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Water, weeds and autumn leaves: Learning to be drier in the Alpine region

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Our paper explores how and what adults living and working in the Alpine region of Victoria understand and are learning about the changes to water availability, in a time when the response to water availability is subject to extensive debate and policy attention. Interviews for this study were conducted in the towns of Bright and Mount Beauty, with participants drawn from across the Alpine region. The interviews focused on what local stakeholders from the Alpine region understood about water availability in the region and how and what they had learned about living and working with climatic changes in their local area.
The findings of our study see that there was evidence of a strong understanding of the direct and indirect impact of climate change on participants' local community area. The study also sees evidence of learning through a community 'frames of reference' as outlined by Berkhout, Hertin and Dann et al.

Introduction

This paper seeks to gain a better understanding of how and what adults living and working in the Alpine region of Victoria understand and are learning about the changes to water availability, in a time when the response to water availability is subject to 'extensive debate and policy attention… [yet] problems remain largely unresolved, and crucial policy measures… have yet to be implemented in practice' (Quiggin 2008: 160).

The Alpine Shire is located about 300 kilometres north east of Melbourne, and 70 kilometres south of Albury / Wodonga. It is a regional community which comprises the three major townships of Bright, Mount Beauty and Myrtleford and is located in the Ovens and Kiewa Valleys. The region surrounds some of Victoria's major ski resorts at Mount Hotham, and Falls Creek, with smaller snowfield attractions at Dinner Plain and Mount Buffalo. The region has a vibrant history, with agriculture, gold prospecting and the construction of the Kiewa hydro electric scheme which has played a role in creating a diverse mix of history, and culture. The shire region has a population of approximately 13,000 which swells during the tourist peak seasons. Water is an important part of a prosperous Alpine lifestyle, and is central to a flourishing tourist economy located around the 'green' aesthetic of the area, the ski season and the well known autumn leaves that capture the imagination of tourists each year who travel to Myrtleford and Bright simply to enjoy the colours.

According to the CSIRO, since the early 1970s, Australian droughts have become more severe as a result of warmer than average temperatures. Projections for increased temperatures and reduced annual rainfall are likely to further increase the risk of drought, predicted to increase by between 10% and 80% in the southern half of the state and by between 10% and 60% in the northern half by 2070 (State Government of Victoria 2008).

CSIRO estimates that by the year 2030, the catchments in Victoria that are located in the north–east and south–east may experience up to 30% reductions in runoff (State Government of Victoria, 2008). With the likelihood of higher temperatures there is an expectation of a shortening of the snow season in the Australian Alps with a higher proportion of precipitation falling as rain rather than snow. For the Alpine region, snow plays a critical role in storing winter precipitation and contributing to the seasonal runoff peak in late spring (Western et al. 2008). By 2020, a 10–40 per cent reduction in snow cover is predicted, resulting in decreased snow melt and runoff to downstream sites (Department of Climate Change 2008).

Along with the likelihood of a reduced snow season there is a predicted increase in the frequency of bushfires, which may result in short-term increases in stream flow, followed by longer-term reductions as forest regenerates. It is estimated that regrowth of vegetation following the 2003 Alpine fires will reduce flows to the River Murray by up to 700 gigalitres (GL) a year or 10% of mean annual flow, with the maximum reduction in flow expected to occur 20 to 25 years after the fire and ongoing impact continuing for another 80 to 100 years after that (State Government of Victoria 2008).

Design of the study

As with other papers in this special edition, a discussion of the methodology for the *Learning to be drier* project is outlined in the *Setting the Scene* paper. The present discussion will focus on some of the specific design elements of the research conducted in the Alpine site. The research was conducted in the Alpine shire region, with interviews conducted in the townships of Bright and Mount Beauty involving participants who travelled from across the shire. An initial reconnaissance visit was conducted in mid April, where we travelled to the Alpine region, allowing ourselves to be situated in

the region and experience its visual [beauty] along with introducing ourselves to local people and inviting them to participation in the project. We found on our reconnaissance visit that in most cases people were very interested in the project and extremely willing to be involved. Following the reconnaissance visit a second visit took place in late May for a period of 2 days. This allowed for a further Alpine experience in Mount Beauty, Bright and the surrounding area and a visit to Albury for an interview at the North East Water Corporation. The second visit involved conducting focus group interviews with all of the participants. The interviews were conducted with 5 separate stakeholder groups; these were adult educators, community members, which included people involved in the local fire brigade, local business owners, farmers, retired people, members of the University of the Third Age (U3A), interest groups and local authorities. The interviews focused on what local stakeholders understood about water availability in the region and how and what they had learned about living and working with climatic changes in their local area.

