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Climate stories: Why do climate scientists and sceptical voices participate in the climate debate?

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Abstract
Public perceptions of a polarised climate debate predominantly frame the key actors as climate scientists (CSs) *versus* sceptical voices (SVs); however it is unclear why CSs and SVs choose to participate in this hostile and antagonistic public battle. This research uses a narrative interview approach to better understand the underlying rationales behind 22 CSs and SVs engagement in the climate debate. It focuses in particular on potential overlaps between previously polarised individuals as well as each actor's ability to be critically self-reflexive about their own opinions about climate change, as well as of the opinions of those who hold different views. Several overlapping rationales are identified such as a sense of duty to publicly engage, agreement that complete certainty about the complex assemblage of climate change is an unattainable prospect, and that political factors are a key topic of interest in the climate debate. The paper concludes that a focus on potential overlaps in perceptions and rationales as well as the ability to be critically self-reflexive may encourage constructive discussion even amongst actors who had previously engaged in purposefully antagonistic exchange.

Keywords
Climate change, polarisation, debate, perceptions, climate scientists, sceptical voices, self-reflection, narrative

1. Introduction

Within the positivist scientific tradition, scepticism refers to an organised investigation of reality via empirical observation, informed questioning and doubting claims based on anecdotal evidence or belief (Gower, 1997). However, in the context of climate change, scepticism has become increasingly associated with a public perception of a dualistic, antagonistic "climate debate" characterised by intense disagreement regarding the existence of a scientific consensus on the reality of anthropogenic climate change (Hobson & Niemeyer, 2012). This perception of polarisation appears justified, as the majority of public-facing debates about climate change present the key actors as climate scientists (CSs) *versus* sceptical voices (SVs)[1] debating the legitimacy of scientific claims in a hostile "battle" or "duel" (Hoffman, 2011; McKewon, 2012). Verheggen et al. (2014, p. 8964) note that the existence of scientific consensus about climate change is at the 'center of the public debate' and Pearce et al. (2014) also suggest that debate is predominantly represented in public as focusing on perceptions of truth of scientific evidence. This differs to more common academic understandings which encompasses both science *and* policy (Martin & Rice, 2014) or, as Rayner (2012, p. 117) suggests, an awareness that the climate debate includes policy debate 'conducted by means of a surrogate dispute over the quality of the science'. Indeed, rhetorical devices such as the notion of "sound science" are understood to be particularly important in terms of the ability to frame fundamentally political debates as scientifically-based (McGarity, 2003-2004). Whilst causality between scientific evidence and policy action is complex to establish and is not the focus here, the *perception* of an active scientific debate about the anthropogenic nature or severity of climate change is important because climate

change is unlikely to appear on policymakers' agendas without public recognition of its legitimacy as a basis for policy action (Pralle, 2009).

But why do CSs or SVs participate in the climate debate? Rooted in Converse's (1964) notion of issue publics where individuals are more interested in issues of perceived personal relevance, a vast literature exists to investigate motivations behind public participation in political debates. Increasing attention is however being paid to participation in specific topic areas, particularly those combining science and controversial policy implications. Examining stem-cell research, Ho et al. (2011) find that perceptions of media bias are directly and positively associated with issue-specific participation and Becker et al. (2010) find that ideological predispositions and attention to particular media are also relevant. Goidel & Nisbet (2006) suggest that religious organisations are influential in increasing participation, but that opinion intensity and news attentiveness are also significant. In the case of climate change, opinion leaders are found to play an important role as 'connective communication tissue' (Nisbet, 2011, p. 357) within issue publics, helping to recruit previously passive members to become further involved. Individuals are thus inspired to move up Milbraith's (1965) hierarchy of political participation, from "spectator" to "gladiator"-type activities (such as contributing time in a campaign) in order to influence others' opinions. However this literature is predominantly focused on political participation by the general public, and is inadequate to explain why those actors presented as the key participants in contentious and vocal public debate (in this case, CSs and SVs) are drawn into, or actively choose to participate in the public scientific controversy in question. These actors are clearly differentiated within the debate from the general public in terms of their (self or other) designated status as holders of relevant expertise (Stehr & Grundmann, 2011; Turner, 2014). The allocation of expert status is fundamental, as those who are deemed "experts" are, within an evidence-based policy model, regarded to have a greater degree of influence and power over subsequent policy decisions (Weible, 2008). Actor involvement therefore not only legitimises existing expertise as designated within more formal epistemic communities of science, but is also a way to introduce 'maverick scientific claims' (Collins, 2014, p. 722) into the debate. Thus, whereas attention has previously been directed towards individual understanding of and personal engagement with climate change as an issue (Wolf & Moser, 2011), it is apparent that a gap exists in terms of understanding the underlying motivations behind more active and vocal participation in public-facing debate.

