Conceptualising climate change in rural Australia: Community perceptions, attitudes and (in)actions

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Abstract Public engagement and support is essential for ensuring adaptation to climate change. The first step in achieving engagement is documenting how the general public currently perceive and understand climate change issues, specifically the importance they place on this global problem and identifying any unique challenges for individual communities. For rural communities, which rely heavily on local agriculture industries, climate change brings both potential impacts and opportunities. Yet, to date, our knowledge about how rural residents conceptualise climate change is limited. Thus, this research explores how the broader rural community – not only farmers – conceptualise climate change and responsive activities, focussing on documenting the understandings and risk perceptions of local residents from two small Australian rural communities. Twenty-three semi-structured interviews were conducted in communities in the Eden/Gippsland region on the border of New South Wales and Victoria, and the North-East of Tasmania. There are conflicting views on how climate change is conceptualised, the degree of concern and need for action, the role of local industry, who will 'win' and 'lose', and the willingness of rural communities to adapt. In particular, residents who believed in anthropogenic or human-induced factors described the changing climate as evidence of 'climate change', whereas those who were more sceptical termed it 'weather variability', suggesting that there is a divide in rural Australia that, unless urgently addressed, will hinder local and national policy responses to this global issue. Engaging these communities in the 21st century climate change debate will require a significant change in terminology and communication strategies.

Introduction

As natural climate change occurs over tens of thousands of years, the vast majority of scientists agree with the United Nations' Intergovernmental Panel on Climate Change (IPCC 2007) that it is very likely (a 90% chance) that anthropogenic or human-induced factors – primarily the impact of using fossil fuels (coal, oil and gas) and land-use changes from agricultural practices – are the main cause of recent global warming and climate change (e.g., Collins et al. 2007; Somerville 2010). Despite this consensus, there remains a small but significant degree of doubt, uncertainty and vocal scepticism among some sectors of the community who typically interpret 'scientific uncertainty' – there will never be absolute 100% confidence in predictions – as a sign that complex climate science is unreliable justifying doubt and inaction (Pollack 2007; Simpson 2011). Translating the complexities and uncertainties of global climate change science "into the language of popular culture" (Lorenzoni and Pidgeon 2006, p74; Trumbo and Shanahan 2000), is an extremely challenging task, with the general public frequently struggling to interpret the scientific jargon, conceptualise the risk and relate global scenarios to their personal experience (Swim et al. 2011; Weber and Stern, 2011). This lack of understanding can translate into disengagement or active disagreement with international measures to reduce greenhouse gas emissions; this lack of public support hinders strong political commitment and leadership - as seen with the resistance to the 1997 Kyoto Protocol and 2010 Copenhagen Climate Summit (Semenza et al. 2008; Weber and Stern 2011). With the increasing realisation that successful implementation of climate change policy is impossible without public support (Kempton 2007), research into community perceptions and understanding of climate change is necessary to improve the communication of climate science, foster public engagement and, as a result, better inform policy and facilitate change.

Risk perceptions and understanding of climate change
While researchers have long recognised the importance of understanding public risk perceptions, (see for example Beck 1992; Douglas and Wildavsky 1983; Slovic 1987), such investigations into public understandings and responses to climate change is relatively new (see for example Berk and Fovell 1999; Moser and Dilling 2004; O'Connor et al. 1999; Shisanya and Khayesi 2007; Stoll-Kleeman et al. 2001; Ungar 2000). While research on risk perceptions and discourse enables scientists and policymakers to better understand community attitudes and behaviours, and in turn, identify and systematically target specific structural and psychological barriers to climate change understanding, acceptance and adaptation (Duerden 2004; Gifford 2011) environmental risk communication on climate change is particularly challenging for several reasons. First, the distance in time and space of climate change means people are less personally involved and concerned about the environmental threat, failing to see how their actions, choices and behaviours contribute to global environmental problems (Leiserowitz, 2005, 2006; Meijnders et al. 2001). Second, the scientific complexity of global environmental problems makes understanding and contributing to the debate difficult for a public with limited maths, science and systems thinking knowledge (Sterman and Sweeney 2002). Scientists often use language in a different way to laypeople, who often struggle to fully understand the problem or the terms utilised, 'climate' and 'climate change', and frequently confuse the cause of climate change with the consequences (Bostrom et al. 1994Dunlap, 1998; Nerlich et al., 2010; Reynolds et al., 2010; Whitmarsh, 2009). Third, research on public understanding of science has illustrated that people's conceptualisations and mental or cultural models of climate change are based on their socio-cultural values and belief systems, which is also reflected in their language choices (see also Grothmann & Patt, 2005; von Storch and Krauss 2005; Weingart et al. 2000; Whitmarsh 2009). For example, Zia and Todd (2010) found that political and religious ideology impacts climate change conceptualisations, with conservative American voters who are less concerned about climate change, predisposed to believe in the 'natural' change argument and least likely to support present and future action. Motivating the public to care about and respond to the climate change challenge will require breaking this liberal-conservative ideological divide and reframing the debate in broader ideological and clearer terminology, so that climate change relates individually and culturally to all (Zia and Todd 2010).

