Climate change; experiences and scientific evidence

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People experience their world locally and in the short term; short relative to the long term scale at which planetary changes, such as climate change, must be understood. Consequently, personal experiences of any climate change signal are disturbed by the noise of natural variability of local climate, and day to day weather fluctuations. However, debate over climate change has persisted for several decades both in science, politics and the public, and awareness and concern have increased, as shown by surveys both nationally (Semenza et al., 2008) and globally (Leiserowitz, 2007). Nonetheless, climate change remains a low priority with the public relative to other contemporary social, environmental and political issues (Leiserowitz, 2007). This is significant in light of the importance of public opinion for policy making and the necessity of individual behaviour change for climate change mitigation (Leiserowitz, 2007, Hansen et al., 2012, Semenza et al., 2008, Lorenzoni et al., 2007). The following discusses factors contributing to public perceptions of climate change, individual and societal barriers to behaviour change and acknowledgement of the underlying science, in order to approach the question of how to close the gap between personal experience and perception, and scientific evidence.

Experience and Perception of Climate Change

While classified as a long term process, climate change is starting to have effects on weather patterns perceivable through experience. For example the observation of a number of unusually "harsh" (Northern Hemisphere) winters are likely consequences of climate change; as Hansen et al. (2012) point out; unusually snow-rich winters are often equated with "harsh" conditions (giving rise to jokes about the obvious incorrectness of theories of global warming), however, snow is – rather than an indication of cold, harsh conditions – a consequence of a warmer atmosphere holding more water vapour, which falls as snow due to the wintery temperatures. Hansen et al. (2012) provide statistical analyses of current warming

trends in relation to recent heat waves. They use standard deviation to project that what has been observed during recent heat waves as extreme, highly uncommon conditions, will soon be the "new normal", with common occurrence of even more extreme conditions. A hot topic in current public debate is the role of climate change for the increasingly frequent storms and floods; this is a positive relationship, with climate change having the "greatest practical impact via effects on the water cycle" (Hansen et al., 2012:22). When Lomborg (2007:6) claims that "*no individual* tropical cyclone can be directly attributed to climate change" [emphasis mine] he fails to articulate two important aspects of climate change, in the attempt to express uncertainty about climate change science. 1) Climate change is essentially observed as *trends* rather than individual events, and while climate change could not be – and is not – said to be the cause of any *individual* tropical cyclone, the *trend* of increasing frequency of super storms can be a reflection of previously mentioned effects of climate change on the water cycle. 2) Climate change and specific weather patterns simultaneously contribute to specific weather events (Hansen et al., 2012:21). Thus, suggesting other causes (e.g. atmospheric blocking or La Niña effects) of specific events and drawing attention to previous examples of similar single events does not oppose the severity of climate change (Hansen et al., 2012:20-21). Rather these omissions and casting of doubt upon the *individual event's* connection to climate change solely function to appeal to human ways of perception through a focus on tangible impacts (Lorenzoni et al., 2007), event based experience – enhanced by the media effect of "breaking news" and privileging of events limited in time at space (Boykoff, 2007) – and the difficulty of perceiving creeping changes.

Vedwan and Rhoades (2001) make a significant observation in their study of climate perception amongst Himalayan apple farmers: local perception of climate change is influenced by "utilitarian aspects" of local climate (Vedwan and Rhoades, 2001:114); for example, these apple farmers recognized changes such as variation in the seasonal cycle, snowfall and distribution of sunlight, factors perceived to influence the growth of apples. Likewise, Ishaya and Abaja (2008) identify a wide perception of environmental and climatic changes amongst indigenous peoples in Nigeria, who are faced with the consequences which rising temperatures and decreasing rainfall have for their farming. Thus, when Leiserowitz (2007) points to a higher awareness of climate change in developed countries than in developing countries, his short comment suggesting a *possibility* of an awareness in developing countries of a changing climate "outside the framework of climate change science" does not do justice to the significance of such indigenous perception of climate

change; in the modern, industrialized, western world, climate has little utilitarian significance to the everyday lives of many individuals, who thus lack such experiential structure in their perception of climate change.