As with all of the papers involved in the *Learning to be drier* study, our paper is based on transcript data in the form of participant narratives taken from audio-recorded focus group interviews. The research method for our paper sees the collected interview data as personal narratives or stories, allowing the participants in the research to tell their own stories of how they learn about the changes in climatic conditions in the Alpine region in a way that is reflective of their own experiences and opinions, and representative of the diversity of people in the region. Using narrative as our method brings *life* through the spoken stories of real people living in the Alpine region, rather than our interpretation of their stories. In what follows under 'stories from the field' are narratives or pieces of exact transcribed data represented in four commonly occurring themes identified across the data. Many of the participants who informed this study spoke from multiple perspectives; for example, we interviewed

farmers who were involved in local shire and community groups along with local business owners who had a level of involvement in the tourism industry. As each interview progressed, participants moved between their various role identities with the result that, it was not possible to attach specific role identities to individual extracts from the transcripts.

Stories from the field

This research project set about to find out what people in the Alpine region are learning in response to changes in water availability. From the data in this study, we were able to identify some commonly occurring narrative themes as occurring across the participants' responses. These themes were seen as constructing common understandings of what people had learned about climatic changes in the Alpine region and what was impacting or had/is affecting them over the past several years around climate change. The narrative themes or markers were identified as occurring or fitting into four distinct themes, these themes were; Learning, Fire, Water and Tourism.

Learning

Learning about changes was the key sentiment behind our research. Adaptation to climate change is described in the literature as a process of adjusting to the impacts of climate change in such a way as to reduce the magnitude of the consequences experienced (Berkhout et al. 2006: 135; Preston and Jones 2006). Climate change adaptation is anticipated to occur at a number of levels: government policy (PMSEIC IWG 2007), business and organisational (Berkhout et al. 2006), community (DPERSP 2008), and individual (Blackadder 2005).

For adaptation to occur, certain conditions need to exist. Berkhout et al.(2006) argued that 'before change can be initiated, a signal

needs to be recognised as evidence of a novel situation, in response to which existing routines are inappropriate or ineffective' (p.138). Organisations tend to operate within established frames of reference, and resist conclusions that challenge these frames of reference 'often in the face of considerable counter-evidence' (p.138). This raises the question of whether the existing or foreseeable impacts of climate change in the Victorian Alpine region were such as to represent a 'novel situation' to which established water use routines would be seen as an inappropriate or ineffective response.

Certainly from the narratives, learning about dryness was a topic that participants were keen to discuss. When asked about where or how people learned to adapt to change conversations were broad ranging and clearly connected to the participants' backgrounds, livelihoods or where they were situated. One commonly occurring conversation particularly was around the need for community to be informed:

> … I think we need to have across the community a conversation about the way in which we value water, not in dollars and cents but what all the elements of water gives us. Its only when we have an understanding at a community level of what we want water to deliver that we can get the highest value use for it.
>
> They all use water and they all have access to water for one reason or another and to extract the wisest value use of that water the community needs to have a discussion about what we need them to achieve but also recognize that things are changing.
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> I think it is an education thing, I really do, I think people need to be much more aware of where the water actually comes from and what difference does it make if we do things … like you say 'if I do this, is that going to make a difference?' … and we don't know, so there's not enough research and there's not enough information out there, so you can't make a valued judgement.

People were also keen to discuss more formal education program availability not only in schools but more broadly in the community:

> … I think to actually educate people about water usage and why and how and what happens to it, how they can have an impact on the environment one way or another if you do this or do that.

In addition to education programs developed for the community to learn about adaptation to change, some participants saw more practical hands-on water education strategies as an important way to educate people to help themselves in a practical sense. These strategies related to learning how to build water saving systems such as micro spray or micro drip systems:

> … but for the people on town water supply where they are not actually taught how to put in water systems, like micro drips and micro sprays, it's usually just a blanket 'don't do this' … in actual fact they could probably flood water a hose for an hour. If you actually had people taught how to use micro sprays they could probably use the same amount of water any time they liked… It might be just a lack of education for people on how to use the micro irrigation, it's very effective, it can even be effective on big scales. You never see anything coming out of the Water Authority at all about that.