Understanding climate change in Australia
Public and political acceptance of climate change and belief in the need for mitigation action varies significantly in Australia, with the topic a key policy platform over the last decade (Speck, 2010). Current government proposals to implement a carbon tax and emissions trading scheme (ETS) has lead to much debate about the

challenge of making climate change policies "environmentally sound, economically viable and politically palatable" (Bryant 2011). In an analysis of a nationally representative sample of Australian voters, Pietsch and McAllister (2010, p232) concluded that while much of the public are generally supportive of political responses to climate change - believing the government can and should do more - "a large minority remains to be convinced of the merits of an ETS". More recently, in a survey of 5036 Australians, Leviston and Walker (2011) found that although most believe climate change is happening, they are divided on the cause: approximately half think it is human-induced and half that it is solely attributable to natural causes. Critically, there was a clear political divide in that conservative voters were more likely to think it is normal fluctuation in the Earth's climate.

Regardless of the cause, the science suggests that global climate change will affect Australia - the hottest and driest inhabited continent - much more than most other countries in the world (Garnaut 2008). The future climate of Australia, currently experiencing the impact of natural weather variability via a series of significant natural disasters over the last decade (floods, bushfire and droughts; Milne et al. 2008), is predicted to be even hotter and drier: up to 30% less rainfall and an additional five degrees in temperature by 2070 (Commonwealth of Australia 2008). Whilst both challenges (i.e., increased risk of fire) and opportunities (i.e., reforestation) are predicted impacts, Australian agriculture, and subsequently the communities of rural Australia, is predicted to be the most affected industry with a decline of 17% expected by 2050 due to the reduced productivity, and thus viability, of family farms (Commonwealth of Australia 2008; Garnaut 2008).

Given such predicted impacts, it would be logical to assume that climate change adaptation is a priority for rural Australia. To date, however, many rural residents remain sceptical about climate change, citing drought and climate variations as a normalcy of rural life (Commonwealth of Australia 2010, p13; Commonwealth of Australia 2008). The cause of this scepticism is difficult to define as there remains little published peer reviewed research that has explored whether and how rural residents in Australia conceptualise climate change and engage in climate change adaptation, which is the overarching aim of this research. The small body of literature available focuses on the perceptions of Australian farmers who have been found to hold differing beliefs about whether local climatic changes are due to natural 'climate variability' (extreme natural weather events) or to 'climate change' (anthropogenic change; Thwaites et al. 2008; McDonald 2006). Donnelly et al. (2009) explained that rural industry stakeholders had negative reactions to the term 'climate change' because of entrenched scepticism over its existence and cause. Similarly, through interviews and focus groups with 148 respondents, Milne et al. (2008) found farmers' willingness to act on climate change was hindered by their uncertainty and conflicting views on the causes of climate change, a lack of clear information and the perception that any change was a 'natural' occurrence with the cycle expected to go back to 'normal'. To justify this cyclic argument farmers utilise their memories of past events, memories which may be inaccurate and therefore unreliable (Weber 1997). While some farmers question the validity of 'climate change' and subsequently the need to adapt, they have historically been forced to adapt to numerous external drivers including climate variability in order to improve productivity (Gunasekera et al. 2007; see Pielke et al. 2007; Quiggin et al. 2010; and Salinger 2005 for specific adaptation strategies proposed and implemented by Australian farmers). Despite this history of adaptation, Hogan et al. (2011) found in their study of 4,000 farmer's decision-making processes towards (in)action on climate change, the vast majority are yet to orient their farming practices towards adaptation due to their focus on addressing ongoing shorter-term pressures (i.e. commodity prices, input costs, condition of on-farm resources, the ongoing drought). The daily challenges contemporary farmers face have been identified as key barriers limiting their acceptance and willingness to act on climate change; thus, farmers need to be convinced that climate change will be more extensive and intensive then the previous climatic variability they have faced (Fleming and Vanclay 2009).

As agriculture is the crux of rural communities, most research to date have focussed on understanding how industry stakeholders (e.g., farmers) perceive the impact and experience of climate change and adaptation activities. However, the reality is that the impacts of climate change on agriculture and farming will also determine the viability – or not – of surrounding rural communities; thus, it is also important to understand local rural residents' views, experiences and expectations of climate change and how it might affect their community. This research explores how the broader rural community – not only farmers – conceptualise climate change and

responsive activities, focussing on documenting the understandings and risk perceptions of local residents from two small Australian rural communities. There are three main aims. First, we assess what residents believed their rural communities felt about climate change. Second, we identify the everyday peer-to-peer language, terminology and 'lay' knowledge utilised in rural climate change discourse and how that might affect actions. Finally, we explore residents' opinions about how climate change might impact – both positively and negatively – their rural region, as well as thoughts on climate change mitigation and adaptation strategies. By enhancing our understanding of the level of climate change discussion and concern within these rural communities, this qualitative research will help inform the development of specific environmental risk communication strategies as well as revealing these communities' understandings, priorities and willingness to adapt.

