Tyndall Centre for Climate Change Research

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April 2012

Tyndall Centre for Climate Change Research Working Paper 152

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Tyndall Working Paper 152, April 2012

# Credibility in climate change research: a reflexive view

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## Abstract

For research to have a positive impact on society, it is essential that it is scientifically credible. The researcher plays a key role in establishing and maintaining credibility, particularly in the field of climate change. This paper provides a structure for relating the credibility of researchers themselves to that of research outputs, analysing 'researcher credibility' with reference to three overlapping domains: personal, professional and public. The researcher's role in each domain is considered in a reflexive way, examining the process of research and the researcher's own actions. The varied definitions of researcher credibility and possible means to achieve it in each domain are discussed, drawing on relevant literature and the perspectives and experiences of the authors. We argue that, in certain contexts, the actions of researchers can have a direct impact on the credibility of their research. More public-oriented definitions of researcher credibility have merit but may be contentious, as there are potential conflicts between public action and professional credibility, with the latter usually taking precedence. By contrast, personal action (or inaction) rarely affects professional credibility, but the personal behaviours of researchers may influence public perceptions of the credibility of research and even of the importance of addressing climate change.

## 1 Introduction

The influence of academic research stems not only from the knowledge presented but also from the process of knowledge creation (Mitchell *et al.,* 2006), making examination of the research process essential for improving the extent to which science can help humanity respond to its greatest challenges. Mitchell *et al.* (2006), building on Torrance (2006)'s analysis of the factors that initially elevated climate change to the international policy agenda, argued that in order for international environmental assessments to influence policy actors, they must viewed as credible, salient, and legitimate. Yet as assessments and other research outputs are always produced by one or more 'researchers', expert legitimacy is a problem involving three bodies: the body of knowledge, the experts themselves, and the institutions through which they give advice, each requiring explicit attention. Past discussions have placed too little emphasis on the latter two components (Jasanoff, 2005), leaving a gap in our understandings of scientific legitimacy and credibility.

Credibility is of particular consequence in climate change research, given its increasingly politicised and polarised nature in public fora[1]. It is not an exaggeration to say that the collective reputation of the climate change research community is at stake – poignant illustrations include the 2009 and 2011 University of East Anglia Climate Research Unit email controversies (Gillis &

[1] In this paper, 'climate change research' is used in a broad, multi-disciplinary sense, including climate science, mitigation, and adaptation across the physical, natural, engineering, and social sciences. Unless explicitly noted, we are speaking of 'Western' research norms (which may vary from those in other parts of the world).

Kaufman, 2011) and the current dispute between US water scientist Peter Gleick and the 'climate-denialist' Heartland Institute (Goldenberg, 2012). At the same time, there is a global failure to effectively address the climate change challenge that has been framed by the research community, as demonstrated by the 'delayed action' plan emerging from the recent United Nations Framework Convention on Climate Change conference in Durban (Black, 2011). Responsibility for this lies with the scientific research community as well as with policymakers: it is the scientific framing of climate change that informs policymakers' understanding of its scale and urgency. The climate change research community thus finds itself at a critical juncture to examine the second of Jasanoff's 'bodies', the 'experts', and reflect on the questions: what does it mean to be a credible climate change researcher and produce credible research outputs? This paper aims to stimulate and inform debate on this topic.

Building on discussions by an interdisciplinary group of early-career researchers within the Tyndall Centre for Climate Change Research, we initiated a wide-ranging and cross-disciplinary (though not systematic) review of conceptions of credibility[2]. Based on this, this paper then considers how the credibility of research outputs (hereafter 'scientific credibility'[3]) is related to that of researchers themselves (hereafter 'researcher credibility') and presents a framework for analysing researcher credibility, unpacking it into three domains: personal, professional and public. We consider the issues and potential conflicts for researchers in maintaining credibility throughout and across each of these domains by drawing on relevant literature in combination with our own disciplinary research perspectives and experiences.

Both scientific and researcher credibility go beyond the purely professional domain but are rarely assessed reflexively in an integrated and systematic way. In particular, the domain of personal behaviour is seldom openly discussed in an explicitly reflexive way by climate change researchers; experience indicates that, when they do occur, such discussions can quickly become both personal and emotionally charged. We expect this paper will help to both stimulate and structure discussion within the interdisciplinary academic community and broader non-academic circles on the behaviour of researchers in the professional, private and public domains and the impact this has on research credibility. Though some of these insights are unique to the field of climate change, many have broader relevance and can inform broader discussions on researcher credibility, particularly in other fields characterised by multidisciplinarity, controversy, and policy relevance.

## 2 Setting the stage for discussion: key definitions and structures

### *2.1 Reflexivity*

The approach of this paper is reflexive, examining the process of research and the researchers' own actions and creeds. Reflexivity involves reflecting upon how research is conducted, in addition to considering how this process moulds research outputs (Holland, 1999). Reflexive thinking also extends to consideration of the network in which the researcher is situated, examining research communities as well as individual researchers (Hardy *et al.*, 2001). At its core, reflexivity requires the researcher to assess their own impact as an observer on the object of investigation; therefore this paper will also explore broader research practices, not just those associated with methodological and analytical decision-making. Whilst some scholars criticise reflexivity as difficult to assess (Seale, 1999) or unnecessary and self-indulgent, prioritising the researcher over the research (Finlay, 2002;

[2] Initial discussions took place at the Tyndall Researchers' Network (TyReNe) meeting at Newcastle University on 14th September 2011.
[3] We stress that both natural and social sciences are included within this term.

Clegg & Hardy, 1996), others discuss how reflexivity may inhibit effective research by impairing self-confidence or creativity (Weick, 1999). In view of such critiques we cast reflexivity as a process rather than an output, through which we examine the concept of credibility in its multiple manifestations.

### *2.2 Credibility*

Bocking (2004, p. 164) defines scientific credibility as: "the extent to which science is recognised as a source of reliable knowledge about the world, and not simply as, say, random observations, or an expression of the preferences of a particular interest group"[4]. In applying the concept of credibility to researchers themselves, we broaden the definition to include both inward-facing (to oneself) and outward-facing (to others) elements. Thus, concepts such as reliability, integrity, trustworthiness, consistency and legitimacy apply not only to 'the science' itself, they also feed into the construction of 'researcher credibility' through the subjective judgements of researchers' peers, policy audience, friends and lay public. Outward-facing components are also important; as scientific debates become politicised and enter the public domain through the media, often the researcher is scrutinised as much as their research. As Keller (2011, p. 21) argues, "It is precisely because the implications of climate research are so huge that the distinction between legitimate and illegitimate criticism has become so intensely politicized; it is also because of the magnitude of what is at stake that we must, somehow, find a way to make this distinction".

