

Pro-Environmental Behaviors of Climate Skeptics: Do Beliefs Matter? A Study in the Dry Tropics, Australia

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Abstract: - Despite the increasing certainty and acceptance of anthropogenic climate change in scientific and political arenas, skepticism about climate change persists in the general population. This study examines the climate change perceptions, attitudes and knowledge of residents of the dry tropics, north Queensland during a period of severe drought. Concern about climate change is ranked against other threats to the community, and their willingness and ability to reduce the perceived threat of climate change is assessed in relation to their beliefs. The results show that skeptics and climate-concerned individuals have similar levels of environmental knowledge and, despite their differing views on climate change, engage in pro-environmental behaviors such as switching lights off when not needed, installing environmentally friendly light bulbs, using a car less often, saving water and recycling. The beliefs and behaviors of climate skeptics have implications for behavioral change strategies directed at climate change—these are briefly outlined.

Key-Words: - Climate change, drought, threats, rural communities

1 Introduction

The Fifth Intergovernmental Panel on Climate Change (IPCC) Report states that ‘It is extremely likely [95 percent confidence] that human influence has been the dominant cause of the observed warming since the mid-20th century’ [1,p.1]. Further, of 4,014 peer-reviewed journal papers that state a position on anthropogenic global warming between 1991 and 2011, over 97% supported the anthropogenic cause of climate change [2]. However, while certainty around anthropogenic climate change is high in the scientific arena, and common in the rhetoric of politicians [3,4], there is social debate among the general public where skepticism around the anthropogenic cause remains [4,5,6,7]. The trend in public perception may be attributed to factors such as more pressing concerns that hold more personal daily relevance [8,9]; colder than average weather in some regions [10]; and the role of popular media in harboring doubt on the topic [11,12]. On the contrary the increasing frequency and severity of extreme weather events (such as floods and heatwaves) has had the opposite effect on the perceptions of others [13].

The term ‘skeptic’ is broadly used. Skeptics have been referred to as ‘those who have taken a highly visible public role in criticizing the scientific

consensus on ... climate change’ [14,p.339], as well as those who strongly reject any anthropogenic responsibility to those who are merely uncertain about aspects of the topic [8]. The use of the term ‘skeptic’ in the latter form is more in keeping with the definition given in The Oxford dictionary as ‘a person inclined to question or doubt accepted opinions’ [15]. To shed light on the beliefs of climate skeptics, Whitmarsh [7] embarked on a study in the UK to examine, among other aspects, the nature of the skepticism. The study asked respondents whether they thought that climate change was the result of natural or anthropogenic influences, whether increasing media coverage of climate-related disasters were influencing their perceptions and whether climate change claims were ‘exaggerated’ or ‘too complex’.

Beliefs around climate change take on significance when it affects behaviors. If people believe that climate change is a natural phenomenon, not influenced by the actions of humans, then they are less likely to believe that their actions will add to- or help mitigate climate change [16]. Given this premise, this study examines whether there is congruity between climate change beliefs and pro- environmental behaviors in

residents of the dry tropics north Queensland, Australia.

1.1 Climate conditions in the study area

The inland region of the dry tropics of north Queensland (covering the Shires of Charters Towers, Cloncurry, and Mount Isa) experience a semi-arid (in the east) to arid climate (in the mid- and west region) with hot summers and mild, dry winters. Typically, rainfall is highly seasonal with around 290 mm falling during summer as heavy thunderstorms or rain penetrations from decayed cyclones, and a further 105 mm falling in autumn. The long-term mean maximum temperature range from 38°C in the far west of the region to 32°C in the east (based on 104 and 92 years of data respectively). Cloncurry, located approximately mid-way between the extremities of the inland region experiences a mean maximum temperature of 32°C and mean annual rainfall of 480.8 mm (based on 55 and 125 years of data respectively). Over the past few decades increasing shifts in seasonal climate patterns have resulted in irregular rainfall [17]. At the time of the study (2013) the annual rainfall was within the lowest 5th percentile in the inland region. Mean maximum temperatures in the inland region have been matched or exceeded in seven or more of the past 10 years [18].

Compared to the inland regions, rainfall along the coast is higher, and generally less impacted by drought episodes than the inland regions. The coastal towns of Ayr and Townsville—covered in this study—receive on average 1,067.7 mm, 1,146.2 mm per annum respectively (based on 126 and 83 years of data respectively). Mean monthly temperatures range from 25°C in winter to around 31°C in summer [18].