Method

Case Study Communities
As a part of a larger research project investigating community perceptions of the forestry industry and the impact of climate change, two Australian regions with well established forests and timber plantations were selected (see Figure 1). These forestry-dependent regional communities were located in two different Australian states: Community 1 (population 1,206; ABS 2010) in the Eden/Gippsland region of New South Wales (on NSW/Victoria state border) and Community 2 (population 1,966; ABS 2010), in north-east Tasmania. To maintain participant's confidentiality and privacy, the exact names of these two small regional communities has been replaced with the pseudonyms Community 1 and 2. Critically, having two demographically similar case study communities, located in different states and with different local priorities, characteristics and politics, helps strengthen the creditability and validity of the findings.
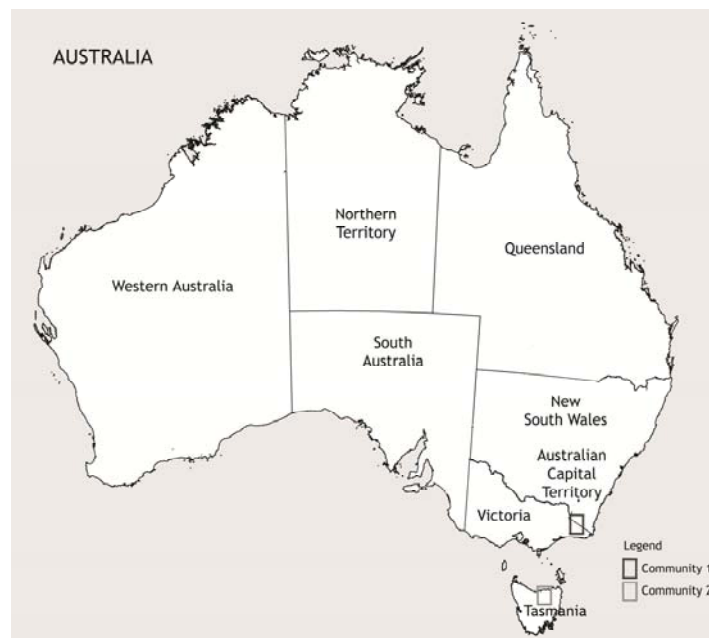
Figure 1 Selected communities in case study regions - Eden/Gippsland in NSW and Tasmania, Australia

Participants
A non-probability purposive sampling technique was utilised to recruit and select a broad range of community residents, with only two criteria: that they were (a) over 18 years of age and (b) had no direct involvement with the forest or timber industry (this was because the overarching aim of the larger research project focussed on non-participants perceptions of the timber industry and the industry's responsiveness to climate change issues, with this paper focussing explicitly on residents perceptions of climate change). The local council's of each community, as well as key local business organisations and volunteer groups, were approached to assist in identifying potential participants. Potential participants were contacted (via telephone) and invited to participate

in an in-depth face-to-face interview in their own home (or other preferred location). As Table 1 illustrates, a total of 23 residents participated, 10 from Community 1 and 13 from Community 2. The sample included 11 males and 12 females, ranging from 20 to 84 years (most, n=16, were 50 years or older), whom represented a broad selection of occupations (only two were farmers).

Table 1 Participants socio-demographic profile

Code*	Gender	Age range^	Occupation	Length of residency
C1-1	F	65-69	Motel/restaurant owner	24 years
C1-2	F	45-49	Assistant librarian	30 years
C1-3	F	30-34	Bank manager	33 years
C1-4	F	75 or above	Retired office administrator	56 years
C1-5	F	55-59	Economic development officer	15 years (back and forward since 1972)
C1-8	M	50-54	Merchandise manager	last 10 years (as well as childhood: up till 18 years)
C1-9	F	50-54	Council Corporate Service Management	All my life, apart from school and five years working in Sydney.
C1-10	M	Not disclosed	Not disclosed	12 years
C1-11	M	60-64	Semi-retired farmer	60 years
C1-12	M	60-64	Retired	4 years
C2-1	F	40-44	Sustainable development manager (PT)	5 years
C2-2	M	40-44	Scientist	3 years
C2-3	M	60-64	Farmer	12 years
C2-4	F	50-54	Retired	24 years
C2-5	F	55-59	Retired teacher aid	48 years
C2-6	F	45-49	Primary healthcare coordinator	2.5 years
C2-7	M	75 or above	Retired electrician	30 years
C2-8	M	65-69	Architect	5 years
C2-9	M	60-64	Minister of Religion	10 months
C2-10	F	55-59	Homemaker	10 months
C2-11	F	40-44	Youth health officer	18 years
C2-12	M	20-24	Student	Not disclosed
C2-13	M	65-69	Semi-retired management consultant	47 years

*Code: C1 = Community 1; C2 = Community 2
^ As participants are sometime reluctant to reveal their exact age, they were asked to indicate an age range