Frequently, talk of credibility is intended to inspire trust in research, used as shorthand for ideas of consensus, truth, knowledge, and a separation of 'belief' from 'fact' (to whatever extent 'facts' can be known). However, it is important to note that consensus, although often a good indicator of scientific credibility in as much as it reveals the scientific community's level of confidence in its propositions, does not by itself confer credibility. Attempts to establish the reliability of scientific claims solely by appeals to consensus are misguided. For example, both the early geocentric and the Copernican heliocentric models of the universe were widely accepted by the consensus of the scientific community of the time but later observationally shown to be incorrect (Fraser, 2006; Russell, 1964). Further, there are limits to consensus, particularly amongst an interdisciplinary group, and attempts to establish it may omit contrarian views, minimize key uncertainties in research, and lead to a conservative outlook (Hulme & Mahony, 2010; Oppenheimer *et al.*, 2007; Hansen, 2007). It is thus important to take a broader view of credibility.

### *2.3 Personal, Public and Professional Domains*

Figure 1 illustrates our proposed framework for the analysis of researcher credibility based on distinctions and interactions between three domains in which the researcher can be said to exist: the professional, personal (or private) and public[5].

[4] Note that this is a somewhat positivist definition of credibility, as it assumes that an objective 'reality' can be reliably and tangibly observed.
[5] The terms domain, realm, sphere, etc., are used synonymously in this paper.

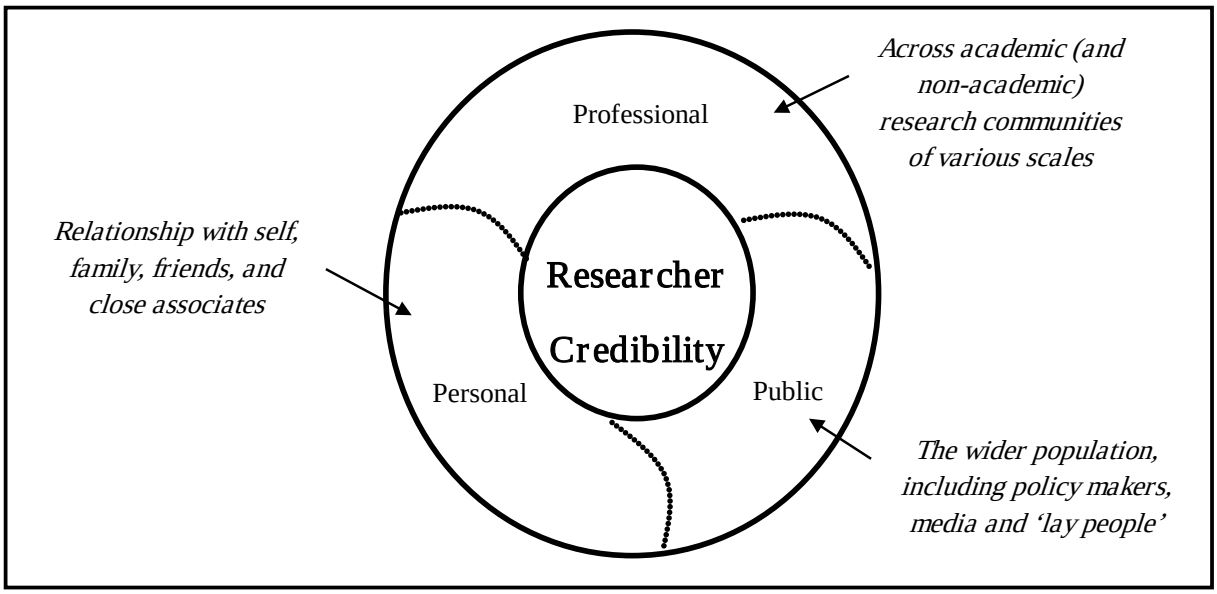


**Figure 1. Domains of researcher credibility**

Our preferred definition of researcher credibility transcends the immediate professional working environment of academia, deriving also from the public and personal domains. Sections Three through Five examine researcher credibility in each of these domains in greater detail. As is shown, this interpretation, which places weight on achieving credibility before a wider audience than the solely professional, may generate greater levels of public engagement than narrower views.

Nevertheless, how, and indeed whether, such a shift in the source of researcher credibility should be sought remains an open question, not least due to potential conflicts between public behaviour and the credibility of the researcher in the professional domain (hereafter 'professional credibility'). *In extremis,* these conflicts could constrain the ability (or, in the US, the *right*) of scientists to act as engaged citizens by limiting their role in political protest and decision-making. In contrast, professional credibility is rarely affected by personal behaviours – that is, whether a researcher leads a 'sustainable' lifestyle or acts as an exemplar of emissions mitigation[6]. Such personal behaviours could, however, positively or negatively influence some public constituencies' perception of how credible a researcher is when presenting findings that have policy implications. In turn, a researcher's 'public credibility' may, by association, affect public perceptions of the validity of the science itself – even to the extent of influencing the perceived importance of addressing climate change. Section Six thus discusses the potential for tensions to arise when trying to maintain credibility simultaneously in all of these spheres.

Beliefs about the meaning of credibility will vary across an interdisciplinary research community, partly determined by the disciplinary paradigms within which researchers work. These 'inquiry paradigms' include assumptions (either explicitly or implicitly) about epistemology (i.e. what one can know) and ontology (i.e. what exists). Beliefs associated with inquiry paradigms largely shape what individuals within that particular 'expert community' count as credible research. For

[6] This may vary between more localised and more dispersed (culturally, disciplinarily and economically) professional networks. For examples, Western researchers whose personal consumption is conspicuous may find it difficult to credibly present mitigation research to an audience of their peers from non-Annex 1 countries, even if their consumptive behaviour is accepted within their own 'globally affluent' community.

example, the positivist paradigm, with its foundations in traditional natural sciences, views knowledge as absolute (the universal discoverable 'truth'), thus methodological credibility is typically sought through objective, replicable and mainly quantitative methods (Cohen *et al.*, 2007). By contrast, the constructivist paradigm, which is increasingly adopted by social scientists, sees objectivity as being undermined by inevitable interactions between the researcher and the object of research.[7]

Climate change research is a diverse field, comprising scientists with differing criteria for professional, academic credibility corresponding to their disciplinary backgrounds. While a course in epistemology is often compulsory for social scientists, physical scientists do not usually undergo such training. The characteristic differences in epistemological assumptions in the physical and social sciences may thus lead to difficulties in defining, designing and conducting collaborative interdisciplinary research (Paletz *et al.*, 2011)[8]. In policy-relevant research, it is not only the epistemologically based views of credibility held by academics that are relevant but also those of policy makers and the general public. Epistemologies may also complicate the dissemination of climate science to the public. For example, Keller (2011, p. 20) suggests that, "If scientists bear some responsibility [for controversies about climate change]… it is for their adherence to an image of science as infallible, capable of delivering absolute truth (and thus value-free)," a view that she suggests may be "indefensible" and "unrealistic".

