly plays a significant role in framing public perceptions of climate change, and research has shown increased audience engagement on the issue and empowerment to act when conversations are held at a local level¹⁷. Nevertheless, the reach, impact and role of local media are often overlooked by universities and scientists. Both could do more to engage with local media by utilizing university press offices and media support organisations such as the Science Media Centre. Press officers, for example, offer valuable insights into how the media operate and what topics are of interest locally. They provide a valuable avenue to local journalists and can act as thermometers of the local press and the public's mood on climate change. Most importantly they can provide strategic support and media training and facilitate increasingly trusted relationships between scientists and local media outlets. As representatives of their universities, their knowledge of research undertaken across the university makes them a valuable resource for demonstrating the different academic dimensions of climate change. Increasing engagement in this way would

facilitate two-way dialogue based on a demand and supply approach where science is 'supplied' when published through these channels, and scientists provide a service of scientific expertise on which the media can draw to align with their often reactive approach to communication and public engagement. However, press officers often act as gatekeepers — a role that is necessary at times, but which does little to encourage trust and open dialogue. The most desirable situation is one in which scientists are equipped with the skills, the contacts and the desire to initiate communication in the same way as any other citizen.

Direct personal experience of climate change increases engagement on the issue, whereas future projections increase its psychological distance¹⁸. We propose that this local salience can be built on to create constructive dialogue between the public and climate scientists in their area if they are willing to engage via local media and other local channels of communication. This would enable local publics to use their engagement with local scientists to 'visualize' climate change in a way that resonates and is relevant to them, enabling them to make informed decisions about

how they choose to engage on the issue and to critically examine climate policies for their national and local implications.

The benefits of increased local engagement would be plentiful. Locally, it would lead to increased salience of the issue, increased science literacy, reduced misperceptions of the science, enlightenment of what research the public helps to fund, better incorporation of local concerns and understanding in decision-making and increased understanding of the scientific process. For climate scientists and local media this would lead to a better understanding of each other's culture, improved science communication skills, clearer understanding of the impact and value of research locally, increased understanding of the context within which science is understood and applied, and trusted relationships between journalists and scientists, where each feels comfortable in dealing with the other. □

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COMMENTARY:

Securing the future of the Great Barrier Reef

Terry P. Hughes, Jon C. Day and Jon Brodie

The decline of the Great Barrier Reef can be reversed by improvements to governance and management: current policies that promote fossil fuels and economic development of the Reef region need to be reformed to prioritize long-term protection from climate change and other stressors.

The Great Barrier Reef (GBR), the world's largest coral reef system, has lost half of its coral cover over the past 40 years^{1–3}. The latest five-yearly analysis of the condition of the GBR, released in August 2014, concluded that its condition is poor and deteriorating, and that reductions in all stressors are required to improve its state³. The Australian government has correctly identified climate change as the greatest threat to the GBR, although ironically Australia is the world's largest exporter of seaborne

fossil fuels, and also has the world's highest per capita emissions of greenhouse gases. So far, global warming has triggered two major bouts of coral bleaching on the GBR, in 1998 and 2002, causing extensive and widespread loss of corals⁴, and there is growing concern for the future impacts of inevitable ocean acidification, extreme weather events and rising sea levels³. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has expressed concern over the decline of the outstanding universal value of the GBR

World Heritage Area (WHA), particularly from the rapid industrialization of the Queensland coastline and the development of ports for export of unprecedented amounts of fossil fuels. The World Heritage Committee is threatening to place the GBR on the World Heritage 'In Danger' list in 2015⁵. Here we briefly outline why the GBR is in decline and provide recommendations for securing its future in the face of rapid climate change that are broadly applicable to coral reefs and many natural WHAs worldwide.