Along with discussing water saving measures and education of the community around water saving strategies, there was a perhaps not so surprising feeling from some of the Mount Beauty participants that water was in abundance in the area because of the hydro-electric dams and their perceived relatively high rain fall compared to other parts of the region.

> The local Water Authority, North East Water send out a pamphlet every now and then about saving water … there was a bit about voluntary restrictions or whatever it was … it doesn't work at our place, we have got a huge property and I have got a vineyard and a lot of town water goes on to that because I can. People don't seem to really seem to worry about water up here because we have got plenty. A good argument is that it goes down the stream to someone else, ultimately it all ends up at the mouth of the Murray which is silted up … whether that should

> be clear or not I don't know, there are arguments that it was originally silted up and then it was clear and now its silted up again, which is a cyclical thing. I think we should be reducing the amount of water, but it's very difficult to get people to do things voluntary.

The feeling down further in Bright was not as optimistic as up stream in Mount Beauty, where water availability is dependent on winter snow melt into the Ovens River:

> … a lot of our water flows from the high country, it is collected up there and comes down to our river systems.
>
> … our winter flows are our high flows where we are an unregulated system here in the Ovens so we rely heavily on the flow of water in the rivers and that is certainly our peak time… in terms of the water use for most of the people in our area there is no dam as such it is just relying on what's coming down the river. There is no real winter storage.

The difference in participants perception of water abundance and availability might be evidence of what Berkhout et al. (2006) suggested as community members from different locations establishing what he describes as a novel situation, that of a perceived 'abundance of water' in one community over the belief that a neighbouring community had less water.

Water

With forest catchments, national parks, and facilities such as Buffalo Dam, water harvesting is one of the main land uses in the Alpine shire. While there is abundant research suggesting that climate change will significantly reduce water availability in the Murray-Darling Basin overall, one major study (CSIRO 2008b) suggests that the direct impact of climate change on townships in the Victorian Alps is anticipated to be less severe than in other regions. Anticipated changes in snow levels, and winter precipitation and (Western et al, 2008) suggested decreased snow melt and runoff to downstream

sites by 2020 (Department of Climate Change 2008). Yet when one CSIRO study (2008b) modelled three different climate projections for the Victorian Alps in 2030, the impact range from a 'best estimate' projection of 'negligible impact' on surface water use, a 'wet extreme' projection in which water availability would be expected to increase slightly, and a 'dry extreme' projection in which water availability for the whole Ovens Region would be reduced by 45 percent. Under the 'dry extreme' model, the direct impact on water availability in Alpine townships such as Bright anticipated mild water restrictions in 62 percent of years, and severe restrictions in 21 percent of years (CSIRO 2008b, p.4). This once again raised the question of whether the existing or foreseeable impacts of climate change on Alpine communities were such as to represent a 'novel situation' to which established water use routines would be seen as an inappropriate or ineffective response (Berkhout et al.2006, p.138).

The fieldwork data suggests that this was the case. Clearly water was a significant point of discussion with the respondents. When asked about water availability and where water came from in the region all of the respondents were able to define where their water was sourced.

> All our water comes from the sky, we don't have any ground water in our place, I live out in the country. If it doesn't rain, the ground water doesn't exist, the ground water dries up in late Spring, so we now have 60,000 litres of storage capacity and its not enough. It is, but if we had bushfires there wouldn't be enough water there. Without that sky water we are out of touch … we tried to get some water but we go through so Murray Goulburn and you have to send in an application.
>
> As far as Mt Beauty goes the water comes from up at Falls Creeks that's where it's captured, a lot of it is snow melt. What I know about it is that it is stored in those hydro dams or whatever they call them and then slowly released into the river. Our water is used for hydro and it gets used a few times on its way down the mountain which is pretty good I reckon.

Some participants had extensive understandings of where the town water was sourced:

> … we have water catchment areas, there's one above Mt Beauty, one above Tawonga South I think another one in Tawonga South further down so there are three catchment areas as far as I know.
>
> There's a specific amount of the hydro water must be kept for the town supply, North East Water has got a guaranteed supply based by Southern Hydro and that is written in stone luckily, even though we get restrictions we are actually guaranteed of that supply. Falls Creek has a guaranteed supply out the Irrigation Licence and Water Use Licence. So the snow making allocation, although that allocation is actually set up in the way of an irrigation, and because the water flows back into the dam it can then be used again, all they are doing is catching the snow so it recycles, but if they spray water below the dam so that it doesn't go back into that catchment to make snow below the race lines … do you know how that works?