Procedure
Whitmarsh (2009, p402) highlighted the importance of qualitative research in the investigation of public perceptions of climate change as "quantitative and qualitative studies can elicit very different findings about public understanding of climate change." Here, we utilised a phenomenological approach to investigate rural residents' understanding and perceptions of climate change. Phenomenology, which emphasises adopting an open approach to understanding the unique 'lived experience' (activities, meanings, beliefs) of a particular phenomena from the perspective of those who experience it, allows - through first-person description – a rich and unique insight into an individual's experience where the "participant is the knower and it is the researcher's ability to engage with the participant's reality that enables an honest and trustworthy account of the lived experience" (Paton et al. 2004, p178). Following formal ethics approval, the in-depth semi-structured discussion

format interviews (lasting approximately 90 minutes) were conducted in participant's homes to explore their views on climate change and the role of forestry. The following key open-ended areas were explored: personal understanding of climate change; perceptions of local community engagement, discussion and concern; any regional-specific impacts in terms of witnessed changes, perceived causes and potential long-term effects of climate change; sources of information on climate change and whether they find them to be reliable and/or trustworthy; current adaptive strategies; the perceived preparedness of the broader community to change their behaviour; and their attitudes towards the local forestry industry. Critically, whilst these areas provided a guide of key issues to be covered during the semi-structured interviews, the semi-structured approach purposely gives the interviewer the flexibility to respond to interviewees' cues, exploring any emergent issues and probing with follow-up questions to fully understand participants' thoughts and opinions (Britten and Fisher 1993).

Analysis

The interviews were audio-recorded and transcribed verbatim, with a thematic analysis conducted to identify the major issues and topics which emerged from the data. Thematic analysis involves a process of data immersion and interpretation, meaning transcripts are read and re-read to identify data and common categories, themes and patterns (Liamputtong and Ezzy 2005). We manually coded the data, with key themes and sub-themes highlighted, grouped and labelled to enable the creation of a comprehensive picture of the ways in which rural community residents perceive climate change (see Table 2). Critically, to enable readers to understand and evaluate our thematic structures, the results reference multiple excerpts from the raw data. At this juncture, it is important to remember that the aim of qualitative research is not the numbers or causal prediction offered by quantitative research, but rather to provide an in-depth illumination and understanding of issues.

Table 2 How rural community residents perceive climate change – five key themes

- Terminology in rural climate conversations - 'climate change' versus 'weather variability'
- Community divisions on climate change - concern versus scepticism
- Climate change and variability will determine viability of rural industries
- Visioning the future impact of climate change - "winners and losers"
- Implementing adaptation – conflicting views on communities' willingness

Results

All participants within these two rural communities were aware of the concept of climate change, with the majority personally believing that climate change was occurring - to some degree - within their region. Whilst there were generally no clear differences as a function of locality or specific socio-demographic characteristics (i.e., age, occupation or gender), residents described how their communities differed in terms of their degree of engagement, acceptance, definition and concern about the impact of climate change. As Table 2 illustrates, five key themes were identified.

Theme 1: Terminology in rural climate conversations - 'climate change' versus 'weather variability'

Climate change was perceived as a major topic of discussion for residents in both rural communities with a general agreement that the local "*weather is definitely changing*" (C2-7). Residents described how friends, family and the general community frequently discussed how changing weather patterns, events and local environmental issues were impacting on their community. Recent local climate events (e.g., droughts, floods, storms etc) were a common talking point, particularly amongst those who directly relied on the weather for their livelihoods (e.g., farmers, forestry workers, fishermen). Residents described the weather as erratic, weird, random and unpredictable, explaining how there were now hotter days in summer, colder days in winter, and heavier, although less frequent, rain. Community 1 residents focussed on the recent return of the wet winter after a long drought, whilst Community 2 residents described their region's relentless lack of rain. What differed was *how* communities conceptualized these local climate changes – rural residents believed that their community was evenly split on terminology preferences and usage in conversations, with half of the locals utilising the term *'climate change'* and the other half purposely avoiding the term in favour of a wide range of words best

conceptualised as '*weather variability*' (see Table 3 for illustrative quotes). This difference in the terminology utilised in resident's daily conversations highlights conscious disagreements about the cause, definition and impact of 'climate change' in these rural communities.