It is possible that fundamental and impenetrable differences exist between certain CSs and SVs, with each actor group entering and operating within the climate debate according to distinct paradigms (Kuhn, 1962). For example, scientists are understood to be particularly anxious about retaining control over knowledge claims (Poliakoff & Webb, 2007), with Young & Matthews finding that scientists become especially concerned when they perceive the public as changing the 'meanings of claims based on non-scientific values and principles' (2007, p. 141). This may be understood as reflecting a desire to uphold the pre-eminence of the positivist scientific tradition as a basis for evidence-based decision-making (Wesselink, Colebatch, & Pearce, 2014) as well as (perhaps unconscious) boundary-making activity (Gieryn, 1999). This research therefore aims to fill a critical empirical and conceptual gap in the literature by investigating not only *why* CSs and SVs participate in the climate debate, but also *how* the paradigms in which they operate may contribute towards the antagonistic nature of the debate itself. It may be that resistance and communication challenges are inevitable, particularly regarding valuing certain types of knowledge and the role of science/scientists in political decision-making. Alternatively, these differences may not be innate, but it is the public perception of a polarised, scientifically-focused debate that *frames* actors as fundamentally different. Thus, framing participants as duelling adversaries in the media (Zhao, Rolfe-Redding, & Kotcher, 2014) or via labelling practices (Howarth & Sharman, 2015), helps to co-construct polarisation over time, ignoring potentially important underlying similarities between actor groups such as overlaps in motivations for involvement or operating paradigms. Ravetz's (2011, 2012) recent work on Climategate using post-normal science gives plausibility to the latter scenario. He finds that, in addition to discomfort experienced by CSs when the speaking truth to power model of the science-policy interface is challenged, so too are many SVs made uneasy. Thus this research builds on work from authors such as Malone (2009) and Hulme (2009) by paying greater attention towards paring back the discussion, i.e. understanding that debate may be more about *how* science operates and what

its *implications* may be for policy, rather than technical disagreements. In so doing, it also refers to notions of more diverse expertise within society (Pfister & Horvath, 2014; Solli & Ryghaug, 2014) and the potential need for 'a more open and interactive boundary' (Berkhout, 2010, p. 565) within public-science discourse than is presently the case.

In 2014, twelve CSs and SVs all active on social media met in the UK in an effort to 'calm the debate' (Yeo, 2014). Such, albeit unusual, occasions indicate the possibility that the actors involved have a more nuanced understanding of the different rationales that contribute to each other's opinion about climate change. It also suggests that engendering some kind of deliberative fora in order to avoid the more common dead-end 'dialogues of the deaf' (van Eeten, 1999, p. 185) evident in public scientific controversies may be necessary in order to inspire critical self-reflexivity to occur. Self-reflexivity is a crucial process as it, in essence, requires individuals to question their own inherent assumptions and values (Cunliffe, 2004), and is arguably particularly important for actors involved in polarised and adversarial public debates. This paper thus aims to better understand the underlying rationales behind CSs' and SVs' participation in the climate debate, focusing in particular on potential overlaps between previously polarised individuals as well as each actor's ability to be critically self-reflexive about their own and others' opinions about climate change. Examining *together* the underlying rationales behind issue publics and more formal epistemic community participation in public scientific controversies is important because it may suggest avenues for constructive dialogue, rather than dualistic debate. This is a critical methodological distinction because it innately reduces the dichotomy of the lay public *versus* an accredited knowledge holder(s).

2. Method

A series of 22 semi-structured interviews of approximately one hour using an identical question set were conducted with UK-based individuals identified as CSs (n=11) and SVs (n=11) (Table 1). In order to delve beyond explicit statements of self-declared rationales towards more latent motivations, interviews aimed to enable participants to build their own narratives and to critically self-reflect on them throughout the interview. While research interviews engender an artificial situation (Hollway & Jefferson, 2000) where interviewees may feel the need to provide answers they think the interviewer wants to hear (Schwarz, 1999), stories told within an interview can also form part of an important 'meaning-making process' (Seidman, 2013, p. 7), interpreted by the researcher using theoretical underpinnings to form relevant conclusions. Daniels & Endfield (2009) suggest that the method in which people receive and interpret climate change information, particularly of its "dangerous" nature, affects resulting actions. Thus, by producing their own stories, interviewees offer a window into personal experiences and a mechanism by which to self-reflect (Hards, 2012). Hiller & DiLuzio (2004) also suggest that interviewees participating in narrative-based interviews carry out a complex discursive activity known as reflexive progression. Through this process the interviewer can 'push further for linkages, motivations and clarifications that lead to new discoveries by the interviewee… [and create] some kind of order that was previously unclear, even to the interviewee' (Hiller & Diluzio, 2004, p. 17).

Questions covered three main themes: (i) how each actor perceives themselves, (ii) perception of a dominant "other" (most commonly framed as a polarised adversary), and (iii) the perceived usefulness of participating in a vocal and public debate, including perceptions of debate framing. Interview transcripts were analysed using a mixture of descriptive and thematic coding (Thomas, 2006). Whilst verbally narrating their thought process, interviewees were also asked to place their opinion, and that of a dominant "other" (representing the main arguments encountered that oppose their point of view) on a spectrum of opinion with two axes (science and policy), building on Capstick & Pidgeon's (2013) epistemic and response scepticism[3].

Table 1: Interview sources

Category	Source	Number of interviewees
Climate scientists (CSs)	Senior, most >30 years post-PhD	6
	Mid-career, most 15-30 years post-PhD	2
	Early-career, most <15 years post-PhD	3
Sceptical voices (SVs)	Individuals from the 'list of sceptics 'mentioned' more than once in 10 UK national newspapers' (Painter, 2011, p. 128)	4
	UK-based blog authors from Sharman (2014)	4
	Involved with the activities of the GWPF e.g. Academic Advisory Council or published on GWPF website	3
		22

Participating CSs' specialisms included climate modelling and climate physics, with all participating in public engagement activities such as public speaking and blogging. Individuals were selected based on Kahan's (2013) list of characteristics defining a credible scientist, including professional experience in the climate science field (e.g. contributors to IPCC assessment reports), number of peer-reviewed publications, and seniority. SVs were identified from three main sources: Painter's (2011, p. 128) 'list of sceptics 'mentioned' more than once in 10 UK national newspapers'; Sharman's (2014) climate sceptical blog authors, chosen due to online sources' increasing importance in the climate debate (Gavin & Marshall, 2011); and those associated with the Global Warming Policy Foundation (GWPF), a well-known sceptical voice about climate change in the UK[2].

