CSIRO

Engaging local communities in climate adaptation: a social network perspective from Bega Valley, New South Wales, Australia

Summary report

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LAND AND WATER FLAGSHIP

Citation

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Acronyms

ABS   Australian Bureau of Statistics

CBO   Community-Based Organisation

CSIRO Commonwealth Scientific and Industrial Research Organisation

DPI   Department of Primary Industries

GHG   Greenhouse Gas Emissions

LLS   Local Land Services

NGO   Non-Government Organisation

NSW   New South Wales

OEH   Office of Environment and Heritage

SNA   Social Network Analysis

Acknowledgments

Executive Summary

Adapting to climate change is a challenging task. Decisions are complex and contested due to the diverse views, values and interests that are mobilised as a result of climate change. Communities are not homogenous and perceptions of risk vary between and within communities across Australia. The effectiveness of planning and policy decisions can be significantly enhanced by improving our understanding of the community structure and community's specific needs, concerns and position in relation to climate change and adaptation. Community structures may be understood more deeply by uncovering the underlying social networks that are activated around particular issues, such as climate change. By using social network analysis (SNA) we explored the social structures around this particular topic in the Bega region of NSW. We also used semi-structured interviews to elicit the experiences and perceptions of the key stakeholders in relation to climate change to determine their major concerns and information needs to enhance their capacity to adapt. The study revealed that individuals accessed (primarily formal) and shared (primarily informal) climate change information from a range of sources. The findings of the SNA also suggest that key individuals (boundary spanners) within the network are well connected at multiple levels through the network and may act as knowledge champions. Key insights from the qualitative data suggest that climate mitigation is more widely communicated or at least understood in the region compared to climate change adaptation. The findings also suggest that while adaptation is not widely talked about within the community, there is evidence of both autonomous and planned adaptation efforts in the Bega community. Major concerns for participants in the region included increased bushfire risk, reduced rainfall (in a region that already suffers from significant rainfall variability), coastal flooding and inundation as a result of sea level rise and storm surge, and ocean acidification.

1 Background

Climate change is a significant challenge for planners and policy makers (Pidgeon et al., 2014). Decisions about when and how to adapt to a changing climate are complex and contested. While mitigation efforts remain a significant global challenge there is widespread acknowledgement that adaptation to unavoidable climate change impacts at the local and regional scale is a critical component of the planning and policy challenge (McEvoy et al., 2010; Agrawal et al., 2012; Huggel et al., 2015). Climate change adaptation is a multi-scale planning and policy 'process that needs to consider different sources of knowledge and also societal and cultural values, objectives and risk perceptions of those involved' (Huggel et al., 2015, p. 80). Understanding how the different types of responses play out within and across different communities is critical to the success of climate change adaptation. Given the diverse sets of interests, actors and values that are mobilised as a result of climate change, community engagement and policy design remain a critical but complex task for planners and policy makers (Serrao-Neumann et al., 2014). There can be no 'one size fits all' approach to community engagement as every community is unique (Green et al., 2009). The effectiveness of planning and policy decisions at the local scale can be significantly enhanced by improving our understanding of the community structure and community's specific needs, concerns and position in relation to climate change and adaptation.

Climate adaptation can be planned or autonomous, anticipatory or reactive (Smit and Wandel, 2006). While the success of government-led policy approaches largely relies on the uptake of policies at the local scale (Harman et al., 2015), it is also important to note that many communities are already adapting to climate change autonomously (Juhola and Westerhoff, 2011). Through autonomous measures many communities may not even be aware that they are making explicit contributions to adaptation. In this regard, the design of climate adaptation policy must recognise the importance of an improved understanding of the community structure for planned adaptation and the subliminal nature of local autonomous action. Community structures may be understood more deeply by uncovering the underlying social networks that are activated around different issues, concerns and interests (Cunningham et al., in press).

To date, there is a lack of scientific inquiry on the role of social networks to understand and improve community engagement and local adaptation policy. This report presents findings from

case study research in the Bega region, NSW conducted between October and November 2014. The results of this study build upon previous case study research in Shoalhaven, NSW, conducted between March and April 2014, as part of a broader project to explore the science, policy and community interface (New South Wales Government, undated-b). To build on the first case study however, this report presents both quantitative and qualitative findings from the Bega region. We adopt a mixed methods approach to map the social network and improve our understanding of how information around climate change adaptation is accessed and shared within this particular community. We used semi-structured interviews to elicit the experiences and perceptions of the key stakeholders to improve knowledge and inform policy design for climate change adaptation. In doing so, we investigate community perceptions about climate change and determine their major concerns and information needs to enhance their capacity to adapt to a changing climate.

The findings presented in this summary report are supported by a scientific journal article by the research team that is currently in review.

2 Aims and approach

In addition to the formal governance networks by which information about climate change is shared and adaptation decisions are taken, a suite of informal networks also influences the ways in which individuals and groups engage with the process of adaptation (Stacey, 1996; Pelling et al., 2008). The main objective of this project is to understand the interaction between the formal and informal governance networks, with a view towards developing effective engagement options. Understanding the structure and influence of these networks is important to developing effective ways to engage with diverse communities at the local scale. The research project explored the following questions:

- What are the informal processes by which community members receive information related to adaptation?
- How can an understanding of the linkages between formal and informal networks lead to better targeted engagement options?
- How do diverse community members currently receive information about climate change and climate adaptation, and what alternative mechanisms are available to improve the communication of adaptation?
- How are messages about adaptation framed, and does this have implications for engagement in adaptation response?
- How can policy makers better engage with communities to improve the acceptance and uptake of climate adaption policies/programs/strategies?

To answer these questions this study employed a mixed methods approach using both quantitative and qualitative techniques. The quantitative component of the research used social network analysis (SNA) to map the formal and informal social network in the Bega region. More specifically, the two social networks mapped in the region related to 'where participants *access* climate adaptation information' and the second network related to 'who they *share* their information with'. We use UCINet and Keyplayer software programs to undertake social network analysis (Borgatti and Freeman, 2002). These two programs were specifically selected on the basis that they provide a wide range of analysis options, including some of which are unique to this

program, but highly relevant to the questions posed in this study (e.g. multiple cohesion measures). For a more detailed outline of social networks and the method for data capture and analysis see Borgatti et al. (2013).

Responses from the interviews were used to create affiliation and attribute data which included name, gender, location and association (e.g. employment, community organisation memberships). All of the entities identified through the interviews (i.e. individuals, websites, media, etc) were placed into symmetric matrices and analysed for a number of specific features. We calculated values for network cohesion which included average degree (the average number of ties attributed to each node), average distance (average geodesic distance amongst reachable pairs), closure (measure of the completeness of relational triads), components (number of cliques), density (number of ties divided by the maximum number possible), diameter (length of the longest geodesic across the network) and fragmentation (proportion of pairs of nodes that are unreachable). For a brief explanation of the network cohesion measures see Table 1.

Table 1: Description of network cohesion measures

Network cohesion measure	Brief description
Average degree	The average number of ties attributed to each node
Average distance	The average geodesic distance amongst reachable pairs
Closure	Measure of the completeness of relational triads
Components	The number of cliques
Density	The number of ties divided by the maximum number possible
Diameter	The length of the longest geodesic across the network
Fragmentation	The proportion of pairs of nodes that are unreachable

These measures were selected specifically due to the research question and design. For example, social networks with higher levels of cohesion mean that nodes within the network are more connected to each other. Higher cohesion in a social network would mean that it would be easier for knowledge to flow through the community. The social network visualisation tool NETDRAW was used to develop socio-grams based on the original social network and group composition network matrices resulting from the UCINet analysis. For the purpose of reporting, the layout of the figures is constrained by Euclidian distance, with the more central nodes being located at the centre of the image.

The qualitative component of the research was used to elicit the experiences and perceptions of the key stakeholders to improve knowledge and inform policy design for climate change adaptation. In doing so, we investigated community perceptions about climate change and determined the community's major concerns and information needs to enhance their capacity to adapt to a changing climate. We used a snow-ball sampling technique to recruit participants and ensure the most appropriate people were identified for interviews. Our initial scoping phase involved a desk top review of the region to identify a cross section of the community to ensure we had representation from a mix of stakeholders that cut across government, industry, non-government organisations and the broader community. In total, 31 interviews were conducted between October and November 2014. All interviews were audio recorded, transcribed, and imported into NVivo for coding and analysis. Our approach to coding was predominately inductive (see for example Glaser and Strauss, 1967). Pre-coding was used to become familiar with the transcripts and identify potentially important segments of text (Layder, 1998). We then adopted an open-coding strategy to extract as many themes as possible. The themes were checked for overlap and duplication before further refinement. Interviews were conducted by the first and second authors, with the first author completing all coding and qualitative analysis. The quantitative data collection was undertaken as a distinctive sub-component of the semi-structured interviews, with specific questioning at the end of each interview.

A demographic breakdown of participants can be seen in Table 2. Of the 31 interviews conducted, 29 participants contributed directly to the SNA quantitative component. In broad terms the interviews explored:

i. perceptions of climate change and adaptation;
ii. community concerns and personal experiences;
iii. roles and responsibility for adaptation policy;
iv. adequacy and usefulness of information and community engagement processes;
v. types of information that interests people the most; and
vi. potential changes people have made to improve liveability and business efficiency under changing climatic conditions.