With the local, short-term nature of human experience, the fact that climate change is a global phenomenon, for many removed in space and time from their immediate realities, unavoidably affects their perspective. This is apparent in Leiserowitz' (2007:9) analysis of "concern" vs. "worry" and "perceived seriousness" vs. prioritizing, in which he shows that surveys tend to show higher levels of "concern" than "worry"; "concern" indicating a more objective awareness and understanding of climate change rather than personal engagement. Similarly high levels of "perceived seriousness" does not give corresponding priority to the issue of climate change in comparison to other pressing issues – both social and environmental (Leiserowitz, 2007:15, Semenza et al., 2008:483). Now, with the wide consensus and serious concern within the scientific community, why – in a culture, where science is "privileged as ultimate authority" (Rayner in Boykoff, 2007) – is this consensus not more accurately mirrored in the concerns of the public?

A vital factor is the different norms and ways of knowing (Boycoff, 2007). In public debates – influenced greatly by politics and media – contention, uncertainty and focus on probabilities do not make for a strong case. Meanwhile, a "language of caution, probability and uncertainty is inherent to science" (Boykoff, 2007:183), and a process of critique, review and corrections is vital in the production of sound scientific knowledge on complex issues. This process is often ignored both in political and media contexts, and uncertainty easily misinterpreted as confusion and incompetence. This contradiction between knowledge philosophies results in a "confusing, contradictory and chaotic [climate change discourse]" (Blewitt, 2010:210), enhanced by a flurry of alarmist, cinematic, 'quasi-religious' media representations, mixed with "comic denial [and] small action pragmatism" (Blewitt, 2010:210, Lomborg, 2007). BBC's *Apocalypse Now ... and Then* compares the language of climate change discourse to that of religious warnings about doomsday and Armageddon; this could, on the one hand, serve to point out a flaw to be corrected in environmental discourse, but seems more to question the reliability of scientists; if they use the language of religion, can these "scientists" really be trusted? Thus, encouraging, perhaps, the idea that climate change and anthropogenic forcing are matters one can chose to believe in, or not.

When climate change is experienced and perceived of from within a modern lifestyle and the capitalist "paradigm of consumption" (Lorenzoni et al., (2007:454), denial becomes a strategy of self-deception, as argued by Lorenzoni et al. (2007). The inherent link between climate change and the very consumption so fundamental to modern society makes recognition of climate change, and the resulting need for action, contradictory to contemporary society (Lorenzoni et al., 2007:454). Perceptions of behaviour change as a sacrifice, a sacrifice of "wants", disguised as "needs", leaves scepticism and denial as ways of justifying the status quo and letting habits go unquestioned. Hence, it may be argued, that messages of scepticism and uncertainty are much more immediately and uncritically picked up and internalized than messages of the reality of climate change and the very serious need for action, posing significant demands to society and the individual.

Reconciling Public Perceptions and Scientific Evidence

Barriers and knowledge gaps, as discussed above, must be approached at multiple levels and by multiple actors. Several studies indicate (Leiserowitz, 2007; Lorenzoni et al., 2007), the need for stronger action by governments; national as well as international regulation. Regulation and government action would imply to the public the seriousness of the issue, as well as ensure fair and collective partaking (Lorenzoni et al., 2007:455). This would deal with individuals' worry of other people's (and governments' and industries') inaction as well as doubt of self-efficacy (Lorenzoni et al., 2007:453, and could attempt to address the inequity of cost-benefit distribution and the fact of climate change as beyond the control of any one group (Leiserowitz, 2007:1) Also with the government lies the responsibility to provide structural support such as low-carbon-living friendly infrastructure, design and land-use (Semenza et al., 2008). Semenza et al. (2008:482-483) show that levels of concern are higher with higher levels of education and, furthermore, that the biggest barrier to individual behaviour change is not knowing *how* to change; thus education is an essential part of the solution. Along the same lines, Lorenzoni et al. (2007:446) emphasize the necessity of "engagement" at a deeper level than simple public participation in decision making; rather as a personal connection with the issue, through knowledge, genuine concern and a will accompanied by ability to act. Variations both between and within societies and cultures must be considered in educational initiatives, to take into account differences in individual and cultural perceptions of climate change (Lorenzoni et al., 2007:454), but also to account for and deal with potential constraints to change (be that money, time other limitations). In light of the previously discussed significance of experiential utilitarian

perceptions of climate change, theories of outdoor education and ecological education (e.g. Orr, 2004) could be considered in more comprehensive work on this topic.