The residents who attributed the cause of changing local weather to natural 'weather variability', referred to past experiences of similar weather patterns to explain how the climate had varied in the past and the current situation was no different. One resident (C1-8) compared the current drought to the Federation drought (in 1902) to illustrate how the region had experienced similar extremes before. These residents were seemingly unwilling to accept or link changes in the weather to the politically loaded concept of climate change: "*You often hear we're going back to the winter that we had when they were a child. That is quite a common thing. Yeah, we are going back 30, 40 years of what it was like back in the '60s or '70s. So there is a lot of that*" (C2-4). The residents who attributed the cause of changing local weather to global climate change openly discussed the concept, with one resident describing it as "*a very hot topic*" (C1-8). Historical references were also made by this group to support their view of climate change, with one describing the hole in the ozone layer to have highly affected their region: "*if you played golf for a day and you would have sunblock on, you would be cut to pieces, that wasn't the case before*" (C2-13). These locals felt others in their community – who thought weather pattern changes were just cyclic natural variations – just did not understand climate change and its impacts, describing how: "*I think [if] you mention the word[s] 'climate change', it tends to switch people off*" (C1-3) and "*to make that next step and say, 'that's because of climate change,' that link isn't there; the ability to make that connection isn't there*" (C2-6). As the indicative quotes in Table 3 illustrate, there was a range of views about the potential causes and impact of climatic change for their region, with many residents very uncertain about what their community truly thought about the concept.

Table 3 Defining and prioritising climate 'change and variability' in rural communities

'Climate Change'	'Weather Variability'	Major Concern	Minor Concern
In a farming community, weather's daily talk, wet or dry...in our circle of contacts there's a percentage of people who think climate change is definitely happening. (C1-11)	We talk about the weather but...[climate change] is not something that you would talk about. I have heard somebody say, 'Oh, it's a lot of hoo hah.' (C1-3)	I have lived my life but I have got grandkids and I worry what the world is going to be like.... I think people worry. (C1-4)	A lot of them would be set in concrete, I just know people say, 'Oh, this is not going to concern me...I'm not going to be around, it's not going to worry me'. (C1-2)
The variability in the climate is certainly increasing where we've had..drought and now ..heavy rain.... We're not going to be exempt from the global warming that clearly is happening. (C2-3)	I don't recall having an argument about climate change or discussion. Well, they talk about it being very wet... But I don't know whether you can class that as a climate change. (C2-10)	It's my estimate - which is reasonable because I talk to people all the time about it - a good 80 per cent care for the environment and are concerned about the future. (C2-13)	I would have to say that it's not that [it's] not important, [it's] not relevant. They don't see the relevance so therefore they don't see the importance... it's not even a thought that would enter their head. (C2-6)
Climate Uncertainty		Climate Uncertainty	
You have the older group that say, 'well, you know, back in the 40s and 50s, we had this drought and it's just coming around again and that's the way it happens,' whereas others who are a bit more mindful that maybe there is some substance to climate change. (C2-1)		Young people... it seems there is a lot of fear in their generation about things like climate change and - I guess from my generation, we had some fear around nuclear war and their generation has some fear around, it seems, climate change. (C2-11)	

Theme 2: Community divisions on climate change - concern versus scepticism

As Table 3 illustrates, residents disagreed about the extent to which their communities were concerned about climate change: half believed their community viewed it as a major issue and half felt that other residents were sceptical, dismissive of the concept and believing it would not affect their community. Typically, differences in concern about climate change mirrored terminology choices – locals who used the term 'climate change' in conversations were concerned about the impact, whereas those who utilised the term 'weather variability' were much less concerned and often openly sceptical about climate change.

Residents who described their community as concerned about climate change described two very different core beliefs, values and motivations that tended to underpin these concerns: environmental commitment and financial impact. The first core value, environmental commitment, was most prominent in driving vocal concern and discussion about climate change. These residents frequently used emotive words like 'frustrated', 'worried', and 'scared' to describe the impact and experience of climate change, and were extremely concerned about the long-term impact of current actions or inactions. The second core value that underpinned concern about climate change was financial impact; these residents had a much more practical motivation for being concerned about climate change – the financial viability of their business and community. They described in very pragmatic terms the need for early action: "*climate change does worry them, because they rely on the weather for their income, even the plantations*" (C1-12). Critically, although there were no differences as a function of locality, socio-demographic characteristics had a minor influence on views; males and older residents were more likely to describe their community as 'concerned' about climate change.

Residents who described their community as less concerned about climate change identified two different core values underpinning this belief: scepticism about climate change (and its impact on their region) and rural resilience. Many locals were extremely sceptical about climate change, explaining it as a 'myth'. One compared the hype surrounding climate change with the expected technology crash on January 1, 2000 (known as Y2K), convinced that there is similarly nothing to be worried about (C2-8). Others within this group implied that they may be more concerned if they were better informed - they felt the current debate is clouded by misinformation, arguing that a free exchange of views is required for them to feel that climate change information is reliable. The rural resilience sub-theme reflects the belief amongst some locals that rural communities have dealt with worse in the past (e.g., economic restructuring, technological change, resource competition, emergence of global agricultural marketplace, population changes etc) and will in the future, and thus worrying about - and preparing for - the *possible* impacts of climate change is pointless. There was a feeling that, whatever happened, their community would just cope and adapt as necessary – as one resident explained, their country-way of thinking meant they "*tend to coast along and I don't think we feel we have a huge effect [on climate change], I think generally [people have] that mentality, when you live in the country*" (C2-5). For many, given ongoing daily concerns about the economic and social viability of their small farming communities, the reality was that the "*immediate concern is not the climate*" (C2-9). However, regardless of the community divisions over whether to be concerned about climate change or not, there was a clear consensus that the proposed national emissions trading scheme (ETS) would significantly impact and potentially harm rural Australian communities. Resident's believed that the true financial ramifications of climate change policy had not been considered, especially for agricultural communities who were "*afraid of what might happen with the ETS*" (C1-4) and concerned about the "*hip pocket nerve*" (C2-3). Residents perceived some socio-economic differences in opinions, believing that the younger generation was more fearful and concerned about climate change than older generations, whereas older locals (especially farmers), who recall their fathers or forefathers describing similar weather patterns occurring 30, 40 or 50 years ago, were less concerned.