Table 2: Breakdown of interviewees

Type	Gender	Residency	Network
Local Government	M	< 5 years	Formal
Local Government	F	> 20 years	Formal
Community	M	Between 5-20 years	Informal
Community	F	Between 5-20 years	Informal
NGO	F	< 5 years	Informal
NGO	M	> 20 years	Informal
Community	M	> 20 years	Informal
State Government	M	> 20 years	Formal
Community	F	Between 5-20 years	Informal
Local Government	F	Between 5-20 years	Formal
Local Government	M	> 20 years	Formal
NGO	M	> 20 years	Informal
NGO	F	> 20 years	Informal
NGO	F	Between 5-20 years	Informal
Community	M	> 20 years	Informal
State Government	F	-	Formal
NGO	F	< 5 years	Informal
Community	M	Between 5-20 years	Informal
Community	M	Between 5-20 years	Informal
Community	F	Between 5-20 years	Informal
Community	F	Between 5-20 years	Informal
Community	F	Between 5-20 years	Informal
State Government	M	-	Formal
State Government	M	Between 5-20 years	Formal
Community	F	Between 5-20 years	Informal
NGO	M	Between 5-20 years	Informal
Community	M	> 20 years	Informal
Community	M	Between 5-20 years	Informal
NGO	M	-	Informal
State Government	M	-	Formal
NGO	F	> 20 years	Informal

The study area - Bega Region

The Bega Valley Shire (also known as the Sapphire Coast) is located on the south coast of New South Wales, Australia (see Figure 1). The region is located approximately 350km south of Sydney, 430km north-east of Melbourne and 170km south-east of Canberra (Bega Valley Shire Council, undated-a).
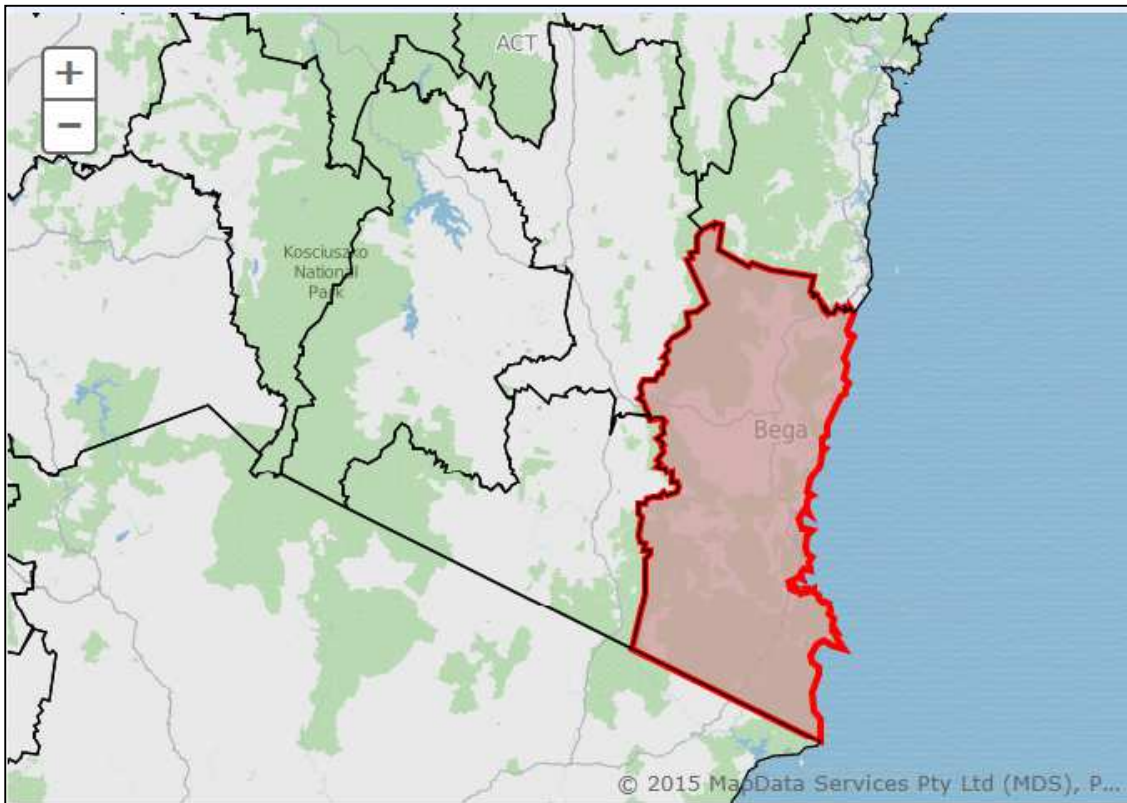
Figure 1: Bega Valley LGA
Source: ABS 2014

The region is home to the Yuin-Monaro people, with the term Bega being a derivative of the local Aboriginal term for 'big camping ground' (Wikipedia, 2015b). European settlement in the region dates from 1830s with the land being used primarily for beef and dairy cattle as well as sheep farming and whaling in coastal areas (Bega Valley Shire Council, undated-b). By the 1860s, dairy had become the primary industry, and the coastal town of Tathra was used as the primary port (Bega Valley Shire Council, undated-b). Today, the region remains a primary dairy producer, with Bega Cheese, manufactured by the Bega Cooperative Society Limited, being disturbed across Australia and worldwide. Almost 75% of the shire's 6277km^2 is protected National Park or State Forest (Bega Valley Shire Council, undated-c; Wikipedia, 2015a). The Bega region has the longest

coastline of any local government area in NSW (Wikipedia, 2015a). Table 3 provides a brief overview of some of the regions characteristics.

Population (2012)	33, 259
Median Age	48.8
Area	6,277km^2
Towns	Bega, Eden, Merimbula, Tura Beach, Wolumla, Cobargo, Bemboka, Pambula, Pambula Beach, Tathra and Towamba
Villages	Bemboka, Cobargo, Candelo, Wyndham, Quaama, Wolumla, Pambula Beach
Coastline	225km
Land use	Conservation, timber production, agriculture (particularly dairy farming), fishing, oyster harvesting, tourism and retail.

In 2012, the estimated residential population for the Bega region was 33, 259 with a population density of 0.05 persons per hectare (ABS, 2014). Analysis of the service age groups indicates that the Bega region had a lower proportion of pre-schoolers and a higher proportion of persons at post retirement age compared to regional NSW in 2011 (see Figures 2 and 3) (Bega Valley Shire Council, 2011).

Babies and pre-schoolers (0 to 4)

Primary schoolers (5 to 11)

Secondary schoolers (12 to 17)

Tertiary education and independence (18 to 24)

Young workforce (25 to 34)

Parents and homebuilders (35 to 49)

Older workers and pre-retirees (50 to 59)

Empty nesters and retirees (60 to 69)

Seniors (70 to 84)

Elderly aged (85 and over)
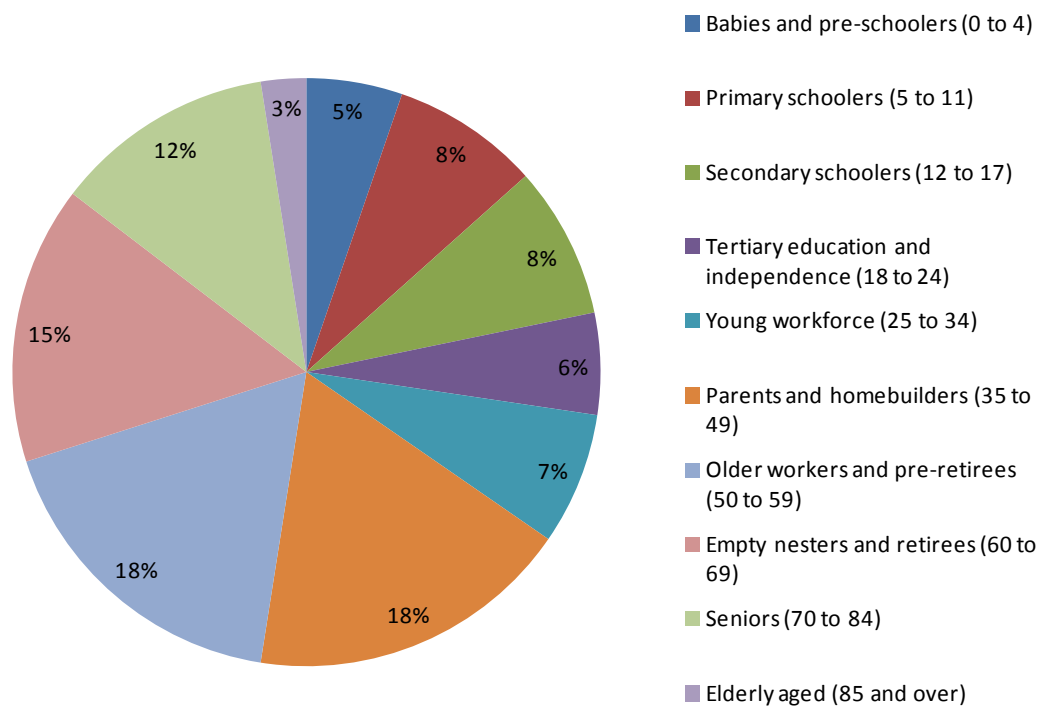
Figure 2: Service Age Groups - Bega Region
Source: Bega Valley Shire Council 2011