Back to the knowledge gap between scientists and the public; Hansen's et al. (2012) paper is an attempt to reach out to the public from a scientific view, but in an approachable language. They show the high degrees of certainty in scientific evidence of anthropogenic climate change based on "real world data", and relate this to real world observations of, for example, increased snowfall, floods, and forest epidemics. Such an approach from scientists might prove effective as what Lorenzoni et al (2007) call for: reliable information from a source perceived of by the public as credible. They (Hansen et al., 2012) explain the significance of the debate about appropriate base period; this could be an important function of scientific communication to the public: explaining reasons for debates and disagreements within the scientific community, and contextualizing them within the bigger picture of broad consensus. Only then would scientific transparency to the public be meaningful (Rayner in Boykoff, 2007). The reality remains, however, that such scientific communication needs to reach the public, one way or the other. This is where the role of mass media comes in to the picture. In their framing of issues, media "privilege certain understandings over others" (Boykoff, 2007:478); their focus on contentious issues (whether marginal to or irrelevant for the emerging scientific consensus) is seldom portrayed in its rightful context, and tends to avert attention from the big picture of significant scientific progress while promoting uncertainty (Boykoff, 2007 and Lorenzoni et al., 2007). With the great influence which the media has upon the political agenda as well as public opinion, reconciling public perceptions and scientific evidence will depend significantly on a more balanced media presentation of the debate.

While climate sceptics such as Lomborg add to the confusion and uncertainty created by mass media framing of climate change issues, especially in the light of his initial denial of climate change (Lomborg, 1998), it is worth examining Lomborg's (2007) more recent work, in which he (besides undermining the magnitude of projected consequences of climate change), draws attention to the necessity of a realistic approach, and suggests benefits of less climate-focussed policies acknowledging the many other problems faced by contemporary civilization. Lomborg (2007) takes a rather extreme standpoint; accusing contemporary science of major exaggeration, dismissing projections on the basis that they are "hypothetical" (Lomborg, 2007:4-5) – an inherent characteristic of any kind of future projections (Blewitt, 2010:59) – and claiming that ultimately, "what we care about is the

damage caused" (Lomborg, 2007:6) – in socio-economic terms. Without adopting the same extremely critical standpoint; Lomborg's emphasis on "how we should view [climate change], deal with it and put it in perspective" (Lomborg, 2007:1) is important. The danger of a climate change discourse revolving around alarmism, urgent tones and a language of acceleration and irreversibility (Lomborg, 2007:3), is that public perception of the issue becomes based in powerlessness, doubt in self-efficacy, ultimately leading to denial (already apparent in contemporary society) (Lorenzoni et al., 2007:453). Thus, a more constructive approach to climate change, one that focusses on what *can* be done, and what positive effects it might have – both in the short term and long term, and both socially, economically, environmentally and in relation to climate change – would serve as a far more encouraging discourse for the public to engage with.

To sum up, while studies show a globally rising awareness of and concern with climate change, the public debate remains dominated by a discourse of chaos and uncertainty, and a need for deeper personal engagement with the issue. This presents a gap between public perception and the growing consensus within the scientific community; a gap with significance for policy making and possibilities of climate change mitigation, which depend to a large degree on public support. Education has been shown to be an important measure to reconcile the two standpoints, both education about the underlying science and about ways of responding. Significantly, in a debate dominated by media framing and political contention, knowledge must be shared from a perceived reliable source, and if science is to be communicated in a useful manner, it must go beyond mere transparency, to target the public with explanations and contextualizing debates and disagreements within the greater context of substantial scientific agreement. Furthermore, it is worth reviewing the language of climate change discourse, since alarmism and irreversibility encourage denial rather than action and personal engagement. Contemporary focus on bottom-up approaches to climate change are suggested to be insufficient, since regulation is often seen as an indication of the seriousness of an issue, as well as ensuring the fair distribution of the burden of change. This demands an active approach by governments, which could also, favourably, supply structural support for the public's response to climate change.

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