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Mini-me: Why do climate scientists' misunderstand users and their needs?

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ABSTRACT

Increasingly climate scientists and the users of climate information are being asked to deliberately co-produce knowledge to improve decision-making about adaptation to climate change. To do this, scientists not only need to be committed and willing to interact with users but also have the capacity to listen, understand, and respond to their needs. Yet little is known about how climate scientists perceive users and respond to their needs when deliberately co-producing knowledge. Using the case study of the UK Climate Projections 2009 (UKCP09) we seek to address this gap. Drawing on interviews with climate scientists, boundary workers, and government officials involved in UKCP09, we investigate how perceptions of users and their needs are constructed as well as the difficulties in responding to them. Our research shows that climate scientists struggle to respond to users other than a small cadre of actors like themselves – highly technical and highly numerate – mini-mes; as what constitutes 'credible, usable, and relevant' science is different for users and scientists. Others involved in UKCP09 considered a broader set of users, with more heterogeneous capacities, as the target audience. We find that the climate scientists' narrow perceptions of users were strongly influenced by (i) their past experiences; (ii) the level and type of scientist-user interactions; and (iii) the institutional setting in which the science took place. This research suggests that climate scientists need broader social support from other experts as well as institutional goals geared towards a broader set of users if they are to successfully co-produce climate knowledge.

1. Introduction

As science finds itself increasingly interwoven with, and answerable to, society at large, new demands over its accountability have arisen. Long gone are the days where scientists received money from the state, shielded from political interference, simply in return for discoveries that advance the nation's health, welfare and prosperity. That social contract has been heavily revised. Climate science is a prime example. It has left the exclusive realm of 'basic' science and is now increasingly called on to prove its 'policy relevance' credentials. As a result, climate scientists are having to accept new social (and political) roles and responsibilities. In turn, calls have grown ever louder for climate scientists to deliberately co-produce climate knowledge with users to improve its uptake and practical use (Briley et al., 2015; Meadow et al., 2015; Sarewitz and Pielke, 2007). Such efforts aim to narrow what Lemos et al. (2012) have called the 'usability gap'. That is, if users of climate information can explain more clearly what makes it usable, and by extension, scientists can deliver exactly what is needed, then in theory, the curse of policy paralysis or inaction could be avoided (Dilling and Lemos, 2011; Feldman and Ingram, 2009; Lemos et al., 2012; Moss et al., 2013).

Such thinking can uncritically evoke what Chilvers and Keanres (2016) have termed a 'residual realist' understanding of scientists, users, and how the two should work together. Pre-given models of 'who' should be involved, 'what' is at stake, and 'how' co-production should be done, are taken-for-granted (Castree et al., 2014; Klenk and Meehan, 2015). Even when these issues are challenged, it is assumed that scientists are able to listen, understand, and importantly, respond to user needs, on the one hand, and wrongly assumes that more or better climate information naturally leads to improved decision-making, on the other.

Such thinking remains alive and well with the recent advent of climate service specialists (Brugger et al., 2016), and before that proliferation of knowledge brokers (Meyer, 2010) and boundary organisations (Agrawala et al., 2001), all of which are keen to plug the perceived cognitive and institutional gap between science and decision-making. For Lowrey et al. (2009), the success of efforts to bring scientists and users closer together depends on the level and quality of interactions achieved. This is because scientists and users often have very different ideas about what constitutes usable or relevant climate information (Lemos et al., 2012). For instance, scientists make a number of assumptions about what they think users need without

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always fully understanding the needs, limits, or pressures faced by users (Feldman and Ingram, 2009; Lemos and Rood, 2010). Likewise users may define their needs differently or ignore new information because it does not fit with existing working practices, despite its potential usefulness (Rayner et al., 2005; Rice et al., 2009). Disappointment can ensue on both sides. Users are left frustrated that scientists have not listened to whilst scientists are left frustrated that their efforts to satisfy user needs go (largely) unappreciated.

Usability of climate information, it is argued, can also suffer when 'who' scientists think the user is and 'who' ends up using it differ (Lemos and Rood, 2010). Such misalignments occur because experts construct a mental model of their idealized user when producing climate information (de Bruin and Bostrom, 2013; Dawes and Mulford, 2004; Nickerson, 1999). Or what Sofoulis (2011: 805) comically terms 'Mini-Me-ism'.[1] That is, where experts 'assume that users will (or ought to) think just like they do, and value the kinds of rational and technical knowledge that [they] consider important' (ibid). An overly simplistic, if not one-dimensional, user is imagined. It is assumed that users either have the same capacity, resources, and time needed to make sense of technical knowledge, or can be coerced into securing them. Some user needs get prioritized over others (Wyatt, 2008), non-use or resistance can arise (Oudshoorn and Pinch, 2008), and particular forms of power and rationality are left unchallenged (Akrich, 1992; Porter and Demeritt, 2012). Such realities are shaped, in large parts, by climate scientists' value judgements over what they think is 'good' science and what users need to know (Shackley et al., 1999). If scientists are to co-produce climate information with users, a more critical discussion is needed about what shapes their perceptions of users and the barriers they face. Otherwise the co-production bandwagon could end up re-introducing the very same frictions, antagonisms, and power imbalances that it aims to challenge (Castree et al., 2014; Chilvers and Keanres, 2016; Klenk and Meehan, 2015).