Babies and pre-schoolers (0 to 4)

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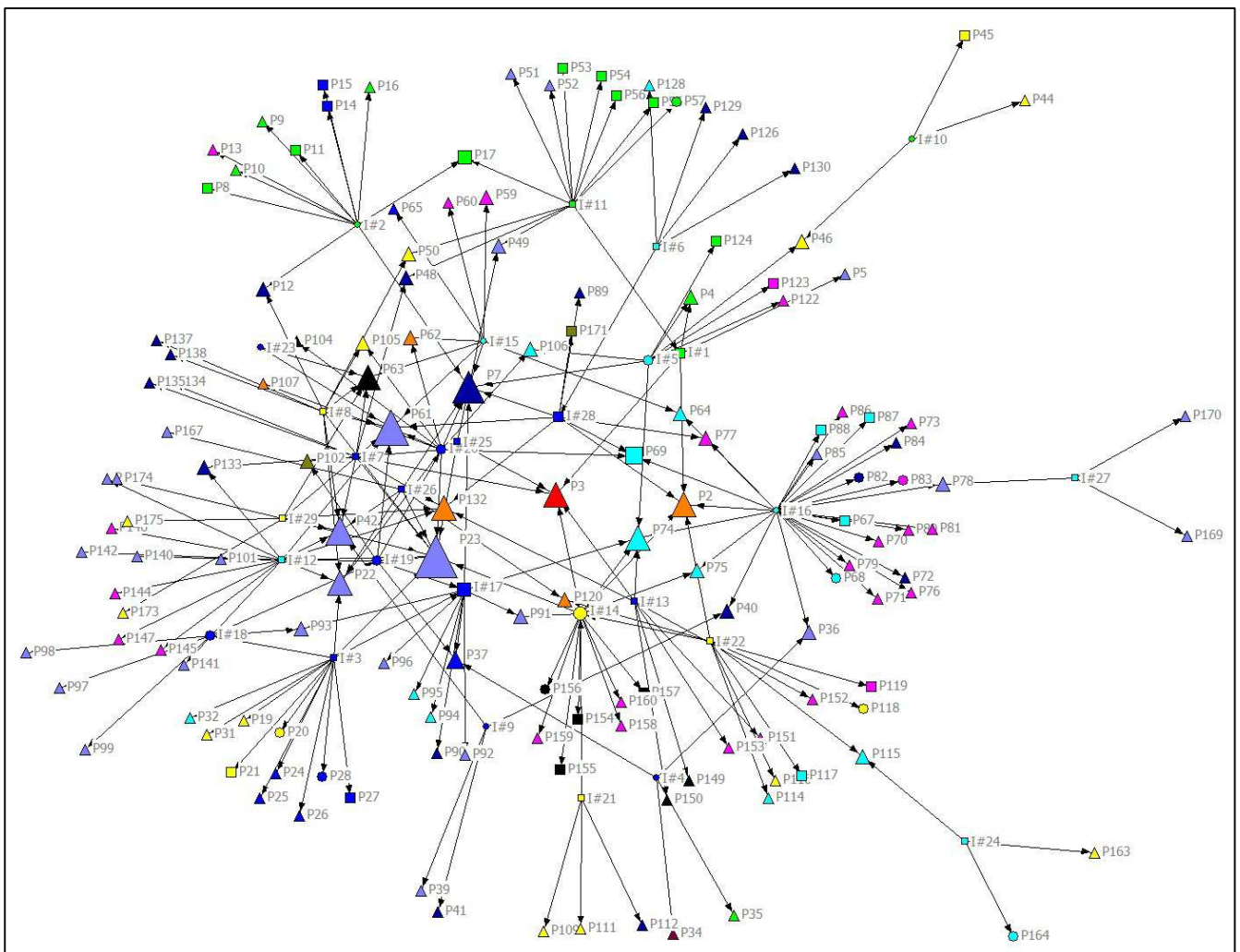
Empty nesters and retirees (60 to 69)

Seniors (70 to 84)
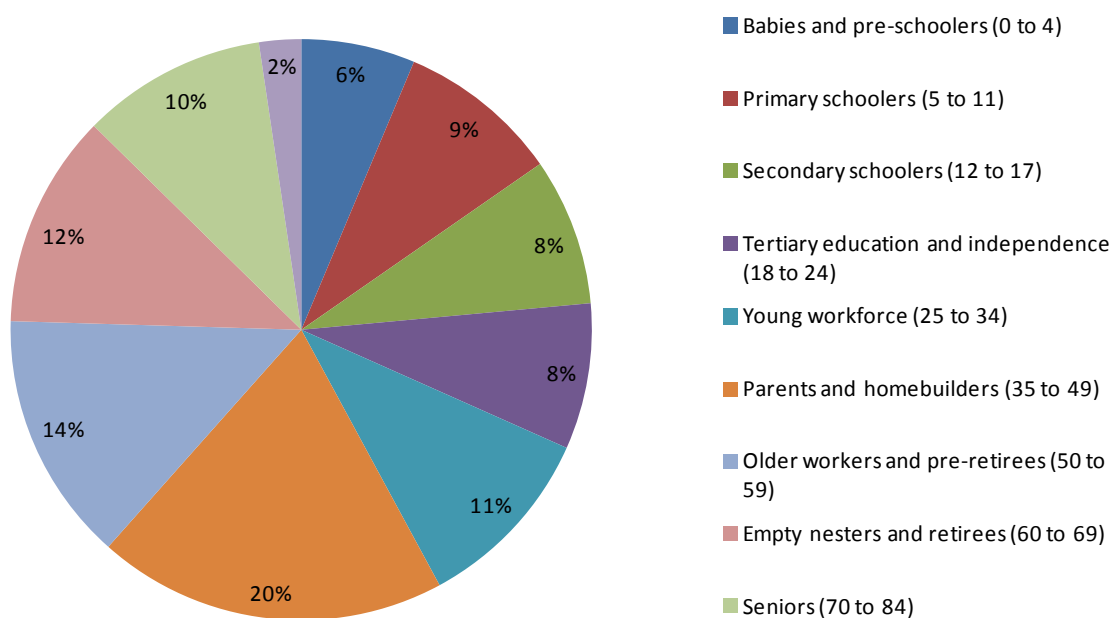
Figure 3: Service Age Groups - Regional NSW
Source: Bega Valley Shire Council 2011

3 Findings from the quantitative SNA

Accessing climate information

In total, the 29 participants interviewed in this study reported a total of 175 entities from which they obtained their climate adaptation information (inclusive of the participants themselves). Of these, 1 was an international entity, 44 were government entities (either local, state or federal), 24 non-government organisations (NGOs), 22 community based organisations (CBOs), 28 mass media entities (e.g., tv, radio, newspaper), 19 mass communication channels (e.g., internet, mobile), 26 social media outlets, 8 research organisations, and 3 other entities, such as individual community members. Figure 4 shows the entire climate information *access* network. Nodes are coded for affiliation by colour and for degree by size, as described in the legend below.

Figure 4: Bega network: Where do you access your climate information?

Legend		
Node shape denotes gender:		
Female = Circle	*Male =Square*	*Not applicable = Triangle.*
Node size denotes popularity or the number of times the node was mentioned by other participants:		
Small node = less mentioned	*Large node = most mentioned.*	*Small node = less mentioned*
Node colour denotes the type of org:		
International = red	*Federal Government = orange*	*State Government = yellow*
Local Government = green	*NGO = light blue*	*Community Based Organisation = blue*
Mass Media (tv, radio) = indigo	*Mass Communication Channels (internet, mobile sms) = violet*	*Social Media = magenta*
Research Centre = black	*Individual = kaki*	*Other = deep burgundy*

When analysing the cohesion of this network, the average degree of each node was 1.320, with an average distance or reach for each node was 1.392. This means that on average, each node had ties to 1.3 alternate nodes, and through these connections could reach up to a further 1.4 nodes. There were 175 components and 0.989 fragmentation in this network which had a diameter of 4 (diameter meaning that it took only 4 nodes to make a path through the network) with a degree of closure of 0.63 (for full cohesion measures please see Table 4).

Table 4: Full Cohesion measures Bega network: Where do you access your climate information?

Avg Degree	1.320
H-Index	5
Density	0.008
Components	175
Component Ratio	1
Connectedness	0.011
Fragmentation	0.989
Closure	0.063
Avg Distance	1.392
SD Distance	0.681
Diameter	4
Breadth	0.991
Compactness	0.009

Further exploration of the data through Keyplayer demonstrated there were 3 key nodes in each scenario as outlined in Tables 5 and 7. The key nodes were #2 – (the CSIRO), #7 – (the internet), and #23 (ABC news). This analysis indicates that although individuals may gather information from other sources such as personal weather stations, websites, reports, and other mass media devices, the three key nodes #2, 7 and 23 could reach the vast majority of the network with a reach of 77.7%.