2 Methodology

The study covers a region of the dry tropics of north Queensland that has not been covered in other climate change perception studies [19,20]. Ethics approval to conduct the research was granted by the University Human Research Ethics Committee.

Questionnaire data were collected from mid- to late 2013 via an 8-page questionnaire that was posted to residents in the study area. The number of questionnaires delivered was limited by letter box restrictions. Recipients were provided with a reply-paid envelope for the completed questionnaire. No incentive was provided for completing the postal questionnaire. Responses were obtained from 343 people (n=343), though not every question was

answered by each respondent. SPSS statistics version 20 was used for data analysis [21].

The questionnaire comprised a mix of open-ended questions, responses to a 6-point Likert scale (from strongly agree to strongly disagree and an option of not interested) and single answer demographic questions. The subsections covered: questions on perceived threats to- and the community's ability to respond to threats (very well to very badly or don't know); the level of satisfaction with services (education, health, banking, postal, retail, government agency); community leadership and organizational ability (e.g. 'Our community leaders have successfully led us through past challenges', 'our community has plans in place to deal with threats'); environmental beliefs and behaviors; memberships of organizations within the community; sources of support within the community; familiarity with environmental terminology; sources of environmental information and their trustworthiness; and demographic questions. Due to length constraints this paper focusses on climate change beliefs and behaviors.

The perceptions of climate skeptics may be under-represented in this paper as previous studies have shown that where questionnaires are uninteresting or difficult to understand rates of participation and completion of surveys are lower; and incomplete surveys are seldom returned [22,23].

3 Results

The results mostly refer to two categories of respondents: skeptics and non-skeptics (climate-concerned) based on responses to the statement 'human induced climate change is occurring at some level'. The demographic characteristics of the two types of respondents are given in Table 1. Fifty-two percent of the 343 respondents to the postal survey were climate-concerned while 44% were climate skeptics. For the remainder of this paper the responses of those who were neutral or did not know the answer (4% of the postal responses) are excluded from the categories of skeptics or non-skeptics. In addition to the anthropogenic cause of climate change skeptics and non-skeptics differed in their views on other climate-related statements, these are summarized in Table 2.

3.1 Environmental knowledge and attitudes of the residents

In this paper 'environmental knowledge' is defined by respondents' self-proclaimed familiarity with environmental terms. The lack of quantification of

environmental knowledge is a limitation in the study, particularly as environmental knowledge tends not to correlate to climate literacy, and a tendency to overestimate ones' knowledge (or failure to recognize ignorance). However, regardless of beliefs familiarity with environmental terms was high (over 80% and 90% of skeptics and non-skeptics respectively; Table 3). Familiarity with 'climate change adaptation' was lower (72% and 82% respectively), but still high. Despite the differing beliefs on climate change, the two groups agreed to a varying extent on other environmental statements (Table 4). The implications of this finding are discussed in Section 4.

Table 1 - Demographic characteristics of climate skeptics (n=65) and non-skeptics (n=246)

Characteristics		Skeptics %	Non-skeptics %
Age	Under 20	1.8	2.1
	20-39	13.0	25.1
	40-59	48.2	46.4
	60 and over	37.0	26.4
Gender	Male	58.5	37.2
	Female	41.5	62.8
Education (highest)	Secondary	50.0	27.2
	Technical/other	17.3	20.5
	Undergraduate	19.2	29.5
	Postgraduate	13.5	22.8
Annual household income \$ 000	Under 20	18.7	11.4
	20-99	50.1	49.4
	100-199	27.0	31.7
	Over 200	4.2	7.5

3.2 Primary concerns of the residents

Although the focus of this study is on climate change, to put the responses into a broader context respondents were asked 'what are the two main challenges you think your community faces in the next five years?'. In addition to open-ended questions, respondents were asked to rank specified threats. Results varied, but regardless of location drought was ranked as the highest 'extreme' to 'moderate' threat to their community. This was followed by economic sustainability, crime, a reduction in the availability of water, and tropical storms. The results from inland regions alone are of note in that despite their climate skepticism, skeptics ranked drought and a lack of water as the highest extreme to moderate threats to the community (100% and 93.5% of responses respectively), followed by economic sustainability (81%).