In this paper, we problematize the tacit assumptions involved in deliberately co-producing climate knowledge by exploring how climate scientists' perceptions of users and their informational needs are constructed and the constraints faced in meeting user needs. We draw on in-depth interviews with climate scientists,[2] boundary workers, and government officials involved in the UK's latest climate projections, UKCP09. These projections paint a picture of how the UK's climate may change in the future (Jenkins et al., 2009). A very broad set of users – including infrastructure firms, water-energy utility companies, transport providers, and national/local government (see Jude et al., 2017) – with different needs and different capacities are expected to use these projections. Over seven years, Met Office scientists and users worked together to co-produce the projections (Steynor et al., 2012; Street et al., 2009). Yet since releasing the projections opinion has been split on their usability (Heaphy, 2015; Frigg et al., 2015; Kelly, 2014; Tang and Dessai, 2012). Subsequently, the projections have taken on a life of their own. They are being used to inform how to engage users for the UK's next set of climate projections, UKCP18, and are being studied closely by other countries as well (Skelton et al., 2017). In turn, the rise of climate services means the type of interactions between scientists and users pioneered by UKCP09 could soon become commonplace.

After providing a brief overview of the UK's climate projections and the role they have historically played in climate adaptation planning, we explain our data and methods. We then explore whom exactly Met Office scientists' had in mind as the user of the projections, what they thought that user needed, and how the projections should be used. Following on, we focus on what has influenced scientists' responses to users and their needs. To close, we ask whether scientists are getting the support or incentives they need, socially and institutionally, to successfully co-produce climate information with users.

2. Case study: the UK climate projections 2009

Since 2008, a strong regulatory regime in the UK has formed around the assessment and management of climate risks. Under the Climate Change Act, the UK Government must assess the risks posed by climate change and develop policies to reduce them every five years. The Secretary of State for the Environment can also use this legislation to direct private companies responsible for critical infrastructure, utilities, and transport networks, to report on how they will manage climate risks. All these adaptation activities have one thing in common: they start from the same place, the UK's climate projections, UKCP09.

The UK has a long history of producing climate projections and/or scenarios (Hulme and Dessai, 2008). Dating back to the early 1990s, these projections have sought to inform adaptation and mitigation decision-making by showing how temperature or rainfall may change over the century, under different conditions (e.g. emission scenarios). Yet the UK's latest climate projections are markedly different to what came before. Users are given greater choice over the spatial resolution, timeframe, and level of risk they wish to use in their decision-making (Jenkins et al., 2009). Instead of giving users single, averaged figures for say temperature change, the new projections provide probability distributions to account for model uncertainty and detail the extent to which different outcomes are supported by different lines of evidence (e.g. climate science, observations, and expert judgment) (Parker, 2013). The projections 'give government and other organizations [the] evidence [needed] to help them take informed, cost-effective, and timely decisions to prepare for the changing climate' (Department for the Environment, Food and Rural Affairs, 2015).

The UK Met Office, an executive agency responsible for making meteorological predictions across very different timescales from weather forecasts to climate change, put the projections together. The UK Government funded the work on the proviso that it delivers policy-relevant knowledge that is also 'world-leading', so that it makes an original contribution to science and influences the IPCC process (Department for the Environment, Food and Rural Affairs, 2007; see also Shackley, 2001). A sharp distinction between basic and applied science is unhelpful here as a hybrid mix is often practiced. To ensure that user needs were considered, the United Kingdom's Climate Impacts Programme (UKCIP) − a boundary organization working at the interface of climate science and policy – was responsible for bringing scientists and users together (Steynor et al., 2012; Street et al., 2009).

Initially UKCIP ran workshops, and conducted an online survey, before a user panel was convened where scientists and users discussed developments in the projections and offered feedback. Meeting every three months over three years, scientists met users, often for the first time, and learnt how climate information was used and what users needed. Why only some users were invited onto the user panel, and what they were able to contribute thereafter, often remained unclear. A preference was given to those that had already used the UK's previous climate scenarios, UKCIP02. As a result, researchers, water companies, and other highly numerate actors became the dominant voice on the user panel.

3. Data and methods

To understand how climate scientists, modelers, and other experts perceive users' needs, and what influences those perceptions and responses, we conducted forty-five in-depth interviews relating to the production of the UK's 2009 climate projections, over the summer of 2013. A purposeful sample was used to select actors who had played different roles at different stages in the development of the projections.

[1] Mini-me is a character who first appeared in the comedy film *Austin Powers: The Spy Who Shagged Me*. He is the clone of one of the main protagonists: Dr. Evil, and is as such identical to him in every way, except being one-eighth of Dr. Evil's size.

[2] For this study, we define a climate scientist as an expert or specialist working in the atmospheric sciences who aims to understand how the climate system works both on a regional and global scale and replicates this through computer modelling to inform policymaking, societal responses, and advance research.