Table 5: Keyplayer findings: Where do you access your climate information?

2	CSIRO
7	Internet
23	ABC News
No. of distinct persons reached by the key players: 136 (77.7% of network)	

Disseminating climate information

As well as accessing climate information from a diverse range of sources, participants also disseminated their knowledge broadly, primarily sharing information within their local professional and often geographical group.

The 29 participants reported a total of 209 entities with which they shared climate information (inclusive of participants themselves). Of these, 47 were federal, state or local government entities, 51 were NGOs, 77 were CBOs and members, 9 were mass media (e.g., tv, radio, newspaper), 1 was a mass communication channel (e.g., internet, mobile), 8 were social media, and 1 was a research centre. In comparison to the network relating to the access of information, there were no international entities identified in this part of the research. In addition, there were 16 other entities, such as individuals, friends, and neighbours. Figure 5 shows the entire climate information *disseminating* network. Nodes are coded for affiliation by colour and for degree by size.
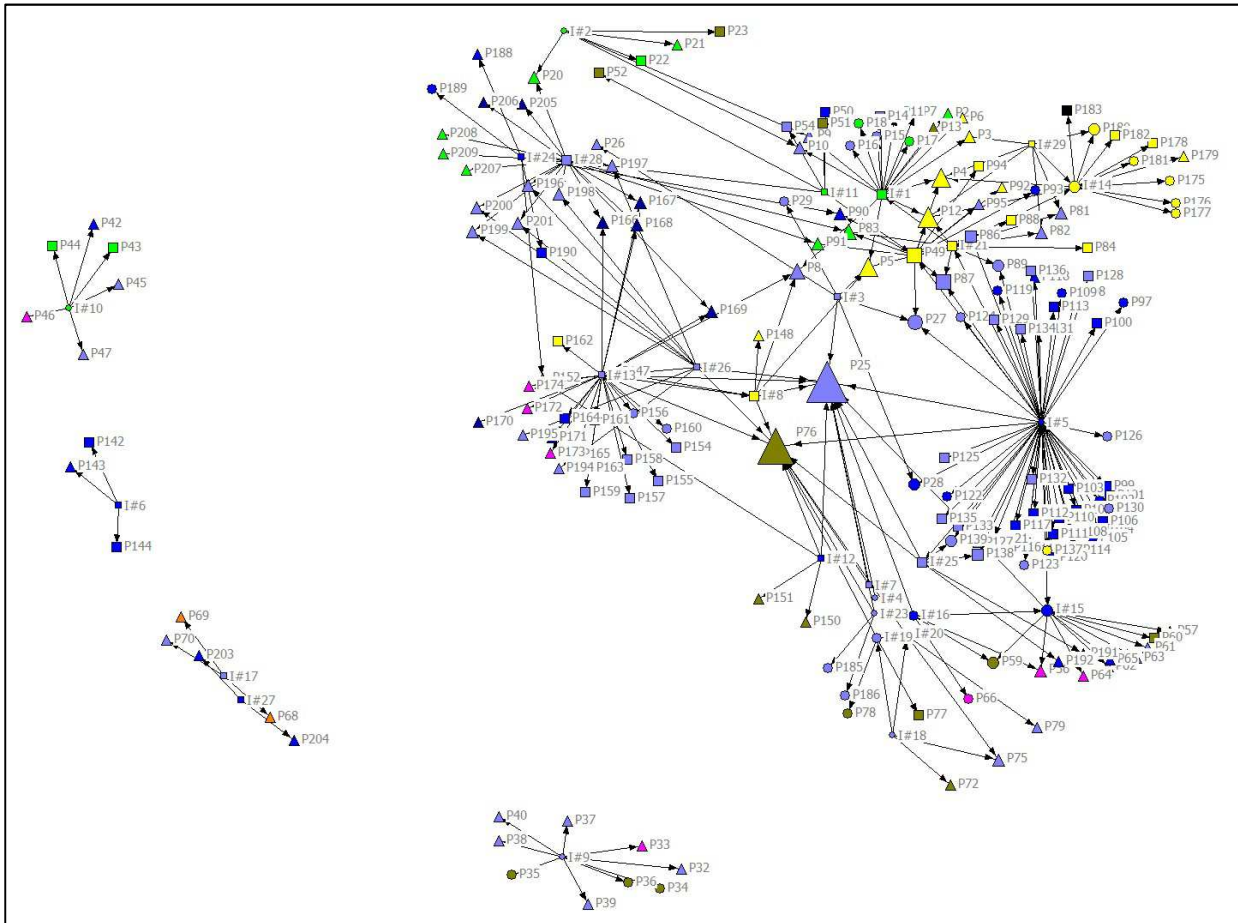
Figure 5: Bega network: Who do you share climate information with?

Legend		
Node shape denotes gender:		
Female = Circle	Male =Square	Not applicable = Triangle.
Node size denotes popularity or the number of times the node was mentioned by other participants:		
Small node = less mentioned	Large node = most mentioned.	Small node = less mentioned
Node colour denotes the type of org:		
International = red	Federal Government = orange	State Government = yellow
Local Government = green	NGO = light blue	Community Based Organisation = blue
Mass Media (tv, radio) = indigo	Mass Communication Channels (internet, mobile sms) = violet	Social Media = magenta
Research Centre = black	Individual = kaki	

When analysing the cohesion of this network, the average degree of each node was 1.257, with an average distance or reach for each node of 1.398. This network was more fractious compared to the information access network (Figure 4) having 209 components with a fragmentation factor of 0.991. The main component had a diameter of 3 with a degree of closure of 0.213 (for full cohesion measures please see Table 6).

Table 6: Full Cohesion measures Bega network: Who do you share climate information with?

Avg Degree	1.257
H-Index	4
Density	0.006
Components	209
Component Ratio	0.995
Connectedness	0.009
Fragmentation	0.991
Closure	0.213
Avg Distance	1.398
SD Distance	0.600
Diameter	3
Breadth	0.993
Compactness	0.007

Keyplayer analysis demonstrated 3 key nodes were the most effective in disseminating climate information: #25 – (friends), #53 – (Interviewee #28 an active member of a community based organisation), and node #80 (Interviewee #21). These key nodes with the longest reach communicated information to both government and community based organisations (Table 7).

Table 7: Keyplayer findings: Where do you share your climate information?

25	Friends
53	Interviewee #28 – active member of community based organisation
80	Interviewee #21 – state government (LLS staff member)
No. of distinct persons reached by the key players: 167 (79.5% of network)	

In sum, the SNA revealed that individuals *accessed* (primarily formal) and *shared* (primarily informal) climate change information from a range of sources.

4   Observations from interviews

While the preceding section of this report identified the knowledge networks in Bega in relation to climate policy, this section represents an analysis of the main themes or issues that emerged as a result of coding the data from the 31 interview transcripts. In particular, this section represents the views and experiences of the key participants in relation to their major concerns and information needs in the context of climate change adaptation. This section complements the quantitative results by adding further insight into how participants in the Bega community perceive and respond to climate change. The research team's interpretation of the implications of these themes along with the SNA is presented in section 5. Appendix A provides a more detailed overview of the themes and quotes from the interviews.

4.1   Mitigation versus adaptation

Interviewees were asked to comment on their understanding of climate change and adaptation. The vast majority of interviewees spoke about pollutants and the need to mitigate greenhouse gas (GHG) emissions as opposed to efforts to adapt to changing climatic conditions. This parallels findings in the academic literature which found that householders were unable to distinguish between mitigation and adaptation (van Kasteren, 2014). Participants who were directly engaged in climate adaptation planning or policy initiatives were exceptions, though, being more explicit about climate change adaptation and the pressing need to adapt to changing environmental conditions. There are several potential reasons why participants focused more on mitigation as opposed to adaptation. Firstly, the Bega region has had a history of local initiatives that seek to manage GHG emissions. In particularly, the 'clean air for eternity' initiative which aims to "help the community understand the challenges of climate change and global warming, and to provide information and support to encourage grass roots action in response to the global crisis..."(Clean Energy for Eternity, 2015). Indeed, this initiative parallels the 'think global act local' phrase in academic literature which supports grass roots activism in various policy context including environmental matters such as climate change (Collier and Lofstedt, 1997). In this particular instance, the 'clean air for eternity' initiative, through voluntary networks, was able to mobilise a large portion of the community to raise awareness and invest in renewable energy and adopt local targets of 50% energy reduction and 50% renewable energy by 2020.

Secondly, climate adaptation is perhaps less tangible and not as easily defined as mitigation and thus people in the community often reverted to mitigation because they felt most comfortable talking about this topic. As one interview participant expressed:

> *I think that's one of the big problems that for a lot of people, because it's not immediate they can't see a cause and effect. (Community-Informal)*

Indeed, recent research in Australia has also found that stakeholders involved in adaptation policy "do not always have a shared view about the meaning and purpose of adaptation despite the fact that a shared understanding is commonly assumed in adaptation processes" (Fuenfgeld and McEvoy, 2014, p. 603). When participants were asked about who they think should be responsible for adaptation policy, the majority of interviewees expressed the need for greater responsibility at the federal level. While the literature suggest that adaptation is predominately a local problem given the impacts will be experienced at this scale (Harman et al., 2015; Taylor et al., 2013; van Kasteren, 2014), the focus on greater national-level responsibility and involvement was perhaps due to the focus on mitigation.