There was also awareness that the Alpine townships were better positioned in water availability than other parts of the region.

> We're lucky because we have Rocky Valley Dam up top, we are a lot luckier than the Ovens Valley side because they don't have that retaining of water, so we have always had a running all year around with the river, whereas the Ovens … we are a lot luckier than over the Ovens Valley that's for sure.

Certainly as indicated under the learning section, water seemed to hold a different value position depending on the location of the participant. For the community of Bright, the notion of Berkhout et al.(2006) frames of reference hold here. While for the Mount Beauty residents up stream have a frames of reference that sees water as abundant, Mount Beauty residents only 25 km down stream see water as this participant appropriately puts as:

> … a real issue for our communities, particularly Bright because we rely so much on the flow of water coming down. Over the past few years in drought conditions the water flow has been fairly low.

Weeds: fire & environment

Hennessy et al. (2003: 17) projected climate change impacts on biodiversity within flora and fauna in the Alps. Williams et al. (2008) concluded that while Australian flora and fauna were resilient to the effects of infrequent fires, slow rates of post-fire regeneration raised concerns about the impact on biodiversity of more frequent or more severe fires resulting from climate change (p.806). In particular, Williams et al. reported that native Alpine bogs were found to experience significant invasions of exotic weeds such as willow after large fires, representing a significant threat to biodiversity that would require an effective control program (p.803).

When asked to explain about changes in the environment over the past 5 years participants under this theme discussed how fire was an ever present concern to the people of the Alpine region. Fire not only had a direct impact on the environment in terms of the loss of forests and the risk to life and property. Other concerns raised were around the impact of the 2003 fires on the region relating to weeds and the ongoing impact on the environment.

> After the 2003 fires I think it was really dry and then around 2006 it was drought then as well and that's just the general knowledge. Again since then up on the high plains we haven't had too bad rainfall… after the 2003 fires there was a real concern about what was happening in the wetland in the high plains and that's generally the sphagnum wetland because we still had cattle grazing in 2003 which then stopped after the fires … so they didn't let them up after the fires and then they stopped cattle grazing on the Alpine area.
>
> We are still working on the bogs … the other thing with the bogs, it's not the fires, but you have long term cattle grazing, you've fox, horses and you've got the aqueducts and the roads and the trucks that have all impacted and taken water away out of these systems. Again no research has been done on the history of these wetland, because if you are talking about peat, has that

> peat contracted over time and there is evidence that we are seeing now that there are a lot less in extent than they were and that's possibly through that climate change happening anyway … the aqueducts and things like that and getting less into the system and more transpiration that will change the dynamics of those systems as well … but we are not formally monitoring or researching some of those.

Some of the participants in the study particularly amongst the local authorities were involved with the implementation of environmental programs after the fires to assist with the eradication of weeds.

> Green Core run 6 months program for youths aged 17–20 so we have had them doing a few projects to improve the water quality, mainly focusing on willow removal and blackberry removal and re-vegetation with needs, but they also do water quality testing as well. We do a number of projects, the major one being willow and blackberry removal along the Ovens river, so that's working with Parks Victoria and DSE and Catchment Management Authorities, so bringing all those resources together.

> A fairly important issue up here [Bright] is improving and regaining our water quality and people see that as a big draw card for this area… because of the last fires the trees are under a great deal of stress because we had two fires in fairly close proximity and drought on top of that and the natives are really struggling.

The effects of fire were also impacting on the Alpine water quality, for the region according to this respondent that affected water usage and availability:

> … during the fires we went to Stage 4 a couple of times but that was only because the soot and rubbish was coming down the water supply … if you used the water you would put it through the system so they were trying to stop the people using the water so that … they could clean it.

Other issues around fire in the region were the loss of not only indigenous trees but exotics as well:

> We lost a hell of a lot, [trees] the fire came up over the dam area really fast and killed off a lot of the exotics and cypress and that sort of thing … we had a big clear out so there are a lot less trees than there used to be. As soon as we plant them the deer wreck everything.