### *2.4 Disciplinary and Cultural Paradigms*

Within a diverse scientific community, particular views may differ widely from seeing science as 'infallible'. Researcher credibility is thus a subjective and interpretive term, heavily influenced by the context in which it is used and one's 'epistemological roots'. It should also be noted that definitions of researcher credibility vary not only by discipline but also culturally; for example, Elaine (2003) notes that Chinese researchers are often less concerned about maintaining professional credibility than their Western counterparts and are instead focussed more on maintaining a harmonious relationship within their community than on objectively presenting and debating work.

## 3 Professional credibility: the view from the ivory tower

Academic research is founded on credibility, with 'truth' (to the extent that any given disciplinary inquiry paradigm claims to apprehend truth) achieved through constant challenge and debate: all researchers are 'sceptics' in the critical sense of best practice science. A reputation as being credible amongst one's professional peers is considered central to a successful research career, although this may come from being conservative or conformist (not 'rocking the boat') as much as from conducting quality research. Within academia, a researcher gains professional credibility by obtaining academic qualifications (usually a PhD), producing peer-reviewed publications, presenting research for challenge and open discussion, ensuring transparency of research methods, and observing professional ethical standards.

Common principles of scientific research (e.g., Shavelson & Towne, 2002) include disclosing research to encourage professional scrutiny and critique, primarily by submitting research publications for peer review and presenting results at academic conferences and meetings. These

[7] Certainly, this is a generalisation, and epistemological underpinnings do not always correlate neatly with specific disciplines.

[8] Disciplinary divisions in 'ways of knowing' may also complicate interdisciplinary research within the social sciences, though not necessarily preventing it (as demonstrated by Shove (2010), and the ensuing responses from Whitmarsh *et al.*. (2011), Shove (2011) and Wilson & Chatterton (2011)).

practices are central to academic research and careers. Hardy *et al.* (2001), citing Jeffcutt (1994), describe research as being, "shaped by the need to submit doctoral theses, publish articles, appear at conferences, etc." 'Publish or perish' is the mantra of early-career researchers seeking career advancement, as professional credibility, which includes aspects of expertise and status, is commonly assessed by citation counts and publication analyses. For example, Anderegg *et al.* (2010) reach a definition of credibility by tallying, "the number of climate-relevant publications authored or co-authored by each researcher… [and] the number of citations for each of the researcher's four highest-cited papers". Furthermore, in the UK, government funding will be allocated to institutions via the Research Excellence Framework (REF)'s 'expert review panels', which will inevitably examine the impact of each institution's most highly cited studies (though, officially, citations are no longer a criterion). Collins & Evans (2002, p. 257) discuss how 'managers and leaders of large scientific projects' (e.g., IPCC assessments) obtain their positions because they have gained a suitably high level of 'contributory expertise' (i.e. demonstrated competence in a specialist field) to justify such a responsibility – usually measured by citations and compliance with professional norms.

Peer review and conference critiques are effectively closed to input from non-academics, with the 'right to criticise' usually given only to members of the relevant discipline (Keller, 2011, p. 22). Historically, formal peer review has its roots in avoiding public exposure to scientific controversies and 'imprudent theses' (Ranalli, 2011, p. 16). Although the system may give scientists confidence in their own conclusions, it is not surprising that this closed process does not always assure and convince the public of scientific credibility. Indeed, there are times when peer review fails to filter out poor-quality scholarship[9].

Another common principle of scientific research is replicating and generalising across studies (e.g., Shavelson & Towne, 2002); in theory another scientist should be able to reproduce similar results using the same data and methodology. Scientific credibility therefore requires transparency of methods and free availability of data, both for internal verification and to build public confidence (CSEPP, 2009). Finally, scientific credibility assumes that research ethics codes are followed, including acknowledgement of funding sources, avoiding conflicts of interest, obtaining informed consent from research participants, and citing all consulted data sources.

Researchers gain professional credibility based on each of these principles. This subsequently translates into influence within academia as newer researchers, who are yet to establish themselves, seek to enhance their own credibility by aligning with this pre-eminence. For example, Yohe & Oppenheimer (2011) discuss how the subjective judgements of IPCC authors in constructing SRES emissions scenarios have shaped nearly every ensuing climate change impact or adaptation study. They attribute this to the need to be anchored around "one or another of the four underlying [SRES] storylines in large measure because they had the IPCC brand attached" (Yohe & Oppenheimer 2011, p. 634). A researcher's professional credibility, then, is judged not only according to their research output but also the various social interpretations of their institutional and professional affiliations (e.g., the principal investigator, supervisor, or co-authors they work with), as well as their source of funding (Collins & Evans, 2002).

[9] For example Wegman *et al.* (2008) in *Computational Statistics and Data Analysis*, later withdrawn (in Vergano 2011), or Soon & Baliunas (2003), the publication of which was followed by the resignation, in protest, of three *Climate Research* editors but also incorporated into policy assessments of the Bush White House (Lewandowsky, 2011). There is also a libel case pending over a 2008 *Nature* article that criticised a researcher for publishing articles that had not been peer reviewed (Ghosh, 2011).

Matters are further complicated if research funders have vested interests (commercial or otherwise) in certain research outcomes, as this may damage scientific credibility. For example, environmental research underwritten by oil companies, or public health research paid for by the tobacco industry, would likely be viewed with scepticism within academia (though it may get considerable media coverage, Oreskes & Conway, 2010). Equally, climate change research funded by environmental NGOs must guard against being biased by the interests of the client organisation. If research appears to be compromised by the interests of its sponsors, the professional credibility of the individual researchers responsible will also be cast in doubt. Conversely, research projects backed by funding sources with a range of political and commercial sympathies may gain scientific credibility if their findings run counter to the vested interests of some backers. For example, the recent Berkeley Earth Surface Temperature Project's climate change meta-analysis, which was initially championed by 'climate change sceptics', may have boosted the credibility of climate science as a whole when it yielded findings generally in line with the consensus view of global warming (BEST, 2011).

The Concordat between funders and employers of researchers in the UK (Research Concordat, 2008) posits six responsibilities of researchers, including: advancing knowledge; transferring and exploiting knowledge where appropriate for the benefit of their employer, the economy and society as a whole; and behaving in an honest and ethical way when conducting and disseminating research. Thus, in addition to conducting the rigorous research required to create and maintain credibility within the professional domain, a researcher must also ensure that the credibility of that research is upheld in the public domain. This interface is discussed in the following section.