Likewise, drought was the highest ranked concern of non-skeptics (100%), followed by environmental sustainability and long term climate change; concerns over economic sustainability ranked fourth.

Table 2 - Differing environmental beliefs and perceptions of climate skeptics and non-skeptics

Statements in questionnaire	Skeptics	Non-skeptics
	Agree %	Agree %
People worry too much about climate change	70.1	14.9
My personal actions contribute to climate change	27.2	79.2
There is little action that I can take to reduce the threat of climate change	50.0	33.0
Carbon dioxide is the primary gas responsible for climate change	17.2	61.3
We cannot change the rate of climate change	65.4	14.1
When we use coal or gas we contribute to climate change	10.3	78.8
People worry too much about pollution	40.3	10.6
The government should take an active role in the global effort to prevent climate change	9.0	83.0

Table 3 - Environmental knowledge of climate skeptics and non-skeptics (F: familiar; U: unsure)

Familiar/unsure of the meaning of the following terms	Skeptics		Non-skeptics	
	F	U	F	U
	%	%	%	%
Environmental protection	88.2	11.8	94.3	5.7
Environmental sustainability	90.0	10.0	96.9	3.1
Sustainable development	84.3	15.7	90.3	9.7
Conservation	92.1	7.9	99.2	0.8
Energy conservation	92.0	8.0	96.6	3.4
Climate change adaptation	72.0	28.0	82.3	17.7

Table 4 – Environmental perceptions of climate skeptics and non-skeptics

	Skeptics	Non-skeptics
Statements in questionnaire	Agree %	Agree %
Environmental issues are important to me	70.7	87.5
The average person is not concerned (climate change)	60.3	60.3
Environmental concerns delay development	80.3	56.3
Economic, social and environmental development are necessary	64.8	91.8
Overuse of resources is a serious threat to our future	60.0	90.7
We must set aside areas to protect endangered species	63.9	91.9
Society will solve the biggest environmental problems	37.9	34.2
Humans have a right to change nature	14.2	6.0

3.3 The environmental behaviors of climate skeptics and non-skeptics

Both groups claimed to engage in pro-environmental behaviors, though to varying degrees (Table 5). The implications of these findings are discussed in the next section.

Table 5 - The environmental behaviors of climate skeptics and non-skeptics

	Skeptics	Non-skeptics
Statements in questionnaire	Agree %	Agree %
I try to recycle as much as I can	76.9	73.9
I have installed environmentally friendly light bulbs in my home	70.2	87.0
I often look for signs of ecosystem deterioration	56.1	64.1
I save water by taking a shower instead of a bath (to save water)	51.7	78.5
I always switch the light off when I don't need it	82.4	93.5
I walk or bike to places instead of going by car	30.3	49.2

4 Discussion

4.1 Environmental knowledge and attitudes

The results showed little difference in environmental knowledge between the climate skeptics and the climate-concerned groups. These findings concur with those of Kempton et al. [24] who found that, in the USA, environmental knowledge was equally lacking among groups despite their differing environmental orientations (strong environmentalists to strong anti-environmentalists). LiveScience [25,p.1] states that 'While people [in the US] ranked climate change as a higher priority [than in the past], their understanding of much of the science involved with the problem and the ways to mitigate it ... has changed little'. In the US, science-based information has little effect on influencing public knowledge and concern about climate change [3],—this has implications for management strategies aimed at mitigating climate change.

Scannell and Grifford [26] state that people with a greater sense of attachment to place tend to be more engaged with climate change issues. Given their dependence, farming families often feel a deeper sense of attachment to their environment [27]. However, in Britain, Whitmarsh [7] found rurality to be negatively correlated with environmental values. Further, in the USA, a study of the perceptions of farmers concluded that where there was greater past personal experience with a highly variable climate farmers were less likely to believe that current levels of climate variability were the result of human-induced climate change [7]. Our results from the inland regions are similar in that, with a history of fluctuating rainfall and temperature extremes, there was a predominance of skepticism around the anthropogenic cause of climate change.

4.2 The primary concerns of residents

Among the inland respondents, the dominance of the perceived threat of drought and a reduction in available water supply does not necessarily contradict the climate skeptics' viewpoints. Given the naturally aridity of the region and history of recurring drought, concerns over water supply are tangible recurring threats within respondents' pasts and thus were perceived to remain a threat. Apart from dominant concerns around drought and reduced water supply, all respondents expressed concern over economic sustainability. Studies show that when other issues become 'more salient' interest in environmental issues diminishes [7,p.698].