4.2   Autonomous and planned adaptation

Despite the absence of any explicit climate adaptation policies, famers are already responding to localised manifestations of climate variability and emerging climate risks in the Bega region. While many don't acknowledge thinking about climate change explicitly, there were suggestions and indications that many in the region were implicitly adapting to climate change through modified business and management practices. As one State Government interviewee noted:

> *A lot of what we do personally on our farm and a lot of what we espouse through work is almost not addressing climate change directly, but all the practices we espouse are arming people for adaptation to climate change, whether it be water use efficiency in irrigation or shelter belts in shade. Now that we've got DPI with us a little bit more work on better pasture species to deal with climate variability. (State Government-Formal)*

These changed management practices however, are predominately motivated by economic efficiency and increased profitability at the farm level. For example, improvements in water use efficiency for irrigation and shelter sheds for cattle for improved milk supply generate both an economic return for farmers and also better equip them for climate change. As such, in many cases, farmers perhaps don't even realise that they are in fact adapting to climate change. While

many of these types of measures are typically ad hoc or reactive, there is also evidence in the region of more conscious decisions in the context of planned adaptation within industry. For example, there is evidence within the oyster industry that some have adjusted their management practices to manage not only current risks, whether they believe in climate change or not, but have also made more conscious decisions about managing future risks such as increased likelihood of extreme heat days which under the right conditions can be catastrophic for oysters and the industry more broadly. Indeed, there is significant evidence to suggest that climate change is a significant threat to the sustainable supply of seafood (Lim-Camacho et al., 2015). Outside of the farming community, there was also broad acknowledgement and support for the need for anticipatory adaptation or planned adaptation before critical thresholds are reached. The need for planned adaptation was particularly strong through the formal network where key actors have explicit responsibilities or roles in regards to climate change adaptation planning and policy. While the Bega Valley Shire Council have an active Climate Change Strategy 2013-2017 it became apparent that most people interviewed had not heard of the strategy or were unfamiliar with the content of the strategy.

4.3   Concerns, information needs and challenges

Given its proximity to the coast and the bush there were a number of *concerns* raised by participants in relation to the regions exposure to certain climate change impacts. Bushfire risk was one of the most common concerns raised amongst the interviewees. While the region has not experienced a major bushfire, as have other parts of Australia (e.g. Canberra 2003, Victoria – Black Saturday 2009), there were significant concerns amongst participants in relation to the region's capacity to respond to such extreme events. This concern largely stems from the fact that the community has not explicitly had to deal with such extremes and thus is unable to apply learning from personal experiences which is often considered a central component of learning to adapt (Ojha et al., 2004). Moreover, previous studies have also found that 'those with past experiences of disasters are inclined to see current weather events as influenced by climate change' (Higginbotham et al., 2014, p. 708). The predictions around changing rainfall patterns (i.e. more rainfall in autumn) was noted as a critical barrier to undertaking controlled burning during the normal hazard reduction season - further adding to the risk of more intense bushfires:

> *I guess I've got particular concerns about the predictions that the rainfall patterns are changing and that we'll get more of our rainfall in autumn, which is our HR season, our hazard reduction*

season...we do most of our controlled burning in autumn and if it's going to be wetter it's going to reduce the opportunities to undertake that sort of work. (State Government-Formal)

In addition to the prospect of shifting rainfall patterns there was also concern over reduced rainfall and an increase in drought conditions. While the region already experiences highly variable rainfall conditions, due to its geographic location (i.e. recognised as being in a rain shadow), there were concerns that under climate change conditions rainfall could become even more variable and unpredictable. This was particularly problematic for the farmers in the region who are highly dependent on water for irrigation purposes. In particular, the dairy industry is sensitive to increased heat stress, reduced rainfall and drought conditions. An increased number of extreme heat days was also a concern for the oyster industry. In addition, there was some concern about the potential impacts of ocean acidification on commercial fisheries and the oyster industry that operate in the area. Sea level rise and coastal inundation was also raised by participants as being particularly problematic for certain low lying communities – in particular around Merimbula.

Despite these concerns, it was largely believed that industry, particularly forestry and fisheries, adopts a reactive rather than an anticipatory approach when it comes to managing changing risk profiles associated with the local climate. Perhaps some of the more proactive industries in the region include some oyster farmers and the dairy industry more broadly through the Bega Cheese network which have demonstrated a more proactive approach to managing changing risks. Both fisheries and forestry industry representatives indicated that climate change was not a major factor that influenced their management practices. Instead they tend to focus on short to medium term survival and as such suggested that there were more pressing issues that threatened the viability of their industry, such as loss of social license to operate (fisheries) and declining global markets (forestry):

> *I think there's - I think that we are at risk of losing our social licence...being managed out of existence through very tough arrangements and costs and levies long before climate change... So I reckon that loss of social licence - will kill us long before climate change does ...(NGO-Informal)*

Indeed, there is a large body of literature that supports these views in terms of the number of social barriers that hinder adaptation, despite the well recognised threat of climate change for industries such as forestry (Vulturius and Swartling, 2015; Higginbotham et al., 2014). In addition, some interviewees suggested that industry, particularly the dairy farmers, were in fact fairly optimistic when it comes to the local weather. The level of optimism stems largely from the legacy

of dealing with significant climate variability in the region. Given the level of optimism there were some suggestions that industry may not be equipped to deal with changing risk profiles under climate change conditions; more specifically, further extremes outside of what they are used to dealing with, such as more frequent and more intense events.

In terms of *information* needs, participants suggested that more balanced but also targeted information was required to enable individuals to make more informed decisions about climate change. As one interviewee stated:

> I think it'd be - they've all heard the story that carbon levels are increasing and that that will lead to warmer temperatures. I suppose they want to know how is that going to impact me, what does that mean for pasture growth, what does it mean for water availability, what does that mean in terms of the future of my cows [that belch out] methane and they're thinking [unclear] what does that actually mean for me and my industry and my farm. [Unclear] by targeted, that's what I mean by targeted. (NGO-Informal)

In addition, there was support for more detailed information on implementable adaptations so that individuals understood their options and the consequences of adopting those specific measures. The socio-economic consequences of adopting specific measures were of particular interest for stakeholders. There was general agreement that less information about the actual science and more tailored information in an understandable format were critical to capture the broader community. This information should be treated as a conversation between key stakeholders involved in the design of adaptation policy and the end users and not just one way information flow. Participants indicated that they are generally interested in information on rainfall predictions, sea level rise and associated inundation impacts and bushfire risk.

In terms of *challenges* for adaptation policy and community engagement in the Bega region, many participants noted the challenging demographics in this particular community. For example, the region was reported by some participants to have an older and more conservative demographic which presented a number of challenges in terms of engagement:

> There are certainly a lot of - maybe it's a generational type thing, we do have quite an older population in this area, they tend to be a bit more cynical about those sorts of things. So that's where I think some good hard facts about the area can really help sway those opinions. (CBO-Informal)

Indeed, analysis of the service age groups indicates that the Bega region had a higher proportion of persons at post retirement age compared to regional NSW in 2011 (see Figures 2 and 3) (Bega

Valley Shire Council, 2011). According to many interviewees, the region has a high percentage of retired people that are not overly concerned about climate change. This parallels findings from recent research by Lil-Camacho et al. (2014) who also found that the older demographic, particular males, either did not believe in climate change or believed it to be a natural phenomenon. In general, people just don't know what they can do at an individual level and they don't see how their actions will make a difference. According to one interviewee, there is currently not a great connection between academia and the broader community. Overall there was a belief that the older demographic were less likely to believe in climate change and thus support any policies or practices around adaptation. In many cases, it was thought that people felt distanced and powerless around climate change. This finding also parallels academic literature which also suggests people often think about climate change as being a long term global problem in which they have limited ability to influence the outcome at an individual level (Spence et al., 2011; O'Neill and Nicholson-Cole, 2009). Interestingly, the older demographic are among the most vulnerable to climate change (Astrom et al., 2015; Carnes et al., 2014).

Given the age profile and the general lack of enthusiasm it was felt that there were not many conversations around climate change. There was also suggestion that the current lack of political leadership across all scales on the climate change issue was seen as a major challenge for local community buy-in. This lack of commitment has led to a certain level of distrust in government and climate change. There was also a belief that government, through cost saving measures, were pulling out of agricultural extension services which is restricting dialogue between government and industry professionals. Lastly, the benefits of adapting to climate change now may not be experienced of felt for many years or decades. The challenge will be to frame adaptation in a way that encourages greater adoption and uptake across the community. Such an approach will need to focus on generating win-win benefits across other domains and areas of interest.