## 4 Public credibility: bringing research to society

The need to maintain credibility in the public domain raises a further set of interrelated questions for the researcher: should one engage with the public (and why)?; how does one engage?; how might engagement (or lack thereof) affect credibility in the professional and personal domains?; and, in turn, how might credibility in those other domains affect public engagement? The first two of these questions are addressed in this section, while the second two will be considered in Section Six, alongside overlaps and tensions between domains.

We acknowledge from the outset that 'the public' is not a homogeneous entity. It is more accurate and helpful to think of multiple 'publics', constituting many different educational backgrounds, political and social ideologies and manifesting various types of scepticism (i.e., 'trend', 'attribution', 'impact', 'policy', and 'science' sceptics; Painter, 2011). Knowledge, even if widely accepted within the research community, will be interpreted differently as it travels amongst these different audiences (Jasanoff, 1996, 2010 in Hulme & Mahony, 2010). As Mitchell *et al.* (2006) note, the diverse audiences of environmental assessments evaluate credibility by different criteria than are assumed to be applied within the scientific community; the varying definitions emerging from this heterogeneity would likely complicate public engagement. Maintaining public credibility is further complicated by the complex cognitive factors involved in the process of understanding climate change (e.g., Grothmann & Patt, 2005). While keeping in mind the heterogeneity and multiplicity of 'publics', for reasons of grammar and clarity of expression we speak of credibility in the *public* domain.

### *4.1 The motivation for 'public credibility'*

In the spirit of the principles of the Research Concordant, researchers, as members of the scientific community, are responsible for maintaining the scientific credibility of their work in the

public domain (Research Concordant, 2009). As research findings are disseminated in the public domain by media and political actors, there is always the risk that they may be misrepresented; for example, attempts by the media to present balance often give considerable weight to 'climate sceptics' (Boykoff & Boykoff, 2004), suggesting a much higher level of disagreement than actually exists within the research community (Painter, 2011). Paul Nurse, president of the Royal Society, has claimed that, "an unholy mix of the media and the politics …[is] distorting the proper reporting of science" (Horizon, 2011).

Whether intentional or not, this messaging may be contributing to the erosion of public confidence in climate change research. For example, public opinion polls, which admittedly may be of dubious value in ascertaining *considered* positions, suggest that approximately 20–25 percent of the UK and 43 percent of the US public 'doubts' the science of climate change (Carrington, 2011; Pew Center, 2009a; Stafford, 2010; UPI, 2011)[10]. A recent *Nature-Scientific American* poll of a science-literate audience found that while most respondents had a high level of trust in science, trust for *climate* science was much lower (*Scientific American,* 2010). Climate change is also often considered a low-priority issue: the balance of public opinion in countries as diverse as Israel, Poland, and China is tipped such that the majority do not view climate change as a serious threat (Pew Center, 2009b), and concern shown by citizens and government officials is generally found to be less than that of climate scientists (Weber, 2010; Dunlap & Saad, 2001 in Weber, 2006).

### *4.2 Public Engagement*

Public engagement, broadly construed as any interaction relating to one's research with people outside one's personal or professional network, may be a prudent measure to counter the undermining of scientific credibility in the public mind and reduce the likelihood that individual research findings will be misrepresented. Disseminating and communicating one's research through proactive public engagement can help to ward off threats to credibility from misrepresentation before they occur. Interpreting the principle that research should be disclosed to encourage professional scrutiny and critique to apply to disclosure outside, as well as within, the research community, arguably further mandates public engagement. Indeed, spending time on 'outreach' activities is typically a condition of UK Research Council funding and many academic contracts. Controversial, timely, or highly policy-relevant research (e.g., climate change research) will often be picked up by the media for dissemination and debate in the public realm, regardless of whether the researchers responsible are ready to engage with the public. In these circumstances, the reticent scientist may find that they must reactively engage with the public in order to limit potential damage to scientific and professional credibility.

Public engagement is widely encouraged. Lackey (2007, p. 8) states that, "scientists have a responsibility to correct misinterpretations of science, especially if it is being conveyed in ways that imply support for particular policies". Keller (2011, p. 26) takes this further, arguing that scientists have a responsibility to the public that includes conveying research findings, responding to concerns, and encouraging them to, "take the lead in breaking through our current impasse ... because their responsibility qua scientists obliges them to do so". This opinion is echoed by Forbes (2011, p. 1), who states that, "for the scientist's social role as epistemic authority to remain justified, public criticism of science should ideally be entertained and answered by practicing scientists".

[10] Though some of these surveys were conducted by respected polling organisations (e.g., the Pew Research Center for People and the Press), methodologies and sample sizes vary, so their findings should be treated with caution. Note also that alternate question phrasings, such as whether people 'doubt' the reliability of the basic science underpinning the working of the climate, may elicit different responses.

Yet the debate is neither novel nor one sided. In a 1954 interview Albert Einstein set himself against public engagement by scientists, stating that, "it is the duty of a scientist to remain obscure" (Douglas 1996, p. 100). Somerville (2010, p. 513-4) allows a limited role for scientists to, "give the public guidelines of recognizing and rejecting junk science and disinformation", after which the public must, "learn about what science has discovered and accept it". In contrast, Jasanoff (2010, p. 81), argues that there is a need to, "enlarge the circles of accountability within which scientific judgment has to prove itself". The differences in the epistemological bases of these researchers – Einstein in physics, Somerville in meteorology, Keller initially in physics (later in history), Forbes in philosophy, and Jasanoff in linguistics and law – may be a root cause of this divergence. For example, while Keller takes a constructivist view in explicitly recognising that science is neither absolutely certain nor value-neutral, Somerville's arguments ascribe an objective validity to science. Of course, disciplinary background is not an entirely reliable proxy for epistemological assumptions: Jasanoff, for example, now works in science and technology studies, several 'hard scientists' (e.g. chemist F. Sherwood Rowland, 1993) have argued for greater scientific communication with the public, and divergent views within the discipline of ecology have long fuelled debate on the scientist's role in policy (Sarewitz, 2004, Lackey, 2007, Scott *et al.*, 2007).

Paul Nurse argues that given current doubts (fostered by the media and political interests) over "whether the public actually trusts scientists", including on the issue of global warming, "scientists have got to get out there [and] be open about what they do" (Horizon, 2011). Since people tend to use new information to confirm, rather than disprove, existing beliefs when dealing with ambiguities (Lord *et al.* 1979, in Patt & Schröter, 2008), it is unlikely that public confidence in the credibility of climate change research will increase without considerable effort on behalf of the scientific community to ensure that research findings are communicated in a clear and unambiguous manner. Furthermore, as Keller (2011, p. 23) points out, "neither the future of evolution nor of planetary motion depends on what people believe about these theories ... it is the link between belief and action on the one hand, and the magnitude of the potential consequences of inaction on the other, that set climate science apart". Thus climate change researchers may have a unique responsibility to engage with the public to ensure that their research remains credible in the public domain.