3. Perceptions of self

A number of themes emerged in the interviews outlining CSs self-perceptions, with the dominant theme best summarised as a "youth-driven aspiration" echoing the actor's personal calling to the issue that "*was stimulating intellectually (…) [that] gave me the impression that I was doing something positive or useful*" (CS2). The CSs' growing curiosity appears to emerge at a young age often stemming from personal experiences of nature where "*I just enjoyed being outdoors*" (CS5), and being in close proximity to "*the natural world which surrounded our houses*" (CS1). Memories of an influential idol also contributed: "*someone came and gave a talk at my primary school (…) I got worried about the environment (…). I ended up in climate change I guess as a result of that really*" (CS10). The CSs' self-perception creates a narrative framed in nostalgia with an engrained awareness of the issue from an early age: "*I've always had an interest in energy, right from being a child. My dad worked at a nuclear power station and we lived around the corner from it*" (CS1).

Two themes further characterise this youthful aspiration: a "romantic fascination" for the environment and a "heroic desire" to do good. CSs have experienced a journey with an early realisation of scepticism on the issue: "*climate wasn't really a subject, then*" (CS7), "*people's attitudes were, 'Why are you looking at this? It's not a serious topic for study.' Now it's much more mainstream*" (CS11). However, sustained curiosity drives this romantic fascination: "*I looked at the data that he showed me and I thought wow that is amazing*" (CS3). For some, this passion originated later on after a few years in the field, as the original choice to work in climate change resulting from the need to be employed: "*I was looking for a job at that time*" (CS7), "*I probably stumbled into the area (…) [after] finishing my PhD I needed a job*" (CS4), "*I didn't believe that this was going to be my life long career*" (CS8). What emerges from the majority of the CSs narratives is that they perceive themselves as having a "heroic desire" to "*do something that felt more tangibly useful to society*" (CS10) or to "*[work] on a problem that was an important problem for society*" (CS2). In making these statements and creating

their personal narratives, the CSs were critically self-reflect on the value of their work to society as well as how this fits in the growing international context: "*you are surrounded by world leading staff in an issue that was starting to gain global prominence; one couldn't help become interested in it*" (CS4).

The spectrum also enabled actors to further self-reflect on their opinions with most CSs placing themselves in the top right quadrant (Figure 1) as "*the way I see the evidence*" (CS6) leads them to be "*certain that we have some impact*" (CS1). The precision and certainty with which the CSs perceive climate change as being certain and policy action required to address it demonstrates a common analytical approach with CS6 and CS9 drawing zones that they felt better described their opinions as evolving and/or wide with CS6 arguing "*nothing is certain, but it's very certain*" and CS9 narrating:

> "*If you're defining anthropogenic climate change as global mean surface temperature, then I'll be right up high at the top here in terms of certain. If you're talking about anthropogenic climate change in particular regions of the globe, at particular times of the year around the place, I would be far less than certain. I have a range, depending on what your definition is.*"

The dominant theme underlying SVs self-perception is that of the "crusader". The actor disinterestedly and independently investigates scientific claims made about climate change and finds them either incorrect or, more commonly, corrupt and self-serving. This critical analysis carried out as an impartial adult is thus clearly distinct from the rationales underpinning CSs more youthful motivations. The SV is fighting to expose climate change as the "*biggest scandal in modern science*" (SV5). The ideal of disinterested investigation based on evidence, unrelated to "*motivation like a thick brown envelope from the oil industry*" (SV9) is critical to this self-perception, even when the actor acknowledges that their view on climate policies influences their view on climate science. Seven SVs disagreed that personal values influenced their opinion such as SV11 who argued that "*none really*" of his opinion was shaped by personal values or motivations as "*why would I want to be difficult? …I'm not looking for trouble*". However others were more critically self-reflective: "*I am more interested in things that suggest it's less of a problem than we are led to believe. So in terms of what I look at and tend to be interested in it certainly affects it in a way*" (SV6). SV8 has "*come to the conclusion that almost everyone's opinion is mainly driven by personal traits…personal values and traits are very important in understanding how people perceive problems and risks*". SV10 argues that "*I don't think anyone's interested in climate science per se… No-one cares. Only people care when it comes to policy*".

Two related themes support the crusader rationale: "anti-hype" and "equity". Anti-hype involves the actor being triggered by a single event (e.g. Climategate) or gradually over time, to investigate scientific claims (and associated economic implications) and finding them "*over-egged… exaggerated…not realistic*" (SV8). This exaggeration is done by scientists, the media or others, all of whom have a financial stake in maintaining the mainstream consensus. Equity captures the opinion that current climate change policy is "*hurting people…the poor in India…the poor in this country*" (SV1) and thus the actor is "*foolish or brave enough to…question the brightest people on the planet*" (SV8) in order to fight for a society which "*should be richer… more abundant, [and where] more people should have access to more energy*" (SV7).