4.4   Framing climate adaptation

As previously identified, not everyone in the region thinks about climate change or the management of its impacts. This was particularly evident within the farming, fishing and forestry sectors which are more concerned about the short to medium term drivers of change. An exception was provided by some dairy farmers who participate in industry led environmental management programs. For the interviewees representing these sectors that did believe in the

science around climate change they typically felt that it was a long term problem that did not have any immediate effects on their respective businesses. This issue along with the abovementioned challenges suggest how important it is to frame adaptation in light of a particular community's beliefs and perceptions of climate change. For industry, they are used to dealing with climate variability and reacting to short term challenges, and don't necessarily subscribe to climate change as bringing a new set of risks or challenges to the region. As such, there was belief that you are more likely to engage the broader farming community if the language is about managing variability or extremes in the context of analysing the social and economic implications of not implementing plans or strategies to alleviate these risks accordingly. Consequently, there was considerable attention given to the prospect of industry adapting to certain drivers of change provided their actions had immediate social and economic benefits. As one interview participant noted:

> *... we sold it under the umbrella of - you're giving medicine in sweet-covered pills because we're saying this is really important...We're almost disguising it in this project about productivity and efficiency gains, helping them become more profitable because that gets their attention. If I just went out there and I said we're going talk, we're going to do a seminar on climate change; I'd hardly have anyone turn up. But if I went out there and said we're going to have seminar on how we're going to improve your resource efficiency and how you're going to get more productive and more profitable, I'll get a lot more interest because they go yeah, well that impacts me, I want to be more profitable (NGO-Informal)*

As such, it was suggested that policies should focus on this framing issue and where possible create win-win or no-regrets policies which have multiple benefits across both spatial and temporal scales. No-regret actions are considered to be cost effective measures that 'yield benefits even in the absence of climate change' (Hallegatte, 2009). Win-win measures contribute to climate adaptation as well as provide a range of other social, economic and environmental policy benefits (Viguié and Hallegatte, 2012). For example, improving water efficiency can help to alleviate drought risk (e.g. changing risk profiles under climate change conditions), improve economic returns through reduced demand on water supplies, and contribute to mitigation of GHG emissions through reduced energy demand to treat water. This can be achieved through both behavioural changes (e.g. education programs) and the adoption of water saving devices (technological advancements).

5 Key insights and policy implications

In this study we find that participants *access* climate information from a variety of sources, including social media, mass media, state government and research centres. While a variety of sources are used to access climate information, Keyplayer revealed that the three key nodes #2, #7 and #23 could reach the vast majority of the network with a reach of 77.7%. The three key nodes included a national research organisation (CSIRO), a national television station (ABC News) and the internet[1] as key places where participants access climate information. In comparison, the network depicting the extent to which participants *share* climate information was more dispersed, and primarily sharing with both family and friends through informal networks. This analysis indicates that although individuals may share to varying degrees both in person and via email lists, websites and social media, three nodes #25, # 53 and #80 could reach almost the entire network with a reach of 79.5%. Both of these interviewees (#53 and #80) are active members of community-based organisations and are intensely embedded within their community, with one having a formal role in a state organisation (Local Land Services, LLS). The vulnerability of this network is that if the nodes #53 and #80 were removed (e.g., moved away, or ceased to perform their roles), this network may fragment significantly. Indeed, local professionals who are active in rallying community based support for environmental matters can also act as champions within knowledge networks. For example, this has been demonstrated in previous attempts to mobilise community involvement in climate mitigation related initiatives.

Key to this case study is the flow of information from the state government, through departments that communicate both to the local government, industry and community-based organisations. Within this case study, the LLS played this important role. This is consistent with the intent of the South East LLS which is to 'delivers quality, customer-focussed services to farmers, landholders and the community across rural and regional New South Wales. South East LLS bring together agricultural production advice, biosecurity, natural resource management and emergency

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[1] The internet was mentioned as a source of information generally as well as specific site such as the Bureau of Meteorology, CSIRO, ABC News, and Google. This is a limitation as not a specific website was mentioned and it is more generic – just as at times participants mentioned 'family' and 'friends' rather than individuals. However, the results still demonstrate that people are using a variety of means (e.g., individuals, media, print, online and social media) in order to both access and share climate information. Where people mentioned specific websites, these were included in the SNA as individual nodes.

management into a single organisation'(New South Wales Government, undated-a). This study also revealed that information flows freely within the dairy industry largely due to the cooperative nature of Bega Cheese and the dedicated roles and responsibilities within state government, in particular LLS. There was some recognition of the benefits and value of adopting these types of cooperative approaches outside of the dairy network such as the 'Farmers Network'. The purpose of this network is to communicate relevant farming information to local farmers. Although this network did not feature significantly within this round of SNA, for this particular industry, it would be of note to include this network in future information sharing strategies in the region. Finally, the oyster industry, although it has a peak body (also newly formed) appears to have far more dispersed communication channels. Figure 6 depicts a simplified illustration of information flow in Bega.
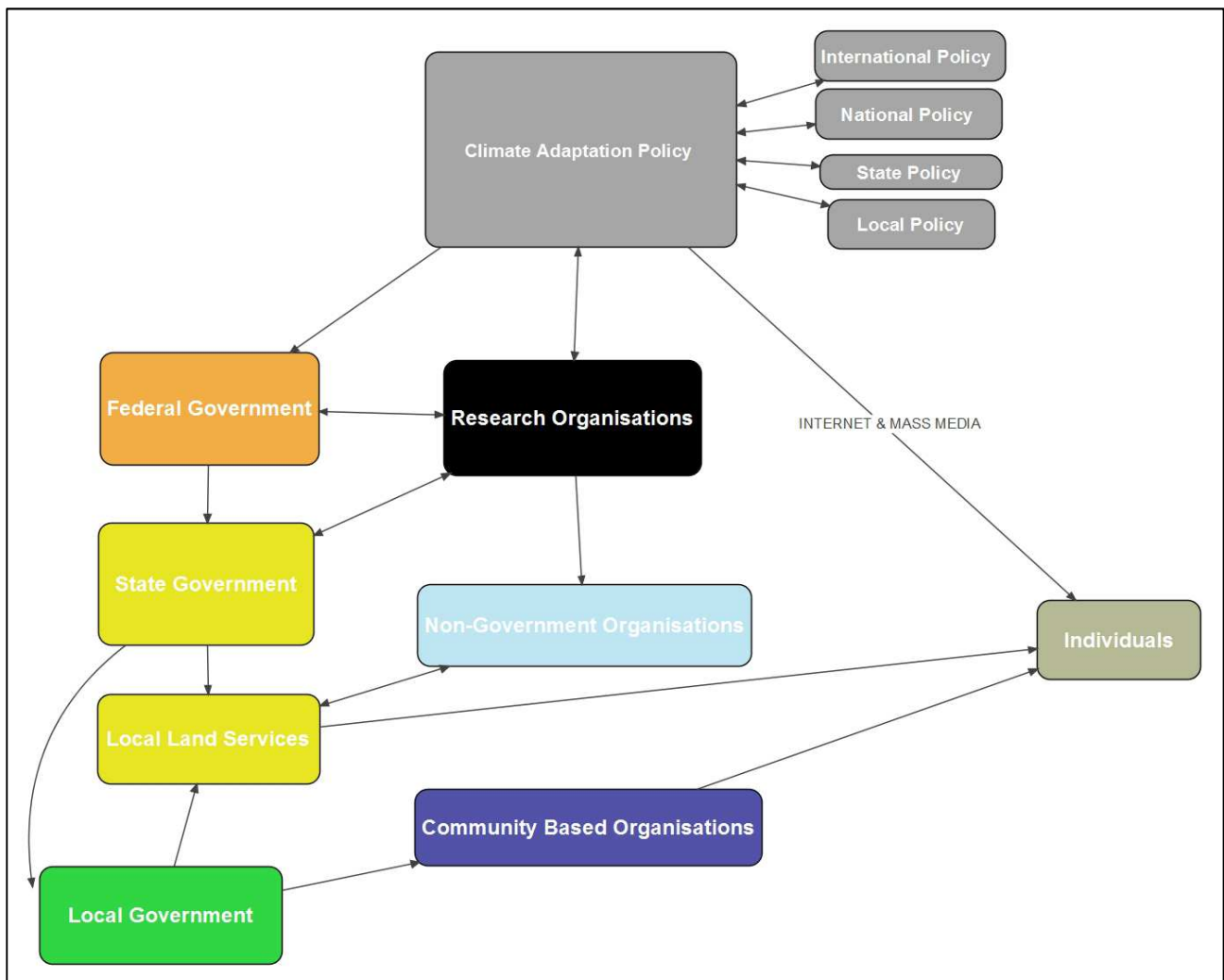

Figure 6: Simplified knowledge flow in Bega

By examining both the *access* and *share* knowledge networks the components of a knowledge system are revealed. Key to the distribution of policy information within this case study would be to insert information into state and local government channels as well as to local community based organisations. To allow for greatest access, information would also need to be disseminated through mass media (e.g., ABC news). Moreover, within this case study, there may be benefit to include social media as a communication strategy. Information should target areas of most importance to this network as outlined above. This information needs to be tailored and pitched at a level that is easily communicated and understood by the broader community. As such, efforts to communicate and engage the Bega community on climate adaptation should take into account the particular concerns, information needs and challenges as outlined above. In particular, planners and policy makers should have regard to how information is conveyed given the challenging demographic and socio-economic profile of this community. Tailoring information based on the findings of this report will help encourage broader dissemination and uptake of climate adaptation policies and practices across different sectors and scales of the community. In doing so, there may be scope to develop a series of sector based briefing notes where adaptation is communicated based on discrete information needs and concerns. In the mapped network, this information should target both Local Land Services with dedicated roles in environmental management and through CBO which act as key climate change champions within the community.