Public engagement can be placed on a spectrum of interaction: from press releases at the lower end of the scale, through lay-language media interviews, to more hands-on, interactive levels of engagement, such as outreach activities in schools and communities. Public statements asserting internal consensus within the professional community are a (generally uncontroversial) move towards direct public engagement; for example the statement by 1700 British scientists declaring their, "utmost confidence in the observational evidence for global warming and the scientific basis for concluding that it is due primarily to human activities" (Price *et al.*, 2009). Yet are such didactic statements sufficient? One might argue that because 'informing' has not led to effective action on climate change by either policymakers or individuals, a more proactive form of engagement is required. Indeed Heide Hackmann, executive director of the International Social Science Council, argues that in order to solve the climate change policy problem, "we need … new ways of making sure our knowledge is utilized" (Marshall, 2011).

Encouraging the comprehension and utilisation of scientific knowledge could take the form of innovative and dialogue-based communication methods (e.g., Marx *et al.*, 2007; Lorenzoni &

Pidgeon, 2006; work by COIN, the Climate Outreach and Information Network [11] ). More controversially, it might also include researchers taking a more direct approach to interacting with policymakers, for example, issuing position statements that include policy opinions, or joining protests for effective action on climate change. Recent examples of this include a group of Australian scientists who petitioned Parliament and launched a publicity campaign to convince Australians that they, "can rely on the scientific evidence to inform decisions because of the rigorous process scientists go through to test and review their research" (Science & Technology Australia, 2012) and American scientist James Hansen, who was arrested outside the US White House for protesting construction of an oil pipeline (Drajem, 2011).

*4.3 Science versus policy engagement*

It is important to note the difference between public engagement on issues of science and on those of policy. While the majority of academics may support public engagement on research, many would argue that involvement in policy ought to be avoided, as it is potentially damaging to the scientist's professional credibility within academia and to broader credibility in the public realm. For example, environmental journalist Andrew Freedman criticised Hansen's advocacy as, "threaten[ing] to paint the AMS [American Meteorological Society] as having a political agenda" (Freedman, 2009) – a sentiment shared by some members of the AMS itself (Freedman, 2009; Revkin 2009a). Physicist Freeman Dyson argues that, "Hansen has turned his science into ideology" (Dawidoff, 2009, p. 4), and *New York Times* columnist Andrew Revkin writes that, "Dr. Hansen has pushed far beyond the boundaries of the conventional role of scientists, particularly government scientists, in the environmental policy debate" (Revkin, 2009b). These arguments may reflect an underlying positivist epistemology and concomitant ability to separate 'fact' from 'value', may be a reaction to perceived 'stealth advocacy' hidden within 'value-neutral' science, or may reflect an innate conservatism of the academic community. Alternatively, such counter-attacks could represent attempts to discredit 'inconvenient' conclusions about the need to make unwanted lifestyle changes.

Speaking about ecological policy, Lackey (2007) argues that while science is not value free, this does not make all science normative. Public policy engagement by scientists, he continues, ought to be non-normative. Lackey asserts that while scientists are obligated to contribute to the policy process through provision and explanation of relevant findings, they must *not* be policy advocates, as doing so would, "corrupt both the political process and scientific enterprise" (2007, p. 11). The Committee on Freedom and Responsibility in the Conduct of Science (CFRS) of the International Council for Science similarly encourages scientists to clearly separate professional from personal opinions, and 'expertise' from 'views' (CFRS, 2010, p. 2). In contrast, Sarewitz (2004) argues that science may make environmental controversies worse by producing a large body of varied findings that prolong the policy debate by offering support for multiple sides and distracting from underlying political disagreements. Scientists, Sarewitz continues, should generally stay out of the policy-making process and, if they do engage, should explicitly state their own private interests and relevant normative values.

There is an argument to be made that science communication should be done by communicators, not scientists. Yohe & Oppenheimer (2011, p. 637) suggest the possibility of solving the IPCC's communication problem by, "leav[ing] the business of messaging entirely to governments and the many non-governmental intermediaries who work in the interface between the scientific communities and the public". Given these competing arguments and interpretations, there is no clear

[11] http://coinet.org.uk/

agreement within the research community on how best to maintain credibility in the public domain, although most researchers would agree that it is a desirable quality.

For the purposes of this paper, we assume that the vast majority of climate change researchers regard climate change as a serious problem and believe that action should be taken to mitigate its causes and adapt to its effects. Yet mitigation approaches vary in both scale and scope, and there is widespread disagreement, both inside and outside the research community, over who should take responsibility for leading mitigation. Some would argue that such change must be led top-down by governments, with individual action effectively useless on its own. Others believe that bottom-up collective or individual action is the only realistic solution, given the constraints that political and economic barriers place on government action. Many people will favour a mix of both, and preferences for the approach to be taken may be driven by research framings. In the following section we discuss whether maintaining credibility in the *personal* domain may necessitate action within one's own life, either by campaigning for top-down change or by altering personal consumption habits and encouraging others to do the same.

## 5 Personal credibility: the researcher as private individual[12]

As noted by Serrat (2009), one of the core constituents of credibility is integrity, adherence to moral and ethical principles, which is demonstrated through an individual's actions. While applying to the conduct of researchers in each domain, integrity has particular resonance within the realm of personal lives and thoughts, for it is here that moral beliefs are first cultivated and, for many, where they achieve their greatest significance. As a private individual the climate change researcher is in an unusual position with respect to personal integrity and credibility, because their personal behaviour (with regards to 'sustainability') cannot be viewed in isolation from their professional expertise. Here we consider aspects of integrity and credibility in this personal domain, focussing on those relevant to Europe-based researchers working on climate change. The following section discusses tensions that may arise from maintaining credibility across different domains.