The vast majority of SVs disagreed with government GHG emissions-reduction policies, near-exclusively on a costliness argument: *"the only way to do this [climate policy] is to actually bust the economy…and the people that are really going to suffer are going to be those at the bottom of the pile"* (SV11). However, opinion as regards the certainty of scientific evidence for anthropogenic climate change was divergent, with most finding placing themselves on the spectrum (Figure 1) "*difficult*" because "*certain is a bad word in science*" (SV2). The spectrum also highlighted the challenge SV felt of articulating necessary "*caveats and assumptions*" (SV10) into the debate. Many SVs railed against the public perception of the debate as "*black and white, yes/no*" arguing it should be more focused on "how *much and* which *policies*" (SV10, emphasis in the original).

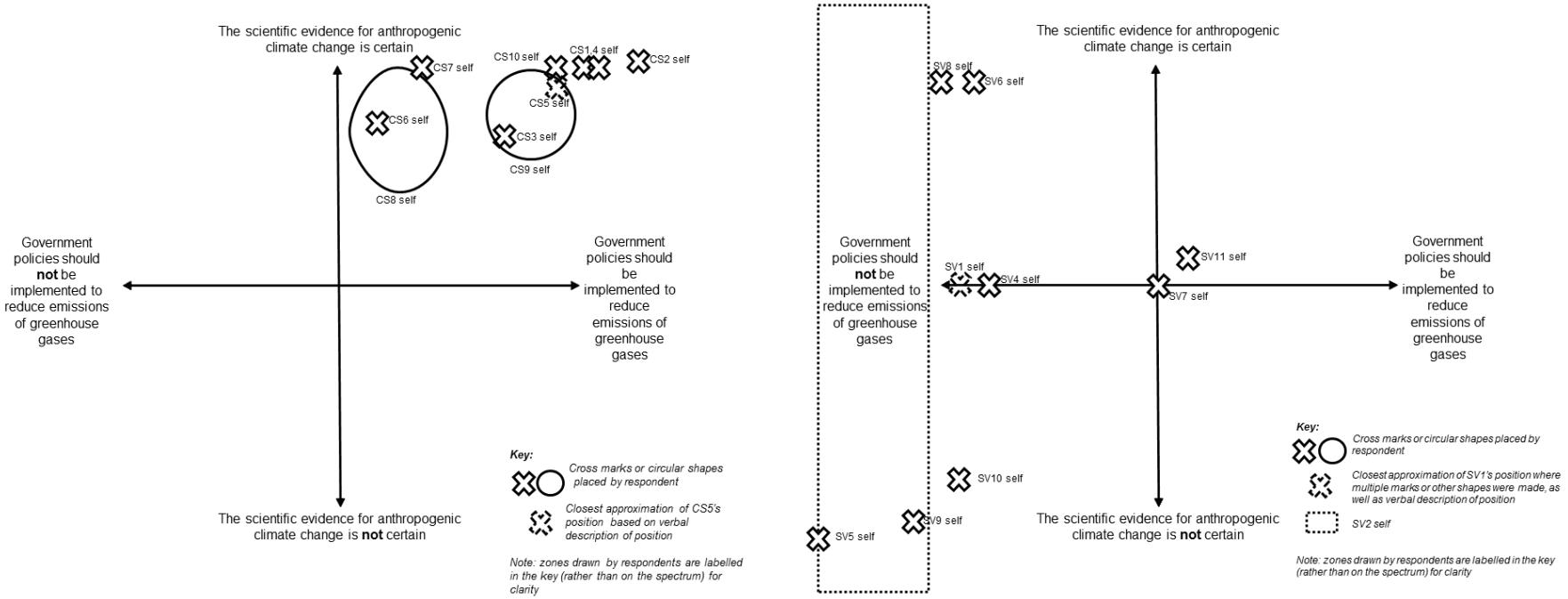

Figure 1: Climate scientists' (left) and sceptical voices' (right) opinions.

4. Perceptions of a dominant 'other'

CSs recognise a wide range of "*voices that populate that entire spectrum*" (CS8) of the debate (Figure 2), making it almost impossible to identify a single opposing voice: "*they cover quite a broad band so I wouldn't put a single spot*" (CS3). The majority of CSs claim the antagonistic nature of opposing opinions results from a lack of understanding, whereby individuals "*don't know what the science says*" (CS4) and thus "*people who are not scientists… [f]eel threatened by people who can. So [they] are just negative… and [are] looking for ways to justify not accepting it."* (CS3). The range of opposing arguments they encounter highlight an array of opinions from those who "*don't think that climate change is certain*" (CS9), through to those who are "*adamant that we don't want to be reducing greenhouse gas emissions*" (CS8) but "*by and large they don't deny there's some anthropogenic component of climate change*" (CS1). CSs acknowledge opposing arguments can be driven by perspectives on government intervention in society, such as those who question the need for action as "*government doesn't have the role to regulate carbon emissions"* or that *"there's not enough evidence to justify government regulating carbon emissions*" (CS11) but they remain divided on the extent to which their role should involve policy recommendations (see Section 5). Opinion rationale is also understood to be linked to values systems as climate change challenges existing ways of life:

> "*What drives people to reject the evidence on climate change is that they don't feel comfortable with what the causes are and what the solutions are. People don't like being told that their actions are killing people in other parts of the world. This comes down to their cognitive and normative values. People don't like bad news. Well they don't want to be told facts which they find uncomfortable*." (CS4)

Opposing voices are perceived by CSs as having being emotionally loaded with a response to the issue of "*fear, guilt, grief, loss, hopelessness*" (CS3) where people "*don't feel comfortable with what the causes are and what the solutions are*" (CS4) and whilst some opposing voices tend to "*accept some causality*" (CS2) there is a sense of a rationale stemming from a "*religious belief that we have dominion over the planet rather than we have its custody and care in our gambit*" (CS3). Nonetheless, a spectrum of opposing arguments is recognised. As CS6 notes, "*[there is a] spectrum of opinions because people have different attitudes and different weightings on how you take now, the future, yourself in the scheme of richer people, poorer people, people in different countries, whether you agree in principle with the governments controlling these things or not*".