Theme 3: Climate change and variability will impact viability of rural industries

Despite the diversity of their occupations, all residents acknowledged that maintaining agriculture (primarily farming and timber) was essential to the ongoing viability of their region. Residents in both regions described, in detail, how recent weather events had impacted on local rural industries, reflecting on the severity of recent

droughts and how the incessant nature of recent extreme weather events made it very difficult for farmers; as one resident explained, where before "*they had a recovery period, now - if it's not the drought, then it's too much rain*" (C1-2).

Residents described two major and distinct adaptive steps many local farmers were putting in place to cope with erratic weather patterns and ensure that their livelihoods remained viable: either changing their farming practices or exiting the industry. Many farmers had consciously selected new crop choices based on tolerance and appropriateness for the changing local climate: "*they couldn't grow carrots, I think it was, and potatoes, because they need constant irrigation, whereas they grew poppies and onions or something.... but they grew things that don't need the water*" (C2-5). Despite this, the unfortunate reality was that some farmers were making the decision to exit the industry and end the tradition of passing down the family farm to the next generation as it was now "*too costly to have a farm, to feed the stock, to keep the water up, all those things*" (C1-3). Given that "*the town depends on the farmers for their living*" (C1-9), residents were very concerned that the changing climate might make farming – and their small rural community – unviable. To a certain extent, the exiting of farmers was a hidden impact of climate change, described by one resident as "*a phenomenon that most people don't realise*" (C1-9). Interestingly, despite both regions being reliant on forestry for generating significant local income, only two residents (1 in each community) mentioned without prompting how climate change and variation might impact forestry. Both had observed dramatic changes in forestry industry practice, with the type of trees planted changing from hardwood to softwood – one thought this change demonstrated the industries capability to adapt (C1-1), while the other, describing herself as ignorant about industry, was unsure whether the decision was made as a response to climate change or not (C2-2).

Theme 4: Visioning the future impact of climate change - "winners and losers"

Residents were asked how climate change might impact – both positively and negatively – on their region. They could see, as the quotes in Table 4 illustrate, that there will be both "winners and losers" (C2-3). Many could identify positive impacts, explaining that warmer temperatures could boost tourism and visitor numbers to Community 2's coastal region. Negative impacts centred on issues of water supplies, with residents describing how diminished rainfall and lack of capacity in the reservoir could lead to water restrictions and increased fire danger. Community 2, situated in a coastal region, highlighted sea-level changes as a key concern, specifically the risk to low-lying properties. In terms of how agriculture would be impacted, most identified positive adaptation possibilities. Longer periods of high temperatures were perceived to correlate with longer cropping seasons, along with fewer frosts, enabling a wider variety of crops to be grown – however, rainfall patterns were considered detrimental.

> [It] could be vastly important so that if our temperatures are at 12 degrees two months earlier, then we have crops in the ground sooner, provided there is a rainfall increase because water is the critical factor not temperature... It's a double whammy because if the temperature increases and the water availability decreases, then that's magnified so that would lead to some issues of viability. (C2-3)

Very few participants (4 of the 23) felt able to comment on how climate change might affect the local forestry industry, explaining that increased temperatures would result in improved growth of the trees but that there might be increased pathogens to the tree crops.

Table 4 The perceived local positive and negative impacts of climate change

Positive Impacts	Negative Impacts
We won't have those really, really freezing cold winters that ruin everything and sort of where nothing grows for three/four months. (C1-9)	I just think there will be a lot of people going off the land. They won't be able to manage. I just feel there will be a food shortage, water shortage. (C1-4)
The demographic is primary agricultural, if they changed to a...tourist type demographic there would be some [positive impacts] because we would be cool compared to the rest of the country. (C1-12)	The greatest effect is going to be home security, land security... by that I simply mean, fire. Fire is going to be the manifestation that's going to be the biggest problem. (C1-10)
If we get a hot summer, we are going to have an extended tourism season in the area. (C2-4)	Another metre on top of a tide...that will have huge effects on our foreshores. It will inundate... properties. It will affect access. It will affect sewerage systems, it will affect just about everything. (C2-13)
People would probably love it... they don't come to Tasmania because it's too cold. So it could be a positive for the tourist industry. (C2-5)	
I believe we stand to gain. If there is global warming I think it'll improve our agricultural prospects. I think there is potential for us to get a better distribution of rainfall. (C2-3)	The biggest impact would be if we have some kind of, say, trading scheme...That would affect how the tree planters run their business ...and that will have an impact on this community. (C2-12)