In both global and national terms, researchers and professional academics working at universities in economically 'advanced' countries[13] are financially privileged[14]. This has particular significance when one considers that personal income is a good proxy for consumption and, in turn, for emissions[15]. Applying a combination of the 'polluter pays principle' (or 'consumer pays principle') and the 'ability to pay principle' (Caney, 2010) arguably places a special obligation on the Western researcher to take action to mitigate their emissions, as it is precisely they who are not only disproportionately *responsible* for the emissions that cause climate change but also best *able* (and informed) to make the greatest individual reductions. Yet researchers tend to have more carbon-intensive travel lifestyles than most, making it likely that they are amongst the top portion of individual emitters. For example, Høyer (2009) estimates the daily $CO_2$ emissions from international

[12] This section of the paper is an explicitly personal viewpoint; opinions will vary on the researcher's role in this domain.
[13] E.g., Annex 1 countries (i.e. Annex 1 parties to the United Nations Framework Convention on Climate Change – UNFCCC), the industrialised countries and 'countries in transition'.
[14] Professional academic salaries are considerably higher than the UK median (IFS, 2011) gross annual earnings of £25,900 p.a. (ONS, 2010), with the majority of academics sitting inside the top income quintile nationally and top income decile globally.
[15] Mean per-capita consumption-based greenhouse gas emissions in the UK are greater than those in China by a factor of 4.5, greater than in India by a factor of twelve, and greater than in Eastern Africa by a factor of thirty-three (Davis & Caldeira, 2010). Note also that the above 'average' salaried professional academic can very likely lay claim to an even greater share of emissions. Furthermore, these are present-day ratios, not taking account of much greater per capita *historical cumulative* emissions from Annex 1 nations.

air travel for a typical Norwegian climate change researcher to be eight times greater than the national mean. Thus it seems researchers are not, by and large, 'practising what they preach'.

Climate change researchers, as professional academics, are members of an educationally privileged intelligentsia, benefiting from a lengthy and costly formal education and research apprenticeship and enjoying almost unparalleled access to state-of-the-science information. One could argue that this, in combination with their privileged economic position, even if it is a structural condition, places a special obligation on climate change researchers to act with integrity and credibility by mitigating their own emissions[16]. The daily working lives of researchers revolve around assimilating and synthesising new information, but it is important to remember that such unfettered access to information as enjoyed by the Western researcher is not universally available. For example, academic journals, free to academics whose libraries have institutional subscriptions, are prohibitively expensive for individuals outside of the university system. Equally, there are still many parts of the world in which internet access is restricted and controlled by the state. So while the layperson may not necessarily have the scientific literacy required to understand the precise nature of the mitigation challenge, or the information to determine how it can be achieved through practical action in their own life, the climate change researcher can claim no such ignorance.

However, the climate change research community is diverse and represents a wide range of ideologies; it would be a mistake to assume that all climate change researchers actually want to mitigate their emissions. Affluent and mobile, researchers tend to benefit from the *status quo*, which they may *believe* does not impose an undue burden on future generations. Taking a narrow, financial cost–benefit view of climate change and assuming a high social discount rate[17], for example, may lead one to conclude that present-day action on climate change is not justified or even desirable (Oreskes & Conway, 2010).[18]

Yet if the researcher believes that the climate situation necessitates a change in Western levels of energy consumption, it can be argued that their specialist knowledge of relevant issues obliges them to be an agent of change. Simply imparting information to others is unlikely to produce change, however, due to the long-documented 'value-action' gap (Blake, 1999; Hulme, 2009; Sarewitz, 2010). Where imparted information does have impact, it is because it captures the attention of the audience, gains their involvement and overcomes potential scepticism, not because of its accuracy (Stern, 1999). Personal motivational behaviour (e.g., exerting peer pressure on one's associates) may be an important contributory factor in influencing behaviour change (Vermeir & Verbeke, 2006). Researchers are well-positioned to exert influence within their private networks, not only by sharing their knowledge of relevant issues with their families, friends and wider communities on a highly personalised basis but also by creating new social norms. Through leading by example (e.g., striving to lead a 'sustainable' lifestyle), researchers may help shift underlying values, beliefs and mistrusts. Conversely, the perceived hypocrisy of an informed but 'emissions-profligate' researcher could

[16] Living and working in the 'West' brings many other important advantages: comparatively greater individual liberty, security, welfare, health, and freedom of speech, with a great variety of choice amongst producers and service providers and the income and time needed to exercise this choice. However, these advantages are not direct consequences of holding a position as a professional academic, so are not dwelt on here.

[17] The social discount rate forms the basis for "convert[ing] the spot prices of... goods and services in the future into their present-value prices." (Dasgupta *et al.,* 1999).

[18] Yet note that the Stern Review of the economics of climate change (Stern 2006) used a *low* social discount rate to weigh the costs of mitigating against costs of adapting to 'dangerous climate change' and strongly found in favour of mitigating. This was justified in stark terms by the Review team: because decisions about long-term investment in climate change mitigation have serious repercussions for future generations, a higher social discount rate amounts to 'ethical discrimination by birth date' (Dietz *et al.,* 2007).

convince their social circle that change is neither required nor attainable. A climate change researcher who eats a diet rich in meat, flies to distant holiday destinations and drives a 4x4 thus damages not only their own personal and public credibility but also, potentially, that of the emissions-reduction message.

The foregoing discussion hinges on an overtly individualistic model of social change, reflecting the dominance of individualism in climate change policy (Shove, 2010). Different implications for personal credibility arise from alternative theories of change. Shove (2010, p. 2) argues that the research community is, "implicated in the reproduction and persistence of competing models of social change". From this perspective, the role of the researcher may lie in motivating wider systemic change, either through research or by attempting to highlight the structural embeddedness of their own decisions and norms.

Amongst researchers, whether to engage with family, friends and local communities on behaviour and climate change issues is generally considered to be a personal decision. It may depend on one's own ideologies and epistemologies as well as those that manifest in one's personal network. The decision whether or not to engage in such individual leadership to avoid hypocrisy and maintain personal credibility may, however, have implications for a researcher's public and professional credibility, as addressed in the following section.

## 6 Tensions in achieving 'holistic' credibility

The tripartite division of 'domains' used in this paper is, admittedly, artificial and has been adopted to bring structure to a discussion that can easily become muddled. In this section, however, we purposefully 'muddy the waters' to address perhaps the most interesting (and hotly debated) aspect of the subject: the tensions between these three domains.

### 6.1 *Professional-Public Tensions*

As mentioned in Section Three, there is evident tension between the professional and public domains. Many commentators (e.g., critics of James Hansen's activism) have put forward an essentially positivist argument that public activism undermines professional credibility; policy advocacy or campaigning harms the impartiality of the scientist and provides fodder to those who would deny climate change, inviting them to impugn the validity of research results. This applies to both sides of the political divide: scholarship by 'climate sceptics' has also been criticised by non-'sceptical' academics for being influenced by the political biases of the authors (Lewandowsky, 2011). Equally, scientists with their own political loyalties and ideologies (backed by industry and political actors with vested interests, financial resources, and media acumen) have attacked and misrepresented research accepted by most of their peers (Oreskes & Conway, 2010).