SVs clearly identified a dominant other fuelled by vested interests, standing in direct contrast to their role as a crusader and "*seeker after truth*" (SV2). For example, SV9 explicitly rejects the oft-made claim that sceptical voices are themselves the ones most likely to have vested interests:

> *"…there is now so much money in it that there is huge vested interests in keeping it going. I think the irony is that the accusation made against what they call deniers like myself, they say oh, these people are in the pay of big oil. Well I can promise you I've never had a penny from any company engaged in the fossil fuel business. I'm into this because a) I think it's interesting, b) I think it's important and c) I think it's a huge economic issue."*

These vested interests extend to scientists who are focused on "*trying to save their jobs*" (SV6). A distrust of the civil service (including but not limited to government scientists) was also present and related to perceptions of a left-wing agenda. SV6 ponders the question of "*Are they doing it because they're left wing or are they left wing because they're in the bureaucracy? What's cause, what's effect, I don't know*". This anger at a "*politicised science*" (SV5) whereby scientists ignore the "*ugly facts*" so that they can make a "*political play*" (SV11) was noteworthy and is particularly interesting when contrasted with perceptions of the role of evidence itself in the decision-making process. Whereas there is frustration with "*people who can't understand that if the policy isn't backed up by the evidence you shouldn't be doing the policy, especially if it's… costly*" (SV3), this does not translate into agreement that "*scient*ists *ought to be having more impact on policies*" (SV11, emphasis added). Evidence should be able to speak for itself because scientists, "*are clearly, clearly not telling the truth*" (SV1). Therefore while most of the SVs entered the climate change debate ostensibly due to disagreements over scientific elements (see the "crusader" discourse above), they do not perceive that

the other is similarly-motivated by a search for scientific truth, and is instead corrupted by political or financial incentives. The dominant other is near-unanimously perceived to be certain about the scientific evidence for anthropogenic climate change and supportive of government GHG emissions-reduction policies, reflecting the public perception of a polarised debate (Figure 2).

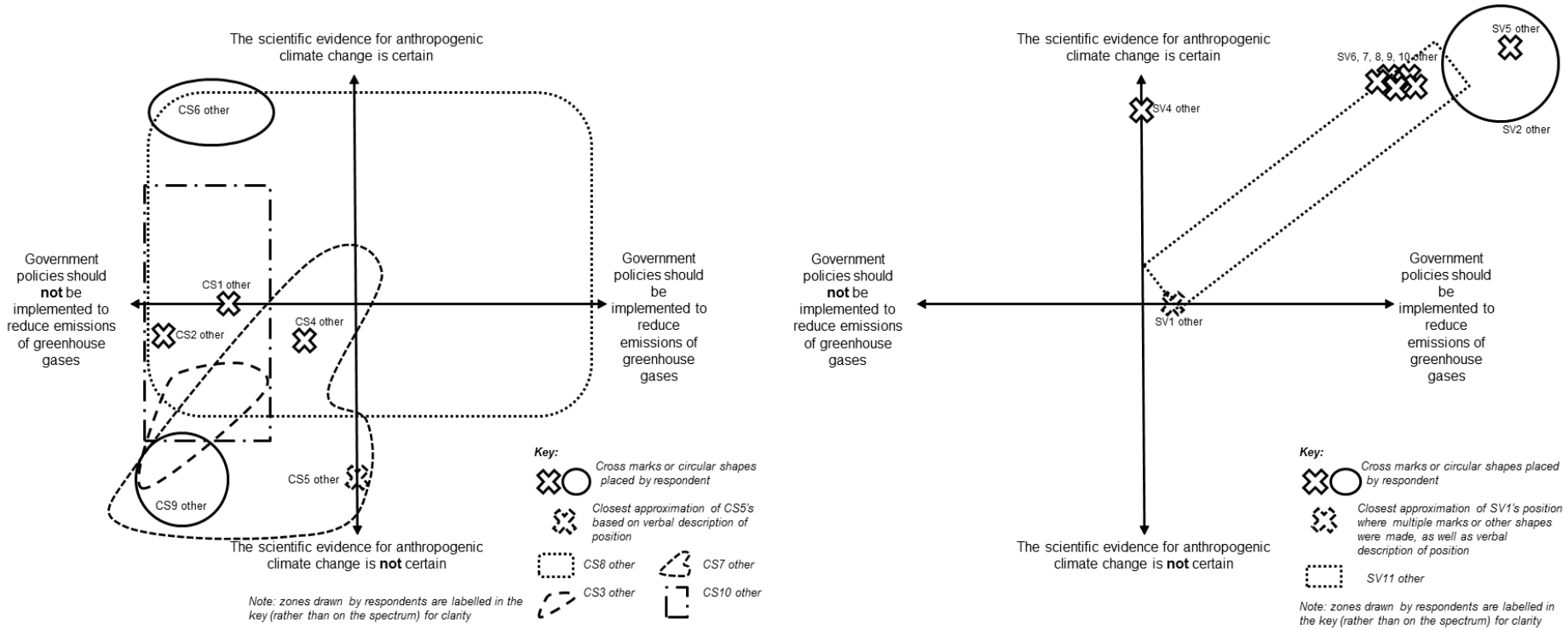

Figure 2: Climate scientists' (left) and sceptical voices' (right) perceptions of the dominant other's opinion.