4.3 The pro-environmental behaviors of skeptics and non-skeptics

Given that over 72% of climate skeptics do not believe that their personal actions contribute to climate change, and 50% believe that ‘there is little action that I can take to reduce the threat of climate change’, one might expect a lack of pro-environmental behaviors from this group, yet over 70% of skeptics engaged in energy-saving activities (Table 5). While this appears contrary to Blake [28] who found that people tend not to act in a pro-environmental way if they feel they are not able to change the outcome or are not responsible for the situation, Whitmarsh [29] warns against equating simple pro-environmental behaviors (such as energy conservation) with beliefs around climate change, particularly where the questions in the study have not specified that the action was done out of concern about climate change.

The engagement in pro-environmental behaviors in skeptics (and non-skeptics alike) may be attributed to a number of factors. Firstly, studies have found pro-environmental behaviors to be economically- rather than attitude-driven [30,31,32]. In our study although the majority of skeptics did not believe that ‘my personal actions contribute to climate change’, nor ‘every time we use coal, oil or gas we contribute to climate change’, the fact that over 70% of skeptics (compared to 73.9% of non-skeptics) stated that they had installed environmentally friendly light bulbs and switch lights off when not needed may be economically-driven. However, as the reason for the behavior was not asked, this is speculation. A further limitation of our study is that behaviors were self-reported. While some studies have found a propensity among respondents to proclaim greater pro-environmental behaviors than is evident in their manifest behaviors or than is congruent with their beliefs [33,34], others have found responses to be candid [35].

Secondly, while climate-specific beliefs differed, 70.7% of skeptics stated that ‘environmental issues are important to me’ which may account for their pro-environmental behaviors (Table 2). The two groups shared attitudes on the overuse of resources, pollution, the right to change nature, and the protection of endangered species, to name a few (Table 3). A sense of ‘ecological citizenship’ or altruism may also motivate pro-environmental behaviors [36]. Discrepancies between attitudes and behaviors were mostly found among the 4% of respondents who were ‘unsure’ (or undecided) on many of the climate-change questions. Poortinga et al. [8] suggest investigating the type of scepticism to help interpret attitude-behavior relationships.

Further, tangible personal experience with weather-related impacts (such as droughts or floods) has been found to affect behavior [37,38,39,40]. In a US-based study the majority of farmers, regardless of climate change beliefs, engaged in risk-reducing behavior to hedge climate risks to their agriculture-dependent income [7]. Here we find mixed results. For example, in the inland areas despite their tangible experience of drought, concerns over the extreme threat of future limited water availability, and the water supply dam being below 20% capacity, 38% of skeptics and 31% of the non-skeptics were either neutral or disagreed with the statement ‘I save water by taking a shower instead of a bath (in order to save water)’. The results are difficult to interpret, it may be that people shower to save on the cost of water, to save time, because they prefer to shower, or their home may only have a shower installed. This would not be the first report of excess water during periods of drought [35,41], yet a further explanation might be the desire for personal wellbeing [42]. The lower engagement in water-saving activities comparing to electricity-saving behaviors may have been driven by a physical need for comfort in a hot region. Similarly, compared to other pro-environmental behaviors, the lower engagement (30 to 49.2%) in walking or cycling instead of using a car (Table 6) may be a reflection on the high temperatures or distances to services rather than a lack of environmental ethics. Here the beliefs and behaviors of skeptics are more congruent: 27.2% of skeptics agreed that ‘car use contributes to climate change’ (Table 2), and 30.3% stated that they ‘walk or bike to places instead of going by car’.

5 Conclusion

If increased pro-environmental actions are the desired outcome rather than changed personal beliefs, then it may be argued, there is little point in trying to convince people on the scientific evidence for anthropogenic climate change. In this study climate skeptics and non-skeptics exhibited similar levels of environmental knowledge. Educational strategies may, however, make a difference to the 4% who were undecided on the matter, as one respondent commented ‘I need proof of the problems from qualified people ...’. Strategies that place the personal context, or the finite nature of earths’ resources foremost in a behavioral change approach are likely to engage residents more than trying to convince them on the existence of anthropogenic climate change.

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