For the respondents in this theme, fire and its impact on the environment, personal safety, water quality and its overall impact on the aesthetic of the Alpine region was a hot topic, most particularly keeping in mind that the interviews took place in mid May and the Black Saturday bush fires were only 3 months prior on 7th February. These fires were dangerously close to Mount Beauty and Bright and threatened Mt Baw Baw, causing significant damage to the Lake Mountain and the Alpine Resort along with the Beechworth fires which burned through 31 thousand hectares.

Certainly there was a very strong connection from the participants in the study that the most significant impact on the region was through the risk of fire and its ultimate impact to the local community. This impact was not only seen through problems with post-fire regeneration on the biodiversity of the region, and the invasions of exotic weeds but also on the impact on the beauty of the region through direct fire damage. Participants in both Bright and Mount Beauty expressed concern about the risk of damage to the 'green' aesthetic of the Alpine area but also to the death of exotic mature trees in the arboretum reserves that drew visitors to the area.

Autumn leaves: tourism

Tourism is the major industry within this region, and the Alpine Region Tourism Board expressed the goal of increasing visitation to the High Country (ARTB 2008: 11). A CSIRO study to project the impact of climate change on natural snow conditions in Australia forecast reduced snow cover including a rise in the natural snowline with reduced or no snow cover on lower slopes, a reduction in the

duration of the annual ski season, and a reduction in the depth of snow (Hennessy et al. 2003). The report concluded that '[A]daptation to climate change will be necessary at all ski resorts' (p.37), with the proposed adaptive strategies including increased use of artificial snow-making. The projected changes to snow cover had clear implications for winter ski season tourism. The fieldwork revealed a high level of awareness and concern in Alpine communities of the potential impact of climate change on tourism, which could ultimately impact heavily on jobs and the economy of the region.

When asked about the affects of climate change on the Bright and Mount Beauty areas, the impact on the tourist industry was unmistakable. The changes in climate, water availability and the devastation through fire had all played its part on the way locals felt about the future of the tourist industry, and the future of the region.

> …We have certainly seen some big impacts on some of our trees. We look at how we manage our key feature avenues…They [Autumn trees] are probably our biggest asset…They are what people come up here [Bright] for.
>
> I guess the peak tourist time is spread out during the year, but winter a lot of people might stay in Bright or they pass through going up to the mountains. There's always a lot of people.
>
> There are quite a few recreational opportunities; people use Bright as a base to go to the high country.
>
> If you look at Bright we are a major tourist town and our major tourist time is summer which is when the river flows at its slowest so you have got like two competing demands there.
>
> I guess the peak tourist time is spread out during the year, but winter a lot of people might stay in Bright or they pass through going up to the mountains. There's always a lot of people.

The impact on the tourist industry is as diverse and complex as the Alpine region itself. Certainly the tourist industry is the lifeblood of

the region. Tourism is not only related to snow falling to facilitate a good ski season, but it is also how much snow falls depends clearly on how much water is ultimately available not only to the immediate region but further down the Murray-Darling catchment.

Green trees, and green lawns are representative of what visitors to the region expect of Bright, Myrtleford and Mount Beauty. This is arguably why many people visit the region in summer, according to this participant strategies for keeping the 'expectation' of green for the tourists was high on the agenda:

> …people like to see green, so we have in the past chosen a couple of key parks … on being down at the river pool area where we get high numbers of people going down there and we maintain water onto those areas, but others we just don't water during the summer months.
>
> Our Parks and Gardens guys also use water crystals when they are doing any planting and they are investigating using foam to put through the grass which acts as a wetting agent as well, so reducing the amount of times that we have to water. I guess being a tourist down there still has expectations that if people come up from Melbourne or other areas they like to see greenery and like to relax so there are still those expectations that we should water our key parks.

Maintaining tourist expectation is undoubtedly impacted by climate change through the maintenance of exotic trees for their autumn displays, through the maintenance of parks and forest regions for the tourists to walk and hike through. The risk of weed infestations, fire that can devastate appearance, of natural areas, that can kill exotic trees and leave ongoing weed and biodiversity issues are plainly significant climate change concerns for the region.