5. Debate participation and framing

Despite it at times affecting relationships with their peers, CSs see it as "*essential*" (CS2) to be vocal about "*science and what it's like to be a scientist and why we have come to the conclusions we have about climate*" (CS10) and that the nature of the issue means that "*some advocacy is warranted*" (CS11). Being publicly vocal is regarded as critical as it was seen as easy for the public "*to dismiss us and dehumanise us and make assumptions about our agenda and have reservations if they don't see us out there*" (CS10). There is a strong sense of duty to communicate research findings: "*[as a] publicly funded academic working on an issue of significant public policy, then I do believe I've got a duty and an obligation to have my voice heard in public*" (CS6). However they acknowledge it is "*not second nature*", "*not necessarily part of their role to be a communicator*" (CS4) and "*the qualities that make you a good scientist they're not qualities that make you good communicators, they're almost the opposite*" (CS2). Consequently CSs have historically been reluctant to be publicly vocal with CS9 being "*deafened by the roar of the silence of scientists*". Public engagement is perceived as "*not valued*" (CS4) by universities and if a mistake is made or "*the journalist has pushed the information maybe a little bit beyond what I wanted to say"* then *"you hear about it the next day*" (CS2). CSs also have extensive experience of being labelled and attacked, using epithets such as *"corrupt"* (CS3), "*naïve, misguided, a moron*" (CS10) and "*a liar, a cheat, a fraud*" (CS7). CSs strongly believe labels, and indeed their personal experience of being labelled, leave people feeling "*angry, defensive*" and "*deepen the polarisation and the entrenchment of views*" (CS10) as they "*undermine the value of your arguments* (…), *the value of the research*" (CS1) undertaken. Hence they feel it is thus necessary to "*find words that have no association, or neutral association or if possible even a positive association*" (CS5) and to focus on *"[t]alking to people, listening to people, meeting people helped to get past the labels… [as] everyone is partially right and partially wrong"* (CS10).

CSs thus support and encourage participation in the debate "*as long as it's constructive*" (CS6) with those involved bringing to the table "*their concerns, their worries, their opinion and what we should do about it, who should do it*" (CS2). CS3 suggests scientists are "*very happy to be challenged*" in an open space with individuals who have "*credible arguments that they can back up with science*" (CS4) where they are "*ready to admit when I'm wrong and listen to criticisms but also, I think, because I'm not vocal about my political views*" (CS10). However whereas "*science isn't about winning debates; it's an accumulation of evidence and that doesn't just go for climate*" (CS6) it is not perceived as an "*equal debate*" (CS4). For example, CS9 is "*increasingly perturbed that people make what look to be very cogent and very eloquent conclusions but actually have completely nebulous, unframed starting points*". CSs therefore justify their caution in participating in debates where their opponent is given a platform because they "*like a good debate*" (CS4) and "*just because they're vocal*" (CS4). These public debates "*should be much more focused*" (CS7) with a "*need to check the credibility of the people*" (CS4) who choose to engage.

Most of the CSs believe the debate should not be political and that they as scientists should remain "*impartial and humble and open to criticism (…) and willing to admit that you are sometimes wrong and listen to an opposing opinion and debate it and modify your position if you're wrong and take unpopular positions*" (CS10). The need for establishing a frame of credibility and expertise came across strongly from the CSs who believe those who participate in the debate must be accredited and where the authoritarians of climate science consist of "*people who have got first or second degrees in relevant disciplines and have spent a certain amount of professional investment of their life and study and publishing*" (CS8). CSs expressed frustration that the climate debate involves actors who mix science and policy issues when engaging with scientists thereby using the arguments interchangeably to suit their purpose: they are "*resistant against the science when really they're resistant about policy*" (CS10) and where "*they're still propagating that policy scepticism back to the science*" (CS10).

Numerous rationales justified SVs participation in the climate debate which the vast majority of SVs perceived as "*politicised*" (SV8) and expressed frustration that, in their view, it has become "*very*

unscientific" (SV11). SV1 is driven by a combination of "*a passion for science and…justice and poverty"* as what is happening (current climate policy) is "*wrong and…is hurting people*". SV2 is concerned with exposing "*scientific fraud*"; to the point that he is "*gradually encircling them [climate scientists] and it will eventually be reported to the police*". Several SVs emphasised the impact of climate policies on energy prices as a key motivation for debate participation. As SV11 argues, "*energy is the basis of all wealth [so]…all this green economy stuff is rubbish…We're not a post-industrial nation. We can't possibly exist on services*". The relationship between energy policy and immediate political imperatives was a common theme. SV10 argued that "*you can completely believe in climate change, but you think well, we need to keep the lights on*" and SV9 noted that "*the debate is being forced if you like by the pricing…energy bills are going up hand over fist…so the debate is inevitable*". Bringing this perspective to the debate is thus imperative to avoid "*damaging both households and industrial competitiveness*" (SV9).

However, an overriding theme of "*a sense of duty*" (SV3) was apparent across nearly all interviewees as a driver for debate participation, as "*somebody has to be [vocal]"* (SV4). SV6 argues that "*sceptical views don't have many outlets…broadcast media is not really open to us apart from sound bites*". Specifically, SV6 considers that journalists are "*political campaigners… [hence] a big role that I see is to try to bring brain power to bear on what we're being told. I see my blog as a crowd-sourcing effort to some extent*". The internet is seen as a particularly useful medium for debate participation as whereas "*in previous ages it would have been almost impossible…to get a hearing at all, through the internet you can reach people who are curious, who are open minded*" (SV8).