Theme 5: Implementing adaptation – conflicting views on communities' willingness

Although most residents openly discussed the adaptation and mitigation strategies that they themselves have implemented (e.g., reduced energy and water use), two residents in particular were strongly opposed to the idea of responding to 'climate change', explaining how they really "*don't like the insurance argument - that it might be true, so let's do it anyway*" (C2-10). Table 5 illustrates residents contrasting perceptions about whether they felt the broader community was adapting and/or willing to adapt. Half of the Community 2 participants stated that they felt their community would only adapt when and if they perceive climate change to be visually obvious in their own environment, regardless of what was occurring within broader national and global communities. There was a sense that climate change adaptation would just happen naturally, with one resident describing how they believed climate change will be so progressive, so slight, that the community will sub-consciously adapt. Indeed, residents described how the community had already been forced to adapt due to new government policies, including the eradication of incandescent bulbs and the energy efficiency requirements of new residential builds.

Residents strongly believed that local agriculture and forestry industries needed to adapt to remain viable; fortunately, all agreed that the capacity for mitigation and adaptation was there. Although vague on the specific details and processes for agricultural adaptation, residents were hopeful that farmers would be able to offset the negatives, describing carbon sequestering as a positive opportunity and explaining that consumers needed to increase support for local agricultural production in order to reduce food miles and improve the sustainability of food production. The majority felt any major change would need to come from the government first, calling upon the local council, state and federal authorities to expand or develop educational and incentive programs. Overall, residents were confident their community, with the support and leadership of government, could ameliorate or overcome the impacts of climate change.

Table 5 Communities' willingness to adapt to climate change

Perceive broader community as willing to adapt	Perceive broader community as NOT willing to adapt
Oh, no question about it, none whatsoever. Yeah, in the industry we're in, which is the rural industry, we will adapt in this area quite comfortably. (C1-11)	Probably the general community wouldn't but the people that their income is directly - you know, the farmers and the timber guys. So if you are the local garage owner, you probably wouldn't. (C1-8)
I think all of us are more aware of what we are actually doing when it comes to water and electricity and all of those things. We are sort of more aware of what's happening. (C1-3)	I just think people have sort of missed the point, really. They are talking about, it's going to cost us, meaning them, money, but if we don't have a livable planet in 50/60, 100 years' time, it doesn't really matter if it's cost you, you know, an extra $2 a week, if you are going to save the planet for future generations. (C1-5)
I just think people are going to have to - have to accept it, that they have got to change their way of living. (C1-4)	
Yes, they will adapt as things change...people will make changes to their habits, I suppose. Yeah, they are willing, but not before anything happens as a result of it. (C2-12)	Until effects are real, Joe in the street isn't going to be reacting. I don't see Joe in the street reacting to hypothetical's; that's the problem of the political debate right now. (C2-3)

Discussion

This qualitative research provides unique insight into how rural Australian residents – predominantly non-farmers – conceptualise and discuss climate change and its impact on their community. It highlights how rural communities are divided about the cause, impact and urgency to address climate change, although neither gender, occupation nor location affected climate change views in a systematic fashion. There were conflicting views on how climate change is conceptualised, the degree of concern and need for action, the role of local industry, who will 'win' and 'lose' and the willingness of rural communities to adapt, with our findings suggesting that there is a divide in rural Australia about climate change that, unless urgently addressed, will continue to hinder national policy response to the global issue. While previous studies have predominantly focussed on the agricultural industry and its direct stakeholders - farmers - the inclusion of a wide range of rural residents enhances our theoretical understanding of the ideology surrounding climate change across rural Australia. As one of the first studies to explore how rural residents – not only farmers - conceptualise climate change, the findings will help guide policy development and assist in the formation of effective community engagement, risk communication and education strategies for rural communities.

Consistent with research with farmers, this research has illustrated there is a clear division in rural Australian communities about climate change, with subsequent differences in climate change discourse and terminology. While rural residents agreed that the environment and local weather events were common talking points within the community, in line with Thwaites et al. (2008) and McDonald et al. (2006), there was a clear divide in how these changes were conceptualised and labelled – as 'climate change' by those who believed in anthropogenic or human-induced factors and as 'weather variability' by those who were more sceptical. These rural communities were also split between those supporting 'reactive' responses to climate change (choosing the wait and see approach, only prepared to respond when, and if, they are truly convinced weather events are indeed a sign of climate change) and those supporting 'proactive' responses to climate change (accept the term 'climate change' and apply it to observed weather events, and are willing to adapt). Those who did not believe in the anthropogenic argument regularly referred to past local weather events to dispute the science (see also Weber 1997); these rural residents need to be convinced that climate change is real and the impacts will be more serious than the climatic variability they have experienced in the past (Donnelly et al., 2009; Fleming & Vanclay, 2009). Engaging these residents in a climate change discussion will be extremely challenging, as like

Zia and Todd's (2010) sample of conservative American voters, our research illustrates that some conservative rural Australian residents have strongly held values and beliefs that climate change is not real.