Discussion

Conversations with participants indicated that people in the Alpine region are aware of a range of impacts around climate change in their

community, and were identified as having a clear understanding of water availability in their local communities. There was some suggestion that levels of awareness and adaptation varied according to people's location in the region and their access to water resources. Essentially this meantthat those who were situated higher up the catchment area understood water availability as being more abundant than those further down the river. A range of considerations beyond the direct impact of climate change may influence a community's ability or willingness to adapt or perhaps change their adaptations around what is seen to directly impact of affect the local community. Berkhout et al. (2006: 151) explored climate change adaptation as a learning process, identifying where the direct impacts of climate change were experienced there was a greater likelihood of adaptive responses being adopted. In contrast, where the experienced impact of climate change was indirect, there was a greater likelihood of a 'wait and see' response. In some cases, indirect impacts rendered climate change 'a hypothetical notion' rather than an 'everyday reality'; something of relevance to government policymaking rather than local business decisions (Berkhout et al. 2006: 147). Certainly the range of people's responses to learning to be drier involved issues relating to climate change that were in some cases indirect. These issues focused around fire and its impact on the local tourist industry and on the environment more broadly. The changes in climate, the reduction of water availability, the changes to snow cover and length of the snow season along with the destructive impact on the indigenous species of flora and the exotic deciduous species of the area was being felt by many of the participants in the study. The effect of this impact was related to the aesthetic [beauty] of the region and its *value* for the local tourist economy.

In the Australian literature, complexity, uncertainty, long timelines and interpretation by experts all emerged as themes. Key government reports on water availability, climate change and dryness explicitly acknowledged uncertainty around the impact of climate change in

general (CSIRO 2008a; PMSEIC IWG 2007: 17), and with specific reference to the impact on Alpine regions (CSIRO 2008b; Hennessey 2003). This complexity gave rise to a perceived need for information to be interpreted by experts as a key tool for adaptation planning (PMSEIC IWG 2007). The focus on complexity and uncertainty in some literature stood in contrast to other literature that showcased a variety of immediate and practical adaptation strategies adopted by farmers in response to the direct impact experienced from climate variability and dryness (Blackadder 2005).

Conclusion

The affects of climate change are likely to see the social fabric and social capital of rural and regional Australia threatening the viability of some regional communities (Hogan et al. 2008). Certainly for the community members involved in the study, there was evidence of a strong understanding of the direct impact and economic cost created through climate change on their local community area. What was also identified in the data was that the 'frames of reference' from where the participants were situated, that is their local communities, focused their understandings of climate change around the issues relating to the impact of climate change on their 'patch' of the Alpine region specifically. This is consistent with Hartz-Karp's (2007:5) observation that the impacts and effects of climate change tend to 'begin at the local level' where lobby groups and communities are 'doing it for themselves' before working toward a larger dialogue to determine initiatives that might best work at the state level. Hartz-Katp picks up on what Michael Booth and others (2006) have called 'practical wisdom', the experience, insight, understanding and local knowledge of 'ordinary people' learning about the challenge of climate change from their local focus. In this study the evidence points to what Berkhout et al. (2006: 151) categorises as 'handling and managing' risks. This was evidenced in the strategies identified, where local approaches were adopted around ongoing environmental projects and

through strategies to maintain tourist expectations, manage fire and weed damage while at the same time minimising water usage.

This study, and we borrow from the title of the Drought Policy Expert Review Social Panel (2008), '*It's about people*', is most definitely about the local people that live and experience climate change from the reference point of the Alpine region, and more specifically those located up river and those located down river. Certainly the Alpine region is no doubt beautiful, diverse, vulnerable to and through fire and drought and cherished by local community members and visitors alike. What we have seen in this small glimpse is evidence of learning through a community 'frames of reference' Berkhout et al.(2006: 138) arguably situating their community learning outside of a more universal understanding of climate change to a more localised focus. What we would suggest from our small study is evidence of a community involved in the beginning stages of a constructivist learning approach to climate change, that is, using a local focus …that 'assists [the community]…to examine the implications of climate change…in relation to a familiar, local context (Bardsley & Bardsley 2007: 332).This could be seen as the beginning of a stage of learning, understanding and managing change at the local level, in its initial stages and culminating or developing over time to a larger scale dialogue, as the process of learning broadens to determine the initiatives that might work best for the state (Hartz-Karp 2007).

References

Alpine Region Tourism Board (2008). *Alpine region tourism strategic plan 2009–2011*, http://www.alpineshire.vic.gov.au/files/Council/ART_strategic_tourism_plan_2009–2011.pdf, Accessed 25 September 2009.