The polarised nature of the debate was seen as concerning, with SV7 noting that *"everyone walks into the room knowing that there are two sides, and there's no nuance. And so you try and express some kind of perspective. Oh right, so you're not one of us, you're one of them, and it's really powerful"*. A clear and consistent message of disagreement with government policies was also a dominant framing strongly linked to rationales for involvement. This incursion of the political into a space where it doesn't belong was a reoccurring theme which was related to the notion of belief or religion, and sometimes with the idea of a scientific consensus. The other "*really, really believes*" (SV10) in their opinion, and the notion of climate science being 'settled' is particularly anathema as it suggests a situation of "*don't argue, the science is certain. Believe."* (SV11). The notion of belief stands in contrast to the desired pre-eminence of traditional scientific enquiry where "*the arbiter of all the arguments is empirical evidence*" (SV8). For many SVs, the notion of belief was also strongly linked to the way that labels were seen to frame the debate as antagonistic between duelling sides. SV11 also noted that the use of labels "*more begs religion than it does science. When you have a religious orthodoxy, then people that disagree with it tend to be called deniers and hunted down*". Labelling was regarded as "*very unhelpful*" (SV10) as it is perceived as a mechanism to shut down debate. It was also suggested that the use of labels can further polarise individuals as those using them "*don't realise that members of the public are thinking, well, that's me as well he's talking about*" (SV10) thus "*forcing a dialogue between the middle ground…and the sceptics*" (SV7).

No overriding clear signal existed as to the importance of either themselves or others being publicly vocal (despite all being chosen due to their public profile). While half believed that it was "*absolutely*" (SV9) vital to vocally express their opinion, others were more cautious, with SV7 suggesting that it "*depends on the level of the debate*" as to whether or not participation was recommended. SV8 took recourse in the idea that evidence would be the key arbiter, only wanting to be vocal "*in a measured way [as] we're not campaigners…at the end of the day arguments will win*". And whereas SV6 considered it critical to be active in the debate as "*people have to fight their corners, so yes, the more the merrier*", he also noted that it would be "*nice if everybody could be polite but you know, not everybody wants to be*". SV4 noted that "*the only people who can be vocal are people like me who've reached a certain stage in life where we don't have to worry about gratifying the powers that be*" indicating a perception of sceptical voices acting as campaigners for freedom of speech. The notion of consensus was clearly seen as an attempt to close down debate, with SV5 passionately arguing that "*you are never ever, don't* ever *tell me what I can or cannot have a debate about, don't you ever say that to me! That's fascism!*".

6. Discussion and conclusion

This research aims to establish a better understanding of the underlying rationales behind the participation of climate scientists' (CSs) and sceptical voices' (SVs) in the climate debate, focusing in particular on potential overlaps between previously polarised individuals as well as each actor's ability to be critically self-reflexive about their own and others' opinions about climate change. Three research themes were investigated using a narrative format: perception of self, perception of a dominant "other", and the perceived usefulness of participating in a vocal and public debate, including perceptions of debate framing. Table 2 summarises the dominant themes emerging from both CS and SV narratives. While the sample size of 22 interviewees necessitates caveats regarding the representativeness of these findings and suggests the need for further research with a larger population, what is immediately apparent is the significant degree of overlap between themes expressed by both actor groups, particularly in terms of motivations for debate participation and framing. Overlaps between perceptions regarding the scientific evidence for anthropogenic climate change and awareness that much debate centres on policy decision-making as shown in the spectrums are also noted.

Table 2: Key themes

	Climate scientists	Sceptical voices
Perception of self	**Youth-driven aspiration**: "*someone came and gave a talk at my primary school (…) I got worried about the environment (…). I ended up in climate change I guess as a result of that really*" (CS10) **Romantic fascination**: "*I got much more involved in research on climate change and I thought it was fascinating"* (CS2) **Heroic desire**: "*…do something that felt more tangibly useful to society*" (CS10)	**Crusader:** "*I have to give up a job and have no earnings in order to have someone…who can stand up and say it's not about politics; it's about whether the evidence is right!"* (SV3) **Anti-hype:** "*…there's something there but it's exaggerated out of all proportion"* (SV6) **Equity:** "*If I had a motivation, it is seeing very, very bad policy which hurts people…the poor…that is appalling"* (SV1)
Perception of a dominant other	**Lack of understanding:** "*people who are not scientists… [f]eel threatened by people who can. So [they] are just negative… and [are] looking for ways to justify not accepting it."* (CS3) **Policy focused:** "*government doesn't have the role to regulate carbon emissions (…) there's not enough evidence to justify government regulating carbon emissions*" (CS11) **Emotional response:** "*fear, guilt, grief, loss, hopelessness*" (CS3)	**Vested interests:** "*…a lot of what goes on within the scientific establishment is about protecting the bureaucracy and the people within it; they're following their economic incentives"* (SV5) **Politicised science:** "*…why would real scientists accept it? Because they have developed this sort of nexus of media plus politicians plus establishment plus science which is funnelling literally billions and billions and billions of pounds into academic research"* (SV9)