6 Conclusions and future research

Climate change adaptation is an important yet challenging task. In particular, community engagement remains a significant challenge for planners and policy makers. However, communities are not homogenous and perceptions of risk vary between and within communities. Indeed, recent research has highlighted the differences in people's perceptions of climate change adaptation and risk in Australia (Higginbotham et al., 2014). The authors also found that climate adaptation can be 'advanced through targeted place based information that make the most sense to those living locally (Higginbotham et al., 2014, p. 710). As such, understanding a particular community's needs and preferences is critical to informing the design of climate adaptation policy. This is important in the context of broadening the scope and potential uptake of policies and practices that seek to deal with climate change adaptation both implicitly and explicitly. By using social network analysis (SNA) we explored the social structures around this particular topic. In sum, analysis of the SNA revealed that individuals sought and shared climate adaptation information from a range of sources, participants reported primarily seeking information from formal sources and sharing through informal channels. The findings of the SNA also suggest that boundary spanners within the network are well connected at multiple levels through the network and may act as knowledge champions. The importance of boundary spanners within knowledge networks was evident in both the Shoalhaven and Bega case studies. However, both case studies also highlight how highly vulnerable the knowledge dissemination networks are to change. The relative influence of individuals versus specific roles in knowledge dissemination networks and the broader implications of fragmentation in the context of climate adaptation policy remain largely untested.

Complementing the quantitative analysis with qualitative research has brought to light findings that couldn't have been inferred from the quantitative analysis alone, such as the fact that much of the adaptation in the region is classed as autonomous rather than planned, and represents informal or 'no regrets' actions. Furthermore, insights from the qualitative data suggest that climate mitigation is more widely communicated or at least understood in the region compared to climate change adaptation. The findings also suggest that while adaptation is not widely talked about within the community, there is evidence of both autonomous and planned adaptation efforts that cut across all sectors and scales of the Bega community. Major concerns for

participants in the region included increased bushfire risk, reduced rainfall (in a region that already suffers from significant rainfall variability), coastal flooding and inundation as a result of sea level rise and storm surge, and ocean acidification. Many interviewees noted their willingness to participate in adaptation but were unsure of what they could do as an individual to make a difference. As such, adaptation efforts should focus on how individuals within the community can implement strategies to better prepare themselves for changing climate profiles. However, given the diverse views, interests and values, these messages need to be framed in a way that people can relate to most and where possible create win-win solutions. Future research should focus on ways of scaling up SNA through more cost/time-effective ways to collect data. There may also be scope to investigate the relative influence or importance of roles versus individuals in knowledge networks by using a longitudinal case study approach. Moreover, there would be benefit in doing a comparative case study analysis using a typology of cases. For example, in this project we analysed two coastal towns in NSW – future research should also compare inland communities to determine if there are any discrete similarities or differences.

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8 Appendix

Theme	Examples
1. **Mitigation v adaptation** Climate change mitigation more of a focus than adaptation in the region	*I think that's one of the big problems that for a lot of people, because it's not immediate they can't see a cause and effect. (Community-Informal)* *That's one of my arguments is that climate change creates such minute and imperceptible changes to an individual observer. There's a guy that wrote a letter to the paper recently, to one of the local papers saying that his family have been farming in the Bega Valley for three generations and he hasn't noticed it getting any hotter. I'm thinking well over three generations we're 0.8 degrees hotter so how on earth are you going to notice that? So on an individual level climate change makes minute and imperceptible changes and that's why - it's the same as sea level out there. (Community-Informal)* *I still think Australia's miniscule contribution is just overwhelmed by what China and some of the others are going to do. That's one of the worried I think. Why flog ourselves, why compromise our standard of living too much if there's no...(NGO-Informal)* *It will always be an issue for the average punter to understand - hence why I think fires get such traction - it's visionally stunning. It's on the news. People understand when things get dry, things burn. There's not that big link when you talk coastal hazards if someone hasn't seen a large south coast low or storm surge come through. They don't get it until the day it happens and then - whereas bushfires, it's [unclear]. (Local Government-Formal)* *Absolutely. Our communication around climate change is overwhelmingly issues based. It's based on quantifiable predictions, likely outcomes, sources of the problem and so people are being inundated with a message of climate change is a thing, climate change is a thing, climate change is a thing. But there's not a great message of - there's not even, necessarily, great capacity from our leaders to be able to implement change. So we're not actually providing people with action based messages about climate change. (State Government-Formal)*
2. **Autonomous and planned adaptation** While climate change not widely acknowledged in the community, there is evidence of both autonomous and planned adaptation efforts	*Well first of all it needs to be anticipatory. Unfortunately the classic problem with humans and climate change is the fact that we've just been happily sitting in that pot of water as it gradually, gradually warms. We need to start undertaking actions in expectation of the need to adapt so that by the time that that extreme has been realised, or that particular threshold has been reached we're already actively adapting. (State Government-Formal)* *So that to us indicated that one of two things was possible. Either the posts that we'd put in to support these oysters had sunk and therefore the oysters were lower and that was why the mud worm was there, or the second possibility is that the level of the water in the estuary was such that we weren't getting the oysters dried out as often and that was because of a rising ocean level. So impossible for us to know which one of those two scenarios was the reason but our response to it has been to build ourselves a little post-riser which raises each post by four-and-a-half centimetres. Basically 80 per cent of our posts in the estuary have now been raised or if they're more recent posts then they've just been put in at a higher height.(NGO-Informal)* *... that's our initial farming practice to deal with climate change and the second thing that we've done and just completed very recently is a system of irrigating. (NGO-Informal).* *A lot of what we do personally on our farm and a lot of what we espouse*

		through work is almost not addressing climate change directly, but all the practices we espouse are arming people for adaptation to climate change, whether it be water use efficiency in irrigation or shelter belts in shade. Now that we've got DPI with us a little bit more work on better pasture species to deal with climate variability. (State Government-Formal)
		But in terms of my general - I believe the science obviously. I think part of the problem is that the conservative Australian Government who a lot of mainstream farmers vote for has a pretty successful obstructionist viewpoint in terms of climate change and what it means, like carbon tax and all this stuff. But the fact is a lot of what farmers do to increase their profitability will better arm them for climate change. (State Government-Formal)
		The program I work on in terms of BEMS is the demand for things like shade and shelter and water efficiency is unquenchable, so regardless of whether they believe in climate change, they can't get enough of practices that will help them handle it better anyway.(State Government-Formal)
3. Concerns, information needs and challenges Major concerns for participants in the region included increased bushfire risk, reduced rainfall (in a region that already suffers from significant rainfall variability), coastal flooding and inundation as a result of sea level rise and storm surge, and ocean acidification. Information should be tailored and pitched at a level that is easily communicated and understood by the broader community.	<u>Concerns:</u> *Definitely bushfires. But I also think areas like Fishpen and Merimbula, they're looking at inundation problems, but I don't know that the people who live there realise it. I know somebody the other day said to me, what do you think about Fishpen, and I said, you're going to get wet feet. (CBO-Informal)* *I guess I've got particular concerns about the predictions that the rainfall patterns are changing and that we'll get more of our rainfall in autumn, which is our HR season, our hazard reduction season...we do most of our controlled burning in autumn and if it's going to be wetter it's going to reduce the opportunities to undertake that sort of work. (State Government-Formal)* *We lived in the Adelaide Hills during the 1980 fires and there it jumped four-lane freeways. People can't comprehend that. So clearing a little strip round your block is not going to do anything. So yeah I see that as a big concern and we assume that as the weather gets hotter it's going to increase the risk of those catastrophic days. People are perhaps focusing too much on assuming that fire can be controlled. In those catastrophic conditions it can't be. (CBO-Informal)* *Rainfall events, in the Bega Valley in particular, have always been fairly variable because of the nature of where we are. If it's going to become even more variable, that makes things like water policy really important and water storage really important. (NGO-Informal)* *We're very vulnerable to climate change in the southeast. In Bega we're a rural community, we're very dependent on the dairy industry. The dairy industry is very dependent on good water supply and climate change threatens with variability in rainfall. We're looking at a drying trend in the southeast which is going to have a big impact on our farming community. (CBO-Informal)* <u>Information needs:</u> *I think it'd be - they've all heard the story that carbon levels are increasing and that that will lead to warmer temperatures. I suppose they want to know how is that going to impact me, what does that mean for pasture growth, what does it mean for water availability, what does that mean in terms of the future of my cows [that belch out] methane and they're thinking [unclear] what does that actually mean for me and my industry and my farm. [Unclear] by targeted, that's what I mean by targeted. (NGO-Informal)* *Farmers don't want to come to another event talking about the science of climate change. They want to come on specifics to their farm business and how to manage the impacts of climate change or the impacts of drought.(State Government-Formal)* *I guess like I was saying before, facts about what's actually happening. What*

can I do as a person? What can I do as an individual that is going to help arrest that rate of change, or at least slow it down? A lot of people want to know, if I'm just little old me doing something, what can I do? I shouldn't be driving my car to work, I should be using the bike paths that have been provided or those sorts of…(CBO-Informal)