Bardsley, D. & Bardsley, A. (2007). A constructivist approach to climate change teaching and learning, *Geographical Research* 45(4): 329–339.

Berkhout, F., Hertin, J. and Gann, DM. (2006). *Learning to adapt: organisational adaptation to climate change impacts*, http://www.springerlink.com/content/0103771771320353/, Accessed 24 September 2009

Blackadder, J. (2005). *Masters of the climate: innovative farmers coming through drought*, Land and Water Australia, http://www.managingclimate.gov.au/Masters_of_the_Climate/index.html Accessed 24 September 2009

Booth, M. (2006) 'Public engagement and practical wisdom' in S. PAULIN (ed.) *COMMUNITY voices: creating sustainable spaces*, Perth, Western Australia: University of Western Australia Press, pp. 12–26.

CSIRO (2008a). *Water availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, October 2008, http://www.csiro.au/files/files/po0n.pdf Accessed 24 September 2009

CSIRO (2008b). *Water Availability in the Ovens: Summary of a report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*, January 2008, http://www.csiro.au/resources/pf15d.html Accessed 24 September 2009

Department of Climate Change 2008, *Adapting to Climate Change: Victoria —Summary of Projected Impacts,* http://www.climatechange.gov.au/impacts/regions/vic.html Accessed 22 September 2009

Drought Policy Expert Review Social Panel (2008). *It's About People: Changing Perspective. A Report to Government by an Expert Social Panel on Dryness*, Report to the Minister for Agriculture, Fisheries and Forestry, Canberra, September, http://www.daff.gov.au/agriculture-food/drought/national_review_of_drought_policy/social_assessment/dryness-report Accessed 24 September 2009

Hartz-karp, J. (2007). *Climate change policy: the 'joined-up community' approach*. http://cpd.org.au/article/climate-change-policy-joined-up-community-approach Accessed 6 November 2009

Hennessy, K, Whetton, P., Smith, I, Bathols, J, Hutchinson, M and Sharples, J. (2003). *The impact of climate change on snow conditions in mainland Australia*, CSIRO Atmospheric.

Research, Victoria, http://www.cmar.csiro.au/e-print/open/hennessy_2003a.pdf Accessed 25 September 2009

Hogan, A; Polidano, C; Russell, J and Stakelum, P (2008). *The social wellbeing of rural Australians: an analysis of the household, income and labour dynamics in Australia (HILDA) longitudinal dataset*. Report prepared for the Drought Review Branch Australian Government Department of Agriculture, Fisheries and Forestry.

PMSEIC Independent Working Group (2007). *Climate change in Australia: regional impacts and adaptation: managing the risk for Australia*, report for the Prime Minister's Science, Engineering and Innovation Council, Canberra, June, http://www.dest.gov.au/sectors/science_innovation/publications_resources/profiles/climate_change_in_australia.htm, Accessed 24 September 2009

Preston, B.L. & Jones, R.N. (2006). *Climate change impacts on Australia and the benefits of early action to reduce global greenhouse gas emissions*, A consultancy report for the Australian Business Roundtable on Climate Change, February 2006, Commonwealth Scientific and Industrial Research Organisation, Australia, http://www.csiro.au/files/files/p6fy.pdf, Accessed 24 September 2009

Quiggan, J. (2008). 'Managing the Murray-Darling Basin: some implications for climate change policy', School of Economics, Nathan: University of Queensland.

State Government of Victoria and the Victorian Traditional Owners Land Justice Group 2008, Victorian Native Title Settlement Framework, State Government of Victoria, Melbourne.

Western, A., Siriwardena, L., Lawrence, R. & Rutherfurd, I. (2008), 'Sponges or wicks? What is the role of bogs in hydrological response on the Bogong High Plains?', Water Down Under 2008.

Williams, R., Wahren, C., Tolsma, A., Sanecki, G., Papst, W., Myers, B., McDougall, K., Heinze, D. and Green, K. (2008). 'Large fires in Australian alpine landscapes: their part in the historical fire regime and their impacts on alpine biodiversity', *International Journal of Wildland Fire*, No.17, pp.793–808, http://www.publish.csiro.au/?act=view_file&file_id=WF07154.pdf, Accessed 24 September 2009

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