Debate participation and framing	**Sense of duty:** "*[as a] publicly funded academic working on an issue of significant public policy, then I do believe I've got a duty and an obligation to have my voice heard in public*" (CS6)	**Sense of duty:** *"I think that's generally true of most of the main sceptics, that it's almost a sense of duty that they have to do it"* (SV3)
	Labelling as damaging: "*deepen the polarisation and the entrenchment of views*" (CS10)	**Labelling can be negative:** *"…to shut down a debate the best way is to label"* (SV8)
	Accreditation is vital: "*…people who have got first or second degrees in relevant disciplines and have spent a certain amount of professional investment of their life and study and publishing*" (CS8)	**Politicised and unscientific:** *"…climate science… is about pursuing a…nasty political agenda, it's a collectivist, centralising, bureaucratic political agenda which will make a few people very rich at the expense of everybody else"* (SV2)
	Credible debate needed: "*…increasingly perturbed that people make what look to be very cogent and very eloquent conclusions but actually have completely nebulous, unframed starting points*" (CS9)	**Disagreement with government policy:** *"…there is a problem of climate change…that does require some level of intervention. But it doesn't have to be top-down…it should be democratic and we should be left better off"* (SV7)
	Debate actually about policy: "*challenge and critique the policy framing of climate change*" (CS8)	**Climate change as a belief:** *"I don't think that's science, you see, that's religion… It was a question of, "Don't argue, the science is certain. Believe"* (SV11)

An immediately obvious example is the mutual sense of duty to participate in the climate debate, albeit recognising that CSs and SVs may have differing levels of inclination as to particular venues for engagement, such as the peer-reviewed literature and university press releases versus live public debates or blogosphere discussion. As recipients of public funds CSs identify an obligation to express their findings even if these are not welcomed: *"We're paid by the state to do our work and ensure that message is got out"* even if *"we know it's politically unpalatable"* (CS9). Nisbet & Markowitz's (2014) finding that scientists' engagement in overtly public activities such as media appearances is a function of political outlook, as well as belief that media coverage was important for career advancement, is thus likely applicable in this instance. Nearly identical in tone are SV perceptions of being *"worried"* or *"concerned"* (SV11) (particularly about climate policy implications) and thus being obliged to start lobbying or engaging directly in public in order to *"get a hearing"* (SV8). Another interesting overlap was the recognition that certainty was a challenging concept both to pin down and as a basis for policy decision-making. While there were clearly differences of opinion regarding the level and/or nature of certainty required for policy implementation, likely the result of distinct "ways of life" as explained by cultural theory (O'Riordan & Jordan, 1999), many CSs and SVs acknowledged that the notion of a general scientific certainty about such a complex assemblage as climate change is unattainable. If it is recognised that it is more the *"degree of effect"* (SV1) that is contested or the way that one can be *"certain about some things and not quite so certain about others"* (CS9), a more explicit discussion about the trade-offs between this inherently uncertain scientific evidence and political decision-making may be more productive than debating the specific technical details of that evidence.

While a common public perception is that of a single debate where climate scientists are representatives of scientific truth and sceptical voices are the dominant challengers (Hoffman, 2011; McKewon, 2012), this research contributes to understanding of a more complex reality by also highlighting the potential misalignment of actors and their roles in engaging in public debate. Nearly all SVs expressed an underlying interest in the impact of climate change policies on the economy, with CSs also being acutely aware that much of the debate centred on disagreement about policy choice rather than the science itself. If the actor-subject interaction in public discourse were to be renegotiated (i.e. politicians debating policies rather than CSs, or CSs choosing to debate the policy

implications of their research), it may reduce the exhaustive nature of the debate where dead-end arguments are being held precisely *because* they do not make explicit what is actually being debated, i.e. Rayner's (2012) surrogate debate. CS5 clearly articulates this frustration: *"…no matter what I said to him, he wouldn't change his mind. Why should I bother with that individual?"* The suggestion of critical self-reflexivity evident in some interviews, such as SV6 and SV8 who presented themselves as able to (at least explicitly) acknowledge that personal values shaped their opinion, was also interesting. It was however not evident in the majority of interviews. We contend that critical self-reflexivity is likely to be particularly useful in debate re-framing as it helps to pare back the actual topic of disagreement (see Hulme 2009) and forces the centre of the debate to shift towards a more explicit policy or values-focused dialogue. This is particularly important for public perceptions of climate change and how debate is understood to be a useful and necessary part of the scientific process.

Nonetheless, despite uncertainty regarding the extent to which self-reflexivity did or can occur, what we consider the more important outcome of the narrative method employed for this research is its ability to uncover overlap in interviewees' perceptions and rationales. Therefore, what is particularly significant is that even the way that each "side" of this polarised debate *chose* to express themselves can invite the possibility for constructive dialogue, for example, understanding that derogatory labelling practices are regarded as mutually unproductive. Critically, identifying and emphasising these commonalities can be seen as a possible mechanism to defuse the antagonism evident in the debate—it is more difficult to continue an aggressive and hostile argument when participants are reminded of, for example, an expressed mutual love of enquiry and scientific understanding. Building on cultural interpretations of the many different understandings of climate change (Hulme, 2014; O'Riordan & Jordan, 1999), we therefore suggest that a focus on potential overlaps between underlying (and/or manifestly expressed) rationales behind climate opinions may encourage constructive discussion even with actors who had previously engaged in purposefully antagonistic exchange.

Notes

1. The identifying term sceptical voice is an attempt to move away from the problematic labelling constructs evident in the climate debate (Howarth & Sharman, 2015), but follows Painter (2011) in recognising the need for a pragmatic descriptor.
2. Four interviewees from Painter (2011) and Sharman (2014) also had links to the GWPF.
3. Two interviewees (one CS, one SV) were critical of the notion of "certain" evidence for anthropogenic climate change and chose not to respond.

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