Despite this distinct divide within these rural communities, our research indicates that residents are acutely aware that weather extremes create an ongoing struggle for local farming families (see also Alston 2010; Anderson 2008, 2009) with concerns that farming family outmigration will negatively impact their broader communities (see also Tonts and Black 2003). The majority of our participants were confident, for the most part, in the farming community's ability to adapt – whether to 'climate change' or ongoing 'weather variability.' Critically, they envisaged not just negative impacts but many opportunities for both the agriculture industry (ie. crop diversification) and the broader community (ie. tourism) to emerge from climate change. Changes in crops was described as an adaptation strategy already being implemented by local farmers. As Fleming and Vanclay (2009) also identified, this general belief and optimism in the 'resilience' of farmers is both a strength and weakness for rural Australia. Walcott et al. (2011) explain that the highly variable climate in which periodic severe droughts are normal means their adaptive capacity is generally high; however, not accepting the reality of climate change and new weather predictions could impede the uptake, effectiveness and efficiency of new technologies and processes designed to help rural communities mitigate and adapt to the impacts of climate change. If rural Australia dismisses climate change as 'not happening' and adopts a stoic, "she'll be right, mate" (C1-4) attitude, the possibility is that rural regions will miss this limited window of time and opportunity to successfully implement climate change resilience strategies and ensure a sustainable future.

Of course, our findings needed to be interpreted with the research limitations in mind: our study is limited by the selection of rural communities (forestry-dependent), recruitment strategy, and time of data collection (just prior to the 2010 federal election, when climate change was a major focus of attention). Although this qualitative research has enabled the collection of a 'rich' set of data from these two rural communities, providing detail that is unobtainable through quantitative methods that are more closed off by predetermined barriers (Grunig 1990), much more qualitative and quantitative research is required to understand the extent to which rural residents, in communities across Australia and around the world, have similar or differing beliefs. Despite these limitations, however, the present study has both theoretical and practical implications. Theoretically, it shows the influence of terminology on the conceptualisation of climate change, exposing a predisposition to conservative ideology - many unwilling to accept the facts about climate change - and the need to break the ideological divide across not just America (see Zia and Todd 2010) or specifically Australian farmers (see Thwaites et al. 2008) but across broader rural Australia as well.

Practically, it shows how messages about climate change "need to be tailored to the needs and predispositions of particular audiences; in some cases to directly challenge fundamental misconceptions, in others to resonate with strongly held values" (Leiserowitz 2006, p64). Due to differing conceptions surrounding climate change terminology, rural residents who have described significant local weather variability do not recognise their own experiences and observations as local evidence of climate change - evidence they require in order to support policy response. Thus, three key strategies are integral to breaking the ideological climate change divide and improving the communication of climate science for all rural residents - farmers and non-farmers alike. First, risk communication needs to break away from confining terminology. Critically, where Thwaites et al (2008) utilised the term 'climate variability', this study identifies that both 'climate' and 'change' are avoided by rural residents and thus suggests that the term 'weather variability' is adopted in communication of climate change to help eliminate the uncertainty associated with the words 'climate change'. Second, the framework of climate change communication needs to be reshaped to tap into the individual and cultural values that define rural and regional Australia. This means acknowledging the history of farmer's adaptive capacity (to a myriad of challenges) and the potential for rural Australia to capitalise on climate change (e.g., through new crops, expanded tourism initiatives). The global issue of climate change needs to be made personally relevant to rural residents, and discussion about the potential economic impacts and opportunities will help facilitate awareness and subsequently willingness to respond. Finally, scientists and policymakers need to recognise that whilst improving understanding of the facts is integral, we need to move past the debate over what is the cause of climate change and focus instead on the need for action, communicating effective viable adaptation strategies that can be implemented at a local level. Critically, communication of such strategies must address the public's

very real concern for personal financial sacrifice making clear that the cost will only increase. In taking these steps, national, state and local governments will heighten community discussion, concern and subsequently engagement with climate change, helping rural communities successfully manage the impacts, foster opportunities and work together towards a prosperous future in the face of a changing climate.

Adaptation defines rural Australia - they have the ability to respond to climate change as they have other challenges, however, the general lack of understanding about the facts and misconceptions about the necessity for immediate action is inhibiting support for national and local policy responses. Even more critically, for these communities, the reality is that arguing about the distinctions between 'climate change' and 'weather variability' may potentially impede efforts to reverse the very real negative impacts of climate change that are already apparent across rural Australia. This research has illustrated that we must change our terminology and communication strategies to better engage rural communities - both farmers and non-farmers - in the 21st century climate change debate, and thus ensure that residents understand that a proactive versus reactive approach - where we develop resilience to climate and weather variability by proactively adopting mitigation and adaptation strategies - could spell the difference between their community thriving or disappearing altogether.

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