A lot of the information that you need is not necessarily the information that's appropriate for untrained people... So I suppose I guess if I was to say anything about that, more information written in lay terms that the majority of the population can understand. (CBO-Informal)

I think if we're going to move forward and start getting the right results, so I think there's a need for someone to be interpreting the science for the masses a little bit. (State Government-Formal)

Just breaking down those myths and fallacies and putting it into easy to understand language too, especially for regions like this where they don't want to have a whole lot of science thrown at them. They want it in lay person's talk. I think they also want to be involved in the conversation. Not just someone sitting there talking at them. That's what was good about the Bega thing as well, people did start to open up. (NGO-Informal)

Sure. So I guess, I suppose, sort of the understanding I've got is probably related to how these things affect farmers mostly. Also, I guess, sort of environment impacts, especially on the coast. So coastal impacts of sea level rise. But probably more that hits home for me is farmer productivity and what farmers are starting to see or what we're starting to see and how that's going to affect farm productivity. So with increasing droughts and that sort of more unpredictable weather patterns where a farmer used to say, for all my lifetime it's been like this but now it's not. Now it's starting to change. I think also for me it's really been understanding and from my perspective, I believe this is happening. This is happening but I'm working with a lot of people who don't think it's happening or have their heads in the sand. So mostly farmers would go it's just another change and thing. (State Government-Formal)

Challenges:

So I suppose what I'm trying to say is those two things, sort of that the highly variable management arrangements and the highly variable natural system at the moment are overriding anything we see - that we would see as being directly related to climate change. Which means that people are not adapting or preparing or even considering it [unclear] bigger levers that work, I suppose. (NGO-Informal)

I think there's - I think that we are at risk of losing our social licence.   [Unclear] being managed out of existence through very tough arrangements and costs and levies long before climate change... So I reckon that loss of social licence - will kill us long before climate change does …(NGO-Informal)

There are certainly a lot of - maybe it's a generational type thing, we do have quite an older population in this area, they tend to be a bit more cynical about those sorts of things. So that's where I think some good hard facts about the area can really help sway those opinions. (CBO-Informal)

I think we need to spend a lot more money on R&D and we've got governments pulling out of R&D in a big way. We need support with extension services and, again, we've got government pulling out of extension services all over the country; basically don't exist. So it's just making it harder and harder to get those important messages out there and to actually know what are the right things to be doing. If you have don't have the research and you don't have the people then to communicate the messages, it's pretty hard to know how are we going to adapt. That's one of the big issues. (NGO-Informal)

That's hard to pin down because it's a continuous thing. I guess just from

reading, listening to radio, good speakers. I think having a scientific background you're more - perhaps more receptive to those ideas, whereas people who haven't ever had any interest in science, perhaps they either don't understand it or don't want to understand it. So I guess I would say it's because of having that background you sort of think yeah. (CBO-Informal)

The fact that we're not - it's not just ignorance, it's avoidance, and I think that's one of the big problems that for a lot of people, because it's not immediate they can't see a cause and effect. (CBO-Informal)

Understanding there are issues out there that have potential to have big impacts on our survival in some cases and other cases it might be economic survival. Not really knowing exactly how to respond to those and probably a sense that the - I'll take fire management as an example. We've got bushfire risk management plans across the valley. We've got an excellent rural fire service, very well equipped, very well resourced, fantastic network on the ground. Is our fire mitigation work up to the kind of fire that hit Victoria in 2008? Was it '08 or '09? I don't know. No and I think everyone involved in fire management, in their bones, knows that. (CBO-Informal)

So yeah, I also think it's - people do feel quite distanced and powerless around climate change. (Local Government-Formal)

So it's almost like there's not many conversations around it because, well, what can I do about it as an individual person? So that's - I probably talk about it less. If I'm not talking about it in a work capacity, it's not a discussion that I would have regularly with people day to day, yeah. (Local Government-Formal)

We tend to cop a lot of the climate change impacts, but not necessarily are on the front foot with regards to what they may be and how the community may need to adapt to those. (Local Government-Formal)

There's such a political reluctance for the most part to acknowledge climate change that there is a lack of, there is no cohesive messages about what you can do...I perceive government agencies to be incapable of forming a position and therefore completely incapable of developing a series of actions to encourage their communities to undertake. (State Government-Formal)

That's party - and also partly becomes I think a lot of land holders, the farmers, especially the more conservative and older families down here, their culture would be to kind of be in a bit of reactionary kind of - to something - not a lot of forward planning and not a lot of thinking far away down the track. So it's kind of like oh this is happening now, this is happening now, feed the stock. No, get rid of stock. So there's this kind of management by crisis which tends to sort of dominate a bit. (State Government-Formal)

Well I think Bega is - the shire - is perhaps a-typical. It's got a high percentage of retired people. The retired people while they don't admit it have benefitted from the cheap sources of energy and they're now in a position in life where they can see that they'll be dead before the consequences become obviously apparent. So they're not unduly concerned. I think in that respect the Bega Valleys are not typical. I do think that there's a minority that are aware of the fact that climate change is very critical. There's also a minority that deny its happening. They tend to be the older people, the people perhaps in my age bracket. The young people generally tend to feel that it is happening but in general people don't know what to do. (CBO-Informal)

So I think there's a bit of a distrust generally perhaps of the scientific community. Well not a great connection anyway between the community and academia...I think the odd sceptic with a big voice certainly gets more hearing than the masses of people with a whole lot of well documented evidence. (State Government-Formal)

I'd start to list out variables like you just said, older demographic, more conservative demographic, people who - one of the greatest gamblers in

	Australia is the Australian farmer who thinks that they can - everything will be - it'll be around it's going to rain, it's going to rain, it's going to rain. So when you've got that climatic wish built into your thinking, your management strategies, rather than saying it's going to be dry and if there's rain this is really good and that's how I can take advantage of it, but they tend to go oh it's going to rain. They don't have a risk management strategy based around it not raining. So when you're coming from that background to have something that's confronting to tell you [unclear] say it's going to get worse, it will be drier, it will be hotter, then they - well it can be a head in the sand scenario really. It's a denial. (State Government-Formal)
4. Framing climate adaptation People in the community motivated to engage in adaptation as long as there are significant social and economic benefits. As such, framing adaptation to generate win-win outcomes important in the context of communication and design of policy.	*... we sold it under the umbrella of - you're giving medicine in sweet-covered pills because we're saying this is really important [unclear]. We're almost disguising it in this project about productivity and efficiency gains, helping them become more profitable because that gets their attention. If I just went out there and I said we're going talk, we're going to do a seminar on climate change; I'd hardly have anyone turn up. But if I went out there and said we're going to have seminar on how we're going to improve your resource efficiency and how you're going to get more productive and more profitable, I'll get a lot more interest because they go yeah, well that impacts me, I want to be more profitable (NGO-Informal)* *So it's about finding the message that resonates with them, which is probably an economic message or a social message or a health message. So yeah, I think there's a broader thing there. (Local Government-Formal)* *Look not to my knowledge at this point in time but that's - there's two things, one is for some of your markets that you might be talking to, so for example, grazing industries, now there's a proportion of the people within those industries who don't subscribe to climate change. So if you are marketing what you should have is a risk based assessment - sorry, your management for climate change is essentially a management for climate variability. So you really are looking at a risk basis which is underlying your financial management at the farm enterprise level. So when you go out and do extension work with individuals and farming or industry communities in general, the language there can evolve around climate variability rather than [having] people miss the message because they turn off at the words climate change. (State Government-Formal)* *That's worked really well because the surf club for example, it's got a broad cross-section of the community in its membership, none of whom would be generally all that interested in doing anything about climate change. But when we're doing a fundraiser to put solar panels on the roof they can see the economic advantage of that. It gets a wide range of people involved in fundraising for solar panels. So that's been quite an effective campaign. (CBO-Informal)* *I've got a bit of a feeling that the climate change message particularly to farmers either hasn't been sold well or has reached saturation point and people are a little bit sick of hearing it. I don't know what the percentage of deniers and believers there is. Despite the fact that 98 per cent of scientists have put their reputations on the line saying that climate change and human-induced climate change is happening, I think there are still people who cling to the idea - plenty of farmers who cling to the idea that it's climate variability; it's just a stage. (State Government-Formal)* *So to an extent because you have to change your language, because you can't talk - I'm not saying this for all audiences, but wherever you're hitting that opposition, you have to change your language, change your message and there's a lot of good information you could and should be - people could and should be getting but they're not getting. (State Government-Formal)* *It's not sexy. It's highly technical. Largely it's academic. It's the result of extensive research and works undertaken by scientists but for the most part it isn't readily simplified into bite size pieces that the community can absorb*

	effectively and incorporate into their daily practices. (State Government-Formal)