Some would question the inherently positivist assumptions of such analysis. Jasanoff (1996), for example, argues that scientists are embedded in a social context; hence scientific knowledge is co-produced by scientists *and* society and cannot be independent of political context. Many pragmatically minded scientists would agree. For example, a 2006 survey of conservation biologists found that the majority believed that scientific journals should publish research papers advocating policy preferences (and that some journals already did so) (Scott *et al.,* 2007). Yet the aforementioned criticisms of Hansen and other scientists engaged in advocacy show that such opinions are far from

universal[19]. While disagreements about empirical results tend to be thrashed out in scientific journals through papers, responses and letters, this process is not necessarily value neutral. As Sarewitz (2004) notes, the harshest scrutineers in the peer review process are those with views in opposition to the author's.

Professional–public tension may be particularly acute for early-career researchers. Seeking to establish themselves and their careers (in some systems, by gaining tenure), they are also part of a generation that is expected to lead major social change. Often drawn to climate change research by personal interests and a knowledge-founded belief in the need to urgently curb emissions, many researchers may frequently find themselves in disagreement with particular government actions (or inaction) on climate change. As such, they may feel impelled to join the 'front line' of public engagement in calling for stronger action. This is in contrast with the common academic view, which holds that, to be professionally credible, scientists must set aside their rights and responsibilities as citizens to call the government to account. Even accepting this 'common' view, there remains a role for researchers to analyse and comment on the process used to achieve government-identified science-based policy objectives via specific policy instruments.

The strength of conservatism in the abovementioned institutional norm is evidenced by how few researchers break ranks; dissenters are notable for their scarcity. One such researcher who defied pressure to remain apolitical is American early-career glaciologist Jason Box. Arrested at the same demonstration as Hansen, Box defended his decision to protest by saying, "I couldn't maintain my self-respect if I didn't go", not fearing that such activism would be at odds with his professional credibility (McGowan, 2011). By protesting, Hansen and Box made necessarily personal decisions, weighing the moral imperative to speak out against the potential harm to their professional standing (and no doubt that of their affiliated institutions). This could have damaging impacts on professional credibility and, by some arguments (e.g., Lackey, 2007), the overall scientific credibility of climate change research, if researchers are seen as having an agenda. Appearing to be non-conservative or alarmist may also result in loss of research funding (Hansen, 2007). Yet one can also argue that while the researcher should not undermine the scientific credibility of research, the decision to enter a research profession does not annul their citizen's right to petition or protest.

Keller (2011, p. 19) summarises the standard view as, "engaging in public controversy over an issue now so conspicuously politicised, [could] compromise [the scientist's] claim to scientific objectivity, and hence undermine their very credibility" but goes on to argue that there are "obvious problems" with this. She suggests that scientists *should* engage and would gain additional credibility for their work by broadening the domain of allowable critics beyond that of intra-disciplinary peer review. Hansen (2007) similarly argues that a general culture of 'scientific reticence' inhibits effective communication on the severity of climate change issues. However, engaging in this way could prove counterproductive if, for example, it drew attention to intra-academy disputes. A more 'open', less insular climate change research community could also highlight the professional behaviours of researchers that are vulnerable to criticism – such as frequent flights to conferences (Høyer, 2009) – and which potentially undermine the credibility of climate science in the public domain. An array of influences separate from the actual science could alienate members of the public, including contextual factors such as the rhetoric employed or even the social connotations of a researcher's accent or attire. Yet hiding behaviours and disputes behind academic veils is unlikely to safeguard credibility—the IPCC Himalayan glacier error, for example, became more damaging to scientific credibility when it

[19] It is worth noting that a preference for 'no change' is equally policy-prescriptive as recommending change-making policy.

was not openly corrected and explained (*Nature*, 2010). Thus, work should be defended in the public domain, but only once it has been established as scientifically credible through rigorous scrutiny by academic peer review.

### 6.2 *Professional-Personal Tensions*

In defending his activism, Jason Box alludes to the way in which professional norms can also be in tension with personal credibility. As discussed in Section Five, public action may be motivated by internal views of credibility (what Box terms 'self-respect') but constrained by the wish to preserve professional credibility. For example, a researcher may feel a sense of responsibility to engage with the public because of their specialist knowledge of climate change issues, or because they think that engaging only their personal network is inadequate. Weighing against these personal beliefs is the concern that public activism may result in a loss of professional credibility. Conversely, having to regularly attend conferences in distant locations may be at odds with personal goals if it means leading a high-emissions work life. While an established academic may not lose much by 'sitting out' a conference in protest if attendance would require international air travel (e.g. Høyer, 2009), the early-career researcher may miss a valuable opportunity to build their professional reputation and network: there are opportunity costs associated with both attending and not attending.

Turning the orthodoxy on its head, an alternative analysis of the relationship between credibility in the personal and professional domains might argue that hypocrisy in personal behaviour (i.e. not acting consistently with the implications of research) undermines the scientific credibility of research. Thus, if a researcher's work posits that effective mitigation can be achieved through widespread changes in behaviour (driven by policy that may be triggered by the voluntary behaviour of informed and motivated individuals), then the researcher's own *un*-modified consumption fundamentally undermines that hypothesis. If the reduction of consumption-based emissions in industrialised countries is a central message of the climate research community, then the personal behaviours and choices of researchers themselves are legitimate subjects of scientific scrutiny. In this view, there is a logical inconsistency between the scientific claims made by researchers about the potential for mitigating dangerous climate change through behaviour change and their abrogation of responsibility for modifying their own consumption[20].

Alternatively, one could view the researcher's lack of personal mitigation as highlighting the embeddedness of social practices in one's sociotechnical landscape, where unconscious, habitual social norms are intricately related to fossil carbon-reliant systems of production and consumption (Shove, 2003). This perspective suggests that a broader sociotechnical transformation is required, beyond the level of the individual, to stimulate a transition in practices. Such systemic changes, however, may then steer wealthy high-emitting individuals in more or less energy-intensive directions.

### 6.3 *Personal-Public Tensions*

Conflict between personal and professional credibility, through which crucial research assumptions are invalidated, and the apparent hypocrisy revealed could also undermine the wider scientific credibility of climate change research. This tension is compounded by the impetus to *increase* public engagement; damage to public credibility becomes all the more likely as barriers between the personal and public domains are removed and researchers (and their behaviour) become

[20] Kevin Anderson, a climate change researcher at the University of Manchester and the Tyndall Centre for Climate Change Research, has made this argument in conversation on many occasions, both privately and publicly.

more visible. Those who enter the public sphere involuntarily may find both their personal and professional lives affected by this: atmospheric scientist Ben Santer found that defending himself and his work against the 'mudslinging' of other scientists took a heavy toll on both work productivity and his marriage (Oreskes & Conway, 2010). Graduate student Justin Lancaster similarly suffered both professionally and personally in settling a libel suit that arose in response to his attempt to defend pioneer climate scientist Roger Revelle, and in 2010 several climate scientists were labelled 'criminals' in a report by US senator and 'sceptic' James Inhofe (*Nature*, 2010). Thus, as Lackey observes, entering the public discourse is not for psychologically sensitive scientists, those with 'thin skins', or those who are averse to scientific and professional challenge (Lackey, 2007).

It may be that only those laypeople of certain ideologies (e.g., liberal) would find such hypocritical behaviour problematic, whereas others (e.g., conservatives) would have negative associations if researchers were to present themselves as exemplars of 'green' lifestyles. Compared to one's own social circle, the general public is considerably less homogenous. Identifying a single 'image' of personal credibility that would resonate with the whole of this diverse audience may, therefore, be impossible.

Arguably, some branches of climate change research do not make direct use of the particular claims of the mitigation research community; therefore researchers working in those areas would not fall foul of the abovementioned 'self-falsifying behavioural inconsistency' trap. One might also attempt a rebuttal by offering cognitive dissonance as a mechanism which allows researchers (who *do* make use of behaviour-based mitigation claims) to separate contingent premises such as, 'in order to avoid $x$°C mean surface temperature increase, then emissions must fall by $x\mathrm{MtCO_2}$ p.a.' from any personal injunction to reduce their own emissions contribution. Through cognitive dissonance, while a researcher might claim that it is *possible* to bring emissions down and even agree that people who emit the most will need to cut back the most, they might just not recognise themselves amongst this group. Or a researcher may recognise their membership of the high-emitting group but believe that their needs are in some way special and that others who do not do such 'important work', or who have lesser *needs*, can more easily make the emissions reductions on their behalf.

While these counter-arguments, if they were accepted, may sidestep the logical inconsistency trap (i.e. the professional–personal conflict), they cannot disguise the appearance of hypocrisy (the personal–public conflict), which is likely to draw stern criticism from those outside the professional domain. Maintaining public credibility may well depend on researchers visibly demonstrating that they believe in the science, for example by personally mitigating their emissions. Furthermore, the UK Research Concordat's instruction to, "transfer and exploit knowledge where appropriate and facilitate its use in policy-making…for the benefit of their employing organisation, the wider society and economy as a whole" (2008, p. 12), could be interpreted to mean that, with regard to mitigation, researchers are enjoined to lead by example. It may be difficult to effectively and credibly transfer knowledge about climate change mitigation to the public and policymakers otherwise.

Some aspects of credibility are out of a researcher's control, being dependent on extraneous factors, such as the actions of others or the characteristics of the socio-political context in which the researcher is embedded. For example, mass media outlets are seldom able to fact-check their reporting of climate change issues rigorously (*Nature*, 2010). In addition, media editors may seek to promote 'balance' in their coverage by giving equal voice to 'climate sceptics', or they may wish to polarize issues to increase sales. Also, misinformation can be propagated rapidly and anonymously on the internet. All of these factors obstructed atmospheric scientist Ben Santer's attempts to respond to

criticism of his editing of the IPCC Second Assessment (Oreskes & Conway, 2010). Such extraneous 'confounding variables' may be manifestations of a wider social norm (supported by institutions that benefit from it) of seeking 'controversy' and 'scandal'. However, the researcher still has considerable control over their owns actions' bearing on personal, professional, and public credibility and must exercise decisions accordingly.

## 7 Conclusions

Over 150 years after John Tyndall first established the greenhouse-gas properties of $CO_2$, there is greater understanding of the climate system and more sophisticated modelling of its sensitivities and responses, yet climate change mitigation policy remains politically deadlocked (Oreskes & Conway, 2010). Public interest in climate change research is greater than ever, and the media spotlight has broadened to include researchers themselves and, in particular, their credibility. This paper has examined the issue of 'researcher credibility' in depth, looking at its epistemological foundations, the ways credibility plays out in the public, personal, and professional domains, and highlighting the tensions that arise from trying to maintain credibility simultaneously across all three domains. Various interpretations of credibility were uncovered, along with numerous tensions between professional, public, and personal motivations and actions. In cases of conflict, professional credibility conventionally trumps personal or public-facing concerns.

Several ways to improve the credibility of climate change researchers and their science have been proposed, including: more interdisciplinary research (e.g., Hackmann, as quoted in Marshall, 2011); more transparent publication and comments procedures (such as that used by the Berkeley Earth Surface Temperature Project (BEST, 2011); openness about uncertainty in science; explicit separation of 'advocacy' from 'science' in publications (Scott *et al.*, 2007); better communication with the public and media, including about the recognition of 'quality' science (e.g., Somerville, 2010; *Nature* 2010); increasing understanding of the peer review process (Science & Technology Australia, 2012); wider dissemination of research findings (Scott *et al.*, 2007); and better science education (e.g., Shepardson *et al.*, 2011). Lackey (2007) advises that when environmental policy debates are motivated by differences in values and preferences rather than science, scientists should endeavour to shift the discourse onto these differences and not let science become a scapegoat issue. However, experience also suggests that many debates hinge on differences in the *framing* of issues pertinent to climate change, rather than on ethical values. Identifying where these underlying contextual differences and assumptions occur can facilitate more productive discussions.

We agree that all of these are helpful and should be promoted. Yet more is needed. Adopting definitions of researcher and scientific credibility that take account of broader concerns in the public and private domains, such as the willingness of researchers to publicly recommend actions based on their findings or to personally put their findings into practice, could prove advantageous in the face of climate scepticism. Even though individual actions are socially and culturally embedded and some aspects of a researcher's credibility are out of their control, there remains an important role for individual choice and action. The present behaviour of climate change researchers in both their personal and professional lives is generally more a part of the climate change problem than part of its solution – despite the researcher's privileges putting them in a prime position to take action to personally mitigate emissions. Better leadership on this issue by researchers in both personal and public domains would help. This would require a shift in values and practices within the research community, recognising that the apparent divide between professional credibility and public or personal action is false (i.e. academics do not surrender their citizen's right / ability to protest when

they receive their PhDs) and that personal actions can also affect the public view of scientific credibility.

This paper does not attempt to prescribe a solution but rather to open a space for more structured debate of these issues. It is difficult to present universal, generalisable rules of best practice; each individual researcher must decide what they are comfortable with and what role they will ultimately play. It is hoped that this discussion will encourage researchers to reflect on how they balance tensions between the three domains and what trade-offs they ultimately concede.

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## 9 Acknowledgements

Many thanks to those who made the Tyndall Researchers Network (TyReNe) meeting (14/09/2011) possible and to Lauren Roffey and Caroline Stuiver who participated in early discussions surrounding the paper. We thank John Turnpenny, Martin Mahony, Maria Sharmina, Lauren Roffey, and Kevin Anderson for their constructive and helpful comments on earlier drafts